

The impact of the four-pillars strategy on the acquisition of scientific and motivational concepts in third-grade middle students in physics

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Abstract

The study aimed to know the strategy of the four pillars in acquiring scientific concepts and motivation for third-grade secondary school students in physics. The researcher chose Al-Warka Secondary School for Boys in Baghdad as an intentional sample for the experiment. The research sample was 50 students from the third-grade secondary school students, divided them into two groups with 25 students for each of the two research groups. The researcher made the two groups equal in the varieties of intelligence and previous academic achievement in science subject in the second grade and the chronological age in months. The researcher prepared a test for acquiring scientific concepts and adopted a measure of motivation. After verifying the validity and reliability of the researcher's use of the T-test to find out the results, the researcher concluded that the strategy of the four pillars has an active effect on the acquisition of scientific concepts and motivation for the experimental group compared to the control group, and the researcher suggested a number of recommendations and suggestions.

Keywords: The four pillars strategy, acquisition of scientific concepts, motivation, physics.

Introduction

Science is the source of progress and strength in various areas of life, and it is considered the cornerstone of the rapid development in the field of technology that has spread throughout various regions of the world, so keeping pace with the huge explosion of science, technology and knowledge is to qualify our rising generations scientifically, technically and technically to form productive, creative and advanced generations.

Educators stressed that education in general, and teaching science in particular, is not only the transfer of scientific knowledge to the

learners, but is a directed. It is interested in the growth of the student (skilful, emotional and mental).

The main purpose in teaching science is to teach students how to think, not how to memorize courses without realizing them, understanding them, or employing them in life(Zaytoun, 2001).

Therefore, the physics curriculum is one of the scientific curricula at the secondary school level. It seeks to achieve the general goals of teaching science, such as acquiring scientific concepts and helping learners understand natural phenomena by studying scientific relationships and laws related to these phases and the factors and variables affecting them, and this helps to develop skills and enhance their hobbies(al-Salam, 2006).

Recently, there have been some demands to find modern strategies in teaching scientific and skill subjects, the purpose of which is to deliver the study material or skills to students in a faster and better way.

Many researchers and workers in the field of education have used various teaching methods in physics with their impact on the educational process because of the projection of educational purposes and contents and their translation into educational experiences and situations. The purpose is to develop the ability to learn based on their own efforts. Students still suffer from a decline in their understanding of scientific concepts, and through the participation of the researcher in many seminars for physics teachers as well as the researcher's experience in the field of teaching for more than (25) years in secondary schools, he noticed the extent to which students suffer in their understanding of the material and their distance from it. Although physics in all academic stages contains many important scientific facts, the researcher found that the vast majority of students cannot distinguish those concepts, and that modern trends in the learning process are moving towards the use of modern strategies in teaching that help the learner to activate his previous knowledge and raise motivation and thus help in achieving the learning goals.

Therefore, the researcher felt that there is a need to use modern strategies in teaching, and one of these strategies is the four pillars, which the researcher believes will contribute to addressing these problems. So, the current research raised the following question:

Is there an impact of the strategy of the four pillars on the acquisition of scientific and defense concepts among students of the third intermediate grade in physics?

The four-pillar strategy is one of the strategies that depend on the student's interaction and activity in the classroom, as this strategy is characterized by adding an atmosphere of fun and fun in the

classroom. It also adds harmony between learners during the implementation of the strategy.

And from the opinion of Al-Khawaldeh (2003) who states that the students in various academic stages do not understand scientific concepts, but memorize them without linking them to other positions. Thus, they have negative attitudes towards science on the one hand and towards their teachers on the other hand. This leads to their loss of passion towards learning, because the acquisition of scientific concepts is one of the goals of teaching science that gives scientific knowledge its flexibility, and allows it to organize each branch of knowledge. Studies have indicated that scientific concepts in general and physics concepts in particular must be studied in a way that needs abstract thinking, and this leads to difficulties in learning. Therefore, many studies have been conducted to develop the appropriate treatment to get rid of the difficulty of learning.

Motivation is an important factor for a learner's ability to obtain and produce knowledge. So it draws its attention to certain activities that affect a learner's behaviour and urges it to act and persevere effectively. Also, the motivation of the educational authority is one of the educational objectives itself. The excitement of students' motivation makes them engage in cognitive activities outside the scope of school and university work in their future lives(Al-Hila, 1999).

The importance of research is determined by: -

- This research is perfectly consistent with modern educational trends that seek to experiment with several modern methods and strategies in the teaching of science.
- The research focuses on the importance of teaching physics as one of the basic natural sciences, and because it plays a significant role in developing students' scientific abilities and abilities.
- Acquiring students' scientific concepts plays an important role in increasing their uptake and motivation of the subject

Third: Research Objectives:

The research aims to identify the effect of the strategy of the four pillars in the acquisition of scientific concepts and motivation among students of the third intermediate grade in physics.

Fourth: Research Hypotheses:

- There is no statistically significant difference at the level of (0.05) between the average scores of the experimental group who study physics in the four-pillar strategy and the average scores of the control group who study the same subject in the usual way in acquiring scientific concepts.

- There is no statistically significant difference at the level of (0.05) between the average scores of the experimental group who study physics in the four-pillar strategy and the average scores of the control group who study the same subject in the usual way in the motivation scale.

Fifth: Research limits: -

The study is limited to the following:

- Students of the third intermediate grade of Baghdad schools / General Directorate of Education of Baghdad / Rusafa I for the academic year (2021-2022).

- First semester of the academic year (2021-2022).

- First, second, third, fourth and fifth semesters of the physics textbook to be taught for the third intermediate grade for the academic year (2021-2022).

Sixth: Definition of terminology

Four pillar strategy

- It is a strategy that requires students to decide on an objective problem or question. Possible responses are placed in every corner of the classroom and students move to the corner that better describes their thinking and share their thoughts with other students in their corner. It then comes to the meeting one member of each group, and share the result in discussions with the entire class students (Andrade & Cizek, 2010)

- "It is a teaching plan based on the idea that the student is actively taught so that there is an atmosphere of activism, enthusiasm and joy in the educational grades, so that the student knows that the task is another non-static perception (Saidi & Al-Hosania, 2016, p. 116).

Conceptual acquisition: defined by

- "It is a means of maintaining long-term learning from loss through a certain amount of teaching for the learner" (Abu-Zina, 1997)

- "It is the ability of an educated individual to identify the distinctive features of the concept, to give examples to it and to compare the concept with other concepts and put it into practice" (Marei & Al-Haila, 2005, p. 153).

Procedural definition of conceptual acquisition:

It is the ability of research sample students to identify the hallmarks of the concept and give examples to each of them and is measured by the degree to which they receive when answering the test of acquiring scientific concepts prepared by the researcher for this purpose.

Motivation: Al-Zagloul and Al-Mahamid (2000, p. 96) defined it as a "driving force of behaviour that agitates, directs and provides energy to it pending the attainment of the associated objective and satisfaction of the need that it raises".

Procedural definition of motivation: -

It is the overall degree obtained by the students of the research sample in the motivation scale adopted by the researcher for this purpose.

Part II

First: Theoretical Framework

Four pillars Strategy

This strategy is based on the teacher's presentation of a question with four options. The answers may include alternative perceptions of students, and the teacher distributes the four options in the classroom pillars. The students are asked to stand up to the answer they think is true. The aim of the strategy is to create an atmosphere of fun and enthusiasm in the classroom in addition to knowing the alternative perceptions of students and implementing the strategy at the end of the lesson or unit.

Steps taken to implement the Strategy

- The teacher explains the lesson to students and then shows them the idea of strategy.
- The teacher asks students a question, which includes four answers, and distributes the four answers in the classroom pillars.
- Students hear the question and exit the class in the form of groups to read the answers the teacher attaches to the four pillars.
- Students are divided into four groups, where each group stands in front of the answer they think is correct.
- There is a discussion between the teacher and the students about the four answers and they come up with the right answer (Saidi & Al-Hosania, 2016).

Acquisition of concepts: -

Learning scientific concepts is one of the most important outputs of science, which gives meaningful images of scientific knowledge. The concepts also have a role in developing scientific knowledge. It is a constant fact that the formation of the concept begins from birth, the child begins to pay attention to the surrounding influences to have unified responses, Therefore, focusing on scientific concepts and identifying their characteristics and nature were the most important

educational goals, and scientific concepts that help to realize the elements between new situations (Abu-Hatab & Sadeq, 1980).

Measuring the acquisition of concepts

Concepts are learned and acquired through the processes of abstraction and generalization. Abstraction is to observe the elements of similarity between different things.

Generalization is the individual's response to similar situations, and the concept is measured by learners or inferred from the composition through methods and means that measure the learner's ability to discover the concept and apply the processes of acquisition, excellence, classification and generalization and his ability. They all determine the verbal significance of the concept and its application and interpretation of events in the environment in which the learner lives and the use of the concept in solving problems (Zaytoun, 2001).

The concept of motivation: The subject of motivation is one of the most important topics of psychology, whether at the applied or theoretical level. It is difficult to face a lot of psychological problems without paying attention to the motives of the organism in determining its behavior quantitatively and qualitatively. The study of the motives of human behavior increases the individual's understanding of himself and others surrounding him, because our knowledge of ourselves increases significantly. If we know the different motives that move us or push us to do multiple types of behavior in all life circumstances, our ability to predict future behaviour increases (Ratib, 2001).

Motivation and learning: - Motivation is one of the main factors behind human learning. It is the force that pushes a person to acquire knowledge, skills, experiences and multiple patterns of behavior, because learning such experiences helps a person in the processes of adaptation and control of experiences and situations that surround them. It helps them to achieve the goals, motivation serves the learning and teaching processes in terms of achieving the following benefits:

- It works to arouse and attract the attention of learners and focus them on the subject of learning while maintaining this attention until the goal is achieved.
- It works to increase learners' interest in educational activities, procedures and preoccupation with them throughout the educational situation.
- It works to direct the behavior of learners towards the available learning resources and increases their level of perseverance, research

and investigation in order to obtain knowledge and achieve goals (Al-Zagloul & Al-Mahamid, 2000).

Previous studies

Studies on the strategy of the four pillars

Khawit (2020) conducted a study in Iraq and the aim was to know the impact of the four-pillar strategy on the achievement of second-grade intermediate students in biology and decision-making ability.

The research sample consisted of (86) students; (43) students for the experimental group who studied according to the strategy of the four pillars and (43) students for the control group studied according to the traditional method. The researcher prepared an achievement test of the type of multiple choice and the measure of decision-making ability. The researcher used in data processing the statistical bag program for collective sciences (SPSS). The results showed that the experimental group outperformed the control group in an achievement test and in the decision-making ability scale.

Studies on the acquisition of concepts

Sahib (2011) conducted a study in Iraq and the aim was to find out "the impact of the Fryer model on the acquisition of concepts and motivation towards physics among students of the second grade intermediate. The research sample consisted of (47) female students of the second grade intermediate divided into two groups: (24) female students within the experimental group who studied in the manner of the Fryer model and (24) students within the control group who studied in the traditional method. The researcher has used the research tools included the selection of multiple to acquire physical concepts and motivation scale. The statistical means used T-test for two independent samples and are not equal. The results showed the superiority of the experimental group that studied according to the Fryer model on the control group that studied according to the usual method.

Studies on motivation

In Iraq, a study aimed to find out "the effect of three strategies for solving physics problems in the development of problem-solving skills and motivation towards the work of physics among students (third intermediate)" (Al-Khafaji, 2012).

The research sample consisted of (86) students randomly divided into three groups. The first experimental group consisted of (29) students, the second experimental group (29) students, and the third experimental group consisted of (28) students. The first experimental

group studied the cube strategy, the second experimental group was studied with the IDEAL strategy.

Finally, the third experimental group studied a proposed strategy. For the purpose of verifying the validity of the two research hypotheses, the researcher conducted a test of skills to solve physics problems after the test was verified. The validity of the calculation of stability, difficulty coefficient and discriminatory ability of the items are confirmed by the researcher. Motivation scale towards learning physics consisted of 30 items.

When analyzing the data using single variance analysis and Scheffe test, the results showed:

- There are statistically significant differences at the level of (0.05) in the test of physics problem-solving skills.
- The use of physics problem solving strategies (IDEAL) and proposed strategies leads to the development of physics problem-solving skills, as well as the development of motivation to learn physics (Al-Khafaji, 2012).

Part III

The Study Procedures

Experimental Design

The researcher selected the experimental design with partial adjustment consisting of two sets, one experimental and the other control (form1) where this type of design was selected because it is suitable for the nature and conditions of the current research yielding accurate results.

(Figure 1) Experimental design approved in research

Dependent variable	Independent variable	parity	Group
<ul style="list-style-type: none"> ❖ Scientific concepts acquisition test ❖ Motivation measure 	<ul style="list-style-type: none"> ❖ Four pillars strategy 	<ul style="list-style-type: none"> ❖ Chronological age in months ❖ Concept acquisition test. ❖ Previous achievement in physics ❖ Intelligence 	<ul style="list-style-type: none"> ❖ Experimental Four Pillars Strategy ❖ Controlling the usual method

Research community and its sample: "A community is an integrated set of individuals, objects or degrees that the researcher wishes to study" (Al-Dabbagh & Tawfiq, 1983, p. 21)

The research community consisted of students of the third intermediate students in middle and secondary schools affiliated to the General Directorate of Education of Baghdad / Rusafa I for the year (2021 = 2022). Al-Warka Intermediate for Boys was selected as an intentional sample to apply the experiment for the following reasons:

- ✓ The readiness of the school administration to cooperate with the researcher as the researcher is on the school staff.
- ✓ The proximity of the school to the place of work of the researcher.
- ✓ The convergence of the socio-economic level of students.

The number of students of the research groups reached (62) students. The researcher has randomly selected two divisions out of four, and division (c) has been chosen for the experimental group, which is studied in a strategic manner the four pillars and division (a) is the control group who studied in the usual way. There were (30) students in division (C) and (32) students in division (A). Upon failure, five students who failed in division C and (7) students in division (A) were excluded. The number of the final sample was (50) students equally divided into the two groups.

Parity of research groups

Chronological age in months

The researcher obtained the date of birth of each student in the research sample from the records of the school administration. It then calculated the chronological age in months until the experiment began on 11/10/2021, where the arithmetic mean and standard deviation were calculated as shown in Table (1).

Table (1) shows the arithmetic mean, standard deviation, calculated and tabular T value of the chronological age variable in months

Statistical significance at the level of 0.05	T value		Standard deviation	SMA	N.O	Group
	Tabular	Calculated				
Non significant on level 0.05	2.00	0.79	9.1	178.06	25	Experimental Four Pillars Strategy
			7,67	176.2	25	control in the usual way

Intelligence:

The researcher used the Raven test for sequential matrices for the purpose of ascertaining the parity of the two groups of research on IQ and rationed on the Iraqi environment prepared by psychologists from good tests. The purpose was general intelligence for knowing an individual's susceptibility to clear observation. Understanding and developing links and relationships between things and learning them and thinking were based on analysis and experience. Al-Dabbagh and

Tawfiq (1983) applied the test to the two research groups simultaneously on 12/10/2021 and calculated the calculation of the average computational and standard deviation of the scores of the members of both groups. The T-test equation was applied for two independent and equal samples; the results were obtained as in table 2.

Table (2) shows the arithmetic mean, standard deviation, calculated and tabular T value of the intelligence variable

Statistical significance at the level of 0.05	T value		Standard deviation	SMA	N.O	Group
	Tabular	Calculated				
Non significant on level 0.05	2.00	0.95	7.5	33.1	25	Experimental Four Pillars Strategy
			6.8	31,2	25	control in the usual way

Previous achievement

The grades of the science subject for the second intermediate grade for the academic year (2020-2021) were obtained from the records of the school administration for the members of the research sample, where the arithmetic mean and standard deviation were calculated and the T-test equation was applied for two independent and equal samples, the results were obtained as in Table (3).

Table (3) shows the arithmetic mean, standard deviation, and the grouped and tabular T value of the academic and previous achievement in science

Statistical significance at the level of 0.05	T value		Standard deviation	SMA	N.O	Group
	Tabular	Calculated				
Non significant on level 0.05	2.00	0.711	12.371	70.91	25	Experimental Four Pillars Strategy
			13.172	70.32	25	control in the usual way

Motivation Scale

The researcher adopted a special tribal measure of motivation, which was applied to the students of two research groups on 14/10/2021

before the start of the actual teaching. This was to measure the cognitive perception possessed by the students of the research sample and benefit from the grades they obtain in the equivalence of the two research groups.

Using the T-test of two independent samples showed no statistically significant difference at the level of (0.05), which indicates the equivalence of the two groups in this variable as shown in Table (4).

Table (4) shows the arithmetic mean, standard deviation, calculated and tabular T value of the pre (motivation) variable

Statistical significance at the level of 0.05	T value		Standard deviation	SMA	N.O	Group
	Tabular	Calculated				
Non significant on level 0.05	2.00	0.356	25.41	145.32	25	Experimental Four Pillars Strategy
			23.72	147.8	25	Control in the usual way

Test the acquisition of scientific concepts:

The researcher built a test to acquire scientific concepts, which was applied to the students of the two research groups before the actual teaching and its purpose is to benefit from the scores they get in the equivalence of the two research groups and using the T-test for two independent samples found that there is no statistically significant difference at the level of (0.05), which indicates the equivalence of the two groups in this variable as in Table (5)

Table (5) shows the arithmetic mean, standard deviation, calculated and tabular T value of the scientific concept acquisition variable

Statistical significance at the level of 0.05	T value		Standard deviation	SMA	N.O	Group
	Tabular	Calculated				
Non significant on level 0.05	2.00	0.436	13.49	58.16	25	Experimental Four Pillars Strategy
			12.42	56.56	25	Control in the usual way

Extraneous variables:

Effect of experimental procedures:

- Teaching: The researcher taught the two groups (experimental and control) himself because he is the teacher of the subject and on the staff of the school.
- Maturity: Maturity is the biological and physiological variables of the individuals

This factor had no effect on the results of the experiment because the duration of the experiment was short, limited and uniform for the two groups since it started on 11/10/2021 and ended on 17/12/2021, where the experiment was conducted in the same time period.

The Study article:

The researcher ensured that the lessons given are equal to the experimental and control groups. The first chapter included static electrical, the second magnetic, third power, the fourth r battery, electric propulsion force, the fifth power and electrical capacity of the physics book for the third grade medium for the school year (2021-2022).

Weekly Course Schedule:

The researcher taught physics for the two groups, (4) classes per week, and two classes for each group over two days as scheduled in the weekly class schedule by the school administration.

School building

The researcher applied the experience in one school and in similar classes in terms of distance, lighting and ventilation indicating that there is no influence of this factor.

The Study Requirements

Identification of scientific material

Before starting the experiment, the researcher identified the subject to be studied by two research groups, which included the first five chapters of the physics book for the third grade average for the academic year (2021-2022) in the following order:

- ✓ Chapter 1: Electric Static.
- ✓ Chapter II: Magnetic.
- ✓ Chapter III: Power supply.
- ✓ Chapter IV: Battery and electric thrust.
- ✓ Chapter V: Power and Electrical Capacity.

Preparation of teaching plans:

Planning is “a scientific method for human beings to take up something current or future, with the aim of ensuring that they succeed in confronting it”(Salama, 2009, p. 91).

The teaching plan has been prepared according to the four-pillar strategy for the experimental group and according to the usual method for the control group. A model of each type of plan has been presented to a number of physics teaching methods specialists (annex 1) to ascertain its validity and modify what they deem appropriate.

The Test Search Tools:

Scientific conceptual acquisition test:

The test is defined as "a set of questions and attitudes to which people are intended to respond"(Zangana, 2007, p. 414).

The researcher prepared a test for the acquisition of scientific concepts in the light of the 14 extracted concepts. A key concept was extracted from the Physics Book for the Third Middle Grade of the Academic Year (2021-2022) Based on Bloom's levels of cognitive field (remembrance, assimilation, application) where multiple selection type test is comprehensive and economical for time (Aiken, 1979) and has high stability(H.E & Ibrahim, 2008).

Authenticity of the test:

Test validity is defined as “the extent to which the test has served the purpose it should achieve”(Abu-Libdeh, 1979, p. 52). Honesty is one of the most important factors in terms of test quality standards(Brown, 1981).

In order to verify the validity of the test, the researcher relied on two types of truthfulness:

☐ Virtual honesty, where this is achieved if the title and phenomenon of the test refer to the measurement of the content for which it was developed(Al-Anani, 2002).

☐ The other type of honesty is the truthfulness of the content, which is concerned with the content of the test topic and the extent to which the content of the topic is represented in the test.

The honest test in its content is the one that represents a good sample of the contents of the subject without neglecting any aspect of it(Attia, 2014). To achieve the sincerity of the test, the researcher presented the test to a group of experts and specialists in the methods of teaching physics (Appendix 1) to judge the integrity of the test items. Based on the opinions of experts, some items were modified and thus the test became ready in its final form.

Exploratory application of the test:

To ascertain the clarity of the items, the clarity of the test instructions and the time taken to answer the test, we modified the test items in the light of the exploratory experience (Ihsan & Abbas, 2008). For the purpose of statistical analysis of the test items, determining the level of difficulty and the strength of the distinction of each item, and to ascertain the effectiveness of its alternatives and the stabilization factor of the test, the researcher applied the test to a survey sample based on (100) students of the selected middle age. The researcher has ascertained that they have completed the subject in cooperation with the school administration and the teacher of the subject.

Statistical analysis of test items:

Analysis of test items is a means of improving its quality by knowing their strength, difficulty and their ability to discriminate and exclude invalid paragraphs (Scannell & Tracy, 1974).

After correcting the answers, grades were graded downward and selected the higher than 27% the higher groups and lower 27% than the lower group. The adoption of this percentage offers us two sets of acceptable differentiation (Ahman & clock, 1971). The responses of the higher and lower groups are analyzed statistically according to the following steps:

Difficulty factor for items:

The difficulty is defined as "the proportion of those who answered the items or question wrong to the total number of students (Murad & Suleiman, 2002). The researcher calculated the difficulty factor for each of the test items, which he found to be between (34%) and (70%). The test items are acceptable if their difficulty rate is between (20%) and (80%).

The power of item distinction: - It is The ability of items to distinguish between higher and lower groups, i.e. the ability of the items to distinguish individual differences between individuals who possess the status or offer the answer and those who do not have the measured character or do not know the correct answer to each test items. After calculating the power of distinguishing each of the test items, the researcher found that it ranged between (0.25 - 0.42) indicating that test items with discriminatory strength (0.20) are better (Brown, 1981).

Effectiveness of erroneous substitutions of items

Al-Baghdadi (1981) believes that the wrong alternative is effective when the number of students who chose it in the lower group exceeds the number of those who chose the same alternative from the upper group. The good and effective camouflage is that alternative that has

a negative and large gravity coefficient (Al-Nabhan, 2004), and after applying the equation of the effectiveness of the wrong alternatives to the multiple choice items, it was found that all alternatives are appropriately effective, so the wrong alternatives have been kept without any change to them.

Test stability

It is defined as "the extent to which multiple learners reach the same conclusion using the same scientific material and using the same method (Qatami, 2005).

Where the researcher used the equation (Cronbach - Richardson - 20) to calculate the stability coefficient to test the acquisition of scientific concepts. Here, it was equal to (0.82) and this value is acceptable because the test is a constant if the value of stability (0.70 - 0.90) in the general balance of the effects of correlation coefficients (Abu-Libdeh, 2008).

Motivation Scale

One of the requirements of the current research is to measure the motivation of third grade students towards physics, where the researcher chose a scale (Al-Khafaji, 2012) for motivation, and in order to adopt the scale, the researcher followed the following steps:

Honesty of the scale: Honesty is one of the basic components that should be available in the research tool as it is the main axis of the entire subsequent measurement process. Honesty is when you measure what was developed to measure (Al-Zobaie & Al-Ghannam, 1981). For the purpose of identifying the validity of the items (virtual honesty), the items of the motivation scale have been presented to a number of specialists in teaching methods and educational and psychological sciences (Appendix 1) to indicate their opinions and verify the honesty of its content and show that all items were valid and the alternatives used.

The first and second exploratory application of the scale: In order to reveal the answer time and the clarity of the instructions for the paragraphs of the scale, the researcher applied the scale to a random sample of (30) students from the intermediate students (Abdul Karim Qassem) for boys. Then the researcher applied the scale to a second exploratory sample of students of the third grade of the average, where the number of students of the sample (100 students) were randomly selected from the average (Abdul Mohsen Al-Kazemi) for boys to find the stability of the scale.

Scale stability: The researcher calculated the stability of the scale of this research by relying on the equation of Cronbach, as the average internal coefficients are the best estimate of the average

coefficient of stability. This can be achieved after methods including the equation of Alfakronbach, where the stability reached (86%), which is a good and acceptable stability coefficient, as the test has high stability if its stability ranges between (0.80 – 0.95)(Duran, 1985).

Implementation of the experiment: -

The researcher followed the following steps during the implementation of the experiment

- 1) The researcher began conducting the experiment on the students of the 11/10/2021 groups with four weekly classes at a rate of two classes per group and continued until 17/12/2021.
- 2) The researcher taught the students of both groups the subject of physics based on the teaching plans he had developed himself, according to the four-pillar strategy for the experimental group and according to the usual method for the control group.
- 3) The dimensional impulse scale was applied to students of both groups simultaneously on 19/12/2021.
- 4) The test for the acquisition of dimensional scientific concepts was applied to students of both experimental and control groups simultaneously on 21/12/2021.

Part IV

Results and discussions

First: Results: Scientific Conceptual Acquisition Test

After applying the test to the two research groups and correcting students' answers and using the T-test as a statistical tool, the results were shown as shown in Table (6).

Table (6) Average arithmetic, standard deviation, variability, calculated and tabular T value of the individual scores of the two research groups in the test of acquisition of scientific concepts and tabular value (theory)

Statistical significance at the level of 0.05	T value		Degree of freedom	Contrast	Standard deviation	SMA	Number of sample members	Group
	Tabular	Calculated						
Significant	2.00	3.00	48	192.604	13.878	65.16	25	Experimental Four Pillars Strategy

on level 0,05				104.368	10.216	55.84	25	Control in the usual way
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Motivation Scale:

The researcher used the T-test for two independent samples to identify the significance of the difference between the average scores of the experimental and control groups in the motivation scale as shown in Table (7)

Table (7) Arithmetic mean, standard deviation, variance, calculated and tabular T value of the scores of the members of the two research groups in the dimensional motivation scale and tabular value

Statistical significance at the level of 0.05	T value		Degree of freedom	Contrast	Standard deviation	SMA	Number of sample members	Group
	Tabular	Calculated						
Significant on level 0,05	2.00	3.595	48	345,9	18,598	162,53	25	Experimental Four Pillars Strategy
				302.04	10.216	144,28	25	Control in the usual way

Interpretation of results:

Conceptual acquisition test:

Table 6 shows that the experimental group who were taught in accordance with the strategy of the four pillars outperform the control group studied in accordance with the usual method in the test of acquiring scientific concepts.

This can be explained to the following reasons

1. Teaching with the four-pillar strategy has increased students' activity and interaction within the classroom by using the method of discussion and constructive dialogue, learning problem solving and their ability to make the right decision when testing the best alternative of the other alternatives put forward, which is reflected in their increased acquisition of scientific concepts.
2. Teaching using a new strategy through the development of solutions in the pillars of the classroom increased students' excitement and attention, resulting in a spirit of fun, enthusiasm and cooperation among them, thereby increasing their acquisition of scientific concepts.

3. The formation of small groups of students and their training by this strategy has led to diversity of their opinions which generates self-confidence and thus access to decision-making ability in solving their problems.

Motivation Scale:

Table No. 7 shows that the experimental group outperforms the control group in the propulsion scale. This can be explained to the following reasons:

- Teaching using the four-pillar strategy has born students with self-confidence and breaking stalemate and motivation towards learning.
- Moving students in the form of small groups between the classroom pillars in search of the right answer enables them to increase their cognitive ability and scientific motivation.

Conclusions:

Through the researcher's findings, the following can be concluded: -

- There was a preference for the four-pillar strategy in gaining scientific concepts for the experimental group compared to the control group.
- The use of the four-pillar strategy increased the motivation of the experimental group's students towards physics learning.

Recommendations:

- ❖ The researcher found that there is a need to train physics teachers in high schools on modern teaching methods, including the four-pillar strategy.
- ❖ The researcher feels that there is a need for libraries with all new research on modern teaching methods, including the four-pillar strategy to enhance the education of educators and teachers on the use of modern teaching methods.

Proposals:

To complement the results of the current research, the researcher suggests the following:

- Using the impact of the four-pillar strategy to acquire scientific concepts and introduce them into other subjects and stages of study.
- Further studies on the use of the four-corner strategy in other variables such as developing scientific or critical thinking.

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