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The effect of Schwartz's model on science achievement among fifth-grade female students

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ABSTRACT
The aim of the research is to find out (the effect of the Schwartz model on the achievement of science for fifth-grade students), by verifying the following null hypothesis:
There is no statistically significant difference at the level (0.05) between the average scores of the experimental group students who study according to the Schwartz model and the average scores of the control group students who study according to the research summary
The aim of the research is to find out (the effect of the Schwartz model on the achievement of science for fifth-grade female students and their convergent thinking), by verifying the following two null hypotheses:
1. There is no statistically significant difference at the level (0.05) between the average scores of the experimental group students who study according to the Schwartz model and the average scores of the control group students who study according to the usual method in the achievement test.
2. There is no statistically significant difference at the level (0.05) between the average scores of the experimental group students who study according to the Schwartz model and the average scores of the control group students who study according to the usual method in the convergent thinking test.

The current research community represented all the students of the fifth grade of primary school in the SaqrQuraish Primary School for Girls, the morning government, affiliated to the Directorate of Education of the Baghdad Governorate \ Karkh second for the academic year (2021-2022), as it reached (108) students by four (a, b, c, d) By simple random assignment, the two divisions (A, B) were chosen by (25) (28) respectively, and after statistically excluding the "failing students," the sample became (24) (26) respectively, as Division B represented the experimental group that will be studied according to the steps of the Schwartz model. And Division A, the control group, which will be studied according to the usual method.

The experimental design with partial control was adopted for the two experimental and control groups with a post test for achievement

The experiment was applied in the first semester of the academic year (2021-2022) and lasted (10) weeks. The researcher herself studied the two research groups (6) lessons per week, with (3) lessons for the experimental group and the same for the control group. The students of the research sample (experimental and control groups) were rewarded. In (chronological age, previous academic achievement in science, previous information test, intelligence), the content of the current research was determined in the second and third units of the science book for the fifth grade of primary school, as it was analyzed into behavioral goals that numbered (100) behavioral goals in the light of classification Bloom for the cognitive domain (remembering, comprehension, application, synthesis, analysis, evaluation). (18) Daily teaching plans were prepared for the experimental group according to the steps of the (Schwartz) model, and the same for the control group according to the usual method. The experiment The achievement test was applied to the students of the two research groups (experimental and control), and the data were treated statistically using the t-test for two independent samples of unequal number.
The results of the research showed the superiority of the students of the experimental group who studied according to the Schwartz model over the students of the control group who studied according to the usual method with significant significance in the achievement test. Schwartz) in the collection.

Definition of Research

Research problem: From the researcher's modest experience (7 years) in teaching science for

the primary stage, he found that the widespread and common problems in the educational field are the adoption of the traditional teaching method, which depends mainly on memorization, memorization and recitation, which led to a decline in the level of achievement due to the lack of science lessons to provide Scientific knowledge and facts directly and in writing do not address the windows of knowledge they have among primary school students. In order to make sure that the problem of research still exists, the researcher conducted an exploratory study by providing a questionnaire to a sample of science teachers who study the fifth grade of primary school, consisting of (10) male and female teachers distributed in primary schools for girls (affiliated to the Directorate of Education of Baghdad Al-Karkh Governorate / the second). Rate:

- (90%) There is a low level of achievement of the fifth grade female students.

(100%) Science teachers do not have knowledge of the Schwartz model and follow the traditional method of teaching science, and they did not receive training courses in modern teaching methods for a long time.

In an effort by the researcher to overcome this problem, the current research came as an attempt to find out the effect of the Schwartz model, which is applied for the first time to the primary stage (to the knowledge of the researcher) and to know its impact on the achievement of the science subject in the current research sample by answering the following question: What is the effect of Model (Schwartz) in the achievement of science for fifth grade students?

Research importance

The importance of the research is summarized in the following points:

1- The current research, according to the researcher's knowledge, is considered one of the leading researches in Iraq, and it has not been previously discussed in science teaching for the fifth grade of primary school and its impact on achievement.

2- The (Schwartz) model may contribute to raising the achievement of the research sample?

3- It may contribute to presenting a new vision for science education using the Schwartz model, which is consistent with modern scientific trends in providing daily teaching plans for teachers.

4- The current research is a qualitative addition to the educational library that graduate students and researchers can benefit from by making use of its results and the methodology and procedures followed in it.

The aim of the research: The research aims to reveal: following the use of the Schwartz model in the achievement of science for fifth-grade students. To achieve the goal of the research, the following null hypothesis was formulated:

There is no statistically significant difference at the level (0.05) between the average scores of the experimental group students who study according to the (Schwartz) model and the average scores of the control group students who study according to the usual method in the achievement test for the fifth grade of primary school for science.

Research limitations: The current research is limited to:

All fifth graders of primary school in SaqrQuraish Girls' Morning School affiliated to the General Directorate of Education in Baghdad Governorate Karkh / Second, the first semester of the year (2021-2022)

Teaching the second and third units represented in chapters (third, fourth, fifth and sixth) of the science book to be taught for the fifth grade of primary school, the first edition of the year (2019).

Define terms:

Schwartz Model: It is defined as:

And an educational model that aims to integrate thinking skills (comparison and interview. Determining the relationship, part to whole, observation, classification, prediction, summarization, class questions, decision making, problem solving, creative thinking, critical thinking) with the science content to make it more accommodating. Before the students of the experimental group, fifth grade of primary school (Qatami, 2013:100).

Collection: defined as:

The set of information, knowledge and skills that the student has acquired and developed within the study subjects, as indicated by the test scores (Shehata and Zainab: 2003:89).

The second chapter / theoretical framework

Schwartz model: Schwartz.

It is a model for teaching thinking that appeared in America in the last decade of the twentieth century by Robert Schwartz, where it calls for training individuals in analytical, critical and creative thinking skills, comparison and contrast, partial analysis, classification, generating alternatives and possibilities, and determining the credibility of information sources and prediction, using thinking maps. Verbal, graphic organizers, and thinking-based writing, that is, this model trains learners to reach solutions to problems and make appropriate decisions. (Schwartz: 2003::34)

Steps of the (Swartz) model for integrating thinking skills within the academic content:

The (Swartz) model is based on integrating thinking skills in the academic content according to the six steps that the researcher will adopt in implementing his training program, which are as follows:

1- Presentation of the lesson: This step aims to prepare the learners to learn the academic content while presenting the thinking skill integrated with the content presented to them. This step includes a set of teaching procedures as follows:

- Clarifying the topic of the lesson and introducing the learners to it, clarifying the paragraphs of that content and the thinking skill built into it.
- Informing learners of the objectives of teaching the course content as well as the objectives of teaching the thinking skill built into it.
- Activating the learners' previous experiences related to the thinking skill, as well as activating their previous knowledge related to the content of the lesson, by stimulating what they have of previous knowledge and experiences about the content and the integrated skill by asking them questions.
- Clarifying the importance of the skill in the daily lives of learners and the situations and contexts in which it is used.

2- Presentation of the skill: The teacher implements a practical application in front of the learners, in which he demonstrates how to integrate the thinking skill into the content, using directed questions.

3- Active thinking: This step begins with teaching the learners the content and making sure that they understand it, then the learners practice a thinking activity. Learners to write information that is difficult in one way or another to keep in memory, to clarify the important relationship between the parts of the material).

4- Thinking in thinking: in which the learners engage in a reflective activity in which they reflect on their thinking in the previous thinking step, by answering the questions contained in the thinking map - referred to in the skill presentation step, as well as through the directed questions posed by the teacher to them, which invites them to reflect on their thinking.

5- Application of thinking: in this step, learners practice new thinking activities, aimed at applying what they have learned to the thinking skill in place of education, and expanding its applications to new situations that they did not know before. There are two types of these activities:

- Immediate near-transition activities: they are activities that are similar to some extent, in their academic content, the activity that the learners practiced in the aforementioned active thinking step.

Distant transition activities: These are activities that differ in their academic content greatly from the activities that the appendices practiced by learners in the active thinking stage.

6- Thinking evaluation: directs the learners to carry out individual activities aimed at evaluating their performance of the integrated thinking skill in place of education, provided that they use the directed questions and the graphic organizer. (Al-Qawasma and Muhammad, 2013: 265-267).

The role of the teacher in the Schwartz model:

1- Openness and acceptance of ideas that integrate thinking skills in the content.
2- Creating an interactive environment and a real position to achieve the integration goals.
3- The possibility of applying skills integration in different situations.
4- Mentally modeling the idea and choosing it afterwards.
5- The teaching process in the form of skills applied according to the program steps.
6- Flexibility in transferring from one skill to another during the integration process. (Qatami, 2013: 98).

The role of the learner in the Swartz model:

1- Be proactive and active in a learning situation.
2- Builds diagrams and maps in thinking and concepts to organize the ideas he has acquired.
3- Focus on the main or basic idea.
4- Effectively acquire knowledge and pass it on to others.
5- He is aware of the awareness of dialogue, discussion, understanding and participation in the development of ideas. (Al-Hajjah: 2014)

Collection:

Collection concept

Achievement refers to an important aspect of the mental activity performed by the learner, in which the effect of academic excellence appears. The concept of success is closely related to the concept of learning, but the concept of learning is more complete and extensive, as it refers to all changes in performance in the conditions of practice and training in the school (Al-Salih, 2004: 26).

Therefore, academic achievement is of great importance in daily life and how to deal with its problems. Academic achievement is very important for the following reasons:

1- Low results lead to repetition, which has psychological and economic effects on the learner, his family and society.

2- Since success is important to learners, it is also important to society, because the progress of society depends mainly on the quality of learners according to the education, the type of learning they receive and the goals achieved.
(Al-Khafaji, 2013: 44-45).
Achievement reflects the extent to which the educational institutions seek to achieve the educational outcomes, in addition to their keenness to achieve a high level of achievement, as the level of achievement indicates the institutions' adequacy and their ability to achieve their goals. It determines (to a large extent) the social and economic value of the individual, it is an indicator of the social value and professional ambition that the individual aspires to achieve (Al-Zaher et al., 1999: 50).
(Al-Isawy: 2000) believes that the most important factors that may affect the achievement are:
1- The extent of the general intelligence, special abilities, tendencies, aptitudes, skills, experiences, talents, etc. of the learner.
2- The extent to which the learners are motivated and feel motivated and interested in studying and exert effort and energy.
3- The extent to which the learner enjoys physical security and mental and psychological health.
4- Teaching methods and the accompanying excitement, stimulating and attracting the attention of learners, adopting appropriate educational methods and methods, and engaging the learner in educational and other activities.
5- The personality of the teacher and the extent of his ability to communicate information and draw the attention of the learners and push them to follow the lesson and comprehension and the extent of his mastery of the scientific material.
6- The quantity of available good and modern books and resources, and the availability of workshops and laboratories.
7- The amount of full-time study, and its lack of effect on the discharge of fees, duties and external obligations.
8- Conditions of the learner in terms of residence and residence.
9- The calm family atmosphere suitable for studying (Al-Esawy, 2000: 149).

The third chapter/ research methodology and procedures

Research methodology and experimental design: The experimental method was chosen, which is the best research method in solving problems in the scientific way, and by which all variables within the research framework are controlled except for one variable in order to know its strength, trends and control, and the researcher chose (partially controlled experimental design) for the experimental and control groups with a post test of the achievement of the female students of the fifth grade of primary school.

The research community and its sample: The community represented all the students of the fifth grade of primary school in SaqrQuraish School for Girls, which were intentionally chosen from one of the primary schools for girls, affiliated with the General Directorate of Education in Baghdad / Al-Karkh II, for the academic year (2021-2022), as the research community reached (108) A female student with four classes (A, B, C, and D), whose number is (27, 26, 28, 27), respectively.
Equality of the two research groups: The two research groups were rewarded before starting the experiment with some variables.
1- Chronological age:The researcher obtained the ages of the students of the research sample (the experimental and control groups) from the school administration on Tuesday (2/11/2021), and he calculated the ages of the students in months.
2- Testing the previous information / preparing a test consisting of (20) paragraphs, and the researcher prepared instructions for answering the paragraphs of the previous information test, and thus the test became ready for application. The test was applied on Thursday (4/11/2021) on the students of the experimental and control groups The researcher himself supervised the application of the test, and after correcting the answers of the test paragraphs, he gave each paragraph one point for the correct answer and zero for the wrong and left out answer. Thus, the total score of the test becomes (20) degrees, and to verify the parity between the students of the experimental group and the control group in the information test.
3- Intelligence/ Raven's matrix test was applied for the successive matrices on Monday on ((7/11/2021)) The test includes (36) test items distributed into three groups (A, B, C) at a rate of (12) items in each group and allocated) 6) available alternatives for each paragraph of the totals (a, b) and (8) alternatives for each paragraph of the totals (c)
4- Previous achievement in science: The researcher obtained the students' grades in science for the fourth grade of primary school for the academic year (2020-2021) for the two research groups on Tuesday (2/11/2021) from the school records with the help of the school administration as in Appendix (8) and to verify parity between the students of the experimental group And the control group in the

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previous achievement, and after calculating the arithmetic mean and standard deviation of the scores of the experimental and control groups, the t-test equation "t-test" was applied for the two independent samples of unequal numbers, and it was found that the calculated (t-Test) value (0.367) is less than the tabular (2.01) at the degree of freedom (48) and that the difference is not statistically significant at the level of significance (0.05), which means that they are equal in this variable

After correcting the answers of the two groups for the variables above, the arithmetic mean and variance were calculated by applying the anti-t-test for two independent samples unequal in number. The results showed that there is no statistical significance at the two levels of function (0.05) and the degree of freedom (48) for the students of the two groups, which indicates the equivalence of the two groups as in the following table.

variable	the group	The number of sample members	Arithmetic mean $\bar{x}$	variance	degree of heat df	value (t)		Significance level (0.05)
						calculated	tabular	
previous collection	Experimental	26	29.103	8.272	48	0.914	2.000	Not statistically significant
	settings	24	31.634	9.351				
Previous information	Experimental	26	12.84	4.53	48	0.48	2.000	Not statistically significant
	settings	24	13.81	4.59				
intelligence	Experimental	26	22.66	5.67	48	0.738	2.000	Not statistically significant
	settings	24	24.11	4.52				
Chronological age	Experimental	26	124.32	10.532	48	0.834	2.000	Not statistically significant
	settings	24	121.73	9.566				

Adjust extraneous variables

The extraneous variables are those that affect the dependent variables. There are two types of variables that threaten honesty. The first that threatens internal honesty, which is the minimum and the basis without which no results can be explained. As for external validity, it is related to the issue of generalizing the results (Al-Bayati and Khalifa, 2015: 214). The researcher tried to limit the impact of some extraneous, non-experimental variables that he believes may affect the safety of the experiment, because controlling them leads to more accurate results, which are (the place of application of the experiment - experimental extinction - class distribution - study material - time period - measurement tools - accompanying accidents).

Reearch supplies

Determining the scientific subject: The scientific material was divided into the second and third units of the science subject book for the study year 2021-2022.

Unit Two: The human body and its health (circulatory system and breathing - digestive and urinary system - digestive system)

Module Three: Matter (Elements - Compounds and Mixtures)

Formulation of behavioral objectives: (100) behavioral objectives have been formulated,

- Number of teaching plans: In light of the content of the second and third units of the science book to be taught to fifth graders and the specific behavioral objectives of these units, the researcher prepared a number of teaching plans for both groups, thus amounting to (18) teaching plans for the experimental group and the same for the control group, distributed on (10) weeks,

Research Procedures

1- Defining the scientific material
2- Formulating behavioral objectives
3- Preparing teaching plans.

The Research Tools

The research tool is a means of collecting data through which the objective of the research is answered and its hypotheses tested, and it is also called by means of measurement such as the questionnaire, observation, interview and choices (Hassan, 2011: 54). And the nature of the current research requires a data collection tool, which is Science achievement test for the fifth grade of primary school.

Building an achievement test

One of the requirements of the current research is to build an achievement test to measure achievement in science for the research sample. The researcher followed the following steps:

Determine the number of test items

The researcher formulated a number of test items, and the number of paragraphs was (26) of the type of multiple choice, as it is appropriate with the time allotted for the answer and covers the topics and objectives of the experiments of the subject, where it gave one degree for the correct answer and zero for the wrong and abandoned answer.

Preparation of the test map (table of specifications):

The specification table is a detailed outline that defines the content of the test and links the content of the study subject to the behavioral goals, and between the relative weight that the teacher gives to each of the different topics, and the relative weights of the cognitive-behavioral goals at their different levels (Al-Khayat, 2010: 176).

Accordingly, the researcher prepared a table of specifications according to the following steps:

- The weight of each chapter of the subject, i.e. the importance of each chapter, was determined based on the time taken for each semester, as in the following equation:

Relative importance of the semester = (each semester per number of hours) / (total number of hours) X 100

The percentage was for the first semester (22%), the second semester (28%), the third semester (22%), and the fourth semester (28%).

The relative weight of the behavioral objectives was determined for each of Bloom's six levels of the cognitive domain. The percentage of the behavioral objectives was calculated as follows:

Relative importance of behavioral purposes = (a certain level of behavioral purposes number) / (behavioral purposes of the total number) X 100

The percentage of the level of remembering (41%), comprehension (18%), application (13%), analysis (12%), composition (10%) and evaluation (5%) were a percentage of the total number of behavioral goals.

The number of questions for each cell of the specification table was calculated as follows:

Number of questions per cell = level percentage x class percentage x total number of test items.

Drafting test items

In formulating the achievement test items that measure the six levels of knowledge, understanding (comprehension), application, analysis, synthesis, evaluation) from the cognitive domain of Bloom's classification, the researcher relied on one of the types of objective tests (multiple choice) with four alternatives. The researcher scored one point for the correct answer for each paragraph of the test and zero for the wrong answer after the researcher made sure of the apparent validity of the test.

- The researcher conducted the first exploratory experiment in order to find out the notes about the test and calculate the average time for the answer, as it was found that the test paragraphs are clear and that the average appropriate time for answering is (35) minutes, by calculating the average of the first three answers + the average of the last three answers divided by (2) and It was (35) minutes.

As for the second exploratory experiment, it was a measure of the psychometric characteristics of the test, as the difficulty coefficient of the paragraphs ranged between ((0.75-0.32), and thus all the paragraphs were considered acceptable. The discrimination coefficient was found to range between (0.67-0.25), while it was found that the effectiveness of the wrong alternatives attracted a number of Learners from the lower group who are more than the number of learners from the upper group and more effective the higher its value in the negative direction.

The researcher also calculated the stability of the achievement test by calculating the Kewder Richard equation -20 and found that the stability of the test is equal to (86%), as the reliability coefficient is good.

Final exam

After confirming the validity of the test, the stability of the test, and the psychometric characteristics, the achievement test in the final form consisted of (26) paragraphs, ready to be applied to the research sample.

Experimental application procedures

1- The experiment was applied in the second semester of the year 2021-2022)) on Tuesday on the date of 2/11/2021 on the two research groups (experimental and control), and the experiment ended on Sunday on the date of 16/1/2022, that is, it took A full academic semester (10 weeks) with three lessons per week for each of the experimental and control groups.

2- The experimental group was taught according to the Schwartz model and according to the daily teaching plans.

3- The achievement test was applied to the two research groups on Sunday (1/25/2022), and the students were informed of its date a week before the specified date.

Statistical means

The researcher used the statistical package for social sciences (10-SPss) and (Microsoft Excel) in data processing.

The fourth chapter presents and interprets the results

A- Results of the achievement test

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For the purpose of verifying the null hypothesis (there is no statistically significant difference at the level (0.05) between the average scores of the experimental group students who study according to the Schwartz model and the average scores of the control group students who study according to the usual method in the academic achievement of science for the fifth grade of primary school

The arithmetic mean and standard deviation of academic achievement for the scores of the two groups (experimental and control) were calculated by the researcher and by applying the t-test for two independent samples, the results shown in the following table:

Table (1) the results of the t-test for two independent samples of the two research groups (experimental and control) in the achievement test

the group	number of students	Averagearithmetic	standard deviation	degree of freedom	T value		Statistical significance at the level (0.05)
					calculated	tabular	
Experimental	26	31.6	5.12	48	4.44	2.01	function
settings	24	24.0	7.85				

From the above table, it is clear that the arithmetic mean of the scores of the experimental group students in the achievement test was (31.6), while the arithmetic mean of the scores of the control group students was (24.0), and the calculated (t.test) value was (4.44) which is greater than the value of (t). .test) tabular (2.01) at a degree of freedom of 48) and a level of significance (0.05), which indicates the existence of a statistically significant difference in favor of the experimental group in the achievement test.

In order to find out the size of the relationship between the research variable, whether that relationship belongs to the chance factor or to the independent variable, Schwartz model, the researcher found the scientific significance of the effect of the independent variable using the effect size equation as in the following table:

Table (**3**)

The effect of the Schwartz model on the achievement test	the valueCalculated T	T-value square	Impact size value U2	Impact size level
	4.35	18.92	0.30	Very big

The table shows that the calculated T value is (35.4), and when the T value is squared, it turns out to be (18.92), and after processing the data statistically using the statistical program (spss), it turns out that the effect size value amounted to (0.03), which means that the level of the effect size is (very large). From these results, it became clear to the researcher that the Schwartz model had a significant impact on raising the level of achievement in science and in favor of the experimental group.

Second: Interpretation of results

A- Interpretation of the results related to the first hypothesis:

The results of the research showed that the Schwartz model has a positive effectiveness in achievement. The researcher attributes these results that led to the superiority of the experimental group over the control group in achievement to:

1- The Schwartz model is more effective than the traditional method because it leads the students to a set of precise and organized steps, which resulted in achieving high levels of knowledge.

2- The Schwartz model excites the students' minds by presenting the topic of the lesson in the form of a problem or an issue, which leads to arousing their curiosity about it and linking the problem or issue with the main ideas and concepts so that it leads to the generation of questions by the students to link all the effects and reasons leading to reaching solutions to the problem, and this requires They associate information related to the issue or problem with the information they possess in their cognitive structure.

3- The change that occurred in the way of presenting the scientific material through the Schwartz model made the female students the focus of the educational process, giving them a positive role and increasing their academic achievement.

4- The interaction in educational situations increased due to the ability of the Schwartz model with its educational steps to help the students to participate positively, which enhanced self-confidence, diversity of visions, treatments and the ability to conclude.

Conclusions: In light of the research results and their interpretation, the researcher concludes the following:

The (Schwartz) model had a significant impact in raising the level of achievement of the experimental group students at the expense of the control group students who studied in the usual way and (very significantly) in favor of the experimental group.

Recommendations: In light of the results of the research and the conclusions reached by the current research, the researcher makes the following recommendations:

1- Teaching the (Schwartz) model in science to students and conducting a workshop to train teachers to use this model in teaching science.

2- Adopting the (Schwartz) model within the teaching vocabulary of the Science Department in the College of Basic Education, as it has a prominent role in raising the level of achievement of learners.

3- Take advantage of the daily teaching plans that were designed according to the (Schwartz) model and prepare the achievement test to evaluate learners that were prepared in the current research.

4- Submitting a request to the Ministry of Education to open training courses on an ongoing basis to develop the capabilities of teachers using the Schwartz model and how to develop teaching plans and appropriate means of explanation.

Suggestions: To complement this study, the researcher suggests making use of the Schwartz model in conducting a number of the following scientific studies and research:

1- Conducting similar studies to the current study in (different study subjects) and in other study stages (intermediate level - middle school).

2- Conducting a comparative study between the (Schwartz) model and other modern teaching methods and their impact on achievement. Studies can be conducted aimed at knowing the effect of the (Schwartz) model with other strategies and models emanating from the constructivist theory such as (concept maps - Thelin model - and acceleration cognitive).

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