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The effect of the (T-shape) strategy on the achievement of chemistry for second-grade intermediate students

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Abstract---The research aims to know the effect of the strategy (T-shape) on the academic achievement of chemistry for second year middle school students. To achieve the goal of the research, the following null hypothesis was formulated • :There is no statistically significant difference at the level of significance (0.05) between the average scores of the experimental group students who study according to the T-shape strategy and the average scores of the control group students who study according to the usual method in the academic achievement test for chemistry . The researcher adopted the experimental research method, which is represented by designing the post-test with partial control for two independent equal groups. Al-Khalidiya for girls (by lottery method), then two divisions of the second intermediate class were chosen randomly (by lottery method) to represent the (B) division of the experimental group that was studied according to the strategy (T-shape), and Division (C) the control group that was studied according to the usual method If the research sample reached (60) students, with (30) students for each group, and parity was made between the two groups in some variables that could affect the results of the research by participating with the independent variable in the dependent variables: (chronological age calculated in months, intelligence, Previous achievement for chemistry, previous information, (the dimensions of mental alertness scale), and the research requirements were prepared, which included defining the scientific subject in the first three chapters of chemistry from a book Science for the second intermediate grade to be taught for the academic year (2021-2022), the formulation of behavioral objectives for these classes, which numbered (157), and the preparation of teaching plans, which numbered (14) teaching plans for

each group, and the researcher taught the experimental and control groups. During the application period of the experiment, two research tools were also built: the achievement test, which consisted of (40) items of multiple choice, and the researcher found a statistically significant difference at the level of significance (0.05) between the average scores of the experimental group students who studied according to the strategy (The shape of the letter T) and the average scores of the students of the control group who studied according to the usual method in the academic achievement test for chemistry and in favor of the experimental group.

Keyword--T-shape, chemistry, second-grade, intermediate students

First, the research problem

Through the researcher's experience in teaching chemistry for the secondary stage (for a period of three years), especially the second intermediate, the researcher concluded that students' achievement in chemistry has recorded a noticeable decline during the previous three years, in addition to the nature of the methods and methods adopted in the educational process and the teachers' abilities in The educational process has also become low, and the importance of science and its teaching stems from the fact that it has a great role in the progress and development of nations, as the developed countries have noticed this importance for a long period of time, so they took their way to improve and develop science curricula and search for teaching methods and methods that are appropriate with the nature of science, including subject matter. Chemistry that needs teaching methods whose basis is to involve students in educational activities (Ambosaidi et al., 75, 2016). In light of this, the research problem crystallizes by answering the following question:

- What is the effect of the (T-shape) strategy on the achievement of chemistry for second-grade intermediate students?

Second: The Importance of Research)

In our current era, we notice the wide progress in the scientific and information field. This progress has led to a reduction in the role of the school in providing students with the knowledge and experience that students need. The activities and skills that the school or educational institution will train students to practice are how students learn. On their own, without total dependence on the teacher, and in light of this comes the importance of adopting a few modern learning strategies that motivate the student to think and encourage collective cooperative work, which is one of the most important goals for the modern school, which aspires to keep pace with the developments of the current era. (Nofal and Faryal, 25, 2010).

One of the modern strategies in active and effective learning is the (T-shape) strategy whose idea includes that students use (T-shape) to make a comparison between scientific topics in terms of similarities and differences, as students write

key information about scientific concepts that are compared in the designated places. After that, the students are required to write the similarities and then the differences in the places designated for them in the figure, emphasizing not to repeat what was written in the first part devoted to each concept, and then write a simple summary of what was compared, and then an interactive discussion is made By the teacher with the students, as it helps them to generate different creative ideas. The T-shape strategy aims to provide students with the skill of comparing chemical concepts and contributes to developing the skill of visual thinking, since the T-shape is a schematic organizer (Ambo Saidi et al., 51, 2019). According to what was previously presented, the importance of the research is crystallized as follows:

- This is the first research according to the researcher's knowledge, which compromises the effect of the T-shape strategy in the achievement of chemistry for second-grade intermediate students.
- The importance of using modern teaching strategies, such as the T-shape strategy.
- The current research may contribute to improving the achievement level of second-grade intermediate students.

Third: Aims of the Research Objectives

The current research aims to know the effect of the T-shape strategy on: the achievement of chemistry among second-grade intermediate students.

Fourth: - Search hypothesis

To achieve the objectives of the research, the null hypothesis was formulated: There is no statistically significant difference at the level of significance (0.05) between the average scores of the experimental group students who study according to the strategy (T-shape) and the average scores of the control group students who study according to the usual method in the academic achievement test for chemistry.

Theoretical definition

The researcher adopts a definition (Abu Jado, 2009). Procedural definition:- The sum of what the students of the second grade average have learned after the specified research period, as measured by the grades obtained by the students in the chemistry achievement test prepared by the researcher for the purposes of the research.

Fifthly: Frontiers of research

The current search is limited to:

- Students of the second intermediate grade of one of the governmental intermediate day schools affiliated to the Ramadi Education Directorate in Anbar / Al-Khalidiya Intermediate School for Girls.
- The first semester (course) of the academic year (2021-2022).

- The first (three) chapters of the Science Book - Part One for the second intermediate grade, second edition for the year (2018 AD), for the Ministry of Education, Republic of Iraq.

Sixth: Defining terms: (Definition of Terms)

(T-shape) defined by (Ambo Saidi et al., 2019, 51): The idea of the T-shape strategy is based on students using the T-shape to make a comparison between certain things in terms of similarities and differences, and it is considered one of the effective teaching strategies.

Procedural definition

A set of regular steps practiced by the researcher during the implementation of the lesson and preparation of teaching plans to teach the second-grade female students of the middle class to the experimental group according to the strategy (shape of the letter T).

The first axis: - theoretical background

First, the constructivist theory

The word Constructivism is derived from construction or structure, which is derived from the Latin origin (sturare) meaning the way a building is erected. The constructivist theory is an educational philosophy that means that the learner creates his own knowledge that he stores inside him, for each person has his own knowledge, and that the learner has his own knowledge, either individually or collectively based on his current knowledge and previous experiences, as the learner selects and transfers information, forms hypotheses and makes decisions based on the structure. conceptual ability to do so. (Al-Adwan and Ahmed, 33, 2016). Therefore, constructivism focuses on the activity of the learner during his learning and learning based on understanding (meaningful learning) and this is done through his participation in the activities effectively so that he can build his own scientific concepts and information, and the teacher must have the ability to know the way students think and build information in a way It is correct so that it can achieve the basic purpose of the constructivist theory. (Suwaidan and Haider, 2018, 108)

Characteristics of the constructivist theory

- Ensuring the student's participation in the learning process is necessary to obtain a better understanding.
- Students are encouraged to make sense of themselves.
- It is concerned with building knowledge and not redirecting it by the teacher to the students.
- The teacher's role as guidance, supervision and leader of the educational process.
- Refuses to receive information in a negative way. (Al-Dulaimi, 2014, 39)

The advantages of active (effective) learning

Scientific research conducted for active learning indicates that the student's ability to focus diminishes after 10-15 minutes, and this results in a decrease in the amount of information that the student can retain. Student achievement, apart from the importance of involving students in the educational process in terms of quantity and quality, in order to reduce the physical, psychological and mental effort that students dedicate while participating in educational and academic experiences. The researcher found only one Arab study for the independent variable, and there is no other Arab or foreign study to the knowledge of the researcher. As for the dependent variable, the researcher mentioned two Arab studies and a foreign study.

A study dealing with the independent variable Tshape strategy

Table 1
study dealing with the independent variable (T-shape strategy)

Results	Statistical means	Tools	Sample	Place	Aim	Study
The experimental group who studied according to the (T-shape) strategy over the control group	T-test, chi-square, coefficient of difficulty, coefficient of discrimination, effectiveness of false alternatives.	achievement test	65 students	Iraq dyali	Knowing the effect of the T-shape strategy on the achievement of Arabic grammar for fifth grade students.	Al awsi 2021.

Practical framework: research methodology and procedures

First: - Research Methodology

The researcher has adopted the experimental method, which is based on determining the various conditions and variables that may appear during the search for information related to a particular phenomenon, as well as controlling those conditions and variables and trying to control them (Al-Jubouri, 2012, 195).

Second: Experimental Design

It is what the researcher does in terms of a program or a plan of action through prior planning for the purpose of knowing the answer to the research problem presented, as well as to ensure the accuracy of the results he reached. (Al-Tayeb et al., 2005: 95). And it can be said that the experimental design with partial control is more suitable for the subject of the research, due to the inability to control all the factors affecting in some situations, and also because of the difficulty of achieving tight control in educational and psychological research in general (Al-Zoba'i and Abdel-Jalil, 1981, 128). Therefore, one of the designs was relied on. Experimental with partial control of the two research groups, the experimental and control with the post-test (achievement test for chemistry) and the table (2) shows the experimental design of the research:

Table 2
Experimental design of the research

post test	Dependant variable	Independent variable	parity	Group
achievement test for chemistry	achievement test for chemistry	T . Shape Strategy the usual way	1. Chronological age in months 2. IQ test (Otis-Lennon) 3. Test the previous information in chemistry 4. Previous achievement of chemistry in science for the first intermediate grade	Experimental
				Control

Third: Identify the research population

The research community is determined according to the nature and purposes of the research, and it is a group of individuals bearing the characteristics of the original community, which the researcher is interested in studying and generalizing the results of his research on the basis of. (Al-Zuhairi and Suwaidan, 139,2018). The current research community consists of all female students of the second intermediate grade in middle and secondary schools, the day government of the Anbar Education Directorate / Habbaniyah District for the academic year (21-2022), and their number is 200 students. Table (3) shows this:

Table 3
Schools that represent the research community

Name of school	T
Al-Hawari Model High School	1
Shoaa al marifa High School for Girls	
Al Rayaheen High School for Girls	
Habbaniyah high school for girls	
Salman Al Farsi High School for Girls	
Al-Qoutouf High School for girls	
Abdul Rahman Al-Nasser High School for Girls	
Andalusia High School for Girls	
Al-Intifada High School for Girls	9
Al-Makassed high school for girls	
Zaid bin Haritha High School for Girls	
Al-Noor high school for girls	
Jannat Al-Khild High School for Girls	
Princes High School for Girls	

Al-Afnan secondary school for girls	
Fatima Al-Zahra Secondary School for Girls	
Medium glory for girls	
Al Khalidiyah Intermediate School for Girls	

Fourth: Identify the Research a Sample

It is a segment of society that contains all the vocabulary to be searched so that it is clearly representative of the society (Abu Allam and Rajaa, 2001: 162), and data is collected through this segment directly and its results are generalized to the society represented by it (Al-Najjar, 2010, 150). Al-Khalidiya Intermediate School for Girls was chosen randomly (the lottery method), which contains three sections for the second intermediate, and was chosen by random assignment (the lottery method) to represent the (B) group of the experimental group and the (C) section of the control group.

Fifth: Content Procedures

There are many factors and variables that may affect the validity of the research application and the accuracy of its results, so the following was done:

The internal safety of the experimental design

In order to achieve the internal safety of the experimental design, the variables must be controlled, which is one of the most important measures for the safety of experimental research, due to the internal validity it provides. Abdul Hafeez and Ikhlas, 2000, 180). The researcher has been keen to make parity between the experimental and control groups so that the results are more accurate and for all variables except for the independent variable whose effect is to be studied (Al-Assaf, 2003, 321) and my agencies: -

The chronological age, calculated in months

The chronological age of the students of the research sample was calculated in months from the date of their birth until (11-7-2021), as it was obtained from the school card and with the help of the school principal, and after treating the values statistically, the average age of the experimental group students was (163.23) months, and The control group (162.73) months, and by applying the t-test for two independent families, it turned out that there was no statistically significant difference at the significance level (0.05) and the degree of freedom (58), as the calculated second value amounted to (0.260), which is less than The tabular value (2), which indicates that there is no statistically significant difference between the two research groups at the level of significance (0.05), and this indicates that the two groups are equivalent in the chronological age variable as shown in Table (4).

Table 4
the arithmetic mean, standard deviation, and the calculated and tabular T-value
of the chronological age variable for the students of the two research groups

Statistic al indicatio n level (0.05)	T value		Free dom Degr ee	Standa rd deviatio n	SMA	Num ber of stud ents	Group	T
	Tabula r	Calcula ted						
Significa nt	2,000	0,260	58	7,58	163,23	30	Experi mental	1
				7.5	162,73	30	Control	2

The effect of experimental procedures

Sometimes we notice that some side effects occur during the application of the experiment, and therefore some measures have been taken to avoid these effects, including:

- Confidentiality of the research: It was agreed with the School of Chemistry and the school administration not to inform the students of the identity of the research or its purpose so that they would not change their activities or make an extra effort, which would affect the results of the research.
- School of Subject: The researcher taught the research sample in order to confirm the implementation of the strategic steps for the experimental group and the usual method for the control group and to reach a high degree of accuracy and precision in the results.
- The study subject: The subject covered by the experiment is the (first three) chapters of chemistry from the science book for the second intermediate school, part one, in its second edition for the year 2018.
- Teaching aids: Illustrations were used for both groups (experimental and control) in terms of using the whiteboard, colored pencils, illustrators, holograms and scientific experiments for the subject to be taught.
- Duration of the trial: The trial began on Sunday (11-7-2021) and ended on Sunday (23-1-2022).
- The place of the experiment: the research sample on which the experiment was applied from one school, which is Al-Khalidiya Intermediate School for Girls, and in two similar classes in terms of (space, ventilation and lighting, and the size of the seats).
- Distribution of lessons: It was agreed with the school administration to allocate Monday and Tuesday of each week the schedule for teaching the two research groups at two lessons per week (for each group), as shown in Table (5).

Table 5
Distribution of the weekly chemistry classes to the female students of the two research groups (experimental and control)

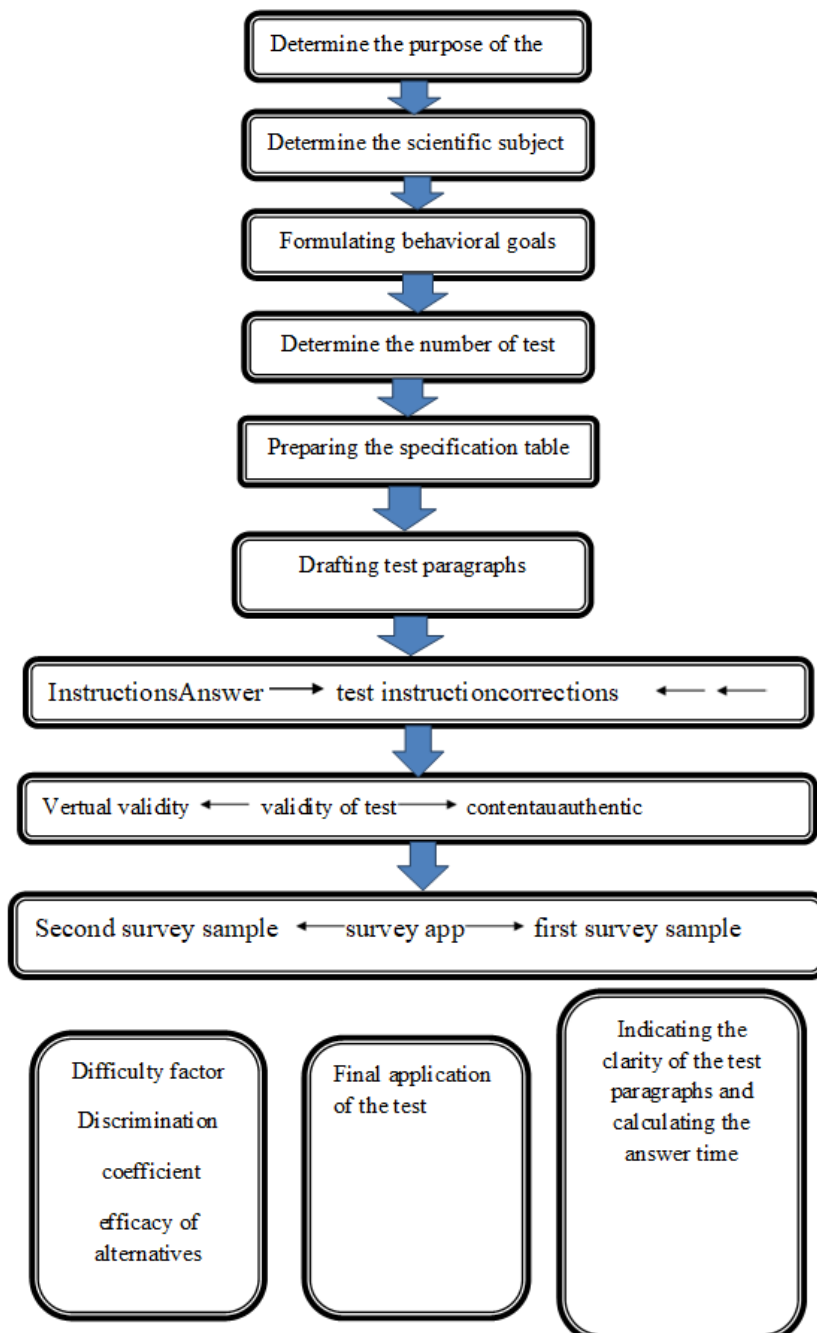
Tuesday	Monday	Group
Third class	Second class	Experimental
Second class	Third class	Control

Sixth: Research Tools

What is meant by the research tool is the method by which the researcher collects data in order to be able to solve his research problem and verify his hypotheses. (Al-Duwaidi and Raja, 2002, 305). The researcher has prepared two tools: a test in the achievement of chemistry for the second intermediate grade, and a scale of dimensions of mental alertness, as follows:

The achievement test (for chemistry for the second intermediate grade)

An achievement test for chemistry has been prepared that is commensurate with the course content and behavioral objectives in light of following the specific steps, as it is one of the most important assessment tools for measuring students' learning outcomes as one of the interests of a successful teacher (Melhem, 2012, 194). As shown in diagram (1):



Scheme No. (1) The steps of constructing the achievement test (designed by the researcher)

Determine the objective of the test

When the teacher designs the test in achievement, he must determine the objective of this test, and formulate it in the appropriate manner, then the test

questions were formulated in accordance with the goal for which it was designed. Science. (Melhem, 201, 2000)

Identification of the scientific material Formulating Behavioral Objectives

According to Bloom's classification within the cognitive domain, treatment objectives were formulated and their level determined after being presented to a number of arbitrators, and their number reached 157.

Determine the number of test items

After taking the opinions of arbitrators and experts, it was agreed that the test should consist of (40) objective paragraphs of the type of multiple choice.

Preparation of the specification table (test map)

The specification table is the most important step in constructing achievement tests, and it is known as a scheme that links the behavioral objectives and the academic content, and the relative weight of each of them (Al-Titi, 2008, 248), and the weights of the behavioral objectives were determined for each level of Bloom's cognitive domain. Percentage by dividing the total behavioral objectives for each level by the total number of behavior objectives. As the test is good if it balances between behavioral purposes and educational content. The relative weights of the content of the three chapters, the percentage of behavioral objectives, and the number of paragraphs were determined according to the following equations:

$$\text{Relative weight of chapter content} = \frac{\text{The number of attributes of the class}}{\text{number of pages}} \times 100$$

Behavioral purpose ratio =

$$\frac{\text{The number of behavioral objectives at a given level}}{\text{The sum total of the behavioral objectives}} \times 100$$

(Al-Khalili and Odeh, 1998, 151)

The number of paragraphs per cell = the relative weight of the content x the percentage of behavioral purposes x the total number of paragraphs and a table (6) represents the test map for the achievement test. (Murad and Mahmoud, 2002, 35).

Table 6
Table of Specifications for the Achievement Test

Total		behavioral purpose ratio					content ratio		
	Assessment %1	%4installing	analysis %8	Applying %18	Understand %31	Remember %38	weight	N.O of pages	Chapter title
%16	0~0.148	1~0.592	1~1.184	3~2.664	5~4.588	6~5.624	%37	15	chapter

									one
%11	0~0.116	0~0.464	1~0.928	2~2.088	4~3.596	4~4.408	%29	12	Chapter 2
%13	%0.136	1~0.544	1~1.088	2~2.448	4~4.216	5~5.168	%34	14	Chapter 3
40	0	2	3	7	13	15	100	41	Total

Drafting test paragraphs

Formulation of multiple-choice paragraphs, as the test consisted of (40) items, as this type of paragraphs is characterized by the efficiency of evaluation, comprehensiveness, its answers are specific and not open to interpretation, include most aspects of the content you deal with, its stability level is high and it is easy to record grades (Al-Dulaimi and Ihsan, 2005, 53), and it helps in achieving goals from different levels of knowledge, and also measures the ability of learners to understand and know different scientific facts, and this paragraph consists of a question that explains a specific problem followed by four alternatives (one of which represents the answer only correct) and the correct answer is selected. (Abu Fouda and Najati, 2012, 30)

Formulation of test instructions

- **Answer Instructions**

A page has been prepared in the introduction to the test that includes instructions to help the students to answer, as it includes information specific to the student, the goal of the test and the number of its paragraphs, in addition to how to answer by not choosing more than one alternative for each paragraph or leaving it without an answer because it is considered wrong.

- **Correction Instructions**

The correction key has been prepared for the paragraphs of the achievement test, as the student is given one mark for the paragraph with the correct answer, and zero for the wrong answer, and thus the total score of the test ranged from (zero as a minimum to 40 as a maximum).

The validity of the test

it means “that the test measures what it is intended to measure,” using certain methodological methods before confirming the results obtained from them. (Abu Hawij, 65, 2013), and to verify this, it was adopted:

- **Face Validity:** Honesty is that the test measures what it was prepared to measure, which is the general structure or form of the test that shows how the paragraphs are formulated and their degree of clarity. (Al-Najjar, 280, 2010) In order to achieve the apparent validity of the test, the test items were presented in its initial form to a group of experts and arbitrators to express their opinions on the validity and formulation of its paragraphs, and their suitability for the behavioral purposes that were set to measure them. The paragraphs and their reformulation, as the paragraphs obtained an

agreement percentage of the arbitrators (80%), and thus are considered acceptable. (Najm and Kholoud, 105, 2016)

- **Content Validity:** It means that the test items accurately represent what is to be measured, and it is verified by checking the content of the test in addition to verifying it by examining the content of the items, depending on what the test measures in terms of behavioral objectives and educational levels (Abdul Al-Rahman and Adnan, 2007:79). This has been verified by preparing the test map (Table 14) to ensure that the paragraphs represent the content of the scientific material and the behavioral purposes, and in light of the previous procedures, the test is ready for exploratory application.

The exploratory application of the achievement test

The first exploratory application of the achievement test

Its purpose is to verify the clarity of the paragraphs and the instructions for the answer, in addition to knowing the time required for the answer. The test was applied to a survey sample of (23) female students of the second intermediate grade from Al-Hawari Model High School on Monday (17-1-2022), as it was found that the test items are clear, and the response time ranged between (41-58) minutes, and after calculating the average time of the first (5) students and the average time of the last (5) students, and the time taken to answer the test items was determined (50) minutes.

The second exploratory application of the achievement test

The achievement test was applied to an exploratory sample of (200) female students of the second intermediate grade at Al-Rayaheen Secondary School for Girls on Tuesday (18-1-2022), after making sure that the students had completed the study of the three semesters of chemistry for the second intermediate school, and in agreement with the school The subject and informing the students of the exam date, to verify the psychometric characteristics of the test, as the statistical analysis of the paragraphs shows the validity of the test and its ability to distinguish individual differences between students. (Kawafha and Tayseer, 2010, 147).

Statistical analysis of test items

The objective of the statistical analysis of the test items is to ensure that they take into account the individual differences among the students by calculating the coefficients of difficulty, and the ability of the items to distinguish between students (with excellent and low level). (Abu Zina and Farid, 1998, 45). After the researcher corrected the answers of the students of the second survey sample, their scores were arranged in descending order, then the scores of the upper and lower groups were sorted by taking the highest (27%) and the lowest (27%) of the total scores, which is the best percentage for comparison between the upper and lower group, and achieving The best distinction between them in calculating the coefficients of difficulty, ease and discrimination. (Al-Dulaimi and Adnan, 81:2005). The psychometric characteristics of the achievement test items were extracted as follows:

Difficulty factor for the achievement test items

The main purpose of the difficulty coefficient is to maintain the appropriate paragraphs and delete difficult and incomprehensible paragraphs. The difficulty coefficients were found using the equation of the difficulty coefficient, and (Melhem, 2012) indicates that the paragraphs' values were acceptable if their difficulty ranged between (0.20-0.75) and it is recommended to keep them. The difficulty coefficient for the objective test items was calculated according to the relevant equation and it was found that its value ranges between (0.43-0.57), which means that it is good and acceptable for all of them (Melhem, 2012).

- **Discrimination coefficient of the achievement test items:**

This factor means the ability of this factor to distinguish the female students with an excellent level in and a weak level in the two groups in the trait that the test was designed to measure (Abu Libdeh, 2008, 307). 0.52-0.76), and thus the test items are acceptable if their discrimination coefficient is greater than (0.20). (Mirence and Irvin, 2003, 288)

- **The effectiveness of the wrong alternatives (subliminals) for the paragraphs of the achievement test:**

It is the ability of the camouflaged in the paragraph to attract the students of the lower group to choose him to choose him as an alternative that represents the correct answer. By using the equation for the effectiveness of the wrong alternatives, it was found that their values are all negative, which indicates that the wrong alternatives have attracted more students from the lower group than to the students of the higher group, and this indicates the effectiveness of the wrong alternatives. (Al-Zuhairi, 2012, 2017)

- **Test reliability coefficient:** Stability means that the test gives the same results if it is applied to the individuals themselves and in the same circumstances (Al-Khatib, 48, 2013). When the test items are objective (Al-Absi and Muhammad, 2010, 213), it was found that the test reliability coefficient is (0.84), and thus the test is good.

Application of the test in its final form

The test in its final form was applied to the research sample on Sunday (1/23/2022), after informing the students of the date of the test.

Statistical Means

The researcher adopted a number of statistical methods from the SPSS statistical package.

Presentation and interpretation of the results

First: Show the results

The search results will be displayed according to the research variables and hypotheses:

Results of academic achievement in chemistry course for chemistry

The t-test was used for two independent equal samples to show the difference between the mean scores of the students of the two research groups (experimental and control) in the achievement test, as shown in Table (7) and Figure (2).

Table 7
Arithmetic averages of the scores of the female students of the two research groups (experimental and control) in the achievement test for chemistry

Indication Level 0,05	T value		Freedom Degree	Standard Deviation	ASM	Number Of Students	Group	T
	Tabular	Calculated						
Large	2,000	3,50	58	9.15	28	30	Experimental	1
				7.92	20.27	30	Adjuster	2

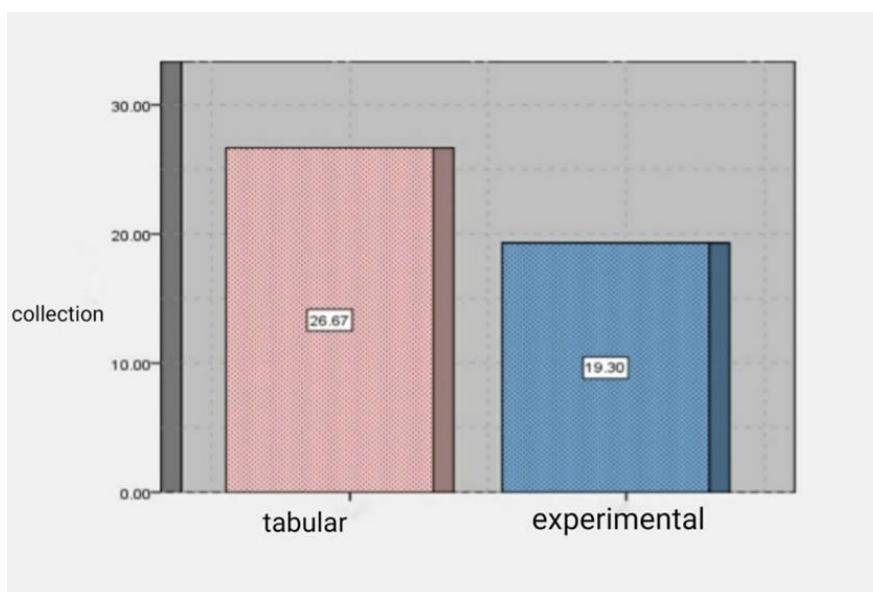


Figure 2. The averages of the achievement test results for the two research groups (experimental and control)

It is clear from the data in Table (18) and Figure (6), that the students of the experimental group outperformed the students of the control group in the achievement test for chemistry, as we note that the arithmetic mean of the scores of the experimental group is (28) with a standard deviation of (9.15), and the arithmetic mean of the scores of the control group is (20.27) With a standard deviation of (7.92), the calculated T-value reached (3.50) at the significance level (0.05) and the degree of freedom (58), and it is clear that it is greater than the tabular value (2), and this indicates the existence of a difference with different

statistical significance between the two groups. Research on academic achievement test in chemistry for the experimental group students. According to the usual method of selecting academic achievement for chemistry and in favor of the experimental group.

To calculate the objective of the effect size of the independent variable, which is the (T-shape strategy) in the achievement dependent variable, the Eta square equation (η^2) was applied to extract the value (d) that represents the effect size, and compare it with what was indicated by (Al-Dardir, 2006) that: If the effect size is equal to (0.20), this indicates a weak effect, and if the effect size is equal to (0.50), it indicates a medium effect, and if the effect size is equal to (0.80) or more, it indicates a significant effect of the independent variable on the dependent variable. (Al-Dardeer, 2006, 76, as the value of (η^2) is (0) and the value of (d) is (0.43), and this indicates that the effect of the independent variable in favor of the experimental group is average, as shown below in Table (8).

Table 8

The value of each of (h^2 and (d) and the effect size of the independent variable) T-shape strategy in the dependent variable (acquisition)

effect size	D value	η^2 value	DF	T value	Dependant variable	Independent variable
Average	0.9	0,17	58	3,50	Collection	t strategy

Second: Interpretation of the results

A-Academic achievement results for chemistry

Through the results related to the first null hypothesis, we note the superiority of the students who studied according to the strategy (T-shape) in the experimental group over the students who studied according to the usual method in the academic achievement test for chemistry for the control group due to:

- The application of the (T-shape) strategy in teaching makes the learning environment cooperative and encouraging to participate in educational situations and activate their positive role through its relevance to the level of maturity of the second year middle school students.

Third: Conclusions

Based on the results, the following conclusions were reached:

- The T-shape strategy had an important role in raising the achievement level of the experimental group students compared with the control group of the second intermediate grade students.
- The use of the (T-shape strategy) in teaching made all the students of the experimental group the focus of the educational process.

Fourth: Recommendations

In light of the findings and conclusions of the research, the following recommendations can be made:

- Emphasis on employing modern constructivist education strategies that allow students to participate actively and positively during learning.
- To train male and female chemistry teachers to adopt a strategy (the letter T) in teaching chemistry for the intermediate stage to prove its effectiveness in teaching the subject.
- Directing teachers of scientific subjects not to be limited to traditional methods of teaching, and the necessity of adopting and diversifying modern teaching methods.

Fifth: Suggestions

- Conducting similar research to the current research, aiming to know the effect of the (T-shape) strategy on achievement and mental alertness in different academic stages and other scientific subjects.
- Building a training program for chemistry teachers according to active learning strategies, including the T-shape strategy.

Sources

1. Abu Hawij, Marwan (2013): Contemporary Educational Research, Arabic Edition, Amman.
2. Abu Allam, Ragaa Mahmoud (2001): Research Methods in Psychological and Educational Sciences, University Publishing House, Cairo.
3. Ambo Saidi, Abdullah bin Khamis, and Huda bint Ali Al-Hosna (2016): Active Education Strategies 180, Strategy 20, Applied Examples, 1st Edition, Dar Al Masirah for Publishing and Distribution, Amman.
4. Ambo Saidi, Abdullah bin Khamis et al. (2019): Teacher strategies for effective teaching, Dar Al Masirah for Publishing, Distribution and Printing, Amman, Jordan.
5. Al-Khatib, Ibrahim Sadiq, Obaid Mustafa Turki (2008): General Chemistry, 3rd floor, Dar Al-Masira, Amman
6. Al-Khatib, Muhammad Al-Amin Mustafa (2013): Educational Measurement and Evaluation, 2nd Edition, University of Science and Technology for the Book, Safaa. :
7. Al-Dulaimi, Issam Hassan (2014): The constructivist theory and its educational applications, Dar Al-Safa Publishing and Distribution, Amman.
8. Al-Dulaimi, Ihsan Alawi and Adnan Al-Mahdawi (2005): Measurement and Evaluation in the Educational Process, 2nd Edition, Al-Shorouk Office, Iraq, Diyala.
9. Al-Duwaydi, Rajaa Waheed (2002): Scientific Research, Its Theoretical Fundamentals and its Scientific Practices, 1st Edition, Dar Al-Fikr Scientific Press, Damascus.
10. Ramadan, Manal Hassan (2016): Active Learning Strategies, Dar Al-Akademon Publishing and Distribution Company, Amman, Jordan

11. Zayer, Saad Ali and Rakan Ayez (2016): Practical educational advice for teachers and schools, Dar Al-Sadiq Al-Thaqafiah for Publishing, Distribution, Babylon, Iraq.
12. Al-Zuhairi, HE and Haider Abdul Karim Mohsen (2018): - Modern trends in teaching in the light of scientific and technological development, 1st Edition, Dar Al-Ibtikar for Publishing and Distribution, Amman.
13. Zaiden, Hassan Hussein (2007): Structural Theory and Teaching Strategies, Edition 1, Dar Al-Shorouk for Publishing and Distribution, Amman.
14. Suwaidan, H.E. Hamdi and Haider Abdul Karim Mohsen Al-Zuhairi (2018): Modern trends in teaching in the light of scientific and technological development, 1st Edition, Dar Al-Ibtikar for Publishing and Distribution, Amman.
15. Abdel Hafeez, Ikhlas Mohammed and Mustafa Hussein (2000): Methods of scientific research and statistical analysis in the educational, psychological and sports fields, Edition 1, Dar Al-Kitab, Cairo.
16. Abdul Rahman and Adnan, Anwar Hussein and Adnan Haqqi Shihab Zangana (2007): Methodological patterns and their applications in the humanities and applied sciences, Al Wafaq Press, Baghdad.
17. Al-Absi, Muhammad Mustafa (2010): Realistic evaluation in the teaching process, 1st edition, Al Masirah Publishing House, Amman.
18. Al-Adwan, Zaid Suleiman and Ahmed Issa Daoud (2016): Social constructivist theory and its applications in teaching, 1st Edition, Debono Center for Teaching Thinking.
19. Al-Assaf, Saleh bin Muhammad (2003): Introduction to Research in Behavioral Sciences, 1st Edition, Al-Obaikan for Printing and Publishing, Riyadh.
20. Al-Afoun, Nadia Hussein and others (2012): Cognitive Learning and Information Processing Strategies, 1st Edition, Dar Al-Mahraj for Publishing and Distribution, Amman.
21. Qatami, Youssef Mahmoud and Nayfa Qatami (2013): Cognitive Learning Strategies, 1st Edition, Dar Al Masirah, Amman.
22. Kawafha, Tayseer Mufleh (2015): Measurement, evaluation, methods of measurement and diagnosis in special education, 3rd edition, Dar Al Masirah Publishing, Amman.
23. Al-Mabrouk, Faraj (2016): General Teaching Methods, 1st Edition, Hamithra House for Publishing and Translation, Cairo.
24. Salt, Sami Muhammad (2012): Measurement and evaluation in education and psychology, 6th edition, Dar Al Masirah for Publishing and Distribution, Amman.
25. Al-Najjar, Nabil Jumaa Saleh (2010): Measurement and Evaluation: An Applied Perspective with SPSS Software Applications, Dar Al-Hamid, Amman.
26. Najm, Saadoun Salman and Kholoud Aziz Rahim (2016): Measurement and Evaluation in Education and Psychology, Al-Amir Library for Printing and Reproduction, Baghdad.
27. Nofal, Muhammad Bakr and Faryal Muhammad Abu Awwad (2010): Thinking and Scientific Research, 1st Edition, Dar Al Masirah, Amman.
28. Suryasa, W. (2019). Historical Religion Dynamics: Phenomenon in Bali Island. *Journal of Advanced Research in Dynamical and Control Systems*, 11(6), 1679-1685.

29. Suryasa, W., Sudipa, I. N., Puspani, I. A. M., & Netra, I. (2019). Towards a Change of Emotion in Translation of Kṛṣṇa Text. *Journal of Advanced Research in Dynamical and Control Systems*, 11(2), 1221-1231.
30. Lopez, M. M. L., Herrera, J. C. E., Figueroa, Y. G. M., & Sanchez, P. K. M. (2019). Neuroscience role in education. *International Journal of Health & Medical Sciences*, 3(1), 21-28. <https://doi.org/10.31295/ijhms.v3n1.109>