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"The effect of R.E.A.C.T strategy on the achievement of fifth-grade students in chemistry"

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Abstract

*The research aims to identify the impact of the REACT strategy on the achievement of fifth-grade students for biochemistry, and to verify the goal the researcher set a zero hypothesis that states: There is no statistically significant difference at the level of significance (0.05) between the average scores of students of the experimental group who will study according to the REACT strategy and the average score Students of the control group who will study according to the usual method of testing the achievement of the chemistry subject, and in order to verify it according to his experience in the first semester of the academic year (2019 - 2020), as the research sample consisted of (60) students from the fifth grade of biology students in Al-Khwarizmi's course For boys, and They were randomly assigned to two groups by (30) students in each group, and the two groups were rewarded in the following variables: chronological age, successful intelligence test, the second course degree from the previous academic year in chemistry, and the testing of previous information, and in light of the relative importance of the content For behavioral purposes, an achievement test consisting of (35) items was constructed, of which (28) were a multiple choice type and (7) paragraphs of the essay questions type, and the researcher has verified the psychological characteristics of the test, the experiment continued to apply (10) weeks, and in At the end of the experiment, the achievement test was applied to the two groups D that analyzed the results and demonstrated the superiority of the experimental group students who studied according to the R.E.A.C.T strategy over the control group who studied in the usual way in the academic achievement variable***.***

keywords: *R.E.A.C.T strategy, fifth-grade bio-students, chemistry, academic achievement*

I. Introduction:

One of the biggest challenges facing those responsible for education is to raise the level of educational attainment of learners, and it is one of the important topics that occupied a large portion of the thinking of educational scientists and psychologists, especially in the era of knowledge explosion in the present time in which competition depends on what the learner has of Knowledge that defines its scientific future, its profession, and its social position in life, which prompted specialists and researchers to search for ways and methods to achieve success in situations facing the learner in a manner that works to overcome the problems resulting from the

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development of the world and the vast amount of endless information In all situations, whether academic or life, as the goal has become nowadays not to obtain the information but rather how to invest this information and benefit from it and use it through effective and careful thinking in order to raise the learner's efficiency in facing problems and enable him to challenge ambiguity and surprises and increase his ability to adapt And the environment in which he lives.

Most learners imagine that chemistry is an abstract decision that is difficult to understand, and they do not see it as related to the world in which they live nor to future life, despite being the science most relevant to all aspects of human life and natural phenomena, and that the reason for this is that the gap between what is known and what is done In schools it has become so vast that many view education today as an ineffective system, so the most prominent other reasons behind this are the usual teaching methods used by the teacher in teaching this subject, which was a major reason for the low level of knowledge and achievement of the learner as well as Limited His ability to think well**.**

Science education has recently passed through many transformations and reform movements, from interest in the scientific method to orientation towards science processes, then attention to scientific inquiry and the spread of scientific culture, and thus science education has targeted all learners to develop many of the functional knowledge, skills and intelligence they have, to play a useful and meaningful role In the development of society as a responsible citizen, this can only be done by increasing the learner's achievement and developing his capabilities and intelligence and his appreciation of the importance of what he learns in life and society (Holbrook & Rannikmae2017: 190), and the learner’s inability to interpret physical / chemical / biolu events In what happened in his environment, this means that learning science does not achieve the desired goals of scientific education (Kortland, 2010; Ultay.E, 2012: 233), and this prompted teachers to search for the best modern methods and strategies that are more beneficial in teaching science about General, and chemistry in particular, and it was found that one of the methods that may contribute to a broader understanding of chemistry and achieve many of its teaching goals in the middle school is the use of modern strategies, including REACT strategy because it is one of the modern strategies that may help to overcome problems that hinder students' understanding For chemistry and raises the level of their achievement C, so this study was conducted to find out as there was a difference between the experimental group taught in accordance with the strategy R.E.A.C.T students and between the control group students taught in accordance with the usual way.

The following table shows the steps for each stage of the strategy:

Table . REACT strategy and descriptions of each step Description	
Relating	learning in the context of one‘s life experiences or preexisting knowledge
Experiencing	learning by doing, or through exploration, discovery, and invention
Applying	learning by putting the concepts to use

Cooperating	learning in the context of sharing, responding, and communicating with other learners
Transferring	using knowledge in a new

II. Theoretical background and previous studies:

The REACT strategy dates back to contextual teaching and learning, which is the core of constructivist theory. The REACT strategy is one of the strategies that diversify educational processes to help learners achieve the desired educational goals within the conceptual context of the scientific subject and link between previous and new experiences as well as applying these experiences in a practical way in the form of Experiences, projects or reports, and are also based on cooperation and participation among learners, so that they are prepared as learners who are able to solve problems.

The strategy of R.E.A.C.T is based on scientific interaction in the light of constructive learning in a context of socio-cultural dialectical, it links the new scientific knowledge to daily experiences and the background of the previous learner, and thus contributes to overcoming alternative concepts and establishing relationships between concepts and improving learning and understanding scientific concepts. (Ultay, E, 2012: 201; Ultay & Ultay, 2014: 211)

The R.E.A.C.T strategy provides learners with an opportunity to see the benefit of the subject in daily life, thereby increasing the interests and attitudes of learners, and helping them explain real life problems associated with chemical concepts and achieving continuous learning more than regular teaching, (Kurt & Ayas, 2012: 981).

previous studies

1- Study (Gunter, 2018) "The effect of R.E.A.C.T strategy on students' achievement in the topic of melting balance in the chemistry course." This study aimed to identify the effect of the REACT strategy on the achievement of middle school students in chemistry in the matter of melting balance, and the researcher prepared an achievement test applied to a sample of 96 students and confirmed the psychometric properties of (difficulty factor - discrimination factor - the effectiveness of wrong alternatives, test stability), And after analyzing the results, it became clear to the researcher that the experimental group students outperformed according to the REACT strategy over the control group students who studied in the usual way.

2- Study (Ultay, N & Ultay, E & Gungoren, 2017) "The effect of REACT strategy on understanding physical and chemical changes" This study aimed to know the effect of REACT strategy on student achievement in the subject of physical and chemical changes in the subject matter of science for the elementary stage, prepared by the researcher An achievement test was applied to a sample of 50 students and confirmed the psychometric properties of (difficulty factor, discrimination factor, the effectiveness of wrong alternatives, the stability of the test), and after analyzing the results, the researcher found that the experimental group students were superior in accordance with the REACT strategy over the control group students who studied in the usual way.

III. Research methodology and procedures:

It includes a presentation of the procedures that have been accomplished to achieve the goals of the research starting from the research methodology and experimental design and defining the research community and its sample, the equivalence of the two research groups (experimental and controlling), preparing research requirements and tools, procedures for applying the experiment and displaying the statistical methods used, and they will be presented as follows:

Experimental design of the research: Includes the independent variable (R.E.A.C.T strategy) and (the usual method), and a dependent variable (academic achievement), so the researcher used experimental design with partial adjustment of two equal groups, one is experimental and the other is control.

The research community and its sample: The current research community represents the second intermediate class students all in the government day and secondary schools (secondary and intermediate) of the General Directorate of Education in Dhi Qar Governorate for the academic year (2019 - 2020), in which the number of fifth-grade class divisions is not less than two divisions, but The researcher appointed him as the researcher (Al-Khwarizmi Prep) in Dhi Qar Governorate intentionally chose to conduct his research, and he found that it includes three divisions for the fifth grade biome (A, B, C), the researcher chose Division A by the method of random drawing (lottery method) to represent the experimental group And the number of its students is (30) students whose students will be taught according to (strategic) R.E.A.C.T), and in the same way the researcher randomly chose Division (B) to represent the control group and the number of its students (30) students whose students will study according to (the usual way).

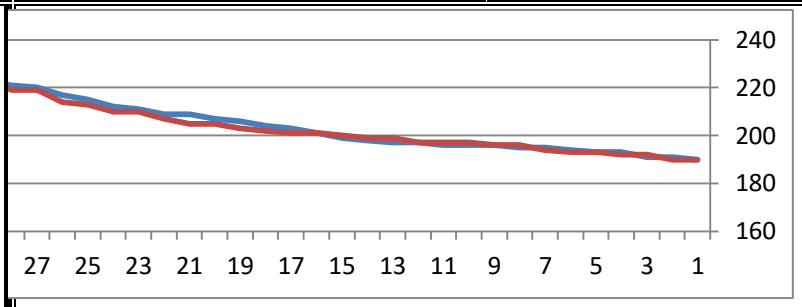
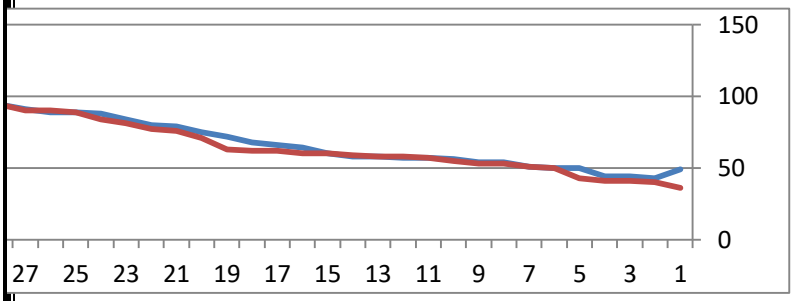
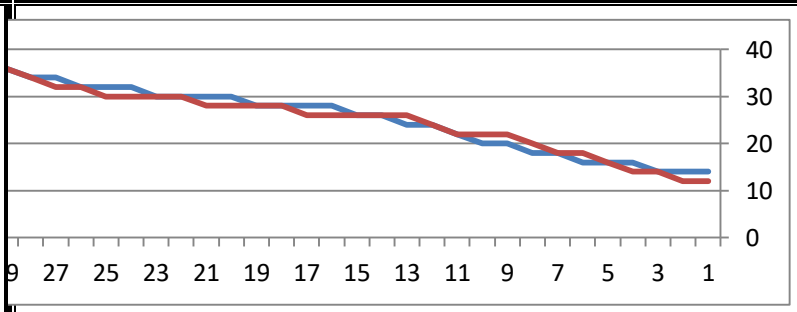
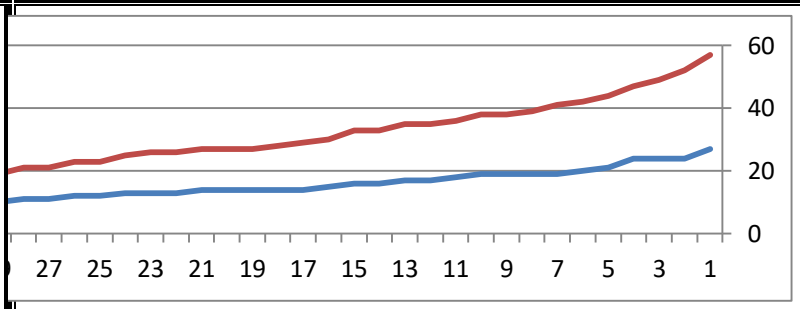
Equivalence of the two research groups: The researcher performed statistically equivalence between the experimental and control groups in some of the variables that affect the results of the experiment, despite the researcher choosing the two groups in a random withdrawal method, despite the fact that the students of the research sample are from a similar social and economic milieu and are studying in one school, However, he was keen on conducting parity with the

following variables: the time age calculated in months, the second course grades, the intelligence test, and the previous information test), as the researcher conducted parity between the two research groups in the above variables and the results showed Vq The following table:

ari able	roup	ample size	ean	tandard leviation	egree f	T test		ignifi cance level
						alculated	Tabular	

					reedom			
ge Calculated by month	xper imental	0	20 40	10,9 8	8	0.25	2,000	ot tatistically significant
	ontr ol	0	20 73	9,91				
est re- xperimental nformation	xper imental	0	26 7	6,00		0.22		
	ontr ol	0	26 0	6,59				
eco d semester grades for he previous year, xperimental	xper imental	0	67 7	17,4 5		0.53		
	ontr ol	0	64 0	18,1 3				
Q Test	xper imental	0	16 0	4,58		- 0,251		
	ontr ol	0	16 3	5,66				

The following figure shows the equivalence of the two research groups with the above variables:

equivalence	Experimental	Control
Age alculated By Month		
Second semester grades For the previous year, experimental		
Test pre-experimental information		
IQ Test		

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Control of exotic variables: Although the researcher verifies the equivalence of the two research groups in some of the variables that are believed to affect the course of the experiment, he tried to avoid the effect of some exotic variables on the course of the experiment and with some of these variables and how to control them: (accidents accompanying the experiment: no The experiment in the research is exposed to any emergency or accident that impedes its course, experimental extinction: there was no interruption or transfer of any student throughout the experiment, the sample was chosen: the two research groups were chosen intentionally and the equivalence of the two groups was confirmed, maturity factor: given that the duration of the experiment Standardized between the two research groups Likewise, the approximate ages of students in the two groups, so the growth that occurs will return to the members of the two groups at the same level, so this factor did not have an impact on the research, the effect of the experimental procedures: The researcher worked to limit the impact of the experimental procedures that could affect the dependent variable during the course of the experiment).

Preparing the research requirements: The research requirements are one of the basic issues upon which the research is based and according to which the research procedures are implemented and these requirements are represented by: The scientific subject (content): The scientific subject that the researcher teaches to the students of the two research groups is determined during the period of the experiment (semester) The first) of the academic year (2019-2020), the scientific subject included studying the periodic table and the chemistry of the transitional elements and solutions, as the researcher prepared 30 plans for the experimental group that is taught according to (REACT strategy) and the same for the control group that is taught according to (the usual way) .

Tools and methods used in the development of the atomic concept, the periodic table, the chemistry of transitional elements and solutions according to the strategy of R.E.A.C.T

The research tool: Steps have been prepared for the research tool (achievement test) represented by the following:

Determining the purpose of the achievement test: The goal of the achievement test is to measure the achievement of fifth-year students of biology (information, skills, and experience) in the subject of chemistry.

Determine the objectives of the test: After the purpose of the achievement test has been determined, the test objectives are determined to know the extent of their achievement and the researcher formulated a number of behavioral goals.

Determining the test items: The researcher determined the number of items that make up the achievement test, as the number of test items reached (35 items).

Take out the test items: The achievement test items were formulated in their initial form in light of what was included in the test map, and the researcher chose the type of test (multiple choice and essay questions). , Analysis, synthesis), and content.

Test Instructions: Instructions and directions for how to answer were formulated (choosing one correct alternative for the paragraph, answering the substantive and essay paragraphs, the time period for answering, writing the triple name, the row and the division in the space provided).

Correcting the test answers: After the test paragraphs were formulated, a criterion was set for correcting the answers, as it set (one score for each correct test paragraph) and (zero for the wrong answer, and the left paragraph that the student did not answer, the paragraph for which more than one choice was made) and thus The upper final score for the objective paragraphs is (28 degrees) and the lower degree (zero). As for the article paragraphs, (two degrees) have been set for each paragraph with a correct answer, and (one degree) for the correct half answer, and zero for the wrong or abandoned answer, and thus the final degree for the article paragraphs. It is (14 degrees) and the lowest (zero).

Thus, the total higher score for the test (42 points) and the minimum (zero).

The truthfulness of the test: The apparent sincerity of the test was confirmed and the content is authenticated, as the results showed that the apparent honesty got an agreement rate (80%) by the arbitrators and the specialists. As for the truthfulness of the content, the results showed that all the passages of the achievement test are statistically significant, so the achievement test is considered true In measuring the extent of understanding and comprehension of fifth-grade students in chemistry.

Exploratory application for achievement test: Including the following

The first exploratory application: The achievement test was applied in its first exploratory stage to a group of fifth-year students from the non-research sample, and the number of students was (30) students, the purpose of which is to know the clarity of test instructions and instructions and the extent of understanding and clarity of the test items for students and calculating the required time period For the test, as the researcher recorded the exit time for each student, and by calculating the mean of time, he found that the time needed to answer all the test items is (44) minutes.

The second exploratory application: The test was applied to a sample of (100) students in the fifth biological class without the research sample, and its purpose is to analyze the achievement test statistically statistically, which is the difficulty of the paragraph, paragraph recognition, and the effectiveness of wrong alternatives.

Statistical analysis of achievement test items: The achievement test items were analyzed as follows:

- **Paragraph difficulty:** By conducting the statistical analysis of the objective paragraphs in the achievement test, it was found that the difficulty factor of its paragraphs ranges from (0.50 - 0.69), whereas the difficulty factor for the article paragraphs (0.50 - 0.54), thus achieving all the achievement test paragraphs Its difficulty is appropriate.
- **Paragraph discrimination**: One of the important characteristics that should be provided in the test items is the distinguishing feature, which means the possibility of items or paragraphs to examine the individual differences of students. The test items are valid as the items discrimination factor is (20,0) and above, and the value of the parameter for distinguishing objective paragraphs ranges in The achievement test is between (0,37 - 0,67), whereas the coefficient of discrimination for the fried paragraphs ranges between (0,59 - 0,74). Thus, the achievement test items are considered to have a good and appropriate discrimination coefficient.

- **Effectiveness of Wrong Alternatives:** The researcher performed a statistical analysis (for the highest 27% score and the lowest 27%) to find the effectiveness of the wrong alternatives ranging between (0.04-0.03) and it became clear from that that the alternatives of the objective paragraphs in the achievement test are all effective and thus all of them are considered occasion.

Stability of the test: The coefficient of the test is dependent on the relationship between each of the other or all of the test items, and this is evident through the stability of its scores and the consistency of its paragraphs, and the test of the coefficient of the test can be calculated using the legal relationship between the units of the test, and it is a good test specification that it is stable and truthful and even Paragraphs of the test have a clear meaning that must be honest and steady at the same time.

IV. Methods of finding test reliability:

Alpha-Kronbach coefficient: consistency is consistency and accuracy in measurement, and consistency in the set of test scores that really measured what must be measured (Majeed, 2014: 124). In order to extract the reliability of the test items consisting of objective and article paragraphs, the researcher used the alpha parameter - Kronbach) for stability, and is an indication of equivalence, that is, it gives good estimated values of the equivalence factor, along with internal consistency or homogeneity, (Allam, 2000: 166), and the stability factor extracted in this way has reached (0.8971) which is a good stability factor.

The application of the research tool: The experimental and control research groups were notified of the date of applying the achievement test a week before it was conducted and it was applied after the completion of teaching the specific subject for the two research groups at one time, and the researcher supervised the process of applying the test.

Statistical means: The researcher used the T-Test equation for two independent samples to conduct equivalence between the experimental and control groups, and the Pearson correlation equation, as the researcher used the equation to correct the correlation coefficient between the two test parts (degrees of individual and even paragraphs) after being extracted by the Pearson correlation coefficient and the bag Statistical spss, and Excel.

V. Results :

To verify the zero hypothesis which states (there is no statistically significant difference at the level of significance (0.05) between the average scores of students of the experimental group who studied chemistry according to the (REACT strategy) and the average score of the students of the control group who studied the same subject according to the usual method of testing Achievement of the chemistry subject for the fifth biological class, the researcher prepared the achievement test and applied it to the experimental and control research groups, and after applying the test the researcher corrected the papers of the two groups and recorded the grades of the students of the two groups, the arithmetic mean was calculated for the grades of the

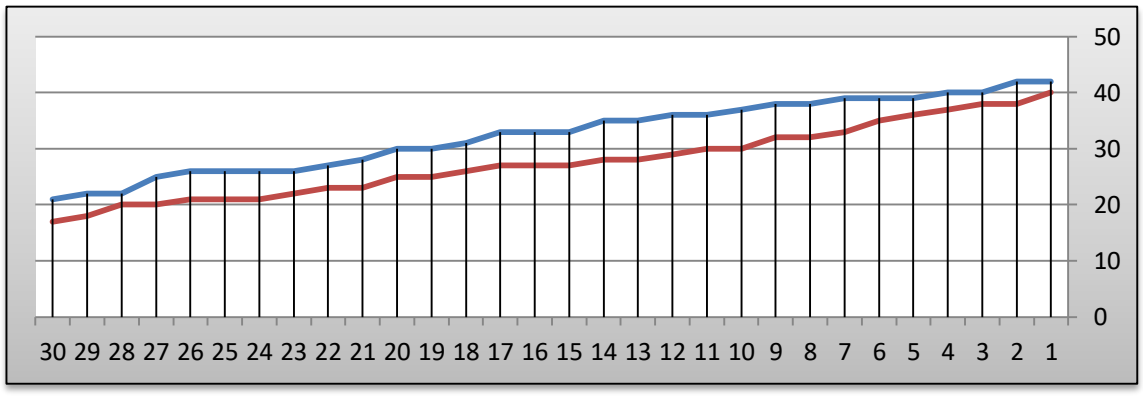
students of the second group Rebeh and control, standard deviation, variance and then was Altaia test t-test application for independent samples, as shown in the table.

Table () the results of the T-test for the two research groups in the chemistry achievement test

group	n umber	ean	S deviation.	v ariance	.f	t- test Cal culated	Statis tical significance (0,05)
Expe rimental	3 0	2,5	6, 36	4 0,74	8	2,9 37	Statis tically significant
Contr ol	3 0	7,6	6, 45	4 1,62		Ta bular 2,0 00	

\The calculated T value reached (2,937), which is greater than the tabular T value of (2,000) at freedom degree (58). Thus, it is clear that the experimental group outperforms the control group in the achievement test, so it rejects the null hypothesis and accepts the alternative hypothesis which states: (There is a difference with Statistical significance at the level of significance (0.05) between the average scores of students of the experimental group who are studying chemistry according to the strategy (REACT) and the average scores of students of the control group who are studying the same subject in the usual way in achievement and in favor of the experimental group), as shown in the figure ().

Figure () is a graph that shows the superiority of the experimental group over the control group



The researcher also used the (ETA) square equation to extract the effect size 2 of the independent variable in the (R.E.A.C.T) strategy in the dependent variable (achievement of chemistry) as shown in the table.

The effect of the independent variable on the chemistry achievement variable

Independent variable	Dependent variable	Impact value□□□2	Impact size
R.E.A.C.T	Achievement	0,129	Average

It is clear from the table () above that the value of the magnitude of the effect amounted to (0,129), and when compared to the values of the effect size in the table () we note that it is an appropriate value to explain the effect size and an average amount of the teaching variable (R.E.A.C.T) in students 'achievement in chemistry and in favor of the experimental group.

Table () the effect size values (2) and the effect amount

Impact size	Impact value□□□2
0,01--- 0,05	Small
0,06 --- 0,13	Average
0,14 ----	Big

This means that the experimental group that studied according to the (REACT) strategy is superior to the control group, and thus this study is consistent with the study (Gunter, 2018) and the study (Ultay, N & Ultay, E & Gungoren, 2017) and the study (Karsli & Yigit, 2015) and study (Ultay, 2011) outweighed the experimental group that studied with the strategy (REACT) over the control group that studied the usual way.

This shows us that teaching according to the REACT strategy had a positive impact in understanding information and scientific facts and the interpretation of mathematical laws through cooperating groups and what students are discussing and this leads to raising their scientific level and raising their level of achievement in light of the experience that the researcher and the results obtained And the reasons that resulted from the research, the researcher reached the following conclusions:

1. The R.E.A.C.T strategy has a positive effect in increasing the achievement of fifth-grade students in chemistry in general and chemistry in particular, and increasing their abilities to understand information, facts and knowledge and raise their academic level.

2. The R.E.A.C.T strategy has a role in making students the focus of the educational process through their active participation in the educational situation, which would increase their self-confidence and encourage them to persevere to raise their level of education.

3. The R.E.A.C.T strategy has had a major role in increasing their academic achievement because it links the new experience with students' daily life experiences.

In light of presenting the results, the researcher recommends the following:

1. The researcher recommends the necessity of adopting the R.E.A.C.T strategy in teaching chemistry for all academic levels.

2. Providing science teachers in a general way and chemistry in a special way with the procedural steps of the R.E.A.C.T strategy, in the light of which subjects are taught.

3. Conducting comparative studies between the R.E.A.C.T strategy and other strategies in student achievement.

4. Conducting research studies on the impact of the R.E.A.C.T strategy in other dependent variables such as thinking, tendencies, and others.

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