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The Effect of Using Interactive Simulation (Phet) and Virtual Laboratories (Praxilabs) on Tenth-Grade Students' Achievement in Physics

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Abstract: *The study aimed at investigating the impact of physics education using the interactive simulation program (PHET) and the virtual laboratories (Praxilabs) on the achievement of the tenth core class students in the Northern Mazar district of education. The study sample consisted of (105) students from the tenth core class of the Irhaba Secondary School for Boys, divided into three simple randomness groups, the first group and the second experimental group and the third group officer. The first experimental group consisted of (32) students who studied using the interactive simulation program (PHET). The second experimental group consisted of (41) students who studied using virtual laboratories (Praxilabs). The third group consisted of (32) students who studied using the standard method. The study tool consisted of a collection test designed by the researcher. The results of the study showed statistically significant differences between the average performance of the students in the two experimental groups and the performance of the RDT for the two experimental groups. The study also showed that there is a statistically significant difference between the average performance of the first experimental group and the second group for the second experimental group, which was studied using the virtual laboratories (PraxiLabs). The study recommended that private physics teachers and general science teachers should use virtual laboratories (PraxiLabs) and PHET in the educational process.*

Keywords: *virtual laboratories (praxilabs); interactive simulation method (phet); physic; tenth-grade*

I. Introduction

Physics is a natural science that is interested in studying the laws of matter and energy, and is considered one of the basic sciences for the advancement of societies and their progress in all fields, where it helps to understand the components of nature, from the nucleus, atom, cells, solids, computers, the atmosphere, the universe that contains life, and explains natural phenomena (skik, 2006). The teaching of physics aims to acquire scientific knowledge, scientific thinking and skills, to learners through experiments, and scientific activities (Abdessalam, 2001).

The conduct of scientific experiments, in most scientific subjects such as physics, chemistry and biology, for all basic, secondary and university learning stages, is of great importance in the consolidation and perception of principles, concepts and laws, which accelerates the development of scientific knowledge in all its forms and patterns (Abu Zeina, 2011).

Olsted (1992, ll) pointed out the importance of experiments in teaching scientific subjects because of their effective role in the direct interaction of the learner with the educational environment, as he considered it an artificial educational position, to

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study scientific natural phenomena, and reveal their causes under certain circumstances, where the problem becomes clear to the learner, and from here he can develop the appropriate hypothesis of the problem, and apply the method of testing.

Interactive simulation is an effective way of communicating concepts, experiences and activities to the learner because of its flexibility and vitality in different fields of Science, which have difficulty in communicating information using the traditional method (Mahfouz, 2000). Interactive simulations also save time and effort in conducting experiments, compared to Real-Life Laboratories, and convey the impact of learning situations to the learner, helping him to apply them in similar situations in life (Al-far, 2002; Abdel Aziz and Fouda, 2011), improve science teaching, different skills, and play an active role in student achievement (Sabah, 2011).

Interactive simulation is defined as: a method that enables an individual to perceive interactions that are not clear due to their spacing in time and space (be NR H, 2002). It is also defined as a method and method used by the teacher to clarify scientific facts by bringing the real world closer to the learners (esteti and Sarhan, 2007).

Uses an interactive simulation in improving science teaching and development of various skills (Sabah, 2011), as you know phenomena from different aspects (Hooperthomas, 2010), and also allows for interactive simulation the learner to interact with the active simulation software, where the effects of educational and Technical High from the consequences of its boosters attitudes and education (Griffiths, et al, 2010).

The interactive simulations play an important role in improving learners ' learning of the concepts, terminology, scientific, and this leads to an increase in the desire to raise attainment (Holtermann & lrvin ,moojani, timms, 2011). Interactive simulation has many advantages, including: interactive simulation keeps the learner from using hazardous materials produced by real experiments and providing rich and many bounties, ease and flexibility in dealing and application, saving time, where the experiment is done in less time than the application of the experiment on the ground, and saving money, as it allows the learner to gain experiences that may cost a lot of money when each attempt to do the experiment. It also creates an atmosphere of suspense and excitement when studying the educational material, gives the learner the skills of solving problems, applying the method of exploration of information, learning new concepts by reworking old misconceptions, helps feedback, improve learning efficiency, improve their motivation towards education, helps in communicating theories, laws and physical principles and their depiction to the learner. This meets the learner's needs of creating conditions and reducing material requirements, studying situations and information that are difficult to apply on the ground because of their gravity, provides mutual experiences, and helps make concepts felt and easy to understand for learners (Al Ghazal, 2015).

It is simulation software interactive program feta (phet), which is a collection of educational software, and rely on interactive simulations that fall under the theory of Constructivism, where it is free-to-use, and available on the internet, the program is designed by Carl Wyman (Carl Wieman) at the University of Colorado in Boulder (Colordo Universite/ Boulder), winner of the Nobel Prize in physics, 1995. The goal was interactive simulation of school stages (Chan &Black, 2006). This program was developed in order to develop an understanding of scientific concepts, which are difficult to acquire in other ways in teaching, and to acquire different basic and complementary science processes (Abu Zeitoun, 2010).

One of the innovations of technology used in conducting scientific experiments in physics is virtual laboratories, defined as interactive programs consisting of tools of the science laboratory, including physics, chemistry and biology to carry out experiments and draw tables of various results (Al Bayati, 2006). It is also known as digital laboratories containing computers, stored energy, scientific software and means to connect to the internet, helping the learner to conduct scientific digital experiments and return them, and watch the results, while maintaining safety and without exposure to risks, and in the least Time, least cost and least effort possible (Al-Mannai, 2008), and it is also known as a virtual environment for conducting experiments, where the real science laboratory is simulated and linking the theoretical material to the practical material (Al-Hashash, 2018).

Advantages and benefits of virtual labs:

Virtual laboratories have many advantages and benefits, including (Al-Shehri, 2009): Help to overcome the problem of shortage of equipment and capabilities, funding experiments and provide security, and protection for learners from health, physical and environmental risks when carrying out experiments, and help the learner to link the theoretical side and the Applied side, and recall and ban experiments anywhere, and the implementation of costly experiments physically and save time and effort for And absorb scientific courses, including physics, biology, chemistry and other sciences, and eliminate boredom among learners.

Examples of virtual laboratories proxy lab (PRAXILABS), in which the computer is used to provide a three-dimensional imaginary environment, was launched in 2018, for the science laboratory in general and the Physics Laboratory in particular to feel the learner, that he deals and coexists and interacts with the science laboratory, physics and other scientific materials, in a real taking into account the different patterns among students It develops skills in the learner and promotes individual growth, critical thinking, problem solving skills and self-learning, keeping abreast of modern day developments in education (Al-Hashash, 2018).

There are many advantages of virtual laboratories, including (Al-Hashash, 2018): it provides learners with protection from the dangers that may result from some experiments, helps them to recall and prepare scientific experiments at any time and place, gives the learner the opportunity to enter variables, the learner can record and compare the results, saves time and effort on the learner, researcher and teacher, provides the practical and theoretical side of the educational content, and provides feedback to the learner by conducting a self-test for the learner. Availability of solving problems related to the lack of potential in the educational institution. Experiences are available in all languages. The principle of help provides the learner with action steps for experiments from videos and in the form of writing. Provide additional information on the subject of the experiment.

The virtual laboratory technology is modern, so its use at the level of schools and universities is very small, while the technology of (PHET) is relatively new, so its use is small. A number of domestic and foreign studies have addressed topics of indirect relevance to the subject of the current study, and have been presented in chronological order from the most recent to the oldest. Al-badrsawi (2019) conducted a study aimed at revealing the impact of the use of PHET technology (PHET) for interactive simulation in the development of achievement and some analytical thinking skills in science among students of the seventh grade in Gaza, where the semi-experimental method was used on two experimental and control groups with measurement before and after, the study sample consisted of (85) : A control group consisting of (42) female students studied in the traditional way, and the experimental one consisting of (43) female students studied with the technique of (PHET) the following tools were used achievement test and analytical thinking test as measuring tools and the results indicated that there are significant differences at the level of significance (0 0.05) between the average grades of students of the experimental group who learned using interactive simulation in the tribal and dimensional application of the test of measuring achievement and measuring analytical thinking skills in favor of dimensional measurement.

A study of Eyadat (2019) investigated the impact of using the interactive simulation method in the achievement of tenth grade female students in the field of physics and their trends towards it, the number of the study sample (59) students from the school of educational harvest. They were selected from the tenth grade people at random, divided into two groups: a control group consisting of (29) female students, and an experimental group consisting of (30) female students. The first group was studied in the traditional way and the second group in the interactive simulation method and after collecting data from the study sample, the results of the study indicated that there is an impact of using the interactive simulation method in teaching various scientific topics, especially in the field of physics for different school stages.

Abu Halima's Study (2018) aimed to identify the effectiveness of a simulation-based learning environment in developing conceptual and procedural knowledge in science among ninth grade students. The study followed a descriptive and empirical approach. The sample (62) consisted of two groups: experimental group (31) uses of the simulation-based learning environment, and control group (31) used the traditional method, and the study used a test tool conceptual knowledge, and test procedural knowledge and the results indicate the existence of significant differences at the level of significance (0 0.5) between the average grades of students of the experimental group and the grades of the control group in the dimensional application of the selection of conceptual knowledge and procedural knowledge in favor of the experimental group.

The study of Abu Fouar and Ayoub (2017) examined the impact of the use of virtual laboratories on the learning of concepts for tenth grade students in the subject of continuous electrical circuits and their attitudes towards physics. The sample of the study consisted of (50) students from the tenth grade were randomly assigned in two groups each group number (25) students experimental group using virtual laboratories and studied activities using Viet PHET the control group was taught using interactive displays and used real laboratory tools. The results showed that the average scores of the experimental group were higher than that of the control group.

Comment on studies

Through the above researcher believes that this study will be characterized from other studies as one of the first studies in the limits of the informed researcher and knowledge at the local level in the use of technology programme of interactive simulation (phet) and the default (praxilabs), being the interface between the two methods in conducting physical experiments that addressed the programme of interactive simulations feta (phet) and the programme on the default (praxilabs) In the detection of collection of the tenth grade students in the brigade further north, and that unless a study by, where he spoke on several studies for specific types of programs, interactive simulations and virtual labs and their impact on achievement and impact in the improvement of some variables.

Due to the importance of physics in human life and the importance of interactive simulations and virtual laboratories in teaching physics and conducting scientific experiments, this study came to reveal the impact of teaching physics using the interactive simulation program (PHET) and virtual laboratories (rrl) in the achievement of tenth grade students in the northern shrine brigade.

Statement of the problem and the study question:

Despite this importance, it has been noted that there is reluctance among students to study physics in Jordanian schools, as many studies have shown (Al-Sadiq, 2013; Fathallah, 2015; Al-Mu'tazbalallah, 2016). This may explain the reluctance to have difficulty learning them, and the lack of distribution of opportunities among learners (al-Qarni, 2004). It is also noted that there is a low level of achievement in physics among students at the basic level, and the difficulty of understanding and absorbing physical concepts because of their abstract nature, which leads to the aversion of students to study them despite their scientific importance.

The use of the traditional method in teaching takes the theoretical side and neglects the Applied side of knowledge (Nuri, 2011). This phenomenon must be addressed through the search for modern teaching strategies that allow the learner to actively participate in teaching situations, self-learning, exploration, inquiry, search for information and excitement, and create a pleasant learning environment during the educational process.

Interactive simulation programs and virtual laboratories are modern strategies and technological applications that can overcome the difficulties that stand in the way of learners in the study of physics, and increase their motivation towards learning physics, which helps them to raise their level of achievement and equipping them with thinking skills. due to the lack of studies – within the limits of the researcher's knowledge - that dealt with the impact of teaching physics using interactive simulation programs and virtual laboratories in Jordan, this study came to reveal the impact of teaching physics using interactive simulation programs and virtual laboratories (r) in the achievement of tenth grade students in the northern Mazar brigade. Specifically, this study tries to answer the following question:

1. Are there statistically significant differences (0 0.05) in the achievement of basic tenth grade students in physics attributable to the method of teaching (teaching using ((Phet), teaching using the virtual coefficient (praxilabs), the traditional method)

Study objectives:

This study aims to reveal the impact of teaching physics using the interactive simulation program (PHET) and virtual laboratories (praxilabs) in teaching physics in the achievement of the tenth grade students in the northern Mazar brigade.

Significance of study:

The importance of the current study is as follows:

1. The study offers modern strategies in teaching physics using the internet in the learning process.
2. Sensitize physics teachers using interactive simulation programs and virtual labs in teaching physics.
3. This study comes to the lack of studies according to the researcher's knowledge that dealt with the program of interactive simulation (PHET) and virtual laboratories (praxilabs) in the achievement of students in physics.
4. This study may benefit curricular authors in including science and physics curricula in particular interactive simulation programs and virtual labs in conducting scientific experiments.

Study terms and procedural definitions:

Interactive simulation: computer programs that enable students to conduct physical experiments through a set of computers regardless of their location at a specific time to make an experiment that is difficult to achieve in practice in the laboratory either because of its danger or impossibility or because of the high cost of implementation or because of the lack of materials and tools in the real laboratory.

Program feta (phet): test for (physics Education Technology), which is a collection of educational software, serving scientific experiments to various get rid of, and rely on interactive simulations that fall under the theory of Constructivism, where it is free-to-use, and available on the internet, the program is designed by Carl Wyman (Carl Wieman) at the University of Colorado in Boulder (Colordo Universite/ Boulder), winner of the Nobel Prize in physics, 1995. The goal was interactive simulation of school stages (Chan &Black, 2006).

The (PHET) program is procedurally defined in this study as a web-based computer program used within the study to conduct physics experiments for the tenth grade.

Virtual labs (praxilabs): it is one of the technological innovations launched in 2018, in which the computer is used to provide a three-dimensional imaginary environment, for the Science Laboratory in general and the Physics Laboratory in particular, to feel the learner, as if dealing and coexist and interact with the science laboratory, physics and other scientific materials in real, the internet, computer and phones can be used anywhere and anytime to conduct physical experiments, (Al-Hashash, 2018).

Virtual labs (praxilabs) are procedurally defined: they are a three-dimensional web-based computer program used within the study to conduct physical experiments for basic tenth grade students.

Standard method: the method of teaching used by the physics teacher in the classroom, which is based on explanation and classroom discussion, and without the use of technology in teaching.

Achievement: the set of concepts, facts and skills acquired by the learner after studying physics. It is measured by the degree obtained by the student in the test prepared for this purpose.

Study limitations:

The limits of the study were as follows:

Objective limits: the study is limited to the use of the interactive simulation program (PHET) and the virtual coefficient (praxilabs) in teaching the unit of motion from the physics textbook for the tenth grade Part I.

Spatial boundaries: the study was applied at Irhaba Comprehensive Secondary School for boys in the northern Mazar district /Irbid.

Time limits: this study was conducted in the first semester of the academic year 2022/2021.

Human limits: the study was applied to students of the basic tenth grade in the Comprehensive High School for boys.

II. Research Methods

2.1 Study Design

The semi-experimental approach was used in this study based on three groups, the first two experimental and the third control to suit the nature of this study and its objectives, where the first experimental group was studied using the interactive simulation program (phet), the second experimental group was studied using virtual laboratories (praxilabs), and the control group was studied using the traditional method.

2.2 Study Population

The study community consists of all students of the tenth basic grade in public schools in the Directorate of education of the northern Mazar district in Irbid governorate for the academic year (2022/2021), which are (1289) students.

2.3 Study Sample

The sample of the study consisted of (105) students from the tenth basic grade, which was selected in the intentional way, which is the Irhaba secondary school for Boys affiliated to the Directorate of education of the northern Mazar district in Irbid governorate, to contain the school on three divisions for the tenth basic grade, The school contains laboratories, computers and necessary software that achieve the objectives of the study, and the proximity of the school to the place of residence of the researcher also, divided into three divisions two divisions were randomly assigned to be two experimental groups and the third control group, the first experimental group consisted of (32) students studied using the interactive simulation program (phet), the second experimental group consisted of (41) students studied using virtual laboratories (praxilabs), and the third group consisted of (32) students studied using the traditional method.

2.4 Study Instrument

The following tools were used to achieve the objectives of the study:

First: Achievement Test in Physics for the tenth grade basic

The achievement test was prepared by the researcher in order to measure the achievement of students in the second unit, from the physics textbook for the tenth grade, where the test is in its initial form of (25) paragraphs of a type of multiple choice, and the test was prepared according to the following steps:

a. Analyzing the characteristics of students, it was found that they have the ability to use a computer and the internet.
b. Content analysis of the second module (movement) in the physics textbook of the tenth grade, identifying the concepts and Skills included in the second module.
c. Formulate the behavioral goals of the material and classify them.
d. Prepare a specification table depending on the behavioral objectives and the number of classes for each subject and Table (2) shows the specification table for the achievement test.
e. Formulation of test paragraphs depending on the specification table prepared, where the number of test paragraphs (25) paragraphs. Table (1) shows this.

Table 1. Specification table of the achievement test

Total 100%	analysis 10%	application 37%	understanding 25%	remember 28%	Subject
13	1	5	3	4	motion in one 50%dimension
12	1	4	3	4	motion in two dimensions 50%
25	2	9	6	8	100% Total

2.5 Validity of the Achievement Test

The achievement test was presented to a group of arbitrators (10) arbitrators. In order to verify his sincerity, and the extent of achieving the objectives of the current study, where it was presented in its initial form to a number of Jordanian university professors, educational supervisors and physics teachers with experience and specialization in physics, curriculum, teaching, measurement and evaluation, and asked them to express their opinion and observations in the paragraphs set for, In terms of the extent to which each of the test paragraphs belong to the subjects within the prescribed study unit, and in terms of linguistic and scientific wording, clarity of paragraphs, and add, delete or modify what they see fit, the proposals and observations of the arbitrators have been taken and make the required amendments, and the achievement test may be in its final form of (25) paragraphs of multiple choice type.

2.6 Sincerity of Internal Consistency of the Achievement Test:

The homogeneity of the achievement test paragraphs was verified internally using the method of internal consistency, which is one of the methods of truthfulness of the composition, where the achievement test was applied to a survey sample from the study community and from outside its sample, namely Zopia secondary school for boys, where the number of (25) students from the tenth basic grade, and the correlation coefficient was found for each paragraph of the achievement test with the total score of the test, and Table (2) shows the results of this.

Table 2. Correlation coefficient for each paragraph of the achievement test with the overall score of the test

correlation coefficient	Item	correlation coefficient	Item
*0.40	14	0.78*	1
*0.86	15	0,66*	2
*0.56	16	0.49*	3
*0.57	17	0.50*	4
*0.46	18	0.61*	5
*0.66	19	0.77*	6
*0.77	20	0.61*	7
*0.70	21	0.41*	8
*0.67	22	0.80*	9
*0.65	23	*0.77	10
*0.61	24	0.56*	11
*0.39	25	0.39*	12
		*0.83	13

* Statistically significant function at the level of indication ($\alpha \leq 0.05$)

Table (2) shows that all the correlation coefficients for each paragraph of the achievement test, and the overall score of the test was statistically significant at a level of (0 0.05) indicating the sincerity of the internal consistency of the achievement test.

2.7 Reliability of the Achievement Test

To verify the constancy of the achievement test was applied to a survey sample of (25) students from the study community and outside the sample, where the constancy of the achievement test was verified using the equation (Coder Richardson (20) (R H-20), as the value of the coefficient of constancy (0.87), and this value is considered acceptable for the purposes of this study.

2.8 Study Procedure:

The following procedures were followed to achieve the objectives of the study:

a. Build the achievement tests, and ensures its honesty and stability.
b. Visit the school where the study was applied, and meets with the school administration to discuss ways of cooperation and facilitate the procedures for the application of the study.
c. Meeting with the physics teacher who taught the experimental and control groups, and clarify the teaching strategies that he will use in teaching, and the teacher was trained on teaching strategies for three days, to be applied during the teaching of the units selected to conduct the study on them.
d. The application of the achievement test on a reconnaissance group, to ensure its suitability for the objectives of the study, in terms of design and coordination commensurate with the target group and was found sincerity and stability of the test depending on the results, and the calculation of the coefficients of difficulty and discrimination of the test paragraphs and ensure the validity of its paragraphs in achieving the objectives of the study.
e. Ensure the parity of the two study groups (experimental and control) by applying the achievement test on the sample members before the start of the application.
f. Start the application of the study, where the three groups were taught at the same time and the same conditions, the researcher also followed up the application of the study and ensure its application as planned, where the control group studied in the traditional way, and studied the first experimental group using the interactive simulation program (phet), and the second experimental group using virtual laboratories (praxilabs).
g. The achievement test was applied to the study sample after the completion of teaching the educational material, for the three groups at the same time.
h. The achievement test was corrected and the students ' answers to the achievement test were monitored, and the data was unloaded and analyzed statistically according to the system (SPSS).

2.9 Study Variables

The study included the following variables:

Independent variable: the teaching method has three levels: (interactive simulation program, virtual labs (r CLL), and the standard method).

Dependent variable: basic tenth grade students ' achievement.

2.10 Statistical Analyses

To answer the questions of the study, statistical treatments were used using the statistical package of Social Sciences (SPSS).

III. Results and Discussion

“Are there statistically significant differences (α0.05) in the achievement of the 10th gr ade students in physics attributable to the teaching method (teaching with the PHET program, teaching with virtual laboratories (praxilabs), and the traditional method)?”"

To answer this question, the dimensional achievement test was applied to the member s of the three groups (the interactive simulation program (phet), the virtual laboratories (praxil abs) and the traditional method). The first group of experiments was taught using the interacti ve simulation program (phet) and the second group of experimental groups was taught using t he virtual laboratories (praxilabs). The third group was studied using the normal method and c alculations of arithmetic averages and standard deviations were made of the results of the thre e groups' collection tests. Table 5 shows this.

Table 3. Arithmetic averages and standard deviations of results

standard deviations	mean	Group
3.85	14.06	traditional method
3.72	16.81	Phet
3.19	19.07	Praxilabs

Table 3 shows the apparent differences in the arithmetic averages between study group members. To see the significance of these differences, the One Way Anova analysis was used to detect differences between groups in the performance level of the RDT, and table 4 shows the results.

Table 4. One Way Anova test results for performance differences between groups on the post- test

function level	F value	Mean squares	degrees of freedom	sum of squares	contrast source
0.000*	17.767	225.663	2	451.327	between groups
		12.701	102	1295.530	Inside groups
			104	1746.857	Total

*A statistically significant function at a significance level (α≤ 0.05)

Table (4) indicates statistically significant differences between groups in the remote ap plication of the collection test, with a value (F) and its concomitant significance level. In order to determine the benefit of those differences, a transparent telemetry test was used and table 5 shows the results.

Table 5. Results of a post.test to detect differences in the performance of study groups

Function level	**difference between the two averages**	**(J) Method**	**(i) Method**
***0.011**	**2.75-**	(phet)	traditional method
***0.000**	**5.01-**	(praxilabs)	traditional method
***0.030**	**2.26-**	(praxilabs)	(phet)

*A statistically significant function at a significance level (α≤ 0.05)

Table (5) shows the following results:

1. Statistically significant differences between the first experimental group studied using PHET, the control group studied in the normal way, for the experimental group studied using PHET. This result may be attributed to:

   Learning with software provides the opportunity to test and verify homework and that teaching with this software is easy to understand and conceptualizes science-physical concepts in comparison with the traditional method. It allows the learner to self-learn and the possibility to conduct experiments anywhere and at any time. Software learning also allows measurement to be done multiple times, contributing to the development of visual intelligence and observation skills and providing the learner with feedback.

   This finding is consistent with the results of studies conducted to investigate computer simulation in crop development. ≤ For example, the Abu Halima (2018) study, which showed statistically significant differences at a semantic level (α0.05) between the mean score of the pilot group students and the control group grades in the remote application of the conceptual and procedural knowledge test for the experimental group, and the study (Al-Ghazal, 2015), which showed results on the effectiveness of the use of chemical self-learning simulations and some visual thinking skills of secondary students, the study (Al-Deek, 2010), which showed statistical differences between the group studied using computers and those who learned in the traditional way, the study (Al-Ghazw, 2015), which outweighed the impact of the physiological method on the impact of the academic concept and processes on the individual's concepts of science.

2. Statistically significant differences between the second experimental group studied using the virtual laboratories (praxilabs), the control group studied in the ordinary way, for the experimental group studied using the virtual laboratories (praxilabs).

   This result can be explained by:

   a. Using praxilabs to learn science, particularly physics, provides an opportunity to experiment and search for answers.
   b. Acquiring observation and data processing skills provides students with the opportunity to learn and gain knowledge through practice and practice.
   c. She helped the students memorize and prepare experiments anytime, anywhere.
   d. allows students to record different results and compare them.
   e. Feedback is also provided to students through self-test.
   f. Providing enriching information about the scientific content of matter.
   g. The opportunity for effective and mutual participation of students and teachers by sharing their results and recorded data.
   h. Help is given to the student by viewing videos and showing how to perform the experiment. This helps the students understand physical concepts.
   i. Helps promote troubleshooting, attempt and error.

   ≤ This is in line with the Abu Faour & Ayoubi study (Abu Faour & Ayoubi, 2017) which showed a significant improvement in theoretical understanding of the electrical circuit and DC, showing that the average score of the experimental group was significantly higher than the control group, and the Abu Zeina study (2011) (which showed a statistically significant difference in achievement at the statistical significance level (α0.05) for the experimental group studied using the virtual laboratory, the Shdeifat study (2013) which showed statistically significant differences ($\alpha \leq 0.05$) between the average score and motivation of the physical group in the tenth grade between the experimental groups and the experimental concept study conducted by the experimental group in the experimental group and laboratory (Kon-tem Sun, et.al.,2008) which showed that the pilot group students using the virtual laboratories scored better than the control group students taught the traditional method.

3. Statistically significant differences between the first experimental group studied using the PHET program and the second group studied using the virtual laboratories (praxilabs) for the second experimental group studied using the virtual laboratories (praxilabs).

The researcher explained the superiority of the virtual laboratories (praxilabs over the interactive simulations software (phet), noting that the virtual laboratory (praxilabs) was designed and developed in 2018 in 3D, taking into account control panels and the options within them to ensure that there were no difficulties in using it. 3D stimulates the desire and excitement of students to learn and keep going. It provides a learning environment akin to electronic games by simulating 3D science experiments, particularly physics, to help motivate students and increase their level of interaction while learning. It provides an opportunity to practice scientific experiments at all steps by fully simulating the tools, devices and materials used in a real laboratory. Full and immediate support is provided during the trial to ensure that they adhere to the steps of conducting the correct experiment and understand the theory and general concept of the experiment. Supported by teaching materials to explain the theories and the steps of experimentation, taking into account different learning patterns among students. It supports multiple languages including Arabic and English, with the possibility of adding other languages. Integration with learning management systems enables you to track students' academic performance by linking praxilaps with e-learning management systems used in the educational institution. It provides the highest level of safety for students, reducing their need to enter real laboratories, repeat experiments and exposure to dangerous materials. They offer use anytime, anywhere, and conduct experiments in proportion to their preferred times and methods of learning. Fostering individual growth, self-learning, critical thinking, cognitive and problem-solving skills all considered modern learning skills.

IV. Conclusion

In light of the results of the study, the researcher recommends the following:

1. Adoption by science teachers in general, and physics in particular, using the interactive simu lation software (phet) and virtual laboratories (praxilabs) in teaching.
2. Conduct more studies interested in using PHET and praxilabs, at other school stages, in va rious instructional materials and other variables.

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