

The Effectiveness of Teaching Using the (Phet) technique in the achievement of second Intermediate School girls in science subject

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Abstract

The goal of current study aimed to identify the effectiveness of teaching using the Phet technique in the achievement of second-grade intermediate students and in science, and the research sample consisted of (70) female students and they were distributed equally into two experimental groups that were studied using the Phet technique, and the other control group that was studied in the usual way. The tool was used is an achievement test, validity, reliability, difficulty, ease and discrimination coefficients were conducted. The results of the research was the superiority of the experimental group over the control group, and the effect size was large.

keywords: efficacy, teaching , Technique (Phet), Achievement

Introduction

First, the research problem : E- learning is a new type of education , which was imposed to us by the changes in Scientific and technological fields Which we witness it the scientific community where traditional methods of education are no longer able to keep pace with it. Which many advanced international educational institutions have worked on, as one of the most important problems that students face in middle, middle and high schools alike is the lack of use of educational aids and modern teaching techniques, because of their impact on students, achievement and developing their mental abilities, in addition to relying on The usual way of teaching and indoctrination and not urging students to use practical experiences and the weakness of activating and employing technology in science by female teachers, and the lack of diversity in teaching methods in line with teaching attitudes, and this makes students rely on memorizing the study material without understanding or understanding and not using educational techniques from Before the students, this is due to the teacher and the method of teaching that he follows. Which

leads them to the inability to know how to benefit from it and apply it in daily life, then the inability to do so leads to the emergence of information and forgetting it and the inability to retrieve it when needed, which led to a low level of students' reciprocal thinking in science, and this is confirmed by studies (Al Kubaisi, 2014), which called on the researcher to search for modern teaching methods to achieve the desired educational goals and lead to the development of their mental abilities.

Therefore, the problem of the current research is summarized in answering the following question:

- What is the effectiveness of teaching using in the achievement of the second intermediate grade students in science?

Second, the importance of research

The middle school stage is considered one of the important stages of education because it is a stage that mediates between the primary and preparatory education stage, and it is a critical stage in the students' lives.

(Al-Heila, 2005) stresses the importance of academic achievement, which is achieved through the behavioral goals that the

individual achieves. Interact with their environment positively and effectively (Al-Hela 2005: 408).

Through the foregoing, the importance of the current research can be summarized in the following:

1. It may benefit those in charge of educational institutions in employing available technologies, especially in the field of Phet technique, in the educational-learning process in subjects of complexity and difficulty, in order to develop the ability to analyze, perceive and understand.
2. It may help fill the gaps resulting from poor resources in school laboratories, and enrich the learning environment.

Third: Research Objective:

The current research aims at recognizing the effectiveness of teaching using Phet technique in the achievement of the second intermediate grade female students in science.

Fourth: the research hypothesis

There are no statistically significant differences at the level of 0.05) between the average achievement scores of the experimental group students who will study according to the (Phet) technique. And the average scores of the control group who will study according to the (ordinary method) in the achievement test.

Fifth: Research Limitations : This search is limited to:

1. **human limitations :** Students of Shams Al-Hurriya Secondary School for Girls, returning to the Directorate of Education in Baghdad / Al-Rusafa 1/ Sector north of Baghdad.
2. **time limitations :** The first semester of the morning study for the year 2021-2022 AD .
3. **Spatial boundaries:** Shams Al-Hurriya Secondary School for Girls.
4. **Cognitive limitations :** The study topics of the first and second units (elements and compounds, chemical reactions and their types) from the science book established by the Ministry of Education of the Republic of Iraq for the second intermediate grade, 1st floor, for the year 2017.

Fifth: Define terms

- 1- **First: efficacy Effectiveness :**
 - **Shehata and Zainab (2003) :** "To achieve the goal and the ability to achieve, and it is

the measure by which we recognize the performance of the teacher and the performance of the student for their role in the teaching and learning process" (Shehata and Zainab, 2003: 23).

procedural definition : The degree of impact of computer-assisted technology (Phet) on the reciprocal thinking of second-grade students in science.

2- Teaching :

- **Attia (2009)** It is: "The sum of the activities that the teacher performs in an educational situation to enable the learners to achieve the objectives of the situation" (Atiya, 2009:30).

procedural definition: A set of targeted activities carried out by the teacher in the classroom to facilitate the learning process and achieve the set goals.

3- Technology (Phet) :

- **(Honey & Hilton, 2010) :** "Dynamic computer models of real or hypothetical situations, or real phenomena, that allow learners to interact with them, and discover the effects of making some modifications to their variables" (Honey & Hilton, 2010:3).

procedural definition : It is a computerized program in which a real system is simulated using virtual reality, which allows second year intermediate students to control variables, observe and measure the effect.

4- collection Achievement :

- **Al-Bdour (2002):** "The result of what the student can achieve in proportion to his capabilities, when the educational goal is achieved" (Al-Badour, 2002:36).

procedural definition: The amount achieved by the second intermediate grade female students after passing new educational experiments, as measured by the degree they obtained in the final achievement test prepared by the researcher for this purpose.

Theoretical background and previous studies

The first axis: theoretical background

First: Phet technique

(Azmi, 2008:434) sees the Phet technique: " An applied method in which learning and teaching

take place according to a hypothetical situation of experiment, research and verification, in which students study basic principles through application and observe the results of this application " .

(Abdul Hamid, 2010: 150) sees it as: " A tight imitation of a particular phenomenon or system, in which the student is given the opportunity to train without high risk or cost. " .

Technical characteristics (Phet): see (Griffiths, JF, 2010) It allows for students Interact actively With its programs Which Is characterized by with effects artistic and educational She is Ali Degree High From enrichment and promote the situation educational that includes Utilization Technique Phet and its diversity . (Griffiths, JF et al, 2010, p522), And from here excel Technique Phet at education On modalities and tools learning other , where stem From Characteristics Unique Which will be mention it On grammar next one :

1. It allows students to gain experience without costing them valuable money for each trial attempt.
2. It protects the student from harmful substances that result from the real experience, as the student can repeat the experiment in various different ways and means.
3. It is easy, as it allows the teacher to introduce various topics to the student until he can face them later.

Justifications for using Phet technique in teaching:

There are many justifications for using Phet technique in education, including as mentioned by (Al-Mahmadi, 2011):

1. **the cost:** Phet technique is used (when real experiments are expensive or when real activities are impossible to carry out in the classroom such as "the solar system and tracking the path of a satellite in its orbit around the Earth or the movement of planets).
2. **The danger:** Phet technique is used (when real laboratory experiments are dangerous when performed, such as nuclear and

atomic reactors, radiation experiments or toxic gases).

3. **shorthand time:** Phet technique is used (when it is required to study a real model for a long time, such as a model of plant growth, a model of human genes, or a model of events that occurred in the past).

4. **Minor:** Such as a model for studying atom or bacteria (Al-Mahmadi, 2011: 183).

Technical Features (Phet): contribute Technique (Phet) at eliminate On Problem non Adequacy hardware laboratory , Especially dear Of which or not Available , and the judiciary On Problem crowding during perform some experiments , and cost its materials less From the cost physical for laboratories traditional , and contain Technique (Phet) On tools help at to support Experience Such as : Fee graphic and fees Animated and analysis , and help at Procedure experiments Which hard made at laboratory Real Because she serious or expensive physically , or require time long to be made at laboratory Real (Al Bayati , 2006: 36).

1- about for the teacher :

Working On reduction the time allotted for teachers to conduct experiments , Especially experiments serious or High the cost or Which take time long to make, and submit feed back suitable for students About their performance at laboratory in a way A quick and suitable , As well as About ease Follow-up guiding their achievement (Al Bayati , 2006: 36).

2 For the student:

It helps reduce the learning time that students spend in the traditional lab, and provides them with the appropriate feedback to students on their hypothetical performance quickly. And the way Which it suits them , and flexibility the use From before the students , where they can performance Activities laboratory at any place and in any time and what Speed , as Allows for students Cooperat while between them Across Internet They conduct joint laboratory activities (Zaytoun, 2005: 164-166).

Obstacles to using Phet technique:

Male (Azmi, 2014) Technical difficulties (Phet) Which are the following:

- a. Exaggeration to the degree of artificiality may affect the misunderstanding of students.

2. Complicated situations require high skills and thus it becomes an unsuitable method of training for some skills.

3. It is expensive to produce and requires experienced and skilled specialists that are not available to many of them

Specialists and programmers (Azmi, 2014: 87).

Principles to consider when using the Phet technique:

There are several basic steps that must be followed in order to ensure the success of education using this technology, and these steps are:

1- **Technical contact:**

One of the conditions for the success of immediate education is that students have the ability to communicate through these means easily and easily; This is in order not to cause any problems or a sense of alienation with these developments.

2- **Procedures and directions:**

Must be that be there instructions and procedures not restricted at Execution , where lead to directions strict Extremely to me Create Hurdles during dialogue and discussion , Than Lead to me reservation the students and not Share them .

9. Previous studies

First: Studies on Phet technique

3- **Calendar:** whether It was Calendar self or process exchange Calendar between the students (Al-Musa, 2005:269).

Second: the collection

Achievement is the basic measure that is relied upon to know the learner's transition from one class to another, and to determine the type of study that he will follow in the later stages).

The importance of academic achievement:

Academic achievement enjoys a special place among teachers, as it is one of the main criteria for the success or failure of educational institutions in achieving their educational goals. Ma (Al-Ghawi, 2011: (26).

Factors affecting academic achievement:

Prepare study factors influential at collection school for students From Topics Which matter staff at area education , Because she Allows the opportunity for students to re thinking at Some methods and procedures and methods used at The school , From During to set factors leading to me to improve collection school for students and find means Occasion to overcome On weakness collection school (Al-Otaibi, 2016: 426) .

Researcher's name	Address book	Tergat	Sample	Tools	Statistical means	Results
Ghassoub Muhammad Hussein (2019) Gaza	The effect of using (PhET) interactive simulation techniques on developing achievement and some analytical thinking skills in science for seventh grade students	To identify the effect of using (PhET) interactive simulation techniques on developing achievement and some analytical thinking skills in science for seventh grade students.	(85) female student	1- Phet technique 2- Analytical thinking skills test 3- An achievement test	Spearman's correlation coefficient, hash-half method, t-test	The difference is statistically significant between the experimental and control groups and in favor of the experimental group

Chapter III : Research Methodology and Procedures

Search procedures

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The researcher adopted the experimental method as the appropriate method for the nature and objectives of the research. It is a method that deals with those research that verify the information, hypotheses and

Table (I) Experimental design of the two groups (experimental and control)

Research community and sample: make

the two groups	Équivalence	The independent variable	Dependent variable
Experimental group	- previous collection	Technology (Phet)	- Collect
Control group	- IQ - Prior information	the usual way	

are two divisions for the second inter

up Community search From female students Grade The second average who are studying at schools government daytime average and high school Girls Affiliate directorate the public educational at Baghdad / Rusafa 1 - boycott north Baghdad for the year school (2021-2022) , by (15th) School medium and secondary and their number (2415) student .

The research sample

The students of Shams Al-Hurriya High School for Girls were intentionally selected from one of the middle and high schools affiliated to the Directorate the public educational at Baghdad / Rusafa 1- A boycott north of Baghdad, and because of the cooperation shown by the school administration and to facilitate the researcher’s task being a teacher in the same school, there

expectations of scientists, and it is one of the most scientific approaches that clearly show the features of the scientific method (Al-Abadi, 2015: 62-87). The experimental group was taught by (Phet) technique, and the second control group was taught by the usual method, as shown in Table (1).

mediate class, Division A to represent the experimental group chosen randomly and the number of its students was (35) students, and Division B to represent the group The control group had (35) students, and (5) students from Division (A) and (6) were excluded from Division (B).

- **The equivalence of the two search groups:** before start Experience did researcher apply Experience parity among students My group search at Some Variables Which may be effect On consequences search Which (collection Previous at the sciences for class the first average , the information Previous for class the first average , and test Intelligence Raven , and he Test not verbal make up From (60) paragraph suitable for the environment Iraqi) Table (2) shows that:

Table (2) The values for the arithmetic mean, standard deviation, and the calculated and tabulated T-value for the four variables

Variables	Experimental(35)		control(35)		T value(0.05)	
	Arithmetic mean	StDev	Arithmetic mean	StDev	tabular	Calculated
previous collection	75.914	13.608	74.000	14.980	2	0.560
Prior information	12.371	2.880	13.057	2.989		0.977
intelligence test	42,542	8,226	40.971	6.478		0.378

Table (2) shows the equivalence of the two groups with the extraneous variables, since the calculated value of any of them did not reach the tabular value of (2) at the level of significance (0.05) at the level of freedom (68), and thus the equivalence was achieved in this.

Research requirement

1- Scientific subject: selected The researcher, before starting the experiment, the scientific material that will be studied in the experiment, and it included (the first and second units),

which included (the first chapter: elements and chemical bonding, the second chapter: chemical compounds, and the third chapter: chemical formulas and reactions).

- 1- **Formulating behavioral goals** After reviewing the objectives of the subject and analyzing the subject of the first three chapters, (144) behavioral objectives were formulated according to the four levels of Bloom's levels (remembering, understanding, application, analysis) for the purpose of relying on them in preparing the teaching plans for those subjects and in constructing the final achievement test. The goals were given to a group of arbitrators and specialists in teaching methods, and all of them were accepted.

3- Number of teaching plans: Prepared by the researcher Two types of trial plans The plans were presented to a group of arbitrators and specialists, and some paragraphs were changed.

Setting up the search tool:

Achievement test: The test items were formulated (in the form of a multiple choice with four alternatives) and its instructions were prepared with an explanation with the example of a solution. The students were asked to carefully read the test items (which amounted to 22 items) and not leave any item unanswered because it will be considered wrong. The final achievement test was prepared, by preparing The test map (Table of Specifications), Table (3) shows that:

Table (3) The achievement test specification table

No .	Educational Content	Number of Classes	Relative weight	Cognitive levels				Number of Paragraphs:
				Remembering 28%	Understanding 28%	Applicability 36%	Analysing 8%	100%
1-	Chapter 1: Elements and Chemical Bonding	8	36%	2	2	3	0.63≈1	8
2-	Chapter 2: Chemical Compounds	8	38%	2	2	3	0.63≈1	8
3-	Chapter 3: Formulas and Chemical Reactions	6	28%	2	2	2	0.4	6
Total		22	100%	6	6	8	2	22

The validity of the achievement test The researcher relied on the opinions and directions of the arbitrators, and all opinions were taken from amendments to the paragraphs, and accordingly, this test was considered apparently honest, as well as the application of the content because the researcher had used the table of specifications in setting the test paragraphs, so this type of honesty was achieved, because of the The benefits of the specification table: It provides high validity for the test, because it forces the researcher to distribute questions e The article, in its various parts, addresses all objectives (Al-Shujairi and Al-Zuhairi, 2022:305).

Statistical analysis sample for achievement test items : It was completed Implementation the test On a sample exploratory From female students Grade The second average From School w/ unit national Girls and their number (120) student , ranged Transactions ease And the difficulty between (0.71-0.32) , ranged Discrimination coefficients (0.71-0.32) , It was Factor constancy that I depend style re the test (0,81) , and average time response for all female students reach (38) Accurate .

Experimental application procedures

1- The experiment was applied in the first semester of the year (2021-2022) on Monday 1/11/2021 on the two research groups (experimental and control), and a The experiment ended on Saturday 22/1/2022, meaning that it is a It took a full semester (11 weeks) and (4 lessons per week for each experimental and control group).

2- The experimental group studied using the Phet technique and according to the daily teaching plans.

3- The achievement test was applied to the two research groups on Sunday (22/1/2022), and the students were informed of its date one week before the scheduled date.

Statistical means:

used researcher means statistic at Procedures search and analysis data and interpretation its results using the program

statistician spss (Test Ka2 , Factor Engagement Pearson , Factor Difficulty and ease and discrimination , Equation keodor – Richardson (Al-Yaqoubi, 2013: 120) (Al-Shujairi and Al-Zuhairi, 273: 2022).

research results : There are no statistically significant differences at the level (0.05) between the achievement rate of the experimental group students who study according to the (Phet) technique and the control group students who study in the usual way in science for the second intermediate grade and to verify the significance of the difference between the mean scores of the academic achievement test for the two research groups The experimental and control subjects used the t-test for two independent and equal samples, and the table (4) shows this

Table (4)

Arithmetic mean, standard deviation, and T-value (calculated and tabular) for the scores of the two research groups in the achievement test

group	Sample	Arithmetic mean	StDev	Freedom degree	T value		Statistical significance at the level (0.05)
					Calculated	tabular	
Experimental group	35	16,571	1,819	68	2,191	2	in favor of the experimental group.
Control group	35	15,628	1,848				

It is clear from Table (4) that the difference is statistically significant at the level (0.05), thus rejecting the null hypothesis and accepting the alternative, that is, there is an effect of using the Phet technique in the achievement of the experimental group students.

Effect Size

" he is Change The resulting About Effect variable independent On variable subordinate using one metrics size the influence statistician according to a sample search . "(Abdul Hamid,

2004:15-53, and by calculating the effect size using (Phet) technique in reciprocal thinking using the square (η^2) It was found that it is equivalent to (0.394) and by comparing the value with the specified standard, it appears that the effect size was large, which reflects the effect of teaching using (Phet) technique in improving and increasing achievement compared to their peers in the control group, Table (5) shows that:

Table (5) value (t) and (η^2) and the size of the effect on the achievement test

T-Table Value	Calculated t value	Effect size value	effect size
2	6,663	394	large

Interpretation of results : result About Results Refusal Hypothesis Zero , Than You know that female students the group

Experimental who studied according to Technique (Phet) excel at the performance On female students the group the officer who

studied the way the usual at collection material the sciences , And she was this is Results agreed With Studies mentioned at search .I attributed researcher this is Results to me Technique (Phet) Which increased From attention the students and wake them up and made them more ready To receive the information and give them the opportunity to think and organize their experiences and inclusion at Store memory , I have facilitated On female students Investigation Goals session for several Advantages Of which : that be Instrument to go out From monotony teaching regular and create Atmosphere From The competition and thinking, and thinking at issues posed , as well Utilization means Fee illustration and pictures Which make it factor effective to increase collection.

Conclusions: In light of the results of the current research, the researcher recommends the following:

- 1- Teaching using the Phet technique has a positive effect on increasing the achievement of second-grade female students in the middle school in science.

Recommendations: at a light consequences search Present recommend researcher the following :

- 1- Procedure courses training during the service for teachers the sciences From Grade The second average About how to Utilization Technique ((Phet during their work teaching at their schools .
- 2- looking at admins educators On Utilization Technique (Phet) and affirmation on her when visit them calendar for teachers and my teacher the sciences at stage medium .
- 3- Prepare requirements educational Farida and exciting Interesting From means educational modern and laboratories fitted all Requirements Such as devices PC and programs educational and the Internet to succeed the operation educational On Technique (Phet).

***Proposals :** at a light consequences search Present suggest researcher Procedure Studies next :

- 1- effectiveness teaching using Technique Phet at teaching the sciences and chemistry and variables Other Such as thinking Scientific and thinking intuitive and thinking predictive at stage Junior high .
- 2- Generalization studying current On Material Other Such as Biology and mathematics and science Earth , and stages educational other Such as the two stages high school and prep .

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