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THE EFFECTIVENESS OF STRATEGY (4H) IN THE ACHIEVEMENT OF SCIENCE SUBJECT AMONG SECOND-GRADE INTERMEDIATE STUDENTS

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Abstract

The research aims to identify the strategy's effectiveness (4H) in achieving science subjects among students of the second intermediate grade. The research sample included two groups: the experimental group and the number of its students was (35), and the control group represented the other group, and the number of its students was (35). Intentionally, the researcher chose (Birir Intermediate School for Boys) from the research community represented by the middle schools affiliated to the Directorate of Education of Diyala Governorate / Baquba. The researcher adopted the experimental research method as a method for conducting his research, which includes one independent variable (the 4H strategy) and a dependent variable (the academic achievement). The researcher chose the experimental design to control the research variables, and before starting the experiment, the researcher rewarded the two research groups for the purpose of obtaining accurate results with the following variables: (chronological age calculated in months, previous achievement of students, and Raven's test of intelligence). After making parity between the two research groups, the researcher prepared the requirements for the application of plans, objectives and tests for the two research groups, and after completing the application of the experiment, the researcher applied his research tools to the two research groups. The researcher obtained data for the two research groups, as these data were processed statistically by t-test for two independent samples. The results showed that the students of the experimental group outperformed the students of the control group who studied according to the strategy (4H) in the achievement of science.

Keywords: Strategy (4H), academic achievement, second-intermediate students, science subject

Section One: Definition of Research

1. The problem of the study:

The impact of progress and rapid development and the accompanying explosion of knowledge that affected all disciplines became necessary to pay attention to learning based on the use of modern educational strategies and contemporary technologies in line with scientific progress and technological development. Day by day, there is an increasing interest in the need to improve and develop teaching strategies and methods. (Al-Jubouri et al., 2011: 7-8). Science is one of the subjects that includes theories, facts, and inventions. Despite its importance, we find that the actual reality of its teaching is still characterized by stagnation and boredom. This is due to the following usual teaching methods in the teaching process: the teacher's fear of losing the classroom control process and reliance on the explanation in the teaching process. Some educational studies and research have indicated teachers' shortcomings in using modern teaching methods and limiting them to memorization and indoctrination (Daye', 2020) and (Saleh, 2021). hence the fundamental research problem emerges, and thus the research problem can be determined by the following question:

What is the effectiveness of the strategy (4H) in the achievement of science for second-grade intermediate students?

2. The Importance of Study:

The (4H) strategy is considered a basic rule influencing academic achievement, as academic achievement represents one of the goals of education due to its educational importance in the life of the learner (Al-Shahri, 2016: 71). Academic achievement is not only a product of the educational process, but is a measure by which students' academic level is determined (Al-Salakhi, 2013: 73). Therefore, academic achievement has become one of the concepts that are taken care of by the educational system and educational institutions, and many of the classroom tests bear the title of achievement. (Al-Jubouri, 2018: 14).

3. The Aim of the Study

The current research aims to identify the strategy's effectiveness (4H) in achieving second-grade students in the intermediate science subject.

4. The hypothesis of the study:

To verify the objective of the research, the researcher put the following hypothesis:
(There is no statistically significant difference at the level (0.05) between the average scores of the experimental group students who study science according to the (4H) strategy and the average scores of the control group students who study the same subject according to the usual method in the achievement test for science).

5. The Limits of the Study

The study was limited on:

1. **Spatial boundaries**: Intermediate and secondary schools (governmental day schools) for boys only are affiliated with the General Directorate of Education in Diyala Governorate / Baquba.
2. **Time limits**: the first semester of the academic year (2021-2022).
3. **Human limits**: second-grade middle school students.
4. **Cognitive limits**: the science book for the second intermediate grade, 3rd floor, for the year (2019), which is scheduled by the Ministry of Education for the academic year (2021-2022), and the study classes were identified, which is (the fourth unit) represented by (Chapter Seven: Simple Organisms, and Chapter Eight: The Kingdom of Plants, Chapter Nine: The Kingdom of Animals, and (The Fifth Unit) represented by (Chapter Ten: The Environment and Its Components).

6. Define Terms

A. Strategy (4H) is defined by:

Abo Saidi and Hoda (2016) identify it as "one of the active learning strategies that activate the role of the student, arouse enthusiasm and break the routine, in which the learner uses his thoughts and feelings as well as some senses and links them directly. It consists of four stages: the head, hand, heart, and heart to increase student achievement. (Ambo Saidi and Hoda, 2016: 140).

Procedurally he defines it as a set of planned and organized stages that the science teacher follows with the members of the experimental group in the second intermediate grade to acquire information, facts, and concepts in science, according to four stages:

The head (the mental processes in the brain): the student's thinking takes place, and the expression of those ideas freely, the hand (skills of all kinds), in which a drawing and a summary of the most important things that came in the subject of the lesson take place to achieve the objectives of the lesson, the heart (emotions and feelings) in which the student's feelings towards the subject of the lesson are aroused and expressing those feelings, and the heat (the amount of interaction and homogeneity) in which students cooperate and interact with each other to reach the appropriate solutions.

B.The achievement is defined as

Al-Tamimi and others (2018) clarify it as "the set of knowledge and skills acquired and developed during the study subjects, which are usually indicated by test scores or grades assigned by teachers, or both." (Al-Tamimi et al., 2018:32).

Procedurally, it was clarified as the number of grades obtained by students in the achievement test set for this research after the specified trial period, which was applied

to second-grade intermediate students for the fourth and fifth units of science and the experimental and control groups.

Section two: Theoretical Background and Previous Studies

1. Theoretical Background:

a) Active Learning

Active learning is "that type of learning that depends on the participation and positive interaction of students in all educational situations in the classroom, and that depends on a group of effective methods such as role-playing, brainstorming, problem-solving, and decision-making, under the supervision and guidance of the teacher." (Khairy, 2018: 26).

b) Strategy (4H)

Hendrix of the University of Iowa in the United States of America is the chief designer of the 4H strategy. Its idea arose at the beginning of the twentieth century due to the reluctance of young people in rural areas to learn. Rural teachers tried to reach these young people through the idea of practical learning, which is an essential point, as they worked to link university education to life. (Lee, B. 1995: 17). The (4H) strategy also activates the role of the learner in the learning process and emphasizes the effective participation between the learner and the teacher and between the learners themselves, as its idea is based on the abbreviation of the letter (H) for the four words, which are (Head, Hand, Heart, Heat) meaning head, hand, and heart. And heat or interaction, as the learner performs the four activities according to each word:

c) Head: (Write your thoughts on the topic) where the learner expresses his thoughts.

d) Hand (an acquired skill): (write, draw, design, color, shape) is related to the learner's recording, either understanding, and learning during the lesson in the form of drawings or diagrams.

e) Heart (the emotional side): (Write your feelings about the topic) in which the learner expresses his feelings related to the topic of the lesson.

f) Heat (working atmosphere): (expressed the working atmosphere inside the classroom) represented by the learners' interaction during the lesson and how they cooperated and formed into cooperative groups.

(Mujahid, 2021: 112)

C. Academic Achievement

It is one of the concepts that are commonly used in the field of education and educational psychology in particular because of its importance in evaluating the student's academic performance, as it is seen as a preliminary test in the light of which it is possible to determine the student's academic level and to judge the size of educational production in quantity and quality(Thursday, 2018: 55).

2. Previous Studies

After reviewing the previous studies and literature, the researcher did not find any study that dealt with the (4H) strategy as an independent variable.

Section Three: Study Methodology and Procedures

1. Experimental design:

The researcher chose the experimental design with partial adjustment, as shown in Figure (1): Experimental Design

Groups	Independent Variable	Dependent Variable	Tool
Experimental	Strategy (4H)	Academic Achievement	Academic Achievement Test
Controller	Normal Way		

2. The Study Community and its Sample:

a) **Research community:** The current research community represents the morning intermediate schools for boys only that are affiliated to the Diyala Education Directorate / Baquba as the researcher visited the General Directorate of Diyala Education / Baquba; to determine the intermediate schools for boys that contain two divisions or more, which are located in Baqubah, as their number reached (32) schools.

b) **Research sample**: The research sample is divided into:

- **Sample of students:** The researcher chose (Birir Intermediate School for Boys) in Diyala Governorate / Baquba to conduct his research.
- **Sample of students:** After the researcher chose (Birer School for Boys) to apply the experiment, he found that it contains two divisions, as shown in table (1).

Table (1): distribution of the research sample to the experimental and control group before and after exclusion.

No.	Groups	No. of students before exclusion	No. of exclusion students	No. of students after exclusion
1	Experimental	**37**	**2**	**35**
2	Controller	**38**	**3**	**35**
Total		**75**	**5**	**70**

3. Equality of the Two Research Groups

The researcher was keen to make equivalence with the following variables: (the chronological age of the students calculated in months, the previous academic achievement of the students, and the intelligence test), and the following is a table showing the equivalences above.

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Table (2): Arithmetic mean, standard deviation, and the two T values of the research variables for the two research groups.

Variables	Groups	No.	SMA	Standard deviation	Variance	Temp.	The two t values		Significant
							Calculation	Tabular	
Chronological age	Experimental	35	125.26	6.48	31.20	68	1.412	2.000	Not statistically significant
	Controller	35	149.73	5.21	25.43				
Previous achievement of students	Experimental	35	6.98	3.52	10.43		1.343		
	Controller	35	7.43	5.12	25.65				
IQ test	Experimental	35	22.76	5.54	27.65		0.983		
	Controller	35	21.12	6.09	32.01				

4. The Study Tool

The procedures that are used to build the tool are:

1) **Achievement test:** The researcher prepared the achievement test according to the following steps:

a) Determining the objective of the test: The test aims to measure the amount of information acquired by the students of the second intermediate class (the research sample) during the duration of the experiment.

b) Determine the number and type of test items: The researcher adopted objective tests of the type (multiple choice) to measure Bloom's cognitive levels, which are (remembering, understanding, application, analysis, synthesis, and evaluation). The total number of items for the achievement test was (40) multiple-choice test items.

➢ **Apparent Honesty:** The researcher distributed the achievement test, accompanied by the behavioral objectives and the specifications table, to a group of arbitrators. In light of their opinions and suggestions, the paragraphs or alternatives that needed to be modified were modified, and the percentage ranged between (85% - 100%). Therefore the test items were kept (at 40) items.

➢ **Validity of the test:** To ensure the validity of the achievement test, the researcher used two types of validity:

✓ **Validity of the content:** the researcher prepared a table of specifications, and its validity was confirmed through the table of specifications presented with the achievement test to a group of arbitrators. Therefore, the paragraphs of the achievement test are representative and comprehensive of the academic content.

✓ **The exploratory application of the achievement test:** The achievement test was applied in two stages:

✓ **The first exploratory application:** After verifying the validity of the test, the achievement test was applied in its first exploratory stage on Wednesday (12/1/2022) to a group of students of the second intermediate grade at (Al-Hassan bin Ali (peace be upon him) secondary school for boys), where the number of Students (30) students and the purpose were to know the clarity of the instructions, paragraphs, and instructions of the test.

✓ **The second exploratory application:** The number of students reached (100) students from the second intermediate grade in (Martyrs of Islam Intermediate School for Boys) on Sunday (16/1/2022), and the students were notified a week before the test, and the researcher himself supervised the application and in cooperation with the Subject teacher at this school. The researcher extracted the coefficient of difficulty, coefficient of ease, discrimination, and the effectiveness of the wrong alternatives for the achievement test by using the method of the two extreme groups (27%) for the upper group, which amounted to (27) students, and (27%) for the lower group, which amounted to (27) students from the sample of statistical analysis. After that, the scores for both upper and lower groups were statistically analyzed to extract the psychometric properties of the achievement test.

➢ **Statistical analysis of the achievement test items:**

1) The difficulty coefficient of the test items: Its value ranges between (0.35-0.70), and thus, the achievement test items are reasonable and appropriate in terms of difficulty, ease, and acceptability.

2) The discrimination coefficient: When calculating the discrimination coefficient, the researcher found that it ranges between (0.22 - 0.55).

3) The effectiveness of the wrong alternatives: It was found limited to (0.03 - _ 0.25).

4) Test reliability: The researcher verified the test's reliability in two ways:

➢ **The split-half method:** was applied in the (Intermediate School of the Martyrs of Islam for Boys) on Sunday (16/1/2022), and the stability was reached using the Pearson correlation coefficient (0.804), then it was corrected by the Spearman-Brown equation, and it reached (0.891.(

➢ **Kewder-Richardson 20 method:** When calculating this equation, the stability coefficient was (0.936).

Section Four: Presentation and Interpretation of Results

1. Results:

The null hypothesis results: The researcher prepared an achievement test for the science subject, and it was applied to the two research groups. The arithmetic mean of the scores of the students of the two research groups and the standard deviation was calculated, and then the t-test was applied for two independent samples, as shown in Table (3):

Table (3): The scores of the two research groups' students in the science achievement test.

Groups	No.	SMA	Standard deviation	Temp.	The two t values		Significant
					Calculation	Tabular	
Experimental	35	31.032	5.632	68	4.540	2.000	Statistically Significant
Controller	35	28.54	7.813				

Through the results, it is clear that the experimental group students outperformed the control group students in the achievement test for science.

2. Interpretation of the Results

The (4H) strategy increases learners' interaction, with discussions between them on the one hand and with the teacher, on the other hand, which makes the educational process run smoothly and good interaction between its components.

3. Conclusions

The (4H) strategy plays a role in making students the focus of the educational process through active participation in the educational situation, increasing their self-confidence, and encouraging them to persevere to raise their scientific level.

4. Recommendations

It is necessary to include the strategy (4H) in the vocabulary of the subject of methods of teaching science for the initial and postgraduate stages in the faculties of education and primary education.

5. Suggestions

We are conducting a similar study using the (4H) strategy in different subjects and other study levels (chemistry, mathematics, physics)

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