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# The Effect of Employing the Ishikawa's Diagram in Teaching History to Develop Productive Thinking and Engagement in Learning among Students

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**Abstract**

*The study aimed to identify the use of Ishikawa's diagram while teaching history to develop productive thinking and engagement in learning among students. The quasi-experimental approach was followed to achieve this goal, where study tools were built, represented by the productive thinking test, which consisted of (22) questions, and the engagement in learning scale, which consisted of (44) items, and were both verified for their validity and reliability. These tools were applied to a group of the study population consisted of (54) female students from the tenth grade at Umm Kulthum Mixed School in the First Zarqa District, where they were divided into two groups: the experimental group studied using Ishikawa's diagram and consisted of (27) female students, and the control group studied using the traditional method and consisted of (27) female student. The results of the study showed that there were statistically significant differences between the mean grades of the first experimental group, the control group in the productive thinking test, and the engagement in learning scale in favor of the experimental group that was taught using Ishikawa's diagram. The study recommended the need to encourage history teachers to employ Ishikawa's diagram strategy while teaching history because of its positive impact on developing productive thinking and raising the level of engagement in learning..*

**Keywords:** *Ishikawa's Diagram; History; Productive Thinking; Engagement in Learning..*

## Introduction

Studying history is a basic necessity for both nations and people because it is their identity and their past, as groups recognize their strengths and weaknesses through it, so they build and develop their present and future on the basis of their past; also, lessons are learned from history and its various events. It is the science of humanity that comprehensively encompasses human life in all its temporal dimensions, and it is an essential factor in human awareness. It is a record of the human experiences that people have realized in overcoming their problems throughout the ages (Obaidat and Al-Tawalba, 2014).

Obaidat (2003) pointed out that teachers' use of traditional teaching methods in the classroom leads to students' boredom, especially in the upper grades who need educational methods that stimulate their thinking, develop their abilities, are in line with their desires, and satisfy their needs. Therefore, it has become necessary for teachers to use methods and strategies that suit their preferences and help them invest in their abilities and aptitudes to the greatest extent possible.

Ishikawa's diagram is a strategy for analyzing problems and making decisions. It is based on the diagram that goes back to the Japanese Carlo Ishikawa, who worked as a quality control expert at the University of Tokyo. He developed it in the 1950s as a developed model for analyzing the cause-and-effect relationship, and it is considered one of the most effective methods in solving problems due to its role in analyzing the problem into its components or causes, dealing with the main causes or components and paying attention to them, and not being preoccupied with secondary causes whose role is weak or secondary. It is a method of solving problems when dealing with the causes of the problem is difficult or not possible because it gives the team the opportunity to focus on the main reasons or cause that may represent (20%) or more of the problem, but its treatment may represent (80%) of its solution (Ahmed, 2018).

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Walsh (2008) defined the strategy of Ishikawa's diagram as "one of the modern learning strategies centered on the student that directs the tendency to work and activity very seriously as a result of understanding how the study content is dealt with". Renee (2010) defined the strategy of Ishikawa's diagram as "a cognitive map that fits the topics of causes, results, and the topics of elements and parts."

Ishikawa's diagram includes several sequential steps that focus on the interaction between the teacher, students, and the educational material to acquire and integrate new knowledge. It consists of defining the problem, drawing a number of rectangles on the left side and a number of rectangles on the right side representing the main causes of the problem or the basic elements of the topic, then drawing arrows for those causes indicating the sub-causes for each cause (Abu Mughnem, 2023).

Ishikawa's diagram strategy has great importance in the learning process, as it helps the student imagine and think, transform problems that appear complex into small problems, helps students follow up on understanding through sequential steps, and enables students to focus on a specific issue, make a decision and issue a judgment (evaluation). It gives the students an opportunity to expand the scope of thinking about the problem in depth and collect detailed information according to their abilities and age stage, so that it gives the students motivation to follow the steps to solve the problem based on their desire to reach a solution. It is the ideal way to provide students with the opportunity to think and employ their brain capabilities to interact with the event and develop appropriate solutions to all problems (Susan, 2020).

When the teacher applies to the strategy of Ishikawa's diagram, he must follow the following steps as stated in Ayyad (2018): Writing the title of the lesson in the head of the fish (the problem) and thinking about it deeply, then asking himself questions such as: What do I know about the topic? Then, he should develop a number of sub-questions that the student is expected to write when applying the strategy, and the necessity of the topic proposed to study with the specified time, by specifying the number of individuals of each group and the number of questions that they put in a specific period of each student and discussing it; this makes the strategy more effective, with a specific time set for each group to ask its questions and discuss them, and to ensure the frequent feedback of students by repeating the questions during the response of the students to ensure that the information is understood and write down ideas related to the topic on a special board, or on the board in distinctive colors that are clear for all students.

The steps of Ishikawa's diagram can be summarized that the teacher divides the student into equal groups, then determines the problem and places it at the head of the fish that the students drew as rectangles; afterwards, they search for the main causes of the problem to be written on the main bone in the fish structure, and they search for the secondary causes of the problem written under each bone on the small ones. Next, one of the group's students provides the main and secondary causes for the problem for the rest of his classmates, so that the reasonable causes are accepted and appointed to the main and branch bones to try to justify them, then each group prepares lists that define only three reasons arranged according to their importance through the direct vote by the student (Ahmed, 2021).

It became clear from the foregoing that Ishikawa's diagram contributes to developing the different thinking skills of the student, including: productive thinking. Suleiman (2021) indicated that the productive thinking enables the student to produce the largest possible number of ideas and solutions and criticize them by carrying out a set of tasks in a collective way, this contributes to reaching a collective decision that depends on dialogue, discussion, and consultation between members of the same group. Also, productive thinking makes the student think in a better manner, which contributes to refining his personality and developing his capabilities to take the judgment on available information, and using logical reasoning skills which increase his ability to think of careful thinking and the integration with the educational subject.

Suleiman (2021) believes that productive thinking skills are represented by the following: originality, as it is one of the most important abilities necessary for creative production, and it is one of the characteristics most closely linked to creativity and creative thinking. When an idea is original, this means that no one has achieved anything like it before. The second skill is flexibility, which is the individual's ability to produce appropriate responses characterized by diversity and spontaneity in response to a specific situation or problem. It is the ability to generate diverse ideas and shift the path of thought as the stimulus changes.

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The third skill is fluency, which is a skill that depends on the individual's ability to produce as many words, ideas, shapes, or drawings as possible. The more the individual is able to produce a greater number of ideas in a specific unit of time, the greater degree of fluency he will have. The fourth skill is deduction, which is the individual's ability to produce the largest number of ideas related to a specific situation determined by the test, provided that the ideas specific to this situation are diverse and unexpected and divert the course of thought. The fifth skill is interpretation, which is the ability to interpret the situation as a whole to give justifications and draw conclusions in light of existing facts that the mind accepts.

Productive thinking stimulates students and pushes them to: discovery, experimentation, produce creative ideas, better define problems, and write information and facts clearly, which benefits society and makes students possess multiple abilities and skills such as: flexibility, drive, deducing, imagining, and interpreting, which highlights the role of the school in the process of upbringing through the activities and academic and educational materials it offers to students (Jaafar, 2024).

Engagement in learning is one of the concepts that has an impact on students' motivation towards the learning process, and is a key to treating many of the problems facing the student. It is also an essential and effective factor in positive educational and social outcomes, and it has a major role in arousing students' attention and making a broader investment of their efforts in the learning process. Therefore, the integration of students into the learning process has become a goal through which enhancing the abilities of all students to face the challenges and problems is achieved. It is a concept that refers to the extent of students' effective participation in the learning process (Garrett, 2018).

While Fredrickson (2004) indicated that engagement in learning is multidimensional, it was agreed that engagement in learning consists of three dimensions, which are as follows:

Behavioral integration: which is the student's participation in educational activities that reflect hard work, diligence, integration into curricular activities. Cognitive integration, which includes learning strategies such as: self-regulation skills, metacognitive skills in planning, monitoring and evaluation of learning content. Emotional integration, which describes the student's positive and negative emotional reactions towards his teachers and classmates, such as: showing interest and pride, not being bored and anxious, and feeling enthusiastic and happy during the learning process.

Ishikawa's diagram also contributes to achieving students' engagement in learning, as Al-Sukkari (2022) noted that one of the most important goals of engagement in learning is to change or add to the student's behavior so that he becomes more in harmony with the environment he is in, and to make his relationship with others more friendly. It also aims to make the student's actions appropriate and compatible with his requirements and desires. It also provides a positive state and a sense of stability, which prompts the student to use all means and capabilities in order to achieve success. It also makes the student reach a stage of self-satisfaction, satisfying his motivations and adapting to his new environment with all its circumstances.

Through the above, both researchers see that the goal of studying history is no longer to fill students' minds with as much information as possible, as much as it is to develop the skills of: thinking, research, interpretation, deduction, and linking causes and results. History aims to collect events from the past, verify them, and confirm their honesty, interpretation, and analysis. It is the key for students to understand the changes throughout history, understand their society, address the present, and prepare the future generation. Therefore, it is necessary to change teaching history from the traditional method to an exciting method that develops students' mental skills and encourages them to be engagement in while learning it. This is done through the use of modern strategies that keep them away from memorization and lecturing, such as Ishikawa's diagram.

**Previous Studies**

Obaidat and Tawalba (2012) conducted a study aimed at revealing the attitudes of primary grade students in the Lawani Bani Kenanah and Ramtha Education Directorates towards social studies topics through drawing. The study sample consisted of (1605) male and female students from primary schools extending

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from the fourth grade until the tenth primary level; their drawings were analyzed, which reflect their attitudes towards social studies topics, and were processed statistically by calculating frequencies and percentages. The results of the study indicated that students in each grade of the primary grade expressed various drawings that reflect their positive or negative feelings and attitudes toward social studies topics. The results also indicated that the arrangement of students' positive attitudes toward social studies topics by grade from the most positive books to the less positive books was in the following order: the fourth grade, the fifth grade, the ninth grade, the tenth grade, followed by the sixth then the seventh grades, and in last place were the social studies books for the eighth grade.

1- As for the study of Khalifa, Obaidat, and Al-Qaoud (2018), it aimed to reveal the effectiveness of using the circular house strategy while teaching history in developing spatial thinking and self-efficacy among tenth grade students. A test for spatial thinking and a self-efficacy scale were prepared to achieve the goal of the study. The quasi-experimental approach was used, and the study sample was selected randomly, which consisted of a group of 39) male and female tenth grade students as an experimental group who studied using the circular house strategy, and another group of (33) male and female students studied using the traditional method. The results showed that there were differences attributable to the teaching strategy and in favor of the circular house strategy with regard to spatial thinking. The results also showed that there were statistically significant differences in favor of the experimental group with regard to the self-efficacy scale attributed to the circular house strategy.

2- Ahmed (2018) also conducted a study that aimed to reveal the effect of using the fishbone strategy in teaching social studies in developing reflective thinking skills among elementary school students.

3- The study adopted the quasi-experimental approach, and its tools were the reflective thinking test that was applied to a sample of third-year elementary school students in Aswan Governorate. The total number was (35) students who were distributed into an experimental group consisting of (17) students, and a control group consisting of (18) students. The results of the study showed that there were statistically significant differences between the mean scores of the students in the experimental group and the students in the control group for the reflective thinking test on the skill of contemplation and observation for the benefit of the experimental group students. Also, there were statistically significant differences between the mean scores of students of the experimental group and the control group in the post-application to test the contemplative thinking skills in favor of the experimental group.

4- Obaidat and Al-Mahasnah (2020) also conducted a study aimed at employing drawing in teaching history and measuring its impact on the development of spacial intelligence among the primary seventh grade students, the quasi-experimental approach was applied, and the spacial intelligence test was prepared to achieve the goal of the research, and its validity and reliability were confirmed. The tools were applied to a sample composed of (100) male and female students in a pre- and post-test manner, as they were divided into two groups: one of them is a control group consisting of (50) male students, and the other is an experimental group consisting of (50) female students. The results showed that there are no statistically significant differences at the significance level of (0.05) between the mean degrees of students on the pre-test for each of both groups (experimental and control), while the results showed that there are statistically significant differences at the significance level of (0.05) between the mean degrees of students on the post-test of each of the experimental and the control groups in favor of the experimental benefit due to employing drawing in teaching history to develop spatial intelligence. The results also showed that there were differences in the arithmetic means of the experimental group due to gender, and these differences were in favor of females.

Al-Talihani (2020) also conducted a study aimed at identifying the impact of the fishbone strategy in developing some critical thinking skills in Geography among fifth grade female students in Umluj Governorate in Saudi Arabia; the quasi-experimental approach was used, and a guide was prepared to teach a number of lessons related to Geography from the course of Social and National Education taught to fifth

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grade female students using the fish bone strategy, and a test was prepared for the following critical thinking skills:

Knowledge of assumptions, deduction, and conclusion. The tools were applied to a sample of (60) female students, who were divided into two groups: a control group that consisted of (30) female students who learned using the traditional method, and an experimental group that consisted of (30) female students who were taught using the fishbone strategy. The results showed that there were statistically significant differences at the significance level of ($\alpha \leq 0.01$) between the mean scores of female students in the control and experimental groups in the post-measurement test of critical thinking skills in favor of the experimental group. The results also showed the effect of the fishbone strategy in developing some critical thinking skills among fifth grade female students.

Ahmed (2022) conducted a study that aimed to measure the effectiveness of the fishbone strategy in teaching Social Studies on developing systemic thinking skills among seventh grade elementary school students in Kuwait. The study relied on the experimental approach, and the study tool was the systemic thinking skills test, which was applied to a sample consisting of (30) students who were divided equally into two groups: experimental and control. The results of the study showed that there was a statistically significant difference between the mean scores of the students of both study groups in the post-application of the systemic thinking skills test as a whole and its dimensions in favor of the experimental group. The impact of the strategy on systemic thinking skills is high, meaning that the strategy is effective in developing systemic thinking skills among seventh grade elementary school students in Kuwait.

Abu Mughnem (2023) conducted a study that aimed to investigate the impact of the two strategies: (The Expert's Cloak and Ishikawa's Diagram) on teaching Geography to develop productive thinking skills and the efficiency of cognitive representation of geographical information among first year secondary school students in Egypt. The study sample consisted of (108) students who were divided into three groups: first experimental with (37) students, second experimental with (35) students, and control with (36) students. The first experimental group studied using the "Expert's Cloak" strategy, while the second experimental group studied using the "Ishikawa's Diagram" strategy, and the control group studied using the traditional method. An experimental research approach with a quasi-experimental design was used to achieve the objectives of the study and prepare its tools, which were: a productive thinking test and a scale of cognitive representation of geographic information. The results of the study showed that there was a statistically significant difference in the post-application of the productive thinking test and the scale of cognitive representation of geographical information in favor of the students of the first and second experimental groups, and there was no statistically significant differences in the post-application of the productive thinking test and cognitive representation between the first and second experimental group due to the teaching strategy.

The current study is unique from previous studies by its goal, which is: revealing the effect of employing Ishikawa's diagram to develop productive thinking and engagement in learning among students. It may be the first study - as far as the researchers know - that addressed the effect of this strategy on productive thinking and engagement in learning together. The study will also be characterized by human and spatial limitations, since it is conducted among tenth grade female students in the first Zarqa Directorate.

**Study Problem and Questions**

The study problem emerged for the researchers from their conviction that the history book is long and full of information that some teachers teach to the students' by lecturing them the information to be memorized by students. Therefore, the teacher realizes that the history book requires a great effort from the students to study and memorize it, which may alienate them from this subject which is characterized by having too much information. Through the discussions presented, both researchers found that most of the male and female teachers of History summarize the material and teach it to the students in order to try to complete the subject, which prevents them from using any strategy that can be applied in the classroom for fear of wasting time due to the lengthy subject. Moreover, this study came in response to modern trends in teaching by presenting information in a way that relies on visual learning for students, so the current study came to

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reveal the effect of employing Ishikawa's diagram in teaching history to develop productive thinking and engagement in learning among students. The current study specifically attempts to answer the following questions:

1. Are there statistically significant differences at the significance level of ($\alpha \leq 0.05$) between the means of the control group and the experimental group on the productive thinking test due to the teaching method (Ishikawa's diagram and the traditional method)?

2. Are there statistically significant differences at the significance level of ($\alpha \leq 0.05$) between the means of the control group and the experimental group on the Engagement in Learning Scale due to the teaching method (Ishikawa's diagram and the traditional method)?

**Importance of the Study**

First: Theoretical importance: This study may be an important reference in the search for its variables for many researchers, especially since it deals with an important strategy such as Ishikawa's diagram. This study will hopefully contribute to alerting those responsible for writing history books in the Hashemite Kingdom of Jordan of the necessity of including information in history books using Ishikawa's diagram.

Second: Practical importance: The results of the current study may benefit history teachers on how to apply Ishikawa's diagram in teaching history, and the results of the current study may contribute to directing educational supervisors to the importance of holding training courses for teachers related to employing Ishikawa's diagram in teaching history.

**Study Terms and Procedural Definitions**

The study included the following terms and procedural definitions:

1. Ishikawa's Diagram: "One of the strategies of active learning centered on the student being active as a result of understanding how the study content is treated, and it is used to identify the topics and their various elements, a well as problems, their causes, and their potential results" (Ahmed, 2018, 66).

It is defined procedurally as a complex graphical representation in the form of a fish's head and skeleton in order to help students determine the causes and consequences in a detailed and organized manner to evaluate possible alternatives when developing an action plan or analyzing the cause of a specific result or impact in the History subject for the tenth grade.

2. Productive Thinking: "The ability to organize the learning process according to previous experiences by accomplishing some tasks and things to solve problems within an integrated framework between the processes of criticism and creativity" (Cunningham & Macgregor, 2014, 47).

It is defined procedurally in this study as the mental processes carried out by the tenth-grade student in the History subject when she faces a situation and a topic that requires some mental skills by integrating sensory perception with experience to reach unfamiliar conclusions characterized by criticism and creativity. It is measured in this study by the productive thinking test that includes productive thinking skills, namely: evaluation of discussions, interpretation, fluency, flexibility, and originality.

3. Engagement in learning: "A multi-dimensional structure that includes emotional, cognitive, and behavioral dimensions, which can be observed such as effort and perseverance when facing problems and challenges. It is a mental state associated with studying that is characterized by high levels of energy, enthusiasm, focus, and participation" (Reeve, 2014, 20).

It is defined procedurally as the score that a tenth-grade student obtains on the Engagement in Learning Scale that will be prepared for the purposes of this study, which includes the following dimensions: the behavioral dimension, the cognitive dimension, and the emotional dimension.

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*Study Limitations and Delimitations*

This study included the following limits:

1. - Objective limitations: the objective limitations were limited to a unit from the book of the tenth grade History subject entitled: "the Ottoman Empire", to clarify the effect of employing Ishikawa's diagram to develop productive thinking and engagement in learning among students.

2. - Time limitations: This study was conducted in the first semester of the year 2024/2025.

3. - Spatial limitations: The current study was conducted in Umm Kulthum Mixed School in the First Zarqa Directorate.

4. - Human limitations: This study was conducted on tenth grade female students at Umm Kulthum Mixed School.

## Methodology and Procedures

Study method: According to the nature of the study, the quasi-experimental method was applied to measure the effect of employing Ishikawa's diagram in teaching History to develop productive thinking and engagement in learning among students. It is based on designing an experimental group and a control group to test the study questions.

Study population: The study population were (54) female students in the tenth grade for the academic year 2024/2025 at Umm Kulthum Mixed School in the First Zarqa Directorate. The reason for choosing the school was intentionally due to the cooperation of the subject teacher with the researcher, and her complete readiness to cooperate when applying the study procedures; the study sample was selected by a simple random method and consisted of two groups: the control group with (27) female students, and the experimental group with (27) female students.

The study tools were as follows:

First: Productive Thinking Test: A set of procedures and steps were followed in preparing the Productive Thinking Test:

1- Determine the purpose of the test: measure the productive thinking skills of the students in the study sample.

2- Educational literature and previous studies that dealt with productive thinking were referenced, such as the studies of (Abu Mughnem, 2023) and (Shlash, 2014).

3- Testing the most important skills of productive thinking, and these skills are: (originality, fluency, flexibility, interpretation, and evaluating discussions).

4- Determining the type of test questions: The type of questions has been selected as (essay, multiple choice).

5- Referring to the unity of the Ottoman Empire from the History book prescribed for tenth grade students, and formulating essay-type and multiple-choice type questions that measure the productive thinking skills that were concluded from previous studies: (originality, fluency, flexibility, interpretation, and evaluating discussions).

6- The test was done in its initial form, and included a number of essay-type and multiple-choice questions, with a total of (22) questions.

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**The validity of the productive thinking test**: The productive thinking skills test was presented to a group of arbitrators with experience and specialization in the field of: curricula, methods of teaching, history, a number of experts in Jordanian universities, as well as a number of educational supervisors in order to express their opinions on the validity of the test, and they were asked to express an opinion about the clarity of questions and their ability to measure productive thinking skills; notes on the test items were written to ensure the integrity of the test, as well as the scientific and linguistic accuracy of its items, how sentences and items were formulated, the extent of their suitability for the age group that was addressed by the study, and how they relate to the issues of the unit, the level of students, and the content which they should measure. Also, the suitability of the essay questions of the skills: (originality, fluency, and flexibility), and the suitability of the alternative objective test items in regards to the skills of (interpretation and evaluation of discussions). The linguistic formulation of some questions, some items, and alternatives were modified in light of the feedback from the arbitrators, so that the number of questions in total became (22) questions distributed on the specific productive thinking skills as shown in Table No. (2). The majority of the items obtained an agreement of (80%) and above.

**Table No. (2) The number of items of each skill of the productive thinking test, the type of question, its mark, and the relative weight of each of the productive thinking skills**

| Skill | Items in the Test | Number of Questions | Type of Question | Marks | Relative Weight of the Grade |
|---|---|---|---|---|---|
| Originality Skill | 1-3 | 3 | Essay | 9 | 22.5% |
| Fluency Skill | 4 – 6 | 3 | Essay | 9 | 22.5% |
| Flexibility Skill | 7 – 9 | 3 | Essay | 9 | 2.55% |
| Interpretation Skill | 10-15 | 6 | Objective | 6 | 15% |
| Evaluating Discussions | 16-22 | 7 | Objective | 7 | 17.5% |

**Test correction method**: The total number of questions in the productive thinking test in its final form was (22) questions, distributed over the five skills. For each of the skills: (originality, fluency, and flexibility) there are three essay-type questions, and they have a specific correction key, so that the highest mark the student gets is (9) in one skill, and the lowest mark the student gets in each skill is (0). As for the interpretation skill, it has (6) multiple choice questions, and the skill of evaluating discussions has (7) multiple choice questions, and each question has four alternatives, including one correct alternative, so that the student gets a mark for each correct answer and a zero for each incorrect answer. Therefore, the maximum mark for the productive thinking test is (40), and the minimum mark is (0). Also, the test correction key was set, the students' marks were estimated, and the maximum mark for the test was set at (40).

**Reliability of the Productive Thinking Test**: The reliability of the Productive Thinking Test was verified by applying the test to an exploratory sample of students outside the study population and then reapplying it to the same sample, where the researcher extracted correlation coefficients between the two applications, and also used internal consistency by calculating the Cronbach's Alpha reliability coefficient, and Table (5) shows this.

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**Table No. (5) Correlation coefficients between the two applications, Cronbach's Alpha reliability coefficients**

| Skill | Correlation Coefficient Between Both Applications | 1. Cronbach Alpha Factor |
|---|---|---|
| Originality Skill | 0.76 | 0.79 |
| Fluency Skill | 0.79 | 0.82 |
| Flexibility Skill | 0.80 | 0.83 |
| 1- Interpretation Skill | 0.82 | 0.88 |
| Evaluating Discussions | 0.81 | 0.89 |
| Test as a Whole | 0.85 | 0.91 |

It is clear from Table (5) that the internal consistency reliability coefficient of the test using the Cronbach Alpha method ranged between (0.79-0.89) for the secondary skills, and (0.91) for the test as a whole. By measuring the Pearson correlation coefficient between the two applications, the repeatability coefficients ranged between (0.76-0.82) for the secondary skills, and (0.85) for the tool as a whole, all of which are higher than (0.70), which indicates the reliability of the tool (Cronbach, 1951).

**Second: The Engagement in Learning Scale**: It was built according to the following steps:

- Determining the objectives of building the scale, which is to measure the level of engagement in learning among tenth grade female students in the History subject.

- Educational literature and previous studies related to integration in learning were reviewed, such as the study of (Al-Mashaqba, 2023), and other relevant educational studies.

- The Engagement in Learning Scale was done in its initial form, consisting of (44) items distributed over three main dimensions: (the cognitive dimension, the behavioral dimension, and the emotional dimension).

- A triple gradient for each items of the scale has been placed: (large, medium, and weak), to judge the items and the level of integration into learning appropriately.

**Validity of the Engagement in Learning Scale**: To verify the validity of the Engagement in Learning Scale, it was presented to (10) specialized arbitrators from faculty members at Jordanian universities in the specializations of: curricula and teaching methods, educational psychology, educational and psychological guidance, and measurement and evaluation with experience and competence, to ensure the clarity of the wording of the items, their clarity, and their suitability to measure what they were designed to measure, and to make any amendment, including: deletion, addition, or reformulation of the items, as well as their suitability for the topic. The agreement rate was set at (80%) by the arbitrators to approve on the validity of an item. After taking into account the arbitrators' comments, the wording of some items was modified, and the scale in its final form consisted of (44) items distributed into three dimensions as follows:

1- The first dimension: The cognitive dimension, and includes items from (1-15).

2- The second dimension: The behavioral dimension, and includes items from (16-31).

3- The third dimension: The emotional dimension, and includes items (32-44).

3: **Reliability of the scale:** The reliability of the Engagement in Learning scale was verified by applying it to a survey sample of (26) female students from outside the study population and reapplying it to the same sample, where the researcher extracted correlation coefficients between the two applications, and also used internal consistency by calculating the Cronbach's Alpha reliability coefficient, and Table No. (7) shows this.

Journal of Ecohumanism
2025
Volume: 4, No: 2, pp. 919 – 937
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
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**Table No. (7) Correlation coefficients between the two applications using the repetition method and Cronbach's alpha reliability coefficients for the Engagement in Learning Scale**

| Dimension | 2. Repeatability Factor | 3. Cronbach Alpha Factor |
|---|---|---|
| Cognitive Dimension | 0.77 | 0.88 |
| Behavioral Dimension | 0.80 | 0.83 |
| Emotional Dimension | 0.79 | 0.89 |
| Scale as a Whole | 0.83 | 0.93 |

It is clear from Table (7) that the internal consistency reliability coefficient of the test using the Cronbach Alpha method ranged between (0.83-0.89) for the secondary dimensions, and (0.93) for the scale as a whole, and the repetition reliability coefficients, as measured by the Pearson correlation coefficient between the two applications, ranged between (0.77-0.80) for the secondary dimensions, and (0.83) for the scale as a whole, all of which are higher than (0.70), which indicates the reliability of the tool (Cronbach, 1951).

Study variables: The study included the following variables:

Independent variable: teaching strategy, which has two levels: (Ishikawa's diagram and the traditional method).

Dependent variables:

- The students' score in the productive thinking test at the overall level and at the level of each of the five productive thinking skills.

- The level of engagement in learning among tenth grade female students, as well as the level in each dimension of the scale.

Statistical processing: To answer the two questions of the study, arithmetic means and standard deviations were calculated, the associated one-way analysis of variance, and the associated multiple analysis of variance were performed.

**Study Results**

First: The results related to the first question, which stated: "Are there statistically significant differences at the significance level of ($\alpha = 0.05$) between the mean scores of tenth grade female students in the productive thinking test in the History subject due to the teaching method (Ishikawa's diagram and traditional method)?"

To answer the first question, the arithmetic means and standard deviations of the scores of the two study groups on the productive thinking test in the pre- and post-test were calculated according to the teaching strategy (Ishikawa's diagram and traditional method), and Table (10) shows this.

**Table (10) Arithmetic means and standard deviations for the scores of students in the two study groups in the pre- and post-test on productive thinking skills according to the teaching strategy variable**

| Test | Group | Pre-test | | Post-test | | No. |
|---|---|---|---|---|---|---|
| | | Arithmetic Mean | Standard Deviation | Arithmetic Mean | Standard Deviation | |
| Productive Thinking | Experimental Group: Ishikawa Diagram | 12.93 | 2.16 | 28.85 | 2.98 | |

Journal of Ecohumanism
2025
Volume: 4, No: 2, pp. 919 – 937
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v4i2.6381

| | | | | | | |
|---|---|---|---|---|---|---|
| | Control Group | 13.04 | 2.86 | 20.19 | 4.07 | |

***The total grade is 40**

It is clear from Table (10) that there are apparent differences between the arithmetic means of the study individuals' scores on the productive thinking test in the pre- and post-applications according to the teaching strategy (Ishikawa's diagram and traditional method). To find out whether these differences are statistically significant, the accompanying one-way analysis of variance (One-way ANCOVA) was used for post-test of the productive thinking test as a whole according to the teaching strategy (Ishikawa's diagram and traditional method), after neutralizing the impact of the pre-test on them. The following is a presentation of these results, as shown in Table (13).

**Table (11) One-way ANCOVA for the post-test of the study individuals' scores on the productive thinking test according to the teaching strategy (Ishikawa's diagram and traditional method) after neutralizing the effect of the pre-test to them.**

| Source of Variance | Sum of Squares | Degrees of Freedom | Mean Squares | F value | Significance Level | ETA Squared $\eta^2$ |
|---|---|---|---|---|---|---|
| Pre-test | 22.357 | 1 | 22.357 | 1.784 | 0.188 | 0.034 |
| Teaching Method | 1020.222 | 1 | 1020.222 | 81.410 | 0.000 | 0.615 |
| Error | 639.124 | 51 | 12.532 | | | |
| Total | 34138.000 | 54 | | | | |
| Adjusted Total | 1675.481 | 53 | | | | |

It is clear from Table (11) that there are statistically significant differences at the significance level of ($\alpha$ = 0.05) in the scores of the study individuals on the productive thinking skills test according to the teaching strategy (Ishikawa's diagram and traditional method). The "F" value reached (81.410) with a statistical significance of (0.000), which means that there is a statistically significant effect of the teaching strategy. It is also clear from the table that the size of the effect of the teaching method was large, as the Eta squared value interpreted (61.5%) of the variance explained in the dependent variable, which is the productive thinking test, and the adjusted arithmetic means and standard errors for each group were extracted after neutralizing the effect of the pre-test, as shown in Table (12).

**Table (12): Adjusted arithmetic means and standard errors on the productive thinking skills test according to teaching method**

| Teaching Method | Adjusted Arithmetic Mean | Standard Error |
|---|---|---|
| Ishikawa's Diagram | 28.866 | 0.681 |
| Control Group | 20.171 | 0.681 |

It is clear from Table (12) that the differences were in favor of the experimental group, whose members were exposed to teaching using the Ishikawa's diagram method, compared to the members of the (traditional) control group. According to the results of Table (11) of the accompanying analysis of variance, Ishikawa's diagram had a statistically significant effect in improving the performance of the experimental group in developing productive thinking skills.

Next, the arithmetic means and standard deviations of the study members' pre- and post-performance on the productive thinking skills test were calculated individually for each skill separately, according to the teaching strategy variable, as shown in Table (13).

Journal of Ecohumanism
2025
Volume: 4, No: 2, pp. 919 – 937
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
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**Table (13) Arithmetic means and standard deviations of the study members' pre- and post-performance on the productive thinking test according to each skill individually**

| Skills | Group | Pre-test | | Post-test | |
|---|---|---|---|---|---|
| | | Arithmetic Mean | Standard Deviation | Arithmetic Mean | Standard Deviation |
| Originality | Ishikawa's Diagram | 2.48 | 0.85 | 6.33 | 1.36 |
| | Control Group | 2.52 | 0.94 | 4.44 | 1.63 |
| Fluency | Ishikawa's Diagram | 2.89 | 1.15 | 6.56 | 1.45 |
| | Control Group | 2.85 | 1.23 | 4.33 | 1.90 |
| Flexibility | Ishikawa's Diagram | 2.26 | 0.81 | 5.93 | 1.14 |
| | Control Group | 2.33 | 0.96 | 4.19 | 1.62 |
| Interpretation | Ishikawa's Diagram | 2.07 | 0.87 | 4.67 | 1.07 |
| | Control Group | 2.04 | 2.08 | 3.26 | 1.35 |
| Evaluating Discussions | Ishikawa's Diagram | 3.22 | 1.12 | 5.37 | 1.28 |
| | Control Group | 3.30 | 2.23 | 3.96 | 1.65 |

Note from Table No. (13) that there are apparent differences between the arithmetic means in the pre- and post-tests of the productive thinking test. In order to verify the significance of the apparent differences, a one-way and multiple-variance analysis was applied to this, as shown in Table (14).

Table (14) Results of the multiple one-way analysis of variance for the effect of the two groups (experimental and control) on the productive thinking skills test

| Effect | Multiple Test Type | Multiple Test Value | Total F Value | Hypothetical Degree of Freedom | Degree of Freedom Error | Statistical Significance | Effect Size $\eta^2$ |
|---|---|---|---|---|---|---|---|
| Teaching Method | Hotelling's Trace | 1.617 | 1.523 | 5.000 | 48.000 | 0.000 | 0.618 |

It is noted from the (14) that there is a statistically significant effect of the teaching strategy variable in productive thinking skills, and the value of ETA squared shows that the variable of the teaching strategy explains (61.8%) of the variation of performance in the five productive thinking skills; to test the statistical significance of the apparent differences in the performance of the study individuals post-test in the skills: (originality, fluency, flexibility, interpretation, and evaluation of discussions) after controlling the effect of the pre-test according to the teaching strategy, the associated one-way contrast analysis was conducted.

Journal of Ecohumanism
2025
Volume: 4, No: 2, pp. 919 – 937
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v4i2.6381

**Table (15) One-way analysis of variance to test the statistical significance of the differences in the post-test performance of study individuals in productive thinking skills (one at a time) after controlling the effect of pre-test performance according to the teaching strategy**

| Source of Variance | Dimensions | Sum of Squares | Degrees of Freedom | Mean Squares | (F) value | Statistical Significance | Partial ETA Squared |
|---|---|---|---|---|---|---|---|
| 4- Pre-test (joint) | Originality | 0.476 | 1 | 0.476 | 0.209 | 0.649 | |
| | Fluency | 0.662 | 1 | 0.662 | 0.228 | 0.635 | |
| | Flexibility | 6.895 | 1 | 6.895 | 3.701 | 0.060 | |
| | Interpretation | 1.194 | 1 | 1.194 | 0.801 | 0.375 | |
| | Evaluating Discussions | 0.507 | 1 | 0.507 | 0.229 | 0.634 | |
| Teaching Strategy | Originality | 48.348 | 1 | 48.348 | 21.221 | 0.000 | 0.294 |
| | Fluency | 66.440 | 1 | 66.440 | 22.894 | 0.000 | 0.310 |
| | Flexibility | 42.268 | 1 | 42.268 | 22.684 | 0.000 | 0.308 |
| | Interpretation | 26.871 | 1 | 26.871 | 18.034 | 0.000 | 0.261 |
| | Evaluating Discussions | 26.886 | 1 | 26.886 | 12.161 | 0.001 | 0.193 |
| Error | Originality | 116.190 | 51 | 2.278 | | | |
| | Fluency | 148.005 | 51 | 2.902 | | | |
| | Flexibility | 95.031 | 51 | 1.863 | | | |
| | Interpretation | 75.991 | 51 | 1.490 | | | |
| | Evaluating Discussions | 112.752 | 51 | 2.211 | | | |
| Total | Originality | 1733.000 | 54 | | | | |
| | Fluency | 1816.000 | 54 | | | | |
| | Flexibility | 1523.000 | 54 | | | | |
| | Interpretation | 952.000 | 54 | | | | |
| | Evaluating Discussions | 1316.000 | 54 | | | | |
| Adjusted Total | Originality | 164.833 | 53 | | | | |
| | Fluency | 215.333 | 53 | | | | |
| | Flexibility | 142.833 | 53 | | | | |
| | Conclusion | 103.926 | 53 | | | | |
| | Interpretation | 140.000 | 53 | | | | |

It is noted from Table (15) that there are statistically significant differences at the significance level of ($\alpha$ = 0.05) according to the effect of the teaching method (Ishikawa's diagram and the traditional method) in all skills. The adjusted arithmetic means and standard errors were extracted for each group after neutralizing the effect of the pre-test as shown in Table (16).

**Table (16) Adjusted arithmetic means and standard errors for the post-test of the productive thinking skills test according to the teaching method**

| Skill | Teaching Method | Adjusted Arithmetic Mean | Standard Error |
|---|---|---|---|
| Originality | Ishikawa's Diagram | 6.335 | 0.291 |
| | Control Group | 4.442 | 0.291 |
| Fluency | Ishikawa's Diagram | 6.554 | 0.328 |
| | Control Group | 4.335 | 0.328 |
| Flexibility | Ishikawa's Diagram | 5.941 | 0.263 |
| | Control Group | 4.170 | 0.263 |
| Interpretation | Ishikawa's Diagram | 4.668 | 0.235 |

Journal of Ecohumanism
2025
Volume: 4, No: 2, pp. 919 – 937
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v4i2.6381

| | | | |
|---|---|---|---|
| | Control Group | 3.258 | 0.235 |
| Evaluating Discussions | Ishikawa's Diagram | 5.372 | 0.286 |
| | Control Group | 3.961 | 0.286 |

It is noted from Table (16) that there is a difference between the performance of the experimental and control groups in all the five productive thinking skills in favor of the experimental group, and according to the results of the one-way analysis of variance accompanying Table (15), it was shown that Ishikawa's diagram had a statistically significant effect in improving the performance of the experimental group in all five productive thinking skills, since the effect size for skills ranged between (19.3%-31.0%).

This result can be attributed to the fact that the Ishikawa's diagram strategy links what the learner learns with his previous experiences, which develops his mental skills during the process of recognizing and organizing those connections. Learning through this strategy is effective because the learner feels that learning is meaningful; this strategy also provides the learner with the knowledge of the main and secondary causes for solving a specific mathematical problem, as it is considered a tool for analyzing a problem by identifying the possible causes in order to find a set of engagement in solutions to the problem. This strategy has an effect in distinguishing and arranging the reasons for the occurrence of an incident, problem, or result, and a depiction of the relationship arranged in a schematic manner that shows the reasons supporting it, according to its level of importance and detail.

This result can also be attributed to the fact that the Ishikawa's diagram strategy directs the learner towards working and being more seriously active as a result of understanding how the study content is tackled, it is more like a cognitive map that suits: topics of causes and results, and the topics of elements and parts, and it is used when the relationship between the causes and the results is complicated and concise. Furthermore, it helps the learner in imagination and thinking, transforms problems that appear complicated into small problems, helps the student to follow up on understanding through successive steps, enables them to focus on a specific issue, take a decision and issue a ruling (evaluation), and gives students a chance to expand the scope of thinking deeply about the problem and collecting detailed information, according to their capabilities and age, which motivates students to follow the steps of solving the problem due to their desire to reach the solution. In addition, the Ishikawa's diagram strategy develops the productive thinking by relying on arguments and proofs, as it develops creative and fluent thinking in mentioning the reasons for the solutions that have been reached by the group, and it also makes students feel joy in the educational process when they draw the fishbone structure.

The result of this study is consistent with the result of Ahmed's study (2018), which showed the effectiveness of using the fishbone strategy in developing reflective thinking skills in teaching Social Studies to elementary school students. It is also consistent with the result of Abu Mughnem's study (2023), which showed the effectiveness of the Ishikawa's diagram strategy in developing productive thinking skills in teaching Geography among first year high school students in Egypt.

**Second: The results related to the second question: which states: "Are there statistically significant differences at the level (α = 0.05) between the mean scores of tenth grade female students on the Engagement in Learning Scale in the History subject due to the teaching method (Ishikawa's diagram and traditional method)?"**

To answer the second question, the arithmetic means and standard deviations were calculated for the scores of the two study groups on the Engagement in Learning Scale in the pre- and post-tests according to the teaching strategy (Ishikawa's diagram and traditional method), and Table (17) shows this.

Journal of Ecohumanism
2025
Volume: 4, No: 2, pp. 919 – 937
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v4i2.6381

**Table (17) Arithmetic means and standard deviations for the scores of students in the two study groups in the pre- and post-tests on the Engagement in Learning Scale according to the teaching strategy variable**

| Group | Pre-performance | | Post-performance | | No. |
|---|---|---|---|---|---|
| | Arithmetic Mean | Standard Deviation | Arithmetic Mean | Standard Deviation | |
| Ishikawa's Diagram | 1.16 | 0.16 | 2.52 | 0.44 | |
| Control Group | 1.17 | 0.13 | 1.87 | 0.55 | |

*** Overall rating out of (3)**

It is clear from Table (17) that there are apparent differences between the arithmetic means of the study individuals' scores on the Engagement in Learning Scale in both the pre- and post-tests according to the teaching strategy (Ishikawa's diagram and traditional method). To find out whether these differences are statistically significant, a one-way accompanying analysis of variance (One way ANCOVA) was used for the post-test of the Engagement in Learning Scale as a whole according to the teaching strategy (Ishikawa's diagram and traditional method), after Neutralizing the effect of the pre-test, the following is a presentation of these results as shown in Table (18).

**Table (18) One way ANCOVA for the post-test of the study individuals' scores on the Engagement in Learning Scale according to the teaching strategy (Ishikawa's diagram and traditional method) after neutralizing the effect of the pre-test on them.**

| Source of Variance | Sum of Squares | Degrees of Freedom | Mean Squares | F value | Significance Level | ETA Squared $\eta^2$ |
|---|---|---|---|---|---|---|
| Pre-test | 0.418 | 1 | 0.418 | 1.707 | 0.197 | 0.032 |
| Teaching Method | 5.666 | 1 | 5.666 | 23.157 | 0.000 | 0.312 |
| Error | 12.478 | 51 | 0.245 | | | |
| Total | 279.064 | 54 | | | | |
| Adjusted Total | 18.666 | 53 | | | | |

It is clear from Table (18) that there are statistically significant differences at the level of significance of ($\alpha = 0.05$) in the scores of the study individuals on the Engagement in Learning Scale according to the teaching strategy (Ishikawa's diagram and traditional method). The "F" value was (23.157) with a statistical significance of (0.000), which means that there is a statistically significant effect of the teaching strategy. It is also clear from the table that the size of the effect of the teaching method was large, since the ETA squared value interpreted (31.2%) of the variance explained in the dependent variable, which is the Engagement in Learning Scale. The adjusted arithmetic means and standard errors were extracted for each group after neutralizing the effect of the pre-test, as shown in Table (19).

**Table (19): Adjusted arithmetic means and standard errors on the Engagement in Learning Scale according to teaching method**

| Teaching Method | Adjusted Arithmetic Mean | Standard Error |
|---|---|---|
| Ishikawa's Diagram | 2.520 | 0.095 |
| Control Group | 1.872 | 0.095 |

It is clear from Table (19) that the differences were in favor of the experimental group, whose members were exposed to teaching using the Ishikawa's diagram method, compared to the members of the

Journal of Ecohumanism
2025
Volume: 4, No: 2, pp. 919 – 937
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v4i2.6381

(traditional method) control group. According to the results of Table (11) of the accompanying variance analysis, Ishikawa's diagram has a statistically significant effect on improving the performance of the experimental group in developing engagement in learning.

Afterwards, the arithmetic means and standard deviations of the pre- and post-tests performance of the study individuals on the dimensions of engagement in learning were calculated individually for each dimension, according to the teaching strategy variable, as shown in Table (20).

**Table (20) Arithmetic means and standard deviations of the study individuals' pre- and post-performance on the dimensions of engagement in learning individually**

| Dimensions | Group | Pre-test | | Post-test | |
|---|---|---|---|---|---|
| | | Arithmetic Mean | Standard Deviation | Arithmetic Mean | Standard Deviation |
| Cognitive | Ishikawa's Diagram | 1.08 | 0.11 | 2.49 | 0.60 |
| | Control Group | 1.14 | 0.22 | 1.89 | 0.68 |
| Behavioral | Ishikawa's Diagram | 1.20 | 0.17 | 2.54 | 0.51 |
| | Control Group | 1.14 | 0.21 | 1.81 | 0.73 |
| Emotional | Ishikawa's Diagram | 1.21 | 0.36 | 2.54 | 0.72 |
| | Control Group | 1.23 | 0.28 | 1.91 | 0.93 |

It is noted from Table No. (20) that there are apparent differences between the arithmetic means in the pre- and post-tests of the Engagement in Learning scale. In order to verify the significance of the apparent differences, a one-way analysis of multiple-variance was applied to this, as shown in Table (21).

**Table (21) Results of the one-way analysis of multiple-variance of the effect of the group (experimental and control) on the dimensions of engagement in learning**

| Effect | Multiple Test Type | Multiple Test Value | Total F Value | Hypothetical Degree of Freedom | Degree of Freedom Error | Statistical Significance | Effect Size $\eta^2$ |
|---|---|---|---|---|---|---|---|
| Teaching Method | Hotelling's Trace | 0.540 | 9.002 | 3.000 | 50.000 | 0.000 | 0.351 |

It is noted from Table (21) that there is a statistically significant effect of the teaching strategy variable on the dimensions of engagement in learning, and the ETA squared value indicates that the teaching strategy variable explains (35.1%) of the variance in performance in the three dimensions of engagement in learning. To test the statistical significance of the apparent differences in the post-test performance of the study individuals in the cognitive, behavioral, and emotional dimensions, after controlling the effect of pre-test according to the teaching strategy, a one-way accompanying analysis of variance was conducted.

**Table (22) One-way accompanying analysis of variance to test the statistical significance of the differences in the post-test performance of study individuals on the dimensions of engagement in learning (one at a time) after controlling the effect of pre-test according to the teaching strategy**

| **Source of Variance** | **Dimensions** | **Sum of Squares** | **Degrees of Freedom** | **Mean Squares** | **(F) value** | **Statistical Significance** | **Partial ETA Squared** |
|---|---|---|---|---|---|---|---|
| | Cognitive | 0.031 | 1 | 0.031 | 0.074 | 0.787 | |

Journal of Ecohumanism
2025
Volume: 4, No: 2, pp. 919 – 937
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v4i2.6381

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 5- Pre-test (joint) | Behavioral | 0.122 | 1 | 0.122 | 0.301 | 0.586 | |
| | Emotional | 2.886 | 1 | 2.886 | 4.424 | 0.040 | |
| Teaching Strategy | Cognitive | 4.864 | 1 | 4.864 | 11.585 | 0.001 | 0.185 |
| | Behavioral | 6.845 | 1 | 6.845 | 16.924 | 0.000 | 0.249 |
| | Emotional | 5.054 | 1 | 5.054 | 7.749 | 0.008 | 0.132 |
| Error | Cognitive | 21.412 | 51 | 0.420 | | | |
| | Behavioral | 20.628 | 51 | 0.404 | | | |
| | Emotional | 33.263 | 51 | 0.652 | | | |
| Total | Cognitive | 285.065 | 54 | | | | |
| | Behavioral | 283.246 | 54 | | | | |
| | Emotional | 308.739 | 54 | | | | |
| Adjusted Total | Cognitive | 26.325 | 53 | | | | |
| | Behavioral | 28.010 | 53 | | | | |
| | Emotional | 41.450 | 53 | | | | |

It is noted from Table (22) that there are statistically significant differences at the level of significance of ($\alpha = 0.05$) according to the effect of the teaching method (Ishikawa's diagram and the traditional method) in all dimensions. The adjusted arithmetic means and standard errors were extracted for each group after neutralizing the effect of the pre-test, as shown in Table (23).

**Table (23) Adjusted arithmetic means and standard errors of the post-test of the dimensions of engagement in learning according to the method of teaching**

| Dimension | Teaching Method | Adjusted Arithmetic Mean | Standard Error |
|---|---|---|---|
| Cognitive | Ishikawa's Diagram | 2.494 | 0.126 |
| | Control Group | 1.884 | 0.126 |
| Behavioral | Ishikawa's Diagram | 2.534 | 0.123 |
| | Control Group | 1.814 | 0.123 |
| Emotional | Ishikawa's Diagram | 2.531 | 0.155 |
| | Control Group | 1.919 | 0.155 |

It is noted from Table (23) that there is a difference between the performance of the experimental and control groups on the dimensions of the Engagement in Learning Scale in favor of the experimental group. According to the results of the one-way accompanying analysis of variance in Table (22), it was shown that Ishikawa's diagram had a statistically significant effect in improving the performance of the experimental group on the Engagement in Learning Scale, noting that the effect size for skills ranged between (13.2%-24.9%).

This result can be attributed to the fact that the Ishikawa's diagram strategy is considered the ideal means of allowing students to think and employ the brain's capabilities to engage with the event and develop appropriate solutions to all problems. This contributes to enhancing the level of engagement in learning among students, as their involvement in thinking and preoccupation with various learning processes contributes to spending a long period during the learning process, and their preoccupation with the educational process during which they seek to solve a problem by engaging the brain in thinking processes contributes to finding an appropriate solution and achieving the desired goal. All of this contributes to raising the level of engagement in their learning and eliminates boredom and feelings of emptiness.

The Ishikawa's diagram strategy also gives room for interaction between the teacher, the student, and the educational material, to acquire and integrate new knowledge, in a way that is consistency with the student's existing knowledge to reach the goals set in the learning process, which gives every learner the right to learn and be active. It develops communication skills of the student, and encourages learners to participate in group work at the same time, and focuses on the group's performance collectively and individually, which

Journal of Ecohumanism
2025
Volume: 4, No: 2, pp. 919 – 937
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v4i2.6381

contributes to preventing distraction and listening to and respecting the ideas of others, which increases their level of engagement due to the educational responsibility that falls on their shoulders and the expectation that they will be asked for an assignment at any moment.

This is consistent with the result of Ahmed's study (2019) which showed the effectiveness of the fishbone strategy in developing some visual thinking skills in social studies for fourth grade primary students in Aswan Governorate. This is also consistent with the result of Ahmed's study (2022) which showed the effectiveness of the fishbone strategy in teaching Social Studies to develop systemic thinking skills among seventh grade students in the elementary school in Kuwait.

## Recommendations

In light of the results, the study recommends the following:

1. Encouraging History teachers to employ the Ishikawa's diagram strategy while teaching History because of its positive impact on developing productive thinking and raising the level of engagement in learning.

2. Holding training courses by educational supervisors to train History teachers on how to develop productive thinking skills in history according to the strategy of Ishikawa's diagram.

3. Conducting a study similar to the current study on students of different educational stages and other variables, such as: critical thinking, creative thinking, and self-learning.

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