

The Impact of (PQ4R) Strategy on the Achievement and Rehabilitation of Physics among Fourth Grade Female Students

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ABSTRACT

The research aims to identify the effect of the strategy (PQ4R) in the achievement of physics material among fourth grade female students.

For the purpose of verifying the goal of the research, the following null hypothesis was formulated: * There is no statistically significant difference at the level of significance (0.05) between the average scores of female students of the experimental group who study physics using the strategy (PQ4R) and the average scores of the control group who study the same subject in the usual way.

The current research was limited to the students of the fourth scientific grade in the secondary school of suspended gardens as a sample for research, which was randomly selected from 24 preparatory and secondary schools of the Directorate of Education of Qadisiyah. The research sample consisted of (60) students, (30) students in each of the two groups. The researcher adopted in this research the experimental approach with partial control in some variables, which required two experimental groups and the other control group, as the experimental group is studying using the PQ4R strategy and the control group is studying in the usual way. The researcher chose two divisions randomly to represent the experimental group and the control group (B). The two groups were rewarded in the variables of chronological age, intelligence, and previous achievement, as well as the researcher adjusted the extraneous variables such as the confidentiality of the experiment and the processes related to maturity and experimental extinction. The researcher identified the scientific material that the last four chapters of the physics book for the fourth grade scientific, I5, 2021. The researcher formulated behavioral goals for the scientific material that reached(207) behavioral goals, as well as the researcher prepared (24) teaching plans for the experimental group and(24) teaching plans for the control group. With regard to the research tools, the researcher prepared an achievement test, which consisted in its final form of (40) items of the multiple choice type with four alternatives. The apparent validity of it was calculated by presenting it to a group of experienced and specialized arbitrators. Reliability was calculated using the Alpha Crowe Nebach equation, calculation of the difficulty coefficient, the coefficient of excellence and the effectiveness of the wrong alternatives to all items . The experiment was applied in the second course of the academic year (2023-2022) to the research sample of the fourth scientific students, where the researcher taught the two research groups. After the end of the experiment, the results were analyzed statistically using the T-test for two independent samples. The results showed that the experimental group who studied with the PQ4R strategy outperformed the control group students who studied with the usual method

Keywords: Strategy(PQ4R), Achievement, Fourth grade (scientific section), Physics

The Problem of the Research:

The world is currently facing tremendous changes in various aspects of life due to political and economic challenges. To address these challenges, societies need to empower younger generations by improving their education system. This can be achieved by developing a robust learning system that delivers dynamic and effective training to support students in the classroom. In this sense, the quality of teaching in various subjects, including physics, needs to be improved (Al-Mousawi & Al-Zuhairi, 2021). Physics education encompasses many and varied aspects to provide the basic information for understanding natural phenomena. Through the researcher's practice of teaching physics and her knowledge of the methods used by the teachers of the subject,

she noticed many shortcomings in multiple aspects. In addition, many schools may suffer from the lack of some necessary laboratory devices and tools or students' reliance on abstracts. Accordingly, the research problem can be formulated with the following question (Al-Khattat, Al-Muhja, & Mohammed, 2019). "

What is the effect of the strategy of (PQ4R) in the Achievement of physics material among fourth-grade students?

The Significance of the Research:

The importance of research can be found in the following:

1. The importance of the study lies in the effect of the PQ4R strategy on improving the thinking skills of fourth grade female students in physics.
2. To know the extent to which this strategy can help students understand the concepts of physics.
3. If the study proves the effectiveness of the PQ4R strategy, this may benefit the educational practices followed in physics for the fourth grade, which helps to achieve better educational results for female students (Alzamili & Mohammed, 2020).
4. The study will provide a deeper understanding of the potential benefits of using the PQ4R strategy within the classroom, which contributes to the development of the field of education, especially that the study will provide insight into the effectiveness of the PQ4R strategy in enhancing the thinking skills of students (Jassim & Mohammed, 2022).

Objectives of the study: This study aims to identify the effect of the strategy (PQ4R) in the achievement of physics material among fourth-grade students.

Study Hypotheses:

There is no statistically significant difference at the significance level (0.05) between the average scores of female students in the experimental group who study physics using the PQ4R strategy and the average scores of the control group who study the same subject in the normal way.

The limits of the study

1. Objective limits: Physics book for the fourth grade prepared by the Ministry of Education and prepared by a committee in the Ministry of Education.
2. Spatial boundaries: Schools of the Qadisiyah Governorate Center affiliated to the General Directorate of Education of Qadisiyah were selected
3. Time Limits: This research is limited to the academic year 2022-2023

Terminology:

1. **Strategy:** It is the basic steps for every action or action that has a purpose or purpose. (Attia, 2009, 33)

Procedural definition: The strategy means organizing and implementing a set of teaching procedures developed by the researcher during the lesson, in line with the desired educational objectives.

2. **Strategy (PO4R):** Identified by (Abdul Khaliq, 1997): (It is an educational strategy aimed at stimulating memory and improving the student's ability to understand and remember the material. The strategy relies on a series of structured steps that help students enhance their understanding of information and improve their ability to retrieve it when needed. (Abdul Khaliq, 1997: 305).

The procedural definition of the PQ4R strategy includes a set of structured and sequential procedures that have been applied to teach the students of the experimental group. These actions include taking an introductory look at the topic, asking questions, careful reading, reflective thinking, listening, and reviewing. These procedures were developed based on the teaching plan prepared specifically for the implementation of this strategy (Al-Khattat, Habeeb, & Mohammed, 2019).

3. **Achievement** is the level of an individual's actual performance in the academic field resulting from mental activity. Achievement is measured by the student's response to achievement tests (Jalali, 2011:25).

Procedural definition of achievement: It refers to the total score achieved by the students of the research groups in the achievement test prepared by the researcher. This test is organized according to the content of the physics material identified by the researcher based on the physics textbook approved for the fourth grade.
Chapter two: theoretical framework

Constructivist theory

Constructive learning theory and the teaching strategies on which it is based are among the most accepted theories among educators (Alzamili & Mohammed, 2019). Accordingly, the teacher must develop, update and develop his educational strategies in line with this theory. Among these strategies teachers use “metacognition” strategies, which aim to expand the circle of knowledge and enhance (Al-Mousawi, 2021: 148)(Al-Mousawi & Al-Zuhairi, 2021)

Subject 1 : PQ4R Strategy)

The PQ4R strategy was developed in 1972 by Toms and Francis Robinson as part of the Metacognitive Strategies. This strategy aims to help learners retain readable information by improving their self-awareness to understand and control reading comprehension processes, both in and out of school (Alzamilia & Mohammedb, 2020). (Blawnee:2020, 14)

This method, called the "letter strategies method", is one of the methods of the strategy of recall aids used to help students remember the content, as this method is based on summarizing the initials of each word in the written texts to achieve optimal results, and the student must follow the following six steps:

1. **Preview The learner** should make sure that the overview of the content to be saved is focused on the headlines.
2. **Formulating Questions** The learner should turn headlines into questions as a way to formulate questions regarding the content to be remembered.
3. **Reading** The learner should read the text thoroughly and reflectively on the content.
4. **Meditation:** in the target text. One way to accomplish this is for the learner to put enough effort into crafting their own examples of how the principles they read in the previous step can be applied.
5. **Recote the text after reading it:** The learner should hear the text after reading it and make a memory of the content.
6. The learner should **review** the content after finishing reading the entire topic. (Qatami: 2012, 433)

Advantage of the (PQ4R) strategy

1. PQ4R helps students improve memorization and recall of information.
2. It encourages learners to research and explore the relationships and connections between new knowledge and previous knowledge.
3. Increases students' intrinsic ability to organize new information, make it meaningful, and facilitate its transition from short-term to long-term memory.
4. Improves reading comprehension and helps develop creative thinking skills.
5. Increases students' awareness of the importance of producing questions and identifying important topics.
6. Increases talk about knowledge and improves analysis and higher thinking. (Attia: 161,2014)

Teacher's Role in PQ4R Strategy

1. Initially, the teacher provides students with introductory reading materials, guides them on how to identify the main idea, and sets learning goals (A. A. Abdulwahed & Shneif, 2018).
2. The teacher emphasizes the importance of understanding the text and assigns students to formulate questions related to the main idea, focusing on asking the questions “what”, “why”, “who” and “how”.
3. Students are instructed to read the text with interest in order to find answers to questions raised previously (Abd & Al-Waeli, 2021).
4. The teacher guides students to reflect on the content of the text by encouraging them to visualize concepts and relate them to real-life examples and models (Al Naily, Shnaef, & Abdulwahed, 2019).

5. Students respond to questions previously raised in whispers or silently to review materials effectively. (Attia :2009, 163)

The Learner's Role in the PQ4RStrategy

In the PQ4R strategy, the learner is encouraged to take an active role in their learning, rather than passively receiving information from the teacher. This helps to enhance learning and promote a deeper understanding of the material, and the learner is responsible for:

1. Preview the material before reading it, and get a general understanding of what the material is about.
2. Ask questions about the material to help focus their reading and increase their understanding.
3. Read the material for a purpose and actively seek answers to the questions they have asked.
4. Reflect on the material he has read, linking it to his previous knowledge and experience.
5. Recite or summarize the main ideas and concepts they have learned.
6. Review materials regularly to establish their understanding and retain information over time. Murphy: 1997, 2-4)

The second chapter: Achievement

Academic achievement is a concept widely used in the field of pedagogy and educational psychology, particularly because of its importance in assessing a student's academic performance (A. P. A. A. Abdulwahed & Shanef, 2019). It is considered a tool for evaluating and measuring educational outcomes, and serves as an important indicator for achieving educational goals, the appropriateness of the educational material, and the evaluation of all teaching activities and events. Experts in education and psychology are interested in academic achievement because of its great importance in the academic life of the student. It is the result of various learning processes and the Achievement of diverse skills, knowledge and science within the educational institution, reflecting the intellectual activity of the student (A. R. Mohammed, Habeeb, & Al-Muhja, 2022),(Jalali: 2011: 12).

Achievement aspects and their development

There are four aspects of achievement that the school should develop:

1. The ability to remember and adopt facts, which is concerned with the type of achievement that achievement tests seek to measure among learners. Personal facts such as initiative, self-reliance, leadership readiness and others (A. R. Mohammed, Al-Khattat, & Al-Muhja, 2019).
2. Practical skills are concerned with the ability to apply knowledge, focus on problem solving, and research skills.
3. Personal and social skills are concerned with the learner's ability to communicate and communicate with others (A. R. Mohammed et al., 2019).
 4. Motivation and self-confidence are concerned with the learner's perception of himself and his abilities. (Malik et al.: 1999, 25)

The role of the teacher in raising academic achievement:

The teacher plays a great role in the upbringing of the student and raising his scientific and academic level. He plays a role as a suppressor within the classroom. He also needs to use the best teaching strategies to provide students with scientific knowledge and experiences, especially guiding students and encouraging them to learn better (hameed Abd & Sarhan, 2022). There are steps that the teacher can perform to raise the level of academic achievement, such as ensuring that the curricula used are the most appropriate and modern, providing the appropriate environment for learning, providing students with the necessary information and skills, and providing comprehensive involvement of students in educational and training activities. (Adrian:2016)

Previous Studies: PQ4R Strategy Studies

1. **Hassan's study:** (2014) The study was conducted in Iraq, and aimed to know the effect of the PQR strategy in the achievement of biology and pivotal thinking skills among middle second grade students. The study sample consisted of (62) students from the total community of average students friendly to boys in the Baghdad Governorate Center of the General Directorate of Education Karkh /The third , the sample was divided into two divisions, the first (31) experimental students studied using the PQ4R strategy, and the

second (31) female officers studied in the usual way, and then equivalence was made between the students of the two groups in each age in months , and the degree of biology for the first semester, and the test of previous information in biology, and the selection of Raf (intelligence) (Thijeel & Mohammed, 2022). The research tools for the study were the preparation of an achievement test, and the pivotal thinking skills test, and the researcher used the statistical methods of the T-selection. The Cooper equation, the faulty substitution efficiency equation, the difficulty coefficient, the differentiation coefficient, and the Cronbach alpha equation. The results of the study were as follows : There is a statistically significant difference between the experimental and control groups and the experimental group in the achievement of biology, and there is also a statistically significant difference between the experimental and control groups and in favor of the experimental group in testing pivotal thinking skills. In light of the results, the study recommended the adoption of the PQ4R strategy in teaching biology

2. **Bibi 2011:** This study was conducted in Rawalpindi, Pakistan, and aimed to identify: (Following the strategy of (P48) in the academic achievement of the fourth grade preparatory students in the state of Punjab (Pakistan). The study sample consisted of (104) students who were randomly selected from (290) students who were randomly selected from (121) government schools for secondary school students located in Rawalpindi region in Pakistan, and to ensure the validity of the achievement test was prepared by preparing a table of specifications , and validity and reliability were determined by the test material, and the research sample was distributed to (25) students for each of the experimental and control groups, and each of the two groups was randomly selected, and the experimental group was studying according to the strategy (PQ4R) (A. R. Mohammed et al., 2022). The control group was studying according to the usual method, and the results indicated that the strategy led to a significant improvement in the achievement of the goals of the students by applying the achievement test before and after the experiment, and it was shown that the achievement of the experimental group students improved on the achievement of the control group

The research methodology:

The researcher deals with the research methodology and procedures, including the selection of the appropriate curriculum and design, the identification of the research community and the selection of the sample, as well as the adjustment of extraneous variables. The tools used are also built, which includes an achievement test for physics. The statistical methods used are as follows:

First: **Experimental design is defined as** a comprehensive plan followed by the researcher to collect accurate and reliable data (i.e. data that is repulsive and stable) and analyze it in a way that allows her to answer research questions. (Qawasmeh et al. 2012: 125)

In this research, the researcher adopted the experimental approach with partial control in some variables, as the current research aims to know (following the strategy of PQ4R in the Achievement of physics material in fourth grade students), which required two experimental groups and the other control, as the experimental group is studying using the PQ4R strategy and the control group is studying in the usual way, and table (1) shows that

Table (1) Experimental design of current research

Group	Valence	The independent variable	The dependent variable	Measuring the dependent variable.
Experimental group	– Chronological age – Intelligence.	PQ4RStrategy	Achievement	test (attainment-)
Control group	– Physics achievement – Background check	Usual method		

The research community and its sample

It is all individuals or persons who constitute the subject of the research, which the researcher seeks to circulate the results of the research. (Abbas et al., 2009: 217)

The current research community is made up of all female students in the fourth scientific grade in the government preparatory and secondary schools affiliated to the General Directorate of Education of Qadisiyah for the academic year (2022-2023). The number of schools reached (24) schools. The researcher randomly selected (by lot) a school from among the schools, which is the Suspended Gardens High School, which contains four divisions for the fourth scientific grade. The researcher randomly selected two divisions (by lot) to represent the experimental group (D) and the control group (B). The researcher statistically excluded all students who failed because they studied the same topics, which may negatively or positively affect the research results. The number of students who failed was (7) students, three in Division (B) and four in Division (D). Thus, the total sample of the experiment became (60) students in the two groups, (30) students in the experimental group and (30) students in the control group and table (2) shows that

Table (2) Number of female students of the two research groups before and after exclusion

Branch	Group	Number of female students before exclusion	Number of female students who failed	Number of female students after exclusion
d	Experimentald	34	4	30
b	Officer (B)	33	3	30
Total		67	7	60

Equivalence of two research groups

The two groups were equated in variables (age in months, intelligence, previous achievement, and previous information in physics) and t-test was calculated where the results were not statistically significant, as in

Table (3) |Equivalent of the two research group (3) t-test

Valence	Group	Number of sample students	Arithmetic Mean	Standard Deviation	Degree of freedom	T		Statistical significance (0,05)
						Calculated	tabular	
Age (Months)	Experimental group	30	194.80	5.16	58	0.29	2	(Nonsignificant)
	Control group	30	195.20	5.40				
Intelligence.	Experimental group	30	26.20	2.68	58	1,12	2	statistically non-significant
	Control group	30	25.43	2.62				
Previous Achievement	Experimental group	30	58.37	6.67	58	1.48	2	(Nonsignificant)
	Control group	30	55.77	6.90				
Prior information	Experimental group	30	9.50	2.33	58	1:49	2	statistically non-significant
	Control group	30	8.60	2.36				

Search tool:

The researcher conducted MCQ achievement test numbers, because it is considered one of the best types of objective tests and is characterized by its flexibility. The researcher has identified the achievement test (40) items

The researcher presented the test items with the content to be measured (behavioral goals) and the study material to a group of experts and arbitrators specialized in teaching methods Physics and asked them to examine the items logically and estimate their validity to measure the content that was prepared to measure it and in light of their views and observations on each item, the researcher modified the wording of some items and did not replace any item because the items received the approval of (80%) of the experts because the researcher adopted this percentage of their approval as evidence of their validity.

After applying the test to the first and second sample and correcting the answers and calculating the scores for each student, the researcher ranked the total scores of the sample from the highest overall score to the lowest overall score and then determined the highest (27%) to represent the highest group (27%) of the lowest scores to represent the lowest group, and the results were as follows:

The calculation of the difficulty coefficient for each of the test items was found to be between (0.50 – 0.67)

Calculating the coefficient of discrimination for each item of the test, and the results ranged between (0.37- 0.67).

The calculation of the effectiveness of the wrong alternatives found to be between (0.1111 - 0.3333-) showed that the wrong alternatives have attracted a number of lower group students more than the upper group and this indicates their effectiveness.

Psychometric characteristics of the test:

1. **The validity of the test:** The researcher prepared items and submitted them with the content components represented by behavioral objectives and topics and their attribution to the judges who estimated the validity of each item in measuring the content to be measured, so the test is honest in its content

Reliability of the test: The researcher used the Coder-Richard 20 equation to verify the reliability of the test items, which uses this equation in particular with tests that have a zero or one correction. (Al-Zamili et al., 2009: 280) The reliability coefficient was (0.87).

Therefore, the average reliability of the test was (0.88) and is considered an acceptable value for the reliability coefficient

Fifth: Preparing daily teaching plans

(24) teaching plans were prepared for each group (experimental and control) in the light of the content of the four chapters of the physics textbook to be taught to fourth-grade students for the academic year (2022-2023) and behavioral purposes (A. R. Mohammed & Naas, 2022). The experimental group's plan included displaying the material and conducting experiments using the PQ4R strategy. The teaching plans of the control group, which were studied according to the usual method, contained the vocabulary of the daily teaching plan, and to ensure the validity of the teaching plans, a model of each of them was presented to a group of judges and specialists in physics and teaching methods, and they were modified in the light of their views to take their final form (A. R. Mohammed, 2017).

Sixth: Application of the experiment

I studied the experimental group chapters (sixth, seventh, eighth, ninth) of the physics book for the fourth grade for eight weeks, three classes per week using the PQ4R strategy, and the students of the control group studied the same subject with the same school, place and duration, but in the usual way (Z. A. Mohammed & Hafieh, 2021)

Search Results:

The hypothesis stated that (there is no statistically significant difference at the level of significance (0.05) between the average scores of female students of the experimental group who study physics using the strategy (PQ4R) and the average scores of the control group who study the same subject in the usual way. To verify the

validity of the hypothesis, the researcher calculated the arithmetic mean, standard deviation and T-value, as in a table below:

Table (4) The arithmetic mean, the standard deviation and the value of (T) for the scores of the students of the two research groups in the achievement test

Group	No.	Arithmetic mean	Standard Deviation	Degree of freedom	Calculated value of t	Table t-value	Level of significance (0.05)
Experimental group	30	32.07	3.13	58	4.35	2	Significant in Favor of the Experimental group
Control group	30	28.67	2.92				

It is clear from the above table that the arithmetic average of the scores of the students of the experimental group is equal to (32.07), while the arithmetic average of the scores of the students of the control group is equal to (28.67) and the calculated T-value is (4.35), which is greater than the tabular value at the degree of freedom (2) and its significance level (0.05). This means that there is a statistically significant difference in favor of the students of the experimental group in the achievement test in physics, so the first zero hypothesis is rejected (Qassem & Mohammed, 2022).

findings

Teaching fourth-grade female students according to the PQ4R strategy has had a positive effect on raising their academic achievement in physics

Recommendations:

1. The PQ4R strategy can be used as a cognitive teaching method in teaching physics at the intermediate and preparatory levels
2. Holding training courses for teachers of physics to familiarize them with the PQ4R strategy and raise their awareness of the importance of using it, and training them to practice it effectively and refine their teaching skills.

Suggestions: Completing the current research The researcher proposes:

1. Conducting studies on (PQ4R) with other variables such as formal thinking (Thijeeel & Mohammed, 2022).
2. Comparative studies between PQ4R and some other strategies (KWL) such as to find out which is more effective in achieving educational goals.

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