

PalArch's Journal of Archaeology
of Egypt / Egyptology

**THE EFFECTIVENESS OF THE INTERLACED WAVES
STRATEGY IN MATHEMATICAL ACHIEVEMENT
AMONG FIRST-GRADE INTERMEDIATE STUDENTS**

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Zainab Haider Bidn Al- Turfy, Ayat Mohammed Jebur Rana Sabih Abboud, The effectiveness of the interlaced waves strategy in mathematical achievement among first-grade intermediate students-Palarch's Journal Of Archaeology Of Egypt/Egyptology 17(9), ISSN 1567-214x

Abstract

The research aims to state: **(the effectiveness of the interlaced waves strategy in mathematical achievement among first- grade intermediate students).**

To verify the objective of the research, the following null hypotheses were formulated:

1. There is no statistically significant difference at the level of significance (0.05) between the mean scores of the students of the experimental group who will study according to the strategy of overlapping waves and the scores of the students of the control group who will study according to the usual method in the mathematical achievement test. $H_0 = H_1 = H_2$
2. There is no statistically significant difference at the level of significance (0.05) for the overlapping wave strategy, according to Kuhn's equation for the size of the effect on the study variable.

In order to verify these two hypotheses:

The research community was determined by female students of the first intermediate grade in secondary and middle schools for the education of the Majar al-Kabir district, and the experimental design with partial control was adopted for two groups (experimental and control) by post-test, and Hajar Intermediate School for Girls affiliated to the education of the Majaral-Kabir district was chosen intentionally, as the research sample consisting of (56) A female student. Division B was chosen randomly to represent the experimental group of (28) students studying according to the strategy of overlapping waves, and Division (A) to represent the control group by (28) students. According to the usual method, the parity of the two groups in the variables was verified (prior knowledge test in mathematics, intelligence test, previous achievement in mathematics, chronological age calculated in months, the general average of the previous school year).

The experiment was applied in the first semester of the academic year (2019-2020) and after determining the scientific subjects, the behavioral objectives were formulated, the teaching plans were prepared, and the (mathematical achievement) test consisting of (30) items of a multiple-choice type was prepared, and validity and consistency were verified as well as the Psychometric properties of the test, after correcting and processing the results they were as follows:

1. Rejecting the null hypothesis and accepting the alternative hypothesis for the existence of a statistically significant difference in the mathematical achievement test in favor of the experimental group students who studied according to the strategy of overlapping waves compared to the control group students who studied in the usual way.
2. Rejecting the null hypothesis and accepting the alternative hypothesis for the existence of a statistically significant difference at the level of significance (0.05) for the overlapping wave strategy according to Cohen's equation for the effect size in the study variable.

In light of these results, the researcher recommends a number of recommendations and proposals.

Key words: cross wave strategy, mathematical achievement

Introduction

Mathematics is considered from the viewpoint of many educators and those interested in teaching it, as an important tool for organizing ideas and understanding the environment in which we live, and it is a subject that helps the individual to understand and control the surrounding environment, and that mathematics grows, increases and develops through our sensory experiences in reality, our needs and our financial motives To solve our problems and increase our understanding of this reality. (Spitan, 2010: 37)

proceeding from the principle of the importance of mathematics as a science that is taught, it is necessary to find modern methods for its teaching that make the learner feel close to life in the classroom, and

the use of modern strategies and their use in education, and since mathematics is an abstract scientific material, it is considered a difficult subject for learners, especially after the wave of curriculum modernization in Iraq, which increased the learners' aversion to studying it, whether the reason was the content of the subject matter or its traditional teaching methods. So it was necessary to find a new role for the teacher as comparable to the accelerated modernity in the world in subjects in general and mathematics in particular, by finding new teaching methods, new goals and structures, as specialists made great efforts to develop them and teaching methods to keep pace with the rapid changes and developments, as the modern trends focus on developing knowledge, assimilating it and building it in a meaningful way in students. The structure of the learner, the development of thinking and the increase of achievement (Al-Azzawi and Nasser, 2011: 135)

So, the methods that are followed by the teacher and the various activities work to attract students' attention and make them desire and yearn for the scientific material, as the teacher's success in his profession is measured by the extent of his students' success in education, and thus it became necessary to use appropriate educational strategies in teaching different subjects, It would teach students how to learn, how to think, and how to participate effectively, and to achieve this, modern mathematics curricula must be based on the activity of learners, their participation and effectiveness during the lesson by providing them with many activities that stimulate learning and interesting learners (Al Amer, 2010: 9)

Societies have attached great importance to academic achievement since ancient times, as the prevailing belief is that achievement is the measure by which we infer the extent of an individual's intelligence and mental abilities, and an individual is considered intelligent if he obtains high grades in his studies, and is less intelligent if that is low. (Nasrallah, 2010: 13) the importance of this extends beyond the public life of the learner by using his knowledge to face the issues he faces in life and to think about solving them (Al-Shahrani, 2010: 28)

Among the results of the questionnaire (1) it was noted that most of the answers agree on the apparent decline in learners' achievement in mathematics for all school stages, especially the first grade intermediate of the current research topic, and the recent change of math vocabulary in a way that is not in line with the educational environment for the learners from its lack of various components of education. Of modern teaching methods, advanced educational methods and many others, it ranked first in terms of importance after sorting out the questionnaires, and the answers centered on the use of most teachers the traditional method of teaching and not using

modern methods and strategies. Which makes the learner active and effective in the classroom and makes him the focus of the educational process has been ranked second in terms of importance, in addition to the overcrowding of classrooms with large numbers of learners and other reasons that affect the low level of achievement. The teaching methods variable is one of the variables that allow researchers to delve into it and search for teaching methods that may have an impact on improving the level of academic achievement.

(Al-Kubaisi study, 2014) indicated that first-grade intermediate students focus on preserving and retrieving mathematical knowledge during exams only, so if it is retrieved in a later year, they will not remember anything from it (Al-Kubaisi, 2014: 358-359).

So, the researcher decided to experiment with the strategy of overlapping waves in teaching mathematics, perhaps contributing to improving the level of academic achievement of the learners, as it is one of the strategies that is based on the cognitive trend in learning and thinking, and the student develops his knowledge himself, through passing through many experiences that lead to building Self-knowledge in his mind, and in this strategy the emphasis is placed on the mind and its processes, and the student's learning is better as his learning is permanent and continuously developing, and the scientific material comes in the form of tasks and problems, students seek to find solutions during the research process (Al-Afif 2013: 59)

He is making an effort to interact with the new material, summon previous experiences and information he has and link it to new information, as teaching with this strategy is not a process of transferring knowledge only, but organizing attitudes and tasks within the classroom, and encouraging learners to participate in learning, in a way that allows discussion between class groups of the students (Abd al-Bari, 2010: 22), and the results of the study (Al-Janabi, 2018) indicated the positive and effectiveness of this strategy in teaching mathematics in particular, as it is based on clarifying knowledge and information in an accurate and sequential manner, which makes learning meaningful for the learner Thus, the study (Al-Janabi, 2018) coincided with the researcher's study of its goal (mathematical achievement test), and this reinforces the importance of the current study, as the independent variable of modernity, which calls for increased research and experimentation about its effect on the various dependent variables.

Research problem

The urge to raise the level of academic achievement was and still is the focus of everyone's attention. The learner's success is the basis on which to know the extent of the success of the educational process, and despite the changes that have taken place in the field of

mathematics in terms of building curricula, but there are many Among the problems that are still related to teaching mathematics, the most prominent of which is the low level of mathematical achievement for all academic stages, and that a large part of mathematics achievement can be achieved by teachers, using methods and means that help raise the level of their mathematical achievement, so it may be among the most important reasons In the low level of achievement, it is the teachers' use of traditional teaching methods. Therefore, the researcher decided to choose a strategy of interlacing waves in teaching mathematics may contribute to improving academic achievement in mathematics among first intermediate.

So that, the research problem is determined from the answer to the following question:

Is the strategy of interlaced waves in teaching mathematics effective in mathematical achievement among first-grade intermediate students?

The importance of the research:

- 1- This study came in response to recent trends that focus on teaching the learner, how to learn based on the principle of multiplicity of modern strategies that help enrich the educational situation in the classroom.
- 2- The research confirms the importance of achievement as it represents one of the objectives of teaching mathematics from ancient times to the present day, as it is considered one of the indicators to show the extent of learners' understanding of mathematics subjects, which makes it an indication of the success or failure of the educational process and those in charge of it.
- 3- It may contribute in providing middle school teachers with non-traditional teaching methods that help learners improve achievement.
- 4 - The importance of the intermediate stage, as it is a transitional stage in the formation of the personality of the learner and the basic rule on which the learner builds his information.
- 5 - The independent and dependent variable research is in harmony with the interests of the Ministry of Education in Iraq in developing and updating teaching methods and strategies.

Objective of the research:The current research aims to know (the effectiveness of the interlaced waves strategy in mathematical achievement among first-grade intermediate students).

Fourth: Hypothec of the Research:

To achieve the two objectives of the research, the following null hypotheses were put:

1- There is no statistically significant difference at the level of significance (0.05) between the mean scores of the experimental group students who will study according to the overlapping waves strategy and the scores of the control group students who will study according to the usual method of mathematical achievement test. $H_0 = H_1 = H_2$

2- There is no statistically significant difference at the level of significance (0.05) for the interlaced waves strategy, according to Kuhn's equation for the size of the effect on the study variable.

Fifth: The Limitations of the Research

The current research is determined by the following:

1- Female students of the first intermediate grade in Hajar Girls Intermediate School affiliated to the Directorate of Education in Majar Al Kabeer District in Maysan.

2-The first semester of the academic year 2019-2020.

3-The subject matter content represented in the first three chapters of the mathematics book for the first intermediate grade for the year (2016), the first edition of its author by Amir Abdul Majeed Jassim and others.

Sixth: Identifying of the terms

1- Overlapping Waves Strategy: Theoretically Defined

1- (Qatami et al., 2010): as one of the strategies of the cognitive trend in learning and thinking, focusing on the work of the mind and its processes, the role of cognitive performance, the environment and the field as a sign of the interaction of these components in a cognitive strand representing the mental cognitive performance of the learner. (Qatami et al., 2010: 247)

Achievement: theoretically defined:

(Al-Bakur, 2016): is the amount of learning achieved by an individual or the amount of information and experience he acquires as a result of studying a topic, course, or educational program. (Al-Bakur, 2016: 11)

The Procedural definition of the researcher: The amount of grades obtained by the students of the research sample in the mathematics achievement test prepared for this research after passing through educational experiences related to the topics of relative numbers, integers and polynomials.

Theoretical framework

First: The Interlaced Waves Strategy This strategy states that the learner can use more than one strategy during the same educational situation, and it is assumed that the learner uses a number of thinking processes in one strand until he arrives at a solution to an educational problem or completes a missing information, or uses a strategy to agree with the goal (Qatami, 2015: 172)

The primary information provides the learner's mind with an appropriate mental stimulation, as the idea of tides overlaps in the cognitive waves, as the wave of knowledge expands, then becomes smaller, then widens, then becomes smaller, and so the waves follow (Shukri, 2017: 241). The cognitive wave grows in learning and thinking, as is the case in the classroom situation, where the cognitive wave rises when the information of the learner is suitable for the developmental knowledge he is going through, and it decreases when the information needs to develop experience and grow to suit the level of the learner and thus the cognitive development proceeds according to wave after wave of the learner In this strategy.

Various forms appeared according to the Overlapping Waves Strategy for learning and thinking, as indicated by (Kattami and Al-Rousan, 2005), as follows:

- 1- High wave and low wave.
- 2- A wave in the wind.
- 3- An enrichment wave and a decay wave.
- 4- Tidal wave and tidal wave.
- 5- A crest wave and a bottom wave.
- 6- A wave far from stability.
- 7- A wave of treatment and feedback (Qatami and Al-Rousan, 2005: 173)

Here, Ziggler raises a question: Is the wave able to reach a steady state? Or does the knowledge of the learner stop when the learner in a specific situation or problem reaches a stage in which he says (I do not know)?

The answer is: (No), as the stability of waves is not possible, so the wave does not stop even after answering correctly because the learner cannot confine his thinking to a single (hovercraft) wave, and this means that the waves are always changing and the mind is always processing, thinking and responding to these waves (Qatami, 2013: 603)

Second: Steps of the Interlaced Waves Strategy:

1- identifying the objectives of the subject in a behavioral identification: the behavioral goal is a phrase or sentence describing the behavior of the learner that is expected to occur as a result of going through an educational experience, and that any work we do must have a goal that represents the goal that we seek to achieve, so the process of determining behavioral goals is necessary for the selection of experiences. In order for the interlocking wave strategy to achieve its effectiveness, it must have clear goals that take a share or parts of the quota to achieve them. (Faraj Allah, 2018: 37-38) The researcher has identified appropriate behavioral goals for the scientific material and for the interlaced waves strategy, which will be mentioned in the search procedures.

2- Determining the mental processes and processes to be developed: The mental processes that are related to the educational stage of the learner should be varied, which leads to the identification of a number of strategies that the learner interacts with, as the efficiency of mental processes is raised and activated through the use of appropriate mental cognitive strategies, and mental processes help to transfer the recent knowledge and apply it in new situations, as every person has a capable mental capacity to develop, and that its development allows him to use different types of strategies (Hilles, 2010: 57).

The researcher has identified a set of treatments and mental processes to be developed during the presentation of the academic subjects in the class, which it is observed that students need to build new knowledge, so previous knowledge of some concepts, principles and mathematical skills is the basis for building new knowledge.

3-Determining thinking skills to be developed: Thinking skills are specific mental processes that the learner intentionally exercises to process information and consists of a long series of skills starting with simple basic skills such as: remembering, analyzing, classifying, and observing, up to higher thinking skills such as evaluation skills and critical thinking. (Al-Harthi, 2009: 34) And learning thinking skills provides the learner with the tools he needs in order to be able to deal with any kind of information that he is exposed to in the future, and teaching thinking skills has a necessary importance for the success of the individual and his community (Al-Wishi, 2013: 8). The researcher has identified a set of basic thinking skills required for students, which are considered the basis for thinking processes (observation, remembering, and analysis) Which students need to solve mathematical problems and problems in the classroom.

4- Detection of the entrance readiness for tribal concepts, thinking skills, processes and necessary mental treatments: the entrance readiness means: The reorganization of the cognitive

environment of the learner, which consists of ideas, concepts and principles in the mind of the learner (Al-Qurazi, 2012: 10). The researcher benefited from the objective tests present at the beginning of each chapter of the mathematics book in determining the cognitive status of the students and the extent of their ownership of the concepts and principles of the academic subject before starting the new lesson, and linking them to later learning.

5-Organizing the classroom students in the form of cooperative groups: The cooperative work group is defined as a group of learners whose number ranges from (4-6) who have a common goal that they all strive to achieve, and each learner in the group has his own role, educators prefer that the number of members of cooperative groups be in pairs. In order for the learners in each group to cooperate with each other more, and these groups are heterogeneous in terms of ability and scientific background. (Alsir et al., 2016: 217) The researcher has arranged the groups of students bilaterally and quadruply according to the nature of the topic and the teaching method used to achieve cooperative learning and the Lesson objectives.

6-The teacher pre-prepares working papers suitable for the topic: The worksheets include overlapping knowledge waves, and these waves include presenting information for discussion and training with the collaborating groups. (Shaheen, 2011: 31), where the researcher prepared worksheets that included overlapping knowledge waves by one working paper for each student in Collaborative group.

7-The teacher gives each hovercraft group an overlapping hovercraft in which the required has been determined: These hovercraft are the mission that the cooperative group is required to do, and these hovercraft include experiences and knowledge that the group is required to answer, as the students seek discussion and consultation among themselves in order to carry out this task, and These hovercraft are symmetrical and similar for all groups. (Siegler, 2000: 26)

The working papers prepared by the researcher contained knowledge hovercraft that gave indications to students about the nature of the question required by specifying the data and what is required to be found, and what laws should be used to reach the correct solution. And every given hovercraft transfers students from one stage to another or returns them to an earlier stage according to the nature of their response to the hovercraft.

8-Conducting a discussion for each group in front of the other groups: the teacher should conduct the class discussion in an oral dialogue with the cooperative classroom groups to verify the

overlapping waves of knowledge (ideas, concepts, and facts) in order to access new data and information, and the learners' role in group discussions should contribute to the discussion and pay attention to What their colleagues say (Qatami et al., 2010: 251-252)

The researcher worked on managing group discussions among the students to ensure that the questions were free from errors, giving enough time for each student in the group to answer and discuss with her colleagues, and she also took into account that the questions asked by the group members stimulate thinking and the participation of everyone in the discussion.

Third: the teacher's role in the strategy of overlapping waves:

- 1- It provides multiple teaching methods in the presentation of the lesson.
- 2- Behaviorally setting the lesson objectives for learners.
- 3- Measuring the time taken to learn.
- 4- Monitor learners' activities.
- 5- Chooses and develops new strategies. (Qatami, 2013: 607)

The researcher mentioned how these roles were taken into account in detail when applying the interlocking wave strategy in the classroom.

Fourth: the role of the learner in the strategy of overlapping waves:

- 1-The axis of the educational process.
- 2- Discusses, debates and proposes ideas.
- 3- He listens to the opinions of his colleagues and gives his opinion.
- 4- Determines what he needs from previous information to start a new step.
- 5- Gather information and organize it to reach the required conclusions (Siegler, 1995: p. 620)

Fifth: the teaching methods used within the overlapping waves strategy:

The researcher chose a set of teaching methods within the strategy of overlapping waves, as the strategy emphasized the need for more than one teaching method to present the educational material in the classroom for its positive role in the learning process and because it creates an atmosphere of thinking and its suitability for time with the strategy steps, in addition to its ease of application in the lesson And the teacher and the learner will not suffer when applying them and

working with their steps, as each method works to represent one or more waves, and then the methods interfere between them in the educational situation to form the strategy of overlapping waves, and this is referred to in the study indicated by (Al-Janabi, 2018), (Siegler, 1996) in the multiplicity of teaching methods followed within the overlapping waves in the classroom.

First: The Think - Pair - Share Model.

Second: How to ask a question (Sent- A - problem).

Third: The Flexible Groups Method.

Fourth: The Plase Mat method.

Fifth: the jigsaw method.

Previous studies

In his Study (Al-Janabi, 2018): the effect of interfering waves strategy on mathematics achievement and creative thinking skills among middle school students.

This study was conducted in Iraq, and the experimental design of partial control was used for two groups (experimental and control) with a pre and post-test, and the parity of the two groups was checked in the variables (chronological age, intelligence, previous knowledge, previous achievement, creative thinking, the educational level of the parents) and after determining the material the scientific behavioral goals were formulated and the instructional plans were prepared. The achievement test and the creative thinking test were prepared. The psychometric properties of the two tests were verified. After collecting the data, the results were in favor of the experimental group in both tests.

Research methodology and procedures:

First: The experimental approach and design: The researcher followed the experimental approach and the experimental design of two groups, one experimental and the other controlling with an independent variable (interfering waves strategy) and a dependent variable (mathematical achievement) As shown in Table (1).

no	Group	the two groups equivalence	Independent variable	Dependent variable	Post test
1	Experimental	1- Examining prior knowledge in mathematics 2- Previous achievement in mathematics	Overlapping Waves Strategy The usual way	Mathematical achievement	Achievement test
2	Control	3-Intelligence test 4- Chronological age calculated in months 5- The general rate for the previous academic year	The usual way		

Table (1) Experimental Design for Research

Second: The research community and its sample: The research community was represented by all female students of the first intermediate grade in the intermediate and secondary schools of the General Directorate of Education for the Major Al Kabeer District in Maysan Governorate for the first semester of the year (2019-2020), and the research sample was intentionally chosen (Hajar Intermediate School for Girls) And it was chosen by the simple random drawing method, two classes out of four, and the number of students from the two classes was (56) students divided into the two groups.

Third: Control procedures: Before starting the experiment, the researcher did the following steps:

The internal integrity of the experimental design (the equivalence of the two research groups): The two groups (experimental and control) were equivalent in some variables and this may affect the results of the research, namely (a test of prior knowledge in mathematics, intelligence, previous test achievement in mathematics, chronological age calculated in months, general average for the previous academic year)

Fifth: Research requirements:

1- Identifying the scientific subject: The researcher identified the first three semesters (the first semester / integers), (the second semester / the relative numbers), (the third semester / polynomials) of the mathematics textbook for the first intermediate grade.

2-Identifying the behavioral goals: The researcher formulated 90 behavioral goals from the content of the assessed material within Bloom's classification of behavioral goals.

3-The Preparation of teaching plans: The researcher prepared three types (subject, exercises, control) of teaching plans for the subjects that will be studied in the experiment, and the number of daily teaching plans for the two study groups reached (40) teaching plans for each group, at (5) lessons per week and for a lesson of (45) minutes.

Sixth: The research tool (achievement test): The following steps have been followed in the Achievement Test:

1- Determining the goal of the achievement test: The achievement test aims to measure the achievement of the students of the two research groups in the subject of mathematics.

Specification table (test map):elaboration of the2-

chapter s	Lessons No	Time of lessons in minutes	Level weight Content weight	Evaluation Goal levels and weights						total
				Kn wle dge 18,8 88	Underst anding 16,666	The application 16,666	Ana l- ysis 15,5 55	Struct -ure 16,66 6	Eval u- ation 15,5 55	
first	12	540	30	2	1	2	1	2	1	9
second	16	720	40	2	2	2	2	2	2	12
third	12	540	30	2	1	2	1	2	1	9
Total	40	1575	100%	6	4	6	4	6	4	30

Table (4) the test map for the achievement test

The researcher prepared a table of specifications in which the topics of the three chapters of the mathematics book for the first intermediate grade, and the levels of behavioral goals in it within the cognitive domain of Bloom's classification represented by (remembering, understanding, application, analysis, synthesis and evaluation)

3- Determining the number of items of the achievement test: It was agreed to specify the items of the achievement test with (30) test items (according to their relative importance) to accurately represent the scientific material.

4- Drafting of test items: The researcher prepared (30) objective test items of the multiple choice type with four alternatives.

5- The set of test instructions:

A- The instructions of the answer: The instructions included the way of answering and the place of the answer, reading the item well, not leaving any item without an answer, and not giving more than one answer for one item.

B- The instructions of test correction: The test correction included the distribution of scores to the items as follows:

- 1- Giving one score for the correct answer for each of the test items.
- 2- Giving a score of zero for the wrong or abandoned answer or that includes more than one answer for each of the test items, and thus the total score of the test ranged from (0 as a minimum to 30 as a maximum).

6-Validity of the test: In order for the test to be valid and appropriate to the behavioral goals that it was designed to achieve, the researcher used three types of validity for the current test:

A-validity of the arbitrators (apparent honesty): In order to verify the validity of the outward test, the researcher presented the achievement test in its initial form consisting of (30) objective items of the type (multiple choice) with a list of behavioral objectives to a group of experts and specialists in mathematics and teaching methods.

B-Validity of the content:The researcher relied on the specification table, which is an indication of the content validity indicators in the setting of the achievement test items, and by this, the validity of the

content was achieved through the test map, and the achievement test became ready for application to the exploratory sample.

C-Validity of the construct or (concept): In order to verify the validity of the test construction, a correlation was found between the score of each of the test items and the total score of the test because the total score is a criterion for the validity of the test, after calculating the scores of the students of the second exploratory sample after arranging the scores obtained and taking the grades Which represents 27% of the highest and lowest scores, and the correlation relationship was calculated using the Pearson correlation coefficient, and the values of the correlation coefficients calculated for them ranged between (0,344 - 0,584) and compared with the tabular value (0,268) at a level of significance (0.05) and with a degree of freedom (54) All were statistically significant, and this is an indication of the internal consistency of the items composing the test, as shown in Table (5).

7-Exploratory application of the test:

A- The first exploratory application: The test was applied to an exploratory sample consisting of (30) students in the first intermediate grade (Majar Al Kabeer High School for Girls) affiliated to the Directorate of Education in Al Majar Al Kabeer District on 23/2/2020 with the help of the teacher of the material, and it was found that the instructions of the answer on the items were clear and the average time it took to respond to items was (45) minutes.

B-The second exploratory application: To conduct the statistical analysis of the test items, the researcher applied the achievement test on 24/2/2020 on a second exploratory random sample consisting of (100) students, (50) students from the Al-Akramin Intermediate School for Girls, and (50) students from Al-Nidal High School that are affiliated to the Education Directorate of Al-Majar Al-Kabeer District, after agreeing with the school administration and mathematics teachers to conduct the test and notify the students a period before the exam date.

The answers of the survey sample were corrected and the scores of the students obtained from the application were arranged in descending order, the scores representing (27%) of the highest and lowest scores were taken to obtain two groups as much as possible, then the following statistical analyzes were performed on the two groups:

A- The test item difficulty factor: The researcher applied the difficulty factor law to the achievement test results, and the items difficulty coefficients ranged between (0.54 - 0.69), which means that the achievement test items are acceptable and their difficulty factor is appropriate.

B- Item discrimination coefficient: When calculating the discriminatory strength of each item of the achievement test, it was found that it ranges between (0.26 - 0.56), as (Al-Kilani and others, 2011: 422) indicated that the item is good and acceptable if the discriminatory strength factor is (0, 20) or more.

C-The effectiveness of the wrong alternatives: After using the formula for the effectiveness of alternatives on the scores of the upper and lower groups of the second exploratory sample, it appeared that the false alternatives had attracted more answers to them than the students of the lower group in the upper group, as it was found that the effectiveness coefficients of all alternatives were negative. Keeping alternatives unchanged.

D-Stability of the test: The reliability of the achievement test was calculated in two ways:

A- Half-segmentation method: The correlation between the two halves of the test items was calculated using Pearson's correlation coefficient, and the value of the correlation coefficient between the two halves was (0.778), then this value was corrected using SpearmanBrown's equation to reach (0.875).

B-The Keoder-Richardson method (K-R20): the value of the stability factor was calculated for the achievement test and it was (0.86), and the results are scientifically acceptable.

The achievement test in its final form: the achievement test in its final form consisted of (30) objective items of the type (multiple choice).

Seventh: The Statistical means: The results were analyzed and statistically treated by the statistical program spss.

First: The Presentation and interpretation of the results

The Result related to the first hypothesis: For the purpose of verifying the first hypothesis, which states that:

))There is no statistically significant difference at the level of significance (0.05) between the mean scores of the experimental

group students who will study according to the overlapping waves strategy and the scores of the control group students who will be taught according to the usual method in the mathematical achievement test $H_0 = H_1 = H_2$)).

The researcher calculated the arithmetic mean and the standard deviation of the achievement of the students of the experimental and control groups in mathematics, then applied the T-test for two independent samples and extracted the result as shown in Table (6)

Table (6) the results of the T-test for two independent samples of the two research groups in the achievement test

Group	Arithmetic mean	standard deviation	sample	Degree of freedom	T-value		Statistical significance
					Calculated	Tabular	
experimental	19,97	4,63	28	54	3,533	2,00	function
	15,54	4,367	28				

It is clear from the table that the average scores of the experimental group students in the achievement test (19.97) with a standard deviation (4.63), the arithmetic mean of the scores of the control group students (15.54) and a standard deviation (4,367), and that the T value calculated for two independent samples was (3,533), which is greater than the tabular T value of (2,00) at the level of significance (0.05) and the degree of freedom (54), and this means that there is a statistically significant difference in favor of the experimental group, and therefore the null hypothesis is rejected, and the alternative hypothesis is accepted. This means the experimental group of female students who studied using the strategy of interfering waves outperformed the control group students who studied in the usual way in the achievement test.

Although, the statistical significance of the results expresses the confidence in the results of the differences without relying on the size of the differences, and there is another concept which is the size of the effect that focuses on the differences, and thus the size of the effect completes and explains the statistical significance, and when

using the T-test for two independent samples it is possible to use the Cohen's scale(d) directly to find the effect amount.

By using the formula (d) for the size of the effect, its value was (0.973), which is the size of a large effect, and for this the size of the effect of the interfering waves strategy in the achievement is large and in favor of the experimental group. The researcher believes that the reason for this is due to the use of the interfering wave strategy, as it is one of the modern strategies that make the learner active and effective in the classroom situation, in addition to that it increases the learner's confidence in himself and others by participating in class cooperative groups, which increases his motivation towards learning and breaking barriers of dread and fear of the teacher.

This is what the study of (Al-Janabi, 2018) indicated in an increase in the level of academic achievement using the strategy of overlapping waves.

Second: Conclusions: After presenting and interpreting the results, we can conclude the following:

1- The strategy of overlapping waves had a major role in raising the level of academic achievement among the students of the experimental group over the students of the control group, because it includes in one of its steps the diversity of mental processes that is linked to the student's educational stage, as the efficiency of mental processes is raised and activated through the use of appropriate cognitive strategies.

2- The interlocking wave strategy makes the learner the focus of the educational process, as he is active and effective during the classroom situation.

Third: Recommendations

1- Organizing training courses by the Iraqi Ministry of Education for teachers focusing on modern trends in teaching, including the strategy of overlapping waves for the various educational stages.

2- Training students of the Faculties of Education, Basic Education and the open colleges to teach according to the strategy of overlapping waves within the teaching methods, because they will become the educators of the future and its teachers.

Fourth: Suggestions: To complement the current research, the researcher proposes to conduct the following studies:

1- Conducting studies that investigate the effectiveness of the interlaced wave strategy in other dependent variables that were not covered by the current research, such as trend, gender, motivation, and retention.

2- Conducting other studies to compare the strategy of overlapping waves with other teaching strategies.

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