

## The Effect of using the damaged Sundries on the Achievement of Students of the Technical Medical Institute in the Subject of Physiology

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### ABSTRACT

The current research seeks to identify the effect of using the strategy of accommodating diaspora in developing scientific thinking among students of the Technical Medical Institute / Baghdad in the subject of physiology. The study was based on the quasi-experimental approach through two groups, the first experimental and the second control. A random sample of students from the Technical Medical Institute was selected. In Baghdad, there were (50) male and female students. A scale of scientific thinking in the subject of physiology was prepared, in addition to verifying the psychometric properties of validity and stability. Before conducting the experiment, the researcher conducted a series of equivalences between the two groups in order to ensure that they were equivalent before conducting the experiment. After conducting the experiment, the researcher conducted Applying the dimensional scientific thinking scale to both groups, the results were:

1. The diaspora harmony strategy has a clear impact on developing scientific thinking among first-year students at the Medical Technical Institute in Baghdad.
2. There are statistically significant differences between both the experimental and control groups, and these differences are in favor of the experimental group.

**Keywords:** damaged Sundries, Achievement of Students, Technical Medical Institute, Physiology.

## Chapter One: Introduction to Research

### Research Problem

The rapid change in the present era is nothing but an introduction to faster and more comprehensive development. If we contemplate the contemporary scientific and technical revolution and the accompanying need to continue research and progress in all fields, it is imperative for us to think seriously about developing creative curricula for individuals from the early stages of their lives. This matter requires developing and improving educational curricula continuously, and for educational institutions to anticipate the development of thinking skills and their bias towards improving them among all categories of students, as a means to achieve sound goals and objectives (Habash, 2005, pp. 21-22).

Developing thinking skills in general and scientific thinking skills in particular is one of the important goals that teaching scientific subjects seeks to achieve. Educators have emphasized that one of the goals of teaching scientific subjects is to teach students how to think, not how to memorize curricula and syllabi by heart without understanding, absorbing, and employing them in life (Youssef, 2013: 3).

Therefore, the educational system must be distinguished by creativity itself and adopt exploratory methods instead of explanation and interpretation, and focus on higher levels of thinking instead of memorization, and be interested in developing and forming the creative personality among all categories of students and developing their creative abilities towards what is useful and valuable.

In addition to directing scientists to study innovation as a developing mental ability that can be cultivated from the early years of an individual's life, by discovering it through choices and scientific methods that help select students who are distinguished by the ability to provide the appropriate environmental and educational climate for its healthy growth (Ghabbari and Abu Sha'ira, 2010: 260).

Accordingly, it has become one of the duties of science subjects to develop thinking and its skills among students to help them understand generalizations based on the scientific method of practical thinking, and that the modern educational environment should not limit its mission to the mental aspect of teaching information, stuffing it and keeping it in the minds of students, but rather it should be concerned with forming the student's mentality and accustoming him to how to learn, which is the goal that the modern educational environment aims for (Abu Saree, 2008: 17-18).

The reality of teaching physiology suffers from difficulties that hinder the achievement of educational and pedagogical goals, and this is due to its teaching being limited to traditional methods that depend on indoctrination and memorization, which has made physiology lose the element of excitement and suspense and neglected the thinking process among students.

The usual traditional teaching methods focus on the scientific material and neglect the learner, so learning becomes a matter of memorizing a set of knowledge and information, which makes the learner passive and dependent on mechanical memorization, giving it great importance and focusing on controlling the material,

with the aim of retaining it and retrieving it when needed. Therefore, learners tended to summarize the study materials in notes and summaries to be easy without interacting with them or applying them in new situations, which weakened their tendency towards analysis, synthesis and innovation skills.

Based on the above, and despite the huge torrent of changes in the era of globalization, our educational institutions still rely on the traditional method as a basic method, making the teacher the main speaker in the class and the student the listener.

Because the teacher plays the role of the sender and the student plays the role of the receiver without having any opportunity to participate in the lesson, and the truth is that the teaching process does not proceed as required unless the subject teacher understands to a great extent the effective teaching methods for teaching his students, as the traditional methods centered around the teacher have become methods of little benefit if their use by the teacher is weakened, and teachers need to become familiar with many of the most appropriate methods so that learning is effective. (Badawi, 2014: 5)

Therefore, using modern teaching strategies helps develop thinking skills, and gives students a greater incentive to be more active in the learning process, and leads to the exchange of different experiences and skills between students.

The diaspora affinity strategy is one of the relatively modern strategies that focus on improving the quality of learning for the student, and allows him to interact with his colleagues, which leads to positive and effective participation on his part, and thus transforms him from a recipient to an active, participating and positive member, and emphasizes development and work with everything new, and instills a spirit of enthusiasm, creativity and innovation in the souls of students, and develops their higher thinking skills (analysis - synthesis - evaluation) and makes the student the focus of the educational process, which was confirmed by many studies such as the study (Al-Azzawi, 2013), the study (Hamid, 2011) and the study (Al-Taie, 2009).

The problem of the current research is highlighted by answering the following question:

What is the effect of using the dispersion fusion strategy in developing scientific thinking among students of the Technical Medical Institute / Baghdad in the subject of Physiology.

### **The importance of the research**

The importance of the research is crystallized in the following aspects:

1-The importance of the subject of Physiology as it is one of the important scientific subjects and the development of scientific thinking in it contributes to the development of scientific processes in it, as it is based on distinguishing between the familiar and unfamiliar ideas, visions and truth and interpreting phenomena scientifically.

2-The importance of studying scientific thinking and opening new horizons that take the side of theory and application together and knowing the means and techniques that stimulate the brain and develop innovation.

- 3-The importance of the dispersion fusion strategy in developing the mental abilities of students, especially their abilities to think scientifically.
- 4-Supplying Iraqi libraries with new information about the (dispersion fusion) strategy.
- 5-Using modern teaching strategies that work to stimulate thinking and confront what is new from the ideas that students face in their study of the subject of Physiology.

### **Research objective and hypothesis**

The current research seeks to identify the effect of using the dispersion composition strategy in developing scientific thinking among students of the Technical Medical Institute / Baghdad in the subject of physiology. Through the previous objective, the following hypothesis can be derived:

"There are no statistically significant differences between the experimental groups that receive instruction using the dispersion composition strategy and the control group that receives instruction using the traditional method in the post-achievement test in the subject of physiology."

### **Research Limits**

1. Spatial Limit: Technical Medical Institute in Baghdad
2. Temporal Limit: Academic Year 2023-2024
3. Human Limit: Students of Technical Medical Institute in Baghdad

### **Defining Terms**

#### **First: The impact**

\* (Al-Jarjani, 2003):- "It is: that the impact has three meanings: the first means the result, which is the result of the thing, the second means the mark and the third means the part" (Al-Jarjani, 2003: 9).

\* (Amer, 2006):- "It is: every negative or positive change that affects a project as a result of practicing any development activity" (Amer, 2006: 9).

The operational definition of the impact:-

"It is the change that occurs in the grades of the students - the research sample - (experimental) in developing their scientific thinking"

## Second: The strategy of dispersion

Dykstra (1996): It is (employing thinking in metaphors to notice what is familiar through unfamiliar means or to notice what is unfamiliar through familiar means or to combine different and apparently unrelated elements) (Dykstra1996)

Harris, 1998): It is (the ability to imagine or invent new things by combining ideas and modifying or changing them) (Harris, 1998)

Saada (2010): It is (a mental process in which the learner interacts with the many experiences he faces with the aim of absorbing the elements of the situation in order to reach a new understanding or new production that achieves an original solution to the problem and is of value to him or the society in which he lives) (Saada, 2010: 260)

Jarwan (2013): It is (linking different elements that have no apparent relationship using the arts of rhetoric, especially metaphor, and the arts of logic, especially the measurement of representation Or analogy according to a methodological framework with the aim of reaching creative solutions to the problem. (Jarwan, 2013: 210).

**Operational definition:** It is a strategy that works to stimulate thinking among the students of the experimental group in the first grade at the Technical Medical Institute in Baghdad through similes and metaphors for the purpose of developing responses characterized by scientific thinking among them by presenting the familiar subject in an unfamiliar way or seeing the unfamiliar subject in a familiar way.

## Third: Scientific thinking

It was defined by:

(Zaytoun, 2007): (They are educational processes that help students employ a set of their individual mental abilities and processes that are necessary in applying learning methods and sound thinking in a correct scientific manner. The ability to employ scientific thinking processes and skills requires students to represent information, process it, and carry out successive mental steps, considering that basic information is the first rule in the scientific thinking system) (Zaytoun, 2007: 101).

(Al-Khazraji, 2011): (Basic thinking based on facts available in the world or things that have an actual objective existence) (Al-Khazraji, 2011: 46).

(Taha, 2016): (One of the mental activities that individuals employ in treating the problems they face in aspects of their daily lives using organized scientific methods to reach appropriate solutions) (Taha, 2016: 12).

## Chapter Two: Theoretical Framework and Previous Studies

### First: Theoretical Framework

#### First Axis: Synectics Strategy

##### Definition of Synectics Strategy:

The study of Balkir & Topkaya (2017: 325) defines the strategy of diaspora affinity as an organized technique, designed to generate ideas, acquire problem-solving skills and produce new things from the way you make a comparison between unrelated elements through metaphor, and that this strategy is an educational model that aims to stimulate creative thinking and creates a sense of new information and provides a basis for it. Adnan Yousef Al-Atoum, Abdul Nasser Diab Al-Jarrah, and Muwaffaq Bishara (2019: 156) agreed that the strategy of diaspora affinity is similar to the brainstorming strategy in terms of the learners' participation in generating and producing new ideas and creating a free climate in which criticism and evaluation are absent, but it includes different connotations represented in its use of forms of metaphor, metaphor and representation in an organized manner to reach innovative solutions to various problems, as these two basic mechanisms are used: making the strange familiar and making the familiar strange.

##### Advantages of the diaspora fusion strategy

Yahya bin Abdul Khaliq Al-Youssef (2011: 185) states that the diaspora fusion strategy has various advantages that make it an effective strategy in different stages and suitable for all age levels. The most important of these advantages are:

- 1-Increases creativity among groups and individuals.
- 2-Encourages team spirit among students.
- 3-Encourages divergent thinking processes.
- 3-Provides students with different educational models.
- 4-Allows the use of feelings and imagination.
- 5-Useful in solving problems and brainstorming.
- 6-Expands the concept.
- 7-It can be used in all works and with all levels of students.

8-Helps students break mental rigidity and master abstract concepts.

Abdullah Mahdi Abdul Hamid Taha (2014: 15-16) believes that the Synctics strategy is characterized by a set of features, as it works to break mental rigidity, simplify abstract concepts, and develop creative responses to solve problems, in addition to being suitable for all ages and levels because it includes many skills such as (personal symmetry, imaginary symmetry, symbolic symmetry, direct symmetry).

The researcher concludes from the above the advantages of the diaspora affinity strategy with learners:

1-It is an effective tool in bringing about conceptual change in the alternative perceptions formed by learners.

2-It facilitates abstract concepts by focusing on the real representation that the learner lives, and provides a visual perception of what is abstract.

3-Uncovering alternative perceptions of what was previously learned at the beginning of training based on uncovering the learners' prior information.

4-Stimulating the learners' interest and thus increasing their motivation towards learning the topic of diaspora harmony.

5-It can be used at all ages and with all levels of learners.

6-Helps learners generate creative responses to solve problems.

7-Helps learners break mental rigidity, reduce cognitive load and simplify abstract concepts.

### **Steps to use the diaspora familiarity strategy:**

Saleh Hamad Ali Abu Jawad and Muhammad Bakr Nofal (2007, 200-201) mention the steps to use the diaspora affinity strategy as detailed by (Gordon, 1971), (Prince, 1970) which are:

**1-Presentation of the problem:** The problem is presented in the form of a goal or a set of goals in clear and simple terms.

**2-Problem analysis:** In this stage, the aspects of the problem are clarified, especially the ambiguous aspects, which is summarized in (making the strange familiar) for all participants.

**3-Immediate suggestions:** Providing the opportunity for participants to reveal their ideas and spontaneous suggestions that come to their minds during the discussion

process to clarify the aspects of the problem. One of the goals of this stage is to deepen understanding of the problem as a result of evaluating the ideas and immediate solutions proposed by the participants.

4- **The problem or objectives as I understood it:** One of the elements of the problem is chosen to deal with in order to find a solution for it. This element is called the problem as I understood it, and each participant expresses his vision of the problem and its solution in his own way.

5-Distraction from the problem: Temporary formal distancing from the problem, where the problem is removed from the center of attention and awareness, and they begin to apply procedural techniques from the pre-conscious level with the aim of (making the familiar strange).

6-Imaginary matching: This includes imposing a type of matching between the model or example that was reached and examined through the direct analogy technique. Gordon calls this stage the stage of wild imagination to impose matching.

7-Scientific matching: The work in this step focuses on finding a practical application of the example (analogous) to the problem, i.e. moving from the matching stage through wild imagination to the stage of practical matching.

8-A new point of view or problem: When the problem-solving process ends without reaching a successful solution, it usually leads to the emergence of a new point of view that represents a possibility and a re-solution.

### **Principles of the strategy of diaspora cohesion:**

1-William (1961: 5-6) explains these principles as follows:

2-Creativity or innovation is an important and necessary feature and ability in aspects of daily activity.

3-The creative process is not a mysterious or hidden matter, but it can be described and its features defined and learners trained to practice it directly in order to increase their creative abilities.

4-Creative breakthroughs are the result of creative mental processes that are similar in all fields such as science, arts, medicine, engineering and economics.

5-We can develop and enhance creative abilities in individuals and groups by helping learners to be aware of the creative process and by developing clear materials and positions that help in this.

6-The emotional and affective component of the creative process is more important than its mental component, and the irrational is more important than the rational, as the irrational allows divergent thinking and open ideas that may lead to a mental state capable of producing new and original ideas and things.

7- The emotional and illogical elements must be understood to help increase the likelihood of success in arriving at creative solutions to the problem at hand. These emotional and illogical elements can be understood and controlled consciously and intentionally. Achieving this conscious, intentional control through analogical metaphor and metaphor is the goal of the creative problem-solving method.

## **Second axis: Scientific thinking**

### **The concept of scientific thinking**

Scientific thinking is considered one of the organized mental activities based on evidence and proofs that individuals use to deal with the situations they are exposed to in sound and organized ways within the mental and realistic axioms. Maamar (2006: 35) stated that scientific thinking is: (A type that is based on the foundations of verification, as individuals do not accept opinions and do not reach judgments except with the availability of evidence that proves their validity by using accurate methods in observing phenomena and using sound logic and reasoning to what the human mind accepts).

Zaytoun (2007: 101) stated that scientific thinking: (It is an educational process that helps students employ a group of their individual and necessary mental abilities and processes in applying learning methods and sound thinking in a correct scientific way. The ability to employ scientific thinking processes and skills requires students to represent information, process it, and carry out successive mental steps, considering that basic information is the first rule in the scientific thinking system).

Scientific thinking is: (Basic thinking based on facts available in the world or things that have an actual objective existence) (Al-Khazraji, 2011: 46).

As for Taha (2016: 12), he explained that scientific thinking is: (One of the mental activities that individuals employ to treat the problems they face in aspects of their daily lives using organized scientific methods to reach appropriate solutions).

Scientific thinking is also known as (one of the conscious activities characterized by complexity, and it is one of the practical mental names that individuals rely on to communicate scientific knowledge) (Mubarak, 2017: 284).

As for Ismaili (2019: 38), he explained that scientific thinking is: (the process of thinking about the contents of science, and a set of logical processes that permeate it, such as deduction, experimental design, causal inference, concept formation,

hypothesis testing, and other processes that seek to find a solution to a specific problem).

Through the above, the researcher sees that scientific thinking is one of the most prominent types of organized thinking that aims to research the study of phenomena surrounding individuals, and work to interpret them and discover the scientific rules that govern them by directly relying on a specific scientific methodology to be able to reach appropriate solutions to problems and verify their validity and suitability to the current educational situation.

Learning a scientific way of thinking and understanding the nature of knowledge is considered one of the most important goals of education, as through it students understand the nature of scientific knowledge in all subjects, and receive an understanding of its principles and concepts, which helps deepen the understanding of scientific thinking phenomena among students, and realize the general problems that students face in learning scientific thinking skills, which enables teachers to develop their own teaching method by including aspects that support students to learn scientific thinking skills (Kazem, 2002: 87).

### Features of Scientific Thinking

Scientific thinking has acquired many features after a long series of developments that the ages have gone through. At the beginning of these developments, individuals thought in a different way that they believed would enable them to reach the truth, but they discovered that some of these methods were wrong, so they were excluded and the methods that proved successful were kept by distinguishing them with many features. The most prominent of these features are the following:

**First: Accumulation:** Sciences are considered accumulated knowledge. Every new theory is based on previous scientific theories and works to go beyond what they have reached and builds on them, and knowledge grows in the horizontal and vertical directions, unlike other theories that destroy the philosophical doctrines that preceded them as soon as they are launched (Mahmoud, 2017: 6).

**Second: Organization:** Organization is one of the most prominent features related to scientific thinking, which is considered organized, i.e. no idea is left free, but rather all ideas are arranged, and through organizing these ideas, the world around us is revealed, and what the individual wants to study is extracted from the overlapping facts and phenomena. Organization paves the way for individuals to follow methods and plans to consider surrounding matters, as it is one of the basic pillars in all sciences (Shiha, 2016: 67).

**Third: Discovering the causes:** Mental activities are not science, in the full sense of the word, unless that goal is accompanied by understanding the phenomena, and these phenomena cannot be understood unless methods are reached that range between the desire to satisfy the theoretical aspects of individuals, or that the goal is connected to

the belief that knowing the cause has no effect from a scientific point of view, which enables us to understand the phenomena and control them better, which helps in reaching successful scientific results (Zakaria, 2021: 87).

**Fourth: Comprehensiveness and certainty:** Scientific knowledge is considered comprehensive because it is applied to all phenomena found in science, and does not look at phenomena individually, even if these phenomena are from daily life, such as the fall of heavy objects to the ground, it is not sufficient to consider the matter as it was observed, but rather its contradiction to more important matters such as the mass of the body and gravity, as the scientific idea does not go back to the fall of the body, but rather the generality of the fall of the body and the reasons that led to its fall (Sabah, 2016: 76)

**Fifth: Abstraction and accuracy:** Individuals often use ambiguous expressions, which are far from accuracy, especially in daily life, which can lead to important functions as well as scientific matters in which it is difficult to issue a definitive scientific decision, but there remains the opportunity for probability based on the latest scientific findings (Khalil, 2012: 76).

From the above, the researcher sees that the most prominent features of scientific thinking are that it includes a large number of operations that scientific activities require. Scientific thinking is also characterized by the accumulation of cognitive sciences and is built on the basis of the sciences that preceded it. This type of thinking is characterized by organizing ideas and not leaving them freely, and the ability to search for reasons. It is also characterized by comprehensiveness and certainty, and the ability to be precise and abstract in expressions and ideas.

#### **Scientific thinking skills:**

Thinking is considered one of the skillful works that include a large number of separate operations and skills, and they are collected together before being used to achieve the required goals, which are called mental operations, or what are called scientific thinking skills, which show the integrated process of science with scientific methods in different fields of thinking, such as scientific research (Remigio, Yangco., & Espinosa, 2014: 8).

Scientific thinking skills are defined as: (A set of mental and practical abilities required, in applying scientific methods, and scientific investigation methods in correct ways) (Fuchs, 2005: 12).

As for Al-Asimi (2014: 6), he defined scientific thinking skills as: (A set of skills represented in special mental abilities and operations that students use in learning as they are among the skills necessary in practicing scientific methods and thinking in a scientific manner, which contributes to achieving goals in the least possible time and effort). Al-Amoudi (2013: 39) also indicated that scientific thinking skills are: (A set of mental processes and methods used to collect information related to a specific

situation, and to think about this information in an organized context in order to reach a logical solution that includes a series of basic integrated processes).

Scientific thinking skills are: (Specific processes that individuals perform and use intentionally in order to process information, such as analysis, evaluation, reaching results, and formulating the necessary decisions in problems) (Al-Qahtani and Al-Rashed: 2020: 67).

Scientific thinking skills are: (The mental processes that the mind performs to be able to collect, retain, and store information through a set of procedures represented in analyzing, classifying, comparing, and making appropriate decisions) (Atiya, 2015: 62)

Through the above, the researcher sees that scientific thinking skills are a set of mental processes and abilities that students follow in solving their problems and educational situations that they are exposed to, based on an organized and integrated series of successive processes.

As for the characteristics of scientific thinking skills, Maamar (2006: 7) pointed out the most prominent characteristics of scientific thinking skills, as follows:

These skills are characterized by problematic, meaning that thinking depends on the problem in determining the topic.

These skills depend on thinking as the axis of all mental activities that students perform.

Scientific thinking is based on experience and what students possess of previous knowledge and information.

Scientific thinking has many levels, as it can be done at the level of scientific actions or levels of employing words and concepts in the form of internal diagrams.

Scientific thinking depends largely on the personality of the learner and his nature, as thinking is not a process independent of the learner.

Scientific thinking skills include many basic skills, such as: observation, the ability to ask and direct questions, striving towards prediction, the ability to test ideas and hypotheses, documenting the data that is reached, communicating ideas to others, and interest in modeling scientific thinking, as well as providing opportunities for learners that allow them to experiment, explore, and participate in play and scientific practices, in order to build a solid foundation for the future application of their scientific research process, and to encourage the development of scientific thinking among learners (Zeilik, 2010).

## **Second: Previous Studies**

### **Study (Daoud, 2017): The effect of using conceptual maps and the diaspora affinity model in learning the concept**

"This study aimed to reveal the effect of using conceptual maps and the diaspora affinity model in learning the concept among second-grade female students in the science subject. Al-Zahour Girls' Elementary School, which is a school affiliated with the International Relief Agency, was chosen intentionally; due to its proximity to the researcher's workplace, and the cooperation of the school administration. Three

classes of second-grade female students were randomly assigned, where one of the classes, numbering (26) students, was the first experimental group on which the conceptual maps were applied, while the second class, numbering (26) students, was the second training group on which the diaspora affinity model was applied, while the third class, numbering (26) students, was the control group. To achieve the objectives of the study, a practical application guide was prepared to teach the environment unit according to the diaspora affinity model and another according to the use of conceptual maps. A set of magnetic tools was also prepared and metal plates were provided to facilitate the application of the study. In order to measure the learning of concepts, a test was prepared to measure the learning of Concepts. The results of the study revealed statistically significant differences between the arithmetic means of second-grade female students in learning concepts in favor of the first and second experimental groups. The results of the study showed that there was no difference in learning the concept between the first experimental group that studied using concept maps and the second experimental group that studied using the diaspora affinity model. The results of the study did not show any difference in the post- and post-test arithmetic means in learning the concept among the two experimental groups, which confirmed the stability of learning the concepts of the environment unit.

Study (Al Saud, 2020): The effectiveness of teaching science using the diaspora affinity strategy in modifying alternative perceptions among first-year middle school students

"The research aimed to identify the effectiveness of teaching science using the diaspora affinity strategy in modifying alternative perceptions among first-year middle school students. To achieve this goal, the experimental approach was relied upon, as the research sample consisted of (63) female students at Al-Bassam School in Sarat Ubaida. They were divided into two experimental groups, numbering (32) female students and a control group, numbering (31) female students. Two tests were used in this research: the alternative perceptions diagnosis test to reveal alternative perceptions, Chapter Twelve "Environmental Science" in the "Life and Environment" unit of the science book for the first-year middle school, and the alternative perceptions test to identify the effectiveness of the diaspora affinity strategy in modifying alternative perceptions among first-year middle school students after applying the experiment. The research reached the most important results: There are statistically significant differences at the significance level ( $\alpha = 0.05$ ) between the average scores of the students of the two experimental groups. The control group in the post-application of the alternative perceptions test in favor of the experimental group students, and the effectiveness of teaching science using the diaspora harmony strategy in modifying the alternative perceptions of the first intermediate grade students.

## Chapter Three: Research Procedures

### First: Research Methodology and Experimental Design:

The researcher used the quasi-experimental method, which is considered one of the most important scientific research methods and the most widely used in research and studies, in addition to the fact that this method is one of the flexible methods that we can adapt to the nature of the subject being studied.

The researcher chose the experimental design with partial control, through two groups, the first experimental through which the experiment is conducted, and the second control through which the equivalence is conducted. In the end, the researcher conducts a final test to measure the effect of the strategy in the experimental group, as shown in the following table:

**Table (1)**  
**Experimental design of the research**

Ser.No.	Groups	Independent variable	Variable
1	Experimental	diaspora familiarity strategy	Scientific thinking
2	Control	Traditional method	

### Second: Research Community

The current research community consists of first-year students at the Technical Medical Institute in Baghdad Governorate for the year 2023-2024, and since the research community is small, estimated at (50) male and female students, the researcher chose the entire community to be the current research sample.

### Third: Research Sample

A sample of students at the Technical Medical Institute in Baghdad was selected, represented by first-year students, and the sample consisted of (50) male and female students who were selected and randomly distributed into the two groups of the current research and what is shown in the following table:

**Table (2)**  
**Experimental Research Sample**

Group	Independent variable	No.
Experimental	Diaspora familiarity	25
Control	Lecture	25

#### Fourth: Equivalence of the two research groups:

##### 1. Equivalence in age

The researcher used the t-test for two independent samples to verify that both groups were equivalent in age, which was estimated in months, as follows:

**Table (3) Equivalence between the two groups in chronological age**

Group	No	Arithmetic mean	Standard deviation	T-Value		Function level	Decision
				Calculated	Tabular		
Experimental	25	231.80	2.483	Calculated	Tabular	0.05	Nonfunctional
Control	25	229.32	3.954	0.356	2.02		

It is clear from the previous table that there is equivalence between both groups in the estimated chronological age in months due to the fact that the calculated value is greater than the tabular value.

##### 2- Equivalence in the intelligence test

The researcher used the Raven Intelligence Test to measure the equivalence of both groups in the level of intelligence. The researcher used the t-test for two independent samples, as shown in the following table:

**Table (4) Equivalence between the two groups in the intelligence test**

Group	No	Arithmetic mean	Standard deviation	T-Value		Function level	Decision
				Calculated	Tabular		
Experimental	25	45.04	1.399	Calculated	Tabular	0.05	Nonfunctional
Control	25	45.12	1.536	0.193	2.02		

It is clear from the previous table that there is equivalence between both groups in the intelligence test due to the fact that the calculated value is greater than the tabular value.

##### 3. Equivalence in the pre-scientific thinking test

The researcher used the pre-scientific thinking test to ensure equivalence between both groups and used the t-test for two independent samples to measure this, as shown in the following table:

**Table (5) Equivalence between the two groups in the pre-scientific thinking scale**

Group	No	Arithmetic mean	Standard deviation	T-Value		Function level	Decision
				Calculated	Tabular		
Experimental	25	87.43	13.24	1.43	2.02	0.05	Nonfunctional
Control	25	88.32	11.45	1.43	2.02		

It is clear from the previous table that there is equivalence between both groups in the pre-scientific thinking due to the fact that the calculated value is greater than the tabular value.

#### **Fifth, the scientific thinking scale:**

Among the procedures for achieving the objectives of the current research is the preparation of a scientific thinking scale in the subject of physiology for first-year students at the Technical Medical Institute in Baghdad. The test may consist of (30) items with five alternatives (always, often, sometimes, rarely, never).

Psychometric characteristics of the test

#### **1- Test Validity**

The researcher verified the validity of the scale through logical validity by a sample of experts and arbitrators, who were asked to express their opinion on the linguistic and scientific integrity of the test paragraphs. The researcher relied on the agreement rate criterion (80%) as a criterion for accepting the paragraph. Accordingly, all paragraphs were considered valid for measuring what they were designed to measure.

#### **2- Stability**

Cronbach's alpha equation was applied to the stability sample and to all test items, and the stability value was found to be (0.77).

#### **Sixth: Statistical methods:**

The researcher used the following statistical methods in processing the data:

1. Arithmetic mean
2. Standard deviation
3. (t) test for two independent samples for equivalence and verification of hypotheses
4. Cronbach's alpha to verify stability
5. Percentages to verify expert agreement.

## Chapter Four

### Research Results

#### First: Research Results

The current research is based on the following hypothesis: "There are no statistically significant differences between the experimental groups that receive instruction using the dispersion strategy and the control group that receives instruction using the traditional method in the post-achievement test in the subject of physiology."

The researcher verified the researcher's hypothesis by applying the scientific thinking scale to the experimental and control research sample at the end of the experiment. The researcher used the t-test for two independent samples in order to verify the hypothesis.

**Table (6) Comparison between the experimental and control groups in the post-application**

Group	No	Arithmetic mean	Standard deviation	T-Value		Function level	Decision
Experimental	25	126.23	16.34	Calculated	Tabular	0.05	Nonfunctional
Control	25	89.32	11.36	5.23	2.02		

From the above, it is clear to us that the calculated T-value reached (8.23), which is greater than the tabular value of (2.02). This means that there are statistically significant differences between the two groups in the post-application, in favor of the experimental group, because its arithmetic mean in the post-application is greater than the control group. As a result, we reject the null hypothesis and accept the alternative hypothesis. Thus, we confirm that there is a clear effect of the diaspora fusion strategy in developing scientific thinking. The researcher sees from the above that this strategy has a clear effect in developing the scientific thinking of learners, due to its reliance on active self-learning, which contributes to motivating learners to obtain knowledge and apply it on the ground. Thus, this matter was reflected in the development of scientific thinking in an experimental and laboratory manner.

#### Second: Conclusions:

1-The strategy of diaspora familiarity has a clear effect on the development of scientific thinking among first-year students at the Technical Medical Institute in Baghdad.

2-There are statistically significant differences between the experimental and control groups, and these differences are in favor of the experimental group.

### **Third: Recommendations:**

1. Work on developing the skills of physiology teachers regarding strategies based on active and self-learning represented by fusion of dispersion
2. Develop the physiology curriculum in line with constructive and modern teaching strategies
3. Hold scientific conferences that specialize in teaching methods and strategies for physiology.
4. Provide the necessary material capabilities to implement teaching strategies based on active learning

### **Fourth: Suggestions:**

The researcher proposes conducting the following studies:

- 1-The effect of the (diaspora familiarity ) strategy on the achievement of students of the Taqi Medical Institute in the subject of physiology.
- 2-The effectiveness of the dispersion fusion strategy in developing scientific concepts in the subject of science among middle school students.

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