

Students' Use of Mind Mapping Strategy in the Psychology Department



Received: 17/07/2025; Accepted: 12/10/2025

Ammar AOUN^{*1}, Ahmed FERHAT²

¹ Teachers' Higher College Mostaganem (Algeria), email. a.aoun@ens-mostaganem.dz

² University of El-oued (Algeria), email Ferhat-ahmed@univ-eloued.dz

Abstract

The current study aims to reveal the level of student use of the mind mapping strategy in the Psychology Department. The study sample consisted of (170) students, including (160) female students, during the 2023-2024 academic year. The descriptive exploratory approach was used, and a questionnaire prepared by the researchers. The study results revealed:

- Students' level of mind mapping use was low.
- There was variance among students regarding mind-mapping which necessitated the teaching and use of these technological programs through computer science classes and training students on them.

Keywords

Students;
Mind-mapping strategy;
Psychology Department;
Technological programs;
Computer.

الكلمات المفتاحية

الطلبة؛
استراتيجية الخرائط الذهنية؛
شعبة علم النفس؛
البرامج التكنولوجية؛
الإعلام الآلي.

استخدام الطلبة لاستراتيجية الخرائط الذهنية في شعبة علم النفس

ملخص

تهدف الدراسة الحالية إلى الكشف عن مستوى استخدام الطلبة لاستراتيجية الخرائط الذهنية في شعبة علم النفس. بلغت عينة الدراسة (170) طالب من بينهم (160) طالبة، وتم ذلك في العام الدراسي: 2023-2024. استخدم فيها المنهج الوصفي الاستكشافي، وأداة الاستبيان من إعداد الباحثان. توصلت نتائج الدراسة إلى:

- مستوى استخدام الطلبة للخريطة الذهنية كانت بدرجة منخفضة.
- تبين بين الطلبة فيما يخص الخرائط الذهنية حيث وجب تدريس واستخدام هذه البرامج التكنولوجية عبر حصص الإعلام الآلي وتدريب الطلبة عليها.

* Corresponding author. E-mail: a.aoun@ens-mostaganem.dz

Doi:

I- Introduction :

Teaching is consider one of the most important and glorious efforts and tasks of a teacher. He is like the captain of a ship, possessing characteristics and qualities that befit the teacher, providing him with the best images and presenting him in the most beautiful form befitting his position as a teacher. Teaching varies in its methods, mechanisms, and means, as well as in its presentation forms, strategies, and techniques. Perhaps the most important and modern of these important teaching strategies are the concept maps strategy and the mind maps strategy (mental, as their theorists and discoverers called them).

The first teaching strategy—the concept maps strategy—as we have presented it, helps create connections between concepts, facilitating their learning and retention. It is an art and creativity in employing, shaping, and distributing knowledge in the form of a map that the student completes as a summary of his lesson, explicitly relying on the meanings and key words of the lesson. The mind maps strategy is no less important than concept maps in teaching. While the former is similar in planning, it differs in its modern form in its reliance on contemporary technology programs such as (Vue map).

Between these and those, the student chooses a strategy that relieves him of the burden of condensing and cramming information, condensing it into concept maps or mind maps. In order to master and learn these strategies and their application, the student must understand their value and essence, on the one hand, and their importance and objectives, on the other, in order to understand what he is doing. The purpose of all this is to facilitate and understand his lessons in a way that spares him the length and complexity of the lessons, making it easier for him to review his lessons after completion.

The effective and successful teacher trains his students in such modern teaching strategies with the goal of achieving a greater educational return, which the student derives from his acquired knowledge and abundant information, using his own unique style of applying that knowledge and information, a product of his learning. The intelligent learner, if he learns and practices such strategies, is a creative, accomplished and organized thinker, just like someone who traces the light of knowledge to illuminate his path. Therefore, the student needs to have creative thinking and visual and auditory perception in order to organize, plan and draw such strategies and create them in the required form and with all the values and knowledge controlled according to his skillful behavior. In this way, he can reach the stage of brilliance and efficiency in achieving the design, implementation, assembly, drawing, review and evaluation of these strategies after completing them in practice at the level he deems appropriate for himself.

This field image demonstrates that the strategy is a place and space, like a playground. The knowledge, topics, and lesson elements are like a competition in which all these knowledge and elements interact. The student—the student—controls the interaction of these elements within the playground, which he has prepared in terms of formulation, organization, composition, retention, and comprehension. This is follow by the retrieval stage for studying and reviewing, followed by the production stage based on his cognitive inputs, which are the fruit of his work and efforts, which he then uses to answer exam questions.

I.1. the Problem and Questions of the Study:

It is neither easy nor impossible for a diligent and persevering student to complete and design their work and lessons in the form of mind maps. Based on this, the reality of modern teaching strategies and their application by students affects the level of teaching and the learning and teaching process as a whole. This is where the problem of our current research began and focused, with its content and purpose: the level of students' use of modern teaching technology in the Psychology Department using the mind map strategy.

In this research, we attempted to answer the following exploratory questions:

- What is the level of students' use of mind maps?
- Are there differences among students in their approach to training on electronic mind maps?

Research Objectives:

The current research aims to identify students' level of use of the mind map strategy to develop their knowledge and explore how to deal with the processes of comprehension, indoctrination, understanding, retrieval, and study.

Research Importance:

- The use of mind maps has an impact on developing students' knowledge and their achievement in their lessons.
- To reveal the effectiveness of using the strategy from students' perspectives in teaching courses.
- The mind mapping strategy helps students with comprehension, linking lesson elements, recall, understanding, and review.
- To reveal the practical aspect of students' use of the strategy through computer-based mind mapping.
- To encourage students to use modern teaching strategies by developing and fostering creative thinking in applications, training, and practice, with the aim of developing their cognitive, emotional, and behavioral (skill-performance) skills.

Terminology of the Study:

Students:

Are those learners studying at Algerian universities, whether at the undergraduate, master's, or doctoral levels, through colleges, institutes, or higher schools designated for pursuing their university education in the Algerian state.

Mind Mapping Strategy:

Tony Buzan defines mind-mapping strategy in his book "Using Mind Maps at Work" as "visual forms for taking notes, which create by one person or a group of people. At the heart of the form is a central idea or image. This idea is then explored through branches representing the main ideas, all of which are connected to the central idea" (Buzan, 2006, p. 8)

We define it procedurally as:

An educational strategy based on specialized computer programs (Vue map). It is prepared by the student to ensure its effectiveness in the educational situation, and to structure, organize, clarify, and facilitate retrieval of ideas in the form of a tree. It includes basic central ideas, branching out into partial and secondary elements. We also use diagrams to illustrate the main and subsidiary ideas related to any topic or educational content relevant to the student. Mind mapping aids in teaching, recall, planning, thinking, and information retrieval. Theoretical Framework and Previous.

I. 2. Studies on the Subject of the Current Study:

Based on the study's terminology, and based on the literature contained in various references and research that addressed the strategy of mind maps, we can provide a section that illustrates these features in the following steps:

A) The differences between concept maps and mind maps (Budd, 2004)

Table .1. Illustrates the differences between concept maps and mind maps.

Nominalization	Concept Maps	Mind Maps
The shape	Pyramidal, with the general concept at the top of the mind map, followed by less general concepts.	Radial, with the general idea in the middle and sub-ideas scattered throughout.
Composition	Relies on the relationships between concepts, connecting them with connecting words that clarify the relationship between them.	Relies on tree branches, or what known as tree structure.
Dependence	Relies on concepts, their arrangement, and the connections between them.	Relies on cognitive structures as a whole, including concepts, rules, principles, and theories, meaning analyzing the content as a whole.
Concepts	Are abstract and only show the relationships between them.	Concepts shown in detail, showing the relationships between them, their extensions and transformations, and identifying the processes and conditions that lead to these transformations (depending on the interpretation and analysis of the components that comprise the subject).
Colors and Images	Colors and images are use less often.	Colors and images are use more often.
Area of Use	Created and drawn on paper.	Created on paper or via computer software.

It is note from the previous table that concept maps and mind maps are somewhat similar. The difference between them lies in the position of the general form and concepts, the degree of use of images and colors, and the areas of use.

b) Educational Applications and Shortcomings:

Many studies and references (Al-Saadani & Awda, 2006) have addressed the educational benefits of the mind mapping strategy. The most important of these are lists below:

- Linking new experiences with existing ones by presenting a large amount of data and information, arranging and organizing them in an attractive manner, and demonstrating the interrelationships between these data.
- An effective, creative means of taking notes and summarizing information in an easy manner.
- A means of storing information, memorizing, reviewing, and thinking creatively.
- Aiding in planning teaching and learning processes.
- Developing the learner's personal cognitive, emotional, and skill-based skills.
- Saving time and facilitating planning for educational objectives.

Despite the importance of mind maps in the educational process. Some shortcomings may hinder their use:

- Requires a competent teacher with a degree of experience and knowledge of the philosophy of this strategy.
- Lack of teaching aids required for mind maps, such as projectors.

- They require a significant amount of training before students become proficient in applying them.
- They may take on a complex and intertwined form, which reduces student comprehension (Al-Janabi, 2011, p. 69)

C) Previous Studies:

Numerous studies and sources have addressed the use of the mind mapping strategy:

(Abu Al-Hassan, 2023) Study aimed to identify the effect of using mind maps on developing the musical reading skills of first-year female students at the College of Early Childhood Education. The study was applied to (20) first-year female students (Teacher Preparation Program). Among the results: There were differences between the students' average scores on the pre- and post-music achievement test, in favor of the post-test, using the mind mapping strategy.

(khairy, 2019) Sought to measure the effectiveness of the electronic mind mapping strategy in developing the acquisition of stock market concepts among students of the Advanced Commercial Technical School (Marketing and Capital Markets Department). The study was applied to a sample of two experimental and control groups, each with (35) students. The results indicated that there were differences between the experimental and control groups in the post-test application of the cognitive test, in favor of the experimental group. There were also differences between the experimental group students in the pre-test and post-test application of the cognitive test, in favor of the post-test. Furthermore, the electronic mind mapping strategy had a significant impact on developing the acquisition of stock market concepts among students in the Advanced Commercial Technical School.

(Harkirat, Makarimi, & Anderson, 2010) Also compared constructive mind maps with the traditional method of teaching physics. It confirmed the effectiveness of constructive mind maps in improving the comprehensiveness and coherence of the mental structure, as well as the coherence of knowledge, for students in the experimental group compared to the control group.

(Erdem, 2017) Also emphasized the importance of mind maps as a method for lifelong learning, especially in light of the constructivist theory for university students, and their importance in creativity, problem-solving, concentration, and organizing ideas.

Previous Studies:

Previous studies are considered a starting point and window into our study of this research, given their importance in scientific research. Their importance lies in expanding the knowledge and information base on the topic under study, ensuring the importance of the study and its distinction from other studies. They use to:

- Select the most appropriate methodology for the research.
- Utilize the measures used in previous studies.
- Interpret the results of the current study and discuss them in light of the results of this study.

Similarities and differences with our current study found in the following:

- Most studies addressed mental maps among university students.
- In our study, we chose a random sample, while previous studies had experimental and control samples.
- Most previous studies adopted an experimental approach. Our current study, however, adopted an exploratory descriptive approach.
- The similarities between these studies and our current study lie in the objectives and significance upon which most studies relied.
-

II– Methods and Materials:

Study Methodology and Procedures:

The researchers used the descriptive exploratory approach, as it is the most appropriate approach for the current study. This approach used to collect, analysis, and statistically process data, arriving at results relevant to the study's questions, objectives, and nature.

Study Population and Sample:

The study population consisted of (170) students, including (160) female students, during the 2023-2024 academic year. The sample selected randomly.

Study Sample Characteristics:

Table .2. Frequency Distribution of Study Individuals by Specialisation and University.

University	Specialty								Total
	Psychology		Educational Sciences		Clinical Psychology		Orthophonie		
	male	Female	male	Female	male	Female	male	Female	
El bayadh		10				10			20
Oran	05	10		10		20		20	65
Relizane		10		10		20			40
Mostaganem	05	10		10		10		10	45
Total's	10	40		30		60		30	170

Source: Prepared by the researchers.

The previous table shows the presence of several university specializations in four universities: El Bayadh, Oran, Relizane, and Mostaganem. It is evident that there is a discrepancy between the number of students at each university, on the one hand, and the lack of responding students, on the other hand, due to the lack of a specialization at the aforementioned university. The results concluded that the number of respondents reached (170) students, including (160) female students.

Study Methodology and Procedures:

The researchers used the descriptive exploratory approach, as it is the most appropriate method for the current study, in terms of data collection, analysis, and statistical processing, arriving at results relevant to the study's questions, objectives, and nature. Data Collection Tool:

A data collection tool is a means of obtaining scientific information and facts. It is define: "The means used by the researcher in his investigation or to obtain the required information from relevant sources in his research" (Abbas & Lufel, 2007, p. 237)

The appropriate tool is determined in light of the research objectives, hypotheses, and the questions he seeks to answer. The researcher may use more than one tool to accurately answer all the questions posed by his study.

Among the tools relied upon in our current study is the questionnaire, which is a means of collecting information related to the research topic by preparing a questionnaire that is completed by a representative sample of individuals. The person who completes the questionnaire is call the respondent (Rabhi & Ghanim, 2000, p. 82)

To achieve the objectives of the current research, a questionnaires prepared by the researchers for scientific research purposes.

Mind Mapping Usage Questionnaire:

The initial and final questionnaire consisted of (16) items measuring the use of mind maps.

For this purpose, the questionnaire's apparent validity verified. It was presented to (9) referees, professors specializing in special education and psychological measurement at Algerian universities. They asked to express their opinions on the paragraphs' clarity, relevance, and degree of validity. The referees reported the comprehensiveness of the paragraphs, with an acceptance rate exceeding 90%.

The questionnaire divided into three dimensions:

- Cognitive dimension: It contains (5) items numbered from 1-5.
- Technological dimension: It contains (5) items numbered from 6-10.
- Achievement dimension: It contains (6) items numbered from 11-16.

All questionnaire items designs according to a five-point Likert scale, which included the following scores: Always (5), Often (4), Sometimes (3), Rarely (2), and Never (1).

The scores for the negative statement : Always (1), Often (2), Sometimes (3), Rarely (4), and Never (5) .

To assess the level of students' use of concept maps, we applied the five-point Likert scale. Weights assign to the scale categories as shown in the following table:

3.4-2.61. 3

4.20-3.41. 4

4.21-5 Very high. 5

Table.3. Rating Score and Weights

Weighted Average	Value Rating Score	Weight
1-1.8	Very low	1
1.81-2.6	Low	2
2.61-3.4	Medium	3
3.41-4.2	High	4
4.21-5	Very high	5

Psychometric Properties of the Study Tool:

By psychometric properties of the tool, we mean the extent to which the instrument used for measurement has an acceptable degree of validity and reliability. To ensure the psychometric properties of the questionnaire applied in the current study, we present them in the following steps:

Tool Validity:

This refers to the extent to which the scale is valid for measuring what it design to measure. It is considers a necessary condition that must be met in the scale; otherwise, it will lose its value as a means of measuring the characteristic we intend to measure. A valid scale is usually reliable (Moqaddam, 2003, p. 146)

To verify the validity of the questionnaire, it administer to a random sample of (42) male and female Master's. The Statistical Package for the Social Sciences (SPSS, 23) use to calculate the R-value for each dimension. The content validity of the questionnaire calculate, as shown in the following table:

Table.4. shows the internal consistency validity of the dimensions of the Mind Mapping Use Questionnaire.

Questionnaire dimensions	sample member's	coefficient value r	Significance level
Cognitive dimension	42	0.809	0.01
Technological dimension	42	0.843	0.01
Achievement dimension	42	0.961	0.01

**Significant at (0.01).

Source: Prepared by the researchers based on SPSS 23.

From Table .4, we find that the value of the correlation coefficient r for all dimensions ranges between (0.809) and (0.961), which is statistically significant at a significance level of (0.01), which confirms that the content of the questionnaire is consistent through the correlation of all dimensions with their overall dimension. Accordingly, it said that the mind-mapping questionnaire enjoys a high degree of validity in terms of content or substance. Therefore, it is consider valid and consistent axes, for what it design to measure. To ensure the reliability of the mind-mapping questionnaire applied in the current study, Cronbach's alpha use for all scale dimensions and the total score, as shown below:

Table.5. internal consistency of scale dimensions and total score according to Cronbach's alpha

Dimensions	Number statement's	Cronbach's alpha	value Decision
Cognitive dimension	5	0.945	Statistically significant
Technological dimension	5	0.815	
Achievement dimension	6	0.844	

Source: Prepared by the researchers based on SPSS 23.

From Table.5, we find that Cronbach's alpha values for the questionnaire's sub-dimensions range between 0.815 and 0.945, a relationship considered high, providing a strong indication of the scale's validity, as there is a positive relationship between each dimension and its indicators, indicating the existence of a statistical relationship between each dimension and its indicators. Therefore, it said that the questionnaire enjoys a high degree of reliability. This high reliability coefficient meets the purposes of scientific research. The researcher also calculated the reliability coefficient using the split-half method. Each questionnaire item divide into two equal halves (upper/lower). The Pearson correlation coefficient was then calculate between the two halves. The Pearson correlation coefficient was then calculate between the individual scores on the odd items and their scores on the even items. The obtained correlation coefficient was then adjust using the Spearman-Brown corrective equation. The results were as follows:

Table.6. Questionnaire Reliability Using the Split-Half Method

Statistical Indicators	Calculated R-value	D.F	Significance Level
Before adjustment: Pearson	0.648	40	Significant at 0.01
Before adjustment: Spearman-Brown	0.786		

Source: Prepared by the researchers based on SPSS 23.

In Table.6, we note that the calculated R-value before Pearson adjustment equals (0.648). In fact, the expressed R-value expresses the value of the correlation coefficient between the two halves of the questionnaire. The length equation must be correct, so we obtain the true R-value after the Spearman-Brown adjustment, which equals (0.786). Function at a significance level of (0.01), and therefore it said that the questionnaire has a high degree of reliability.

Statistical Methods Used:

- Statistical Package for the Social Sciences (SPSS 23).
- Arithmetic Mean
- Standard Deviation
- Likert Scale (Likert 5 Scale).
- Application of the t-test

III- Results and discussion :

1. Presentation of Results and Interpretation of the First Exploratory Question:

What is the Level of Student Use of mind maps?

To measure this exploratory question, the arithmetic mean and standard deviation used, as shown in the following table:

Table .7. Level of students' use of mind maps.

Serial Number	Phrase	Arithmetic Mean	Standard Deviation	Phrase Order	Phrase Estimate
1	I learn about cognitive structures through mind maps.	2.54	0.537	09	Low
2	Mind mapping includes content analysis.	2.50	0.579	12	Low
3	Mind mapping highlights concepts and their relationships.	2.53	0.583	11	Low
4	I rely on interpretation and analysis of the components of a topic in mind mapping.	2.04	0.472	13	Low
5	Mind mapping helps me retrieve acquired knowledge.	2.60	0.498	08	Low
6	I develop a plan when using a mind map on a computer.	2.73	0.390	02	Medium
7	I choose appropriate technology programs for mind mapping on a computer.	2.74	0.386	01	Medium
8	I am proficient in designing a mind map using Vue.	1.74	0.805	16	Very Low
9	I diversify the presentation of mind maps on a computer.	2.53	0.507	10	Low
10	I keep up with developments in the field of electronic mind mapping programs.	1.84	0.797	14	Low
11	I easily view electronic presentations of mind maps.	2.65	0.466	05	Medium
12	I can convert educational content into mind maps on a computer.	2.65	0.487	06	Medium
13	I possess the ability to innovate and think quickly when completing a mind map on a computer.	1.76	0.821	15	Very Low
14	I am able to run modifications to mind maps on a computer.	2.6	0.502	07	Low
15	I use colors and images extensively.	2.65	0.463	04	Medium
16	I review mind maps on a computer.	2.7	0.430	03	Medium
Total survey		2.42	0.107		Low

Source: Prepared by the researchers based on SPSS 23.

The table above shows that the overall rating for the questionnaire items was low, with an arithmetic mean of (2.42), a DF of (198), and a standard deviation of (0.107). This indicates that the students' level of mind mapping usage was **low**.

The results also show that most of the statements received a low rating, ranging from an arithmetic mean of (1.84-2.6).

While two statements received a very low rating, with an arithmetic mean of (1.74-1.76) .

Six statements received an average rating, ranging from an arithmetic mean of (2.74-2.65). This can explained by the results, which indicate that the students' level of use of mind maps was **low**.

This indicates that they have not received better training on mind mapping on computers, nor do they keep up with the latest developments in mind mapping software for achievement and design purposes, nor do they possess sufficient capacity to do so. This indicates students' reluctance or lack of mastery of such software, which they employ as a learning strategy and a method for memorization, reflection, and review. Furthermore, there are some concepts that require familiarization through training on such mind mapping software by their teachers, and this is precisely what is correct.

The results of this question differ from the findings of Khairy's (2019) study, which indicated that the electronic mind mapping strategy has a significant impact on developing students' conceptual understanding.

It also differs from the results of Herkirat's (2010) study, which indicated the improvement, comprehensiveness, and coherence of students' mental structures and knowledge interconnectedness.

2. Presentation of the results and interpretation of the second exploratory question:

-Are there differences among students in their approach to training on electronic mind maps?

To measure this exploratory question, the arithmetic mean and standard deviation used to measure the level of difficulties faced by psychological specialists in the educational team, depending on gender. A t-test applied, as shown in the following results:

Table .8. Shows the level of differences among students in their approach to training on electronic mind maps.

Gender	Number	Mean	Standard Deviation	DF	significance Level
Males	10	33.525	16.5549	168	0.05
Females	160	89.29375	16.37372		

Source: Prepared by the researchers based on SPSS 23.

The results obtained in Table.8, indicate the presence of statistically significant differences at a significance level of (0.05) in the level of differences between students in addressing training on electronic mind maps, in favor of females, with a mean of (89.29) and a D.F(168).

Based on the previous results, we can interpret the level of differences between students in addressing training on electronic mind maps, in favor of females. This is because female students addressed and attempted to learn how to use mind maps more than males.

This is also due to the interest in the field of scientific research among females, and perhaps also due to the higher level of cognitive abilities and achievement among females than males. What is noticeable is perhaps the difference in the number of respondents, as females are more numerous.

However, this does not mean that the small number of males is incapable of researching, applying, and practicing the use of electronic mind maps. Rather, the idea lies in the greater interest, curiosity, and creative thinking of females than males. The results of this question are consistent with the findings of Khairy's (2019) study and the studies of Herkirat (2010) and Erdem and Aliye (2017), which indicate that the effectiveness of the electronic mind mapping strategy in developing conceptual understanding, knowledge interconnectedness, mental structure, creativity, problem-solving, concentration, and idea organization. Furthermore, during our interviews with male and female students, we observed and recorded several observations, the most important of which were:

- Females' completion of mind maps was somewhat more proficient than that of males.
- Females' completion of electronic mind maps prompted several questions from female students, unlike males, who chose easy methods of completion without guessing or allocating the possible time for creative completion.
- Females took notes and attempted to grasp the elements and concepts of the topic through interaction, unlike males. All these observations reflect the extent of females' response to training on, use of, and application of electronic mind maps. Furthermore, subjective factors in achievement and training were also a factor in the students' variability and response to the use of electronic mind maps.

IV- Conclusion:

According to the current data and results, the study concluded:

- The level of student use of mind maps was **low**, with an arithmetic mean of (2.42).
- There was a disparity among students in their engagement with training on electronic mind maps, in favor of females, with an average of (89.29).

The research concluded with a set of recommendations and suggestions, the contents of which are lists below:

- Allocating extensive training for students on modern teaching strategies and their applications, as required by professors.
- Valuing the distance learning space in such applications of modern teaching strategies.
- Keeping pace with developments by accompanying students in scientific research and reviewing electronic programs that bring a qualitative leap to teaching and a significant impact on improving the quality of university education and research.
- Allocating time for field training for professors is important, as is the use of modern and effective electronic programs at university teaching levels.

References

- [1]. Abbas, M. K., & Lufel, M. (2007). *Introduction to Research Methods in Education and Psychology*. Jordan: Dar Al-Masirah.
- [2]. Abu Al-Hassan, R. M. (2023, May). A Mind Mapping-Based Strategy and Its Effect on Developing Music Reading Skills among First-Year Female Students at the College of Childhood Education. *Childhood Magazine*, pp. 2307-2328.
- [3]. Al-Janabi, T. (2011). *Concept Maps and the Problem-Centered Approach and Their Effect on the Acquisition of Biological Concepts and the Development of Scientific Curiosity*. Amman: Dar Al-Safa.
- [4]. Al-Saadani, A., & Awda, T. (2006). *Practical Education: Approaches and Strategies*. Cairo: Al-Kitab Al-Hadith.
- [5]. Budd, J. w. (2004, February). Mind Maps as Classroom Exercises. *the Journal of Economic Education*, pp. 35-46.
- [6]. Buzan, T. (2006). *Mind Maps*. Saudi Arabia: Jarir Bookstore.
- [7]. Erdem, A. (2017, December). Mind Maps as a Lifelong Learning Tool. *Universal Journal of Educational Research*, pp. 1-7.
- [8]. Harkirat, S. D., Makarimi, K., & Anderson, R. (2010, April). Constructivism Visual Mind Map Teaching Approach & The Quality of Students, Cognitive Structures. *Journal of Science Education & Technology*, pp. 186-200.
- [9]. khairy, m. m. (2019). The Effectiveness of the Electronic Mind Mapping Strategy in Developing the Acquisition of Stock Market Concepts among Advanced Commercial Technical School Students. *Journal of the Faculty of Education, Ain Shams University*, pp. 281-351.
- [10]. Moqaddam, A. (2003). *Statistics and Psychological and Educational Measurement*. Office of University Publications: Algeria.
- [11]. Rabhi, M. A., & Ghanim, O. (2000). *Scientific Research Methods and Approaches: Theory and Application*. Amman: Al-Safa for Publishing and Distribution.