Journal of Education and Practice
ISSN 2222-1735 (Paper) ISSN 2222-288X (Online)
Vol.13, No.22, 2022

The Extent of Using the Virtual Laboratory in Science Teaching and Its Obstacles from the Point of View of Science Teachers in Karak Governorate

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Abstract
The study aimed to identify the extent to which the virtual laboratory is used in science teaching and its obstacles from the point of view of science teachers in the Southern Jordan region. The male and female teachers were randomly selected. The results of the study showed that the extent to which science teachers use the virtual laboratory came to a medium degree with arithmetic mean (2.83), and the obstacles faced by science teachers in using the virtual laboratory came to a large degree and arithmetic mean (3.91), and the results also showed that there were no statistically significant differences for the extent of the use of the laboratory The default according to the variables: (gender, educational qualification, and work experience). The study recommended the necessity of holding courses and workshops for teachers and students to develop their attitudes towards the virtual laboratory, training them on the methods of using it, and providing virtual laboratories to include all schools.
Keywords: Virtual Laboratory, Virtual Laboratory Obstacles, Science Teachers.
DOI: 10.7176/JEP/13-22-02
Publication date: August 31st 2022

INTRODUCTION

The world is now witnessing rapid technological developments and changes in various fields. In the midst of this rapid technological progress, educational institutions must keep pace with these rapid and growing developments and changes. To develop the educational process through teaching and learning methods that ensure the quality of educational outcomes; Therefore, many educators see that the use of modern educational technology tools is an urgent necessity because of its many advantages. Educational practices in general, and teaching and education of sciences in particular, are witnessing tremendous developments and changes for the better to keep pace with this era characterized by scientific and technical progress.

Science is one of the most important fields in which computers and its applications have made a great revolution in its education, as science is one of the subjects that most need in its teaching and teaching, and the interpretation of its concepts to the use of virtual laboratories to help teachers reach the learning goals and outcomes that they seek to achieve with their students and also to help students to Gaining multiple and varied experiences (Al-Shehri, 2009).

The laboratory is an integral part of the educational process in teaching science. It is its basis in its various stages, as science is not considered a science unless it is accompanied by experimentation and laboratory and laboratory work; Therefore, recent trends give the laboratory and its activities an important and prominent role in teaching science, and this role is represented by the laboratory's link to the scientific methodological subjects, which are accompanied by activities and scientific investigation on the one hand, and the achievement of the goals of science education on the other hand (Zaytoon, 2004).

The importance of the laboratory in science education is highlighted in proving the truthfulness of information, scientific knowledge, and students' understanding of the scientific material and not memorizing it and thus trying to apply it in his life or in the field of future study, achieving the principle of learning by doing, acquiring scientific trends and tendencies and helping to develop scientific thinking and provide an opportunity for creativity and innovation (El Baltan, 2011).

In the virtual laboratory, computer programs are used that include software and multimedia that can be downloaded and used through the personal computer, or through the Internet, and they are mostly self-running programs and do not need operational programs. Its aspects include all the tools, devices and materials needed to conduct experiments in any branch of science (Liu et at, 2015). The programs used in the virtual laboratory are also characterized by the presence of different mediums for conducting experiments such as vacuum, air, water and dark mediums, and the presence of various sources for emitting all types of waves and frequencies as well as mediums Different one-dimensional and two-dimensional, and the programs are equipped with a large number of ready-made experiments as models covering the experiments of different branches of science (Babateen, 2011).

Despite the continuous seminars from educators to use new methods in teaching science, such as the use of the virtual laboratory, this topic did not receive in Jordan what it deserves from study and research, and accordingly the study came to find out the extent of using the virtual laboratory in teaching science and its

obstacles from the point of view of teachers Science in Karak Governorate, being a new method that constitutes an explicit challenge to the use of the usual method, is worthy of research and study.

STUDY PROBLEM:

What the researcher has noticed through his work is the low level of students' achievement and motivation in science and that the majority of science teachers follow a method that usually depends on explanation and memorization in teaching their students. Science teachers' use of the virtual lab and the obstacles they might face that might affect their use of the virtual lab.

Also, based on the role and necessity of scientific laboratories in facilitating and understanding science in a theoretical and procedural manner, and since the prescribed curricula are full of educational and scientific learning experiences that stand in the way of teachers to use the laboratory, due to the lack of sufficient time for teachers to implement practical activities inside laboratories, and because of the weak ability of the teacher to The use and employment of skills within laboratories, whether real or virtual, as well as the acute shortage of equipment and materials, are among the most prominent obstacles to working in the laboratory; Which prevented the application of scientific experiments as a basic requirement in understanding science and scientific phenomena, and based on what was indicated by the results of previous studies (Al Baltan, 2012; Thiqa, 2011; Al Zahrani, 2010), which recommended the need to develop teaching methods according to the capabilities in every place and time according to the needs of the capabilities of those communities; In line with global trends towards the use of computers in the field of education in general, and teaching methods in particular; This came to know the extent to which the virtual laboratory is used in science teaching and its obstacles from the point of view of science teachers in Karak Governorate, by answering the following questions:

Therefore, this study aims to discuss this issue by answering the following questions:

1. "What is the extent of the use of the virtual laboratory in teaching science from the point of view of science teachers in Karak Governorate?
2. "What are the obstacles that science teachers face in Karak governorate in using the virtual laboratory from their point of view"?
3. "Does the extent to which science teachers use the virtual laboratory in Karak governorate differ according to the variables: (gender, educational qualification, and job experience)"?

OBJECTIVES OF THE STUDY:

The study seeks to achieve the following objectives:

- Knowing the extent to which the virtual laboratory is used in science teaching by science teachers.
- "Detecting the obstacles facing science teachers using the virtual laboratory".
- "Disclosure of the extent to which the virtual laboratory is used according to (gender, educational qualification, and job experience)."

IMPORTANCE OF STUDY:

What distinguishes the study is that it looks at an important topic, which is "the extent of using the virtual laboratory in teaching science and its obstacles from the point of view of science teachers in Karak Governorate." It is hoped that this study will be able to achieve its desired goals and that it will be able to:

1. "To highlight the importance of the virtual laboratory because of its role in facilitating science education in general, as it is one of the modern strategies in teaching science."
2. "Knowing the extent to which the virtual laboratory is used in science teaching."

THE LIMITS OF THE STUDY:

SPATIAL LIMITS: "The study was applied in public schools in the Karak Governorate in the Hashemite Kingdom of Jordan."

TIME LIMITS: "The field study was conducted during the academic year 2021-2022."

HUMAN LIMITS: "Science Teachers in Governmental Schools of the Karak Governorate in the Hashemite Kingdom of Jordan".

OBJECTIVE LIMITS: "This study deals with the extent to which the virtual laboratory is used in teaching science from the point of view of science teachers in Karak Governorate.

TERMINOLOGY OF STUDY:

PROCEDURAL VIRTUAL LABORATORY: "The place where scientific experiments are conducted electronically through special applications and programs so that they are simulated to reality and where new innovative components and experiments are added, without risk and helps to save time and effort."

PROCEDURAL OBSTACLES FACING TEACHERS: "The degree obtained by answering the study scale items (represented in a group of obstacles that hinder science teachers from using laboratories, whether traditional or virtual, in performing scientific experiments)."

THEORETICAL FRAMEWORK AND PREVIOUS STUDIES:

The world is now witnessing rapid technological leaps in various fields, and in the midst of this rapid technological progress, it was necessary for educational institutions to keep pace with these rapid and growing

changes; To develop teaching and learning methods that ensure the quality of educational outcomes; Therefore, many educators see that the use of modern educational technology tools is an urgent necessity because of its many advantages, including: improving the general scientific level, shortening time, reducing effort and cost, and providing an enjoyable and interesting educational atmosphere, whether in the classroom or in school laboratories, through Integrating technology with education and developing educational curricula with its comprehensive concept to respond to modern scientific and technical developments.

The use of technology and its various technical tools is one of the most important educational means in limiting many of the challenges facing the usual methods of teaching in general and teaching science in particular, based on the role of technology tools in helping the learner to interact with the educational material to a high degree, and this is what distinguishes the use of technology and its various technical tools. Technological programs are different from other educational devices, and their use allows the learner to provide self-learning opportunities, which are achieved by expanding training, practice and feedback (Al-Ajlouni, 2007).

Given what the science curricula contain of abstract concepts and experiments that can take extra time and effort and the lack of sufficient necessary tools, the use of technological programs and applications and virtual laboratories in teaching scientific material contributes to the embodiment of concepts in an interactive and sensory manner. The great achievement of the computer and its various augmentative and virtual applications in science education, as it contains many abstract concepts that require time and effort for sensory understanding.

Scientific subjects are considered complex subjects in their teaching, because they reflect the intangible world in which it is difficult to apply some experiments due to their danger and material cost, and due to the rapid technological progress witnessed by the educational field, sophisticated computer simulation programs have been designed that simulate real laboratories in their functions (Al-Hafiz and Amin, 2013).

The researcher believes that virtual laboratories are one of the most important sources of learning and education available in the educational process through the great role they play, as teaching science is one of the basic subjects and attention to its teaching tools contributes to enhancing the educational process and helps students gain scientific and technical skills and contributes to understanding scientific facts Which leads to the completion of learning, facilitating its occurrence, making it more effective, and increasing students' motivation towards learning science.

THE CONCEPT OF VIRTUAL LABORATORIES:

Virtual laboratories are “one of the main pillars of the educational process and e-learning in the scientific and applied fields, as it is a natural extension of the development of electronic simulation systems.

Virtual laboratories are defined as “e-learning and teaching environments through which simulation of real laboratories takes place, as they contribute to the application of scientific experiments by default that simulates and parallels the real application (Al-Ghashem and Al-Hammadi, 2017), and Brinson (2015) indicated that these laboratories contribute to the development of The development of basic science processes such as sensation, perception, and observation, and the acquisition of the skill of scientific thinking, and the development of higher mental skills such as analysis, synthesis, and evaluation.

And defined (Jagodzinski & Wolski, 2015) as computer-based educational software that allows the learning process anywhere and at any time and helps liberate students from normal learning, makes abstract concepts in science more understandable, and enables the student to participate effectively in conducting experiments Alone or in cooperation with colleagues.

The virtual laboratory can be applied distinctly in the field of science education, which is considered a fertile environment for activating the uses of the laboratory in the educational process, due to the great diversity of educational experiences and skills that should be acquired by the learner (Salah, 2017).

The researcher believes that virtual laboratories provide tangible and realistic experiences, through which they can overcome many practical and scientific problems that teachers may face at school.

ADVANTAGES OF USING THE VIRTUAL LABORATORY

One of the most important features of the virtual lab is not to be restricted to the number of students who perform the experiment at the same time as long as the capacity of the communication channel is sufficient to transfer data, and the possibility of re-forming the groups of students who are doing the experiment with high flexibility in order to increase interdependence and cooperation among the users of the virtual laboratory to consolidate the concept of working as a team, It is very important to help adaptation in future work, and the possibility of recording all that the student has done in the laboratory and then analyzing it through specialized computer programs. The extent of progress in students’ skills is very difficult and requires great effort in terms of supervisors who are required to follow up the work of each group and follow up their work during the semester, especially with the great increase in the preparation of students, and also one of the most important features is that the barrier of time and space has been eliminated (Al-Bayati, 2006).

(Herga, Grmek&Dinevski, 2014) indicated that it is possible to conduct experiments that are difficult to conduct due to the economic cost, spatial and time limits, as well as the possibility of using the laboratory to contribute to a better understanding of the content of the science subject, and its use of modern technological and

informational technical tools that are unfamiliar to students, which are considered a tool Strong motivation, in the production of new and diverse methods of teaching science.

The researcher also sees several advantages of the virtual laboratory, the most important of which are: doing laboratory experiments that pose a challenge in their implementation through real laboratories because of their danger to the learner, while making laboratory experiments available at all times and from anywhere, in addition to conducting the experiment more than once according to the learner's ability to comprehend At the appropriate time for him, with the possibility of evaluating the student's performance electronically and following up his progress in conducting the experiment.

THE IMPORTANCE OF THE VIRTUAL LABORATORY IN SCIENCE TEACHING

Renewal in teaching methods and diversity in practical educational activities aimed at learning and acquiring skills is a form of development and modernization in the educational process (Sariay& Yilmaz, 2015). The postgraduate stage, as many scientific concepts are clarified through practical educational activities in the laboratory, and one of the most important goals of science education is to provide students with laboratory work skills.

The virtual laboratory contributes to overcoming obstacles and problems that limit the use of realistic scientific experiments, such as: the lack of sufficient and permanent equipment, the factors of space and time, and the extreme accuracy of the scientific material that affect the conduct of experiments and scientific activities through the traditional laboratory, as the virtual laboratory is one of the techniques Modern technologies that can contribute to giving good fruits during the implementation of laboratory experiments and the development of laboratory skills for students, and contribute to the development of positive attitudes among teachers and students towards science and the experiences it includes in general and towards technology and the importance of integrating it into the educational process in particular (Al-Radi, 2008; Al-Shahri, 2009).

LEVELS OF USING VIRTUAL LABORATORIES IN SCIENCE TEACHING

The levels of using virtual laboratories in science teaching can be classified into three levels, as indicated by Abdel Razek (2015), which are as follows:

1. Enrichment level: It means using the virtual laboratory as an additional source of information so that the learner can benefit from it in supporting achievement and acquiring skills. It is a level based mainly on the learner's desire to develop and enrich his knowledge or information.
2. Basic level: It means relying on the virtual laboratory completely in learning as an alternative to the usual laboratory, where a system is built for the virtual laboratory and its requirements are provided in the school, then the courses, teaching tools and interaction methods are designed to suit this level.
3. Integration level: It means the integration between the use of the virtual laboratory and the usual laboratory in teaching science, and each laboratory has its function and role so that neither of them can be dispensed with in the educational process.

THE TASKS OF THE TEACHER IN THE VIRTUAL LABORATORY ENVIRONMENT

Among the tasks of the teacher in the virtual laboratory environment is that (Khaled, 2008; Tracey &Stuckay, 2007):

1. Researcher: His role as a researcher is to search within electronic libraries and databases scattered on the network to bring what is suitable for his students.
2. Designer: He must consider the audience, the educational objectives, and the content provided through the virtual lab.
3. Technician: It is important to have skills related to the use of the Internet, operating systems, network connection requirements, and some technical problems.
4. Coordinator: His role is to support communication and interaction between users and each other as in traditional educational situations and supports interactive and competitive learning.
5. Mentor: is to guide and guide learners while they deal with the content or with each other.
6. Facilitator of the learning process: Responsible for creating the process of collective and individual learning, and for creating a safe environment worthy of respect for learners.
7. Oriented to the educational process: It is to define a detailed framework for the agenda of the educational session
8. Assessment of learners' work: Assessment takes many forms. If teaching takes place in a directive manner, the teacher can evaluate the exercises, discussions and interactions that take place during the live session.
9. Director of online sessions: The process of good management of sessions is one of the roles of special importance for the teacher.

OBSTACLES TO USING THE VIRTUAL LABORATORY

They pointed out (Nikoonezhad, Nili&Esfahani, 2015) to some of the obstacles to the use of virtual laboratories, such as the lack of technical infrastructure and software, poor interaction between teachers and students, poor use of virtual laboratory software by students and teachers, and the failure to design virtual laboratory programs in a professional and entertaining way that attracts students And the lack of experts in the field of producing

virtual laboratory programs for local curricula.

Al-Hazmi (2010) mentions other obstacles to the use of virtual laboratories, which are that they may be relatively confusing for some students who do not know how to use a computer, in addition to errors and technical problems specific to virtual or computer-related laboratory software, as well as resistance to changing the teaching style that may appear. by some teachers and students.

PREVIOUS STUDIES

The Rajendram study (2016) "aimed at identifying teachers' attitudes and perceptions of using virtual chemistry laboratories in secondary schools in England, and the study sample consisted of (156) male and female secondary school teachers in Southampton. The results showed the need to improve the reality of using the virtual lab compared to the traditional lab, and the virtual lab lacks realism compared to traditional lab offerings, in addition to the need to expand the design of virtual labs to meet the needs of teachers."

Al-Thubaiti study (2016), which aimed to identify the attitudes and perceptions of science teachers for the secondary stage about the effectiveness of employing the virtual laboratory in teaching science in the Qurayyat Governorate. The perceptions of secondary school science teachers about the effectiveness of employing the virtual laboratory in teaching science were high, as it came after the positives of the virtual laboratory in the first and high degree, while the negatives of the virtual laboratory came in the last and medium degree, and the results showed that there were statistically significant differences in teachers' perceptions of the tool As a whole, and all its dimensions are attributed to the gender variable and in favor of females, the results also showed that there were no differences in teachers' perceptions due to experience, with the exception of (negatives of the virtual laboratory), which came in favor of the experience of the category (10 years and more) compared to the experience category (less than 5 years). It showed that there are no differences in teachers' perceptions of the tool as a whole, and all its dimensions are due to the variables (educational qualification, educational qualification, specialization).

Study by Thigah (2011), "aimed at identifying the attitudes of science teachers and chemistry supervisors towards the use of virtual laboratory technology and some of its demands in Makkah Al-Mukarramah. The study sample consisted of (97) secondary school chemistry teachers, and (14) chemistry supervisors, and they were chosen by random method, The results showed that the teachers' responses towards the concept of virtual laboratories and their characteristics in teaching chemistry were positive and at a very high degree.

The study of Yaseen and Hamza (2010), "aimed at revealing teachers' attitudes and perceptions about the use of virtual lab software in science teaching. The study sample consisted of (164) teachers working in Texas schools, and the results showed that (91%) Of the teachers, they believe that the main objective of the science lab is to motivate students to develop an understanding of scientific concepts compared to memorizing facts, and (70%) of them agreed that virtual lab programs enhanced students' learning of basic concepts, and (64%) of them looked at The use of interactive programs in scientific experiments improves students' achievement, and (55%) of them consider that software simulation is safer than traditional scientific laboratories. Availability of adequate equipment and supplies for laboratories, while (42%) of them indicated weak administrative support, difficulty managing class, lack of technology, and lack of training for teachers to implement technology in science laboratories.

COMMENTING ON PREVIOUS STUDIES

After reviewing previous studies, the researcher found that they provided many important results, the most prominent of which are: the lack of experience among teachers with the mechanism of employing this technology (virtual laboratory), and the need to improve the reality of using the virtual laboratory and its activation in an optimal way compared to the traditional laboratory, and the results showed The degree of secondary school science teachers' perceptions about the effectiveness of employing the virtual laboratory in teaching science was high, and the results also showed that female teachers' responses towards the concept and characteristics of virtual laboratories in teaching chemistry were highly positive and highly.

This study agrees with previous studies in the primary goal it seeks, which is the virtual laboratory, and this study benefited from the results of previous studies in enriching its theoretical framework and interpreting its results. It is distinguished by its handling of the variables: (gender, educational qualification, and work experience).

Perhaps what distinguishes this study from previous studies is that all previous studies aimed to know the teachers' attitudes towards the virtual laboratory, while the current study examined the extent to which the virtual laboratory is used and its obstacles in teaching science.

STUDY METHODOLOGY:

The researcher used the descriptive analytical method; It fits with the nature of this study, which aims to know the extent to which the virtual laboratory is used in science teaching and its obstacles from the point of view of science teachers in Karak Governorate.

STUDY COMMUNITY:

The study population consisted of all science teachers affiliated with the Ministry of Education in public schools

in the Karak Governorate in the Hashemite Kingdom of Jordan, who numbered (627) teachers for the year (2021/2022).

THE STUDY SAMPLE

The study sample consisted of (216) male and female science teachers affiliated with the Ministry of Education in public schools in the Karak Governorate in Jordan, where the study sample was chosen by simple random method, and constituted (34.4%) of the study population, and Table No. (1) shows the distribution of the study sample members.

Table (1) describes the characteristics of the study sample

Variable	Category	NO.	Percentage
Sex	Male	**105**	**% 48.61**
	Female	**111**	**% 51.39**
	Bachelor	**133**	**% 61.57**
Qualification	Master	**67**	**% 31.02**
	Doctorate	**16**	**% 07.41**
	Less than 5 years	**35**	**% 16.20**
Job Experience	5-10 years	**92**	**% 42.59**
	More than	**89**	**% 41.21**
Total		**216**	**100.0**

STUDY TOOL:

The most appropriate tool to achieve the objectives of studying the extent to which the virtual laboratory is used in science teaching and its obstacles from the point of view of science teachers in the Southern Jordan region is: the questionnaire, which was designed after reviewing the literature, scientific research methods, and field studies related to the subject of the study.

The tool consisted of (27) paragraphs, interested in knowing the extent to which the virtual laboratory is used in science teaching and its obstacles from the point of view of science teachers in the southern Jordan region.

VALIDITY OF THE STUDY TOOL:

The study tool was presented to (10) arbitrators with experience and specialization; To know their opinions about the consistency, clarity, and comprehensiveness of the questionnaire, as this included the affiliation of the paragraphs to the scale as a whole, and the questions were modified and formulated based on the referees' recommendation, which achieved its apparent honesty.

STABILITY OF THE STUDY INSTRUMENT:

To verify the stability of the internal consistency of the tool, the Cronbach's Alpha coefficient was calculated on an exploratory sample similar to the study sample consisting of (17) male and female teachers. It is an appropriate value for study purposes.

PRESENTATION AND DISCUSSION OF THE RESULTS:

The researcher relied on the Likart Five-Point Scale in order to determine the degree of agreement of the study sample, numbering (216), on the paragraphs of the questionnaire for each axis. The arithmetic averages and standard deviations of each paragraph of the questionnaire and the tool as a whole were calculated. The values of the arithmetic averages were adopted to measure the extent to which the sample members agreed on the paragraphs of the questionnaire, as shown in Table No. (2).

Table No. (2): The values of the arithmetic averages of the Likert Five Scale

The average	Level
From 1 to 1080	**Very low**
From 1.80 to 2.60	**Low**
From 2.60 to 3.40	**Average**
From 3.40 to 4.30	**High**
From 4.31 to 5	**Very High**

RESULTS RELATED TO ANSWERING THE FIRST QUESTION: "To what extent is the virtual laboratory used in science teaching from the science teachers' point of view in the Southern Jordan region?"

To answer this question, the arithmetic means and standard deviations of the responses of the sample members were calculated, and Table (3) shows the results.

Table (3) The arithmetic mean and standard deviation of the responses of the sample members towards the virtual laboratory

NO	Items	Arithmetic Mean	Standard Deviation	Level
1	The use of the virtual laboratory to contribute to the development of methods of teaching science.	2.15	1.05	Average
2	I am good at designing experiments included in virtual laboratory programs	2.61	0.99	Average
3	I feel that using a virtual lab increases my motivation towards science education.	3.25	1.21	Average
4	I regularly follow courses on virtual lab technology.	2.59	1.04	Low
5	I think the virtual lab can be a substitute for the real lab.	2.64	1.22	Average
6	Motivate students when they use the virtual laboratory in preparing experiments.	2.75	0.98	Average
7	I think that the virtual laboratory is one of the most important and good alternatives for the development of education.	3.82	1.16	High
8	Use the virtual laboratory permanently, regularly, and continuously.	2.05	1.07	Low
9	I think that the use of the virtual laboratory contributes to the dissemination of science and knowledge.	3.95	0.94	High
10	I assign students scientific assignments through the virtual lab.	1.78	1.12	Very low
11	Allow sufficient time to discuss the results of the hypothetical lab work.	3.35	1.27	Average
12	I see that the virtual lab is stressful and tiring when teaching science.	1.85	0.87	Low
13	I encourage the use of software and websites linked to the virtual lab.	3.97	0.96	High
	Total	2.83	0.89	Average

Table (3) shows that the arithmetic averages of the answers of the study sample members to the extent of the use of the virtual laboratory in teaching science from the point of view of science teachers in the Southern Jordan region, ranged from a large level to very few, and with an arithmetic mean ranged between (1.78-3.97), and the degree was The totality of the tool is at a medium level, with an arithmetic mean (2.83), and a standard deviation (0.89), where the highest for the paragraph was “I encourage the use of programs and websites related to the virtual laboratory”, then followed by “I believe that the use of the virtual laboratory contributes to the dissemination of science and knowledge”, while I got Paragraph "I assign students to scientific assignments through the virtual laboratory.", at the lowest arithmetic mean (1.78), and with a deviation (1.12).

The results showed that the extent to which science teachers use the virtual laboratory came at an average level, and the researcher attributes the result: to the awareness of teachers of the requirements of teaching science using the virtual laboratory, and the role of the virtual laboratory in the spread of science and knowledge, especially with the technological development witnessed by the current era, as the virtual laboratory is one of the most important Alternatives for developing science and one of the most important alternatives to the real laboratory, which indicates an agreement to a (medium) degree on the importance of the virtual laboratory in teaching science.

RESULTS RELATED TO ANSWERING THE SECOND QUESTION: "What are the obstacles that science teachers face in using the virtual laboratory?"

To answer this question, the arithmetic means and standard deviations of the responses of the sample members were calculated, and the table (4) shows the results.

Table (4) The arithmetic mean and standard deviation of the responses of the sample members to the obstacles facing teachers

NO	Items	Arithmetic Mean	Standard Deviation	Level
1	The scarcity of Arabic-language software used in the virtual laboratory.	4.25	1.32	High
2	Weakness of students in using virtual laboratories.	3.56	1.05	High
3	Weak interaction between teachers and students directly.	3.39	0.98	Average
4	Teachers are not convinced of the feasibility of the virtual laboratory in implementing practical lessons.	3.53	0.96	Low
5	I see that the virtual lab simulates the visual pattern only for students.	2.62	1.22	Average
6	The lack of trainers to give training programs to science teachers on how to use the virtual laboratory.	3.59	1.13	High
7	The cost of special software in the virtual laboratory is high.	4.30	0.95	High
8	Lack of computers for students to use the virtual laboratory.	4.27	1.06	High
9	Class time is not enough to use the virtual lab in teaching science.	4.22	1.23	High
10	The lack of experience of teachers and students using the virtual laboratory.	3.95	0.98	High
11	Low effectiveness of educational devices and technologies available in schools.	4.29	0.75	High
12	The lack of the financial capabilities necessary to secure the needs of the virtual laboratory.	4.27	1.03	High
13	Weak internet when using virtual lab.	4.25	1.22	High
14	The density of scientific material in science curricula hinders the use of the virtual laboratory.	4.21	0.89	High
	Total	3.91	0.87	High

Table (4) shows that the arithmetic averages of the answers of the study sample members to the obstacles facing science teachers ranged from a large level to a few, with an arithmetic mean that ranged between (3.53 - 4.30), and the total score of the tool came at a large level, with an arithmetic mean (3.91), and with a deviation (0.87), where the highest for the paragraph “the cost of special software in the virtual laboratory is high”, then followed by “the low effectiveness of educational devices and technologies available in schools, while the paragraph “teachers are not convinced of the feasibility of the virtual laboratory in implementing practical lessons.””, the lowest My arithmetic mean is (3.53), with a deviation of (0.96)".

The results showed that the obstacles facing science teachers in the virtual laboratory from their point of view came to a large extent, and the researcher attributes to the cost of special applications in the virtual laboratory, where special software is involved in its design, its cost is high. Negatively on the use of the virtual laboratory, the lack of sufficient training of teachers on the use of the virtual laboratory or their low ability to use the virtual laboratory, and their lack of awareness of the importance and advantages of the virtual laboratory, and the increase in the number of students in one class hinders the use of the virtual laboratory, and the courses may be a reason for Obstacles that cannot be covered by the virtual laboratory, as well as the lack of specialists for technical support for laboratories inside schools, and the weakness of the Internet. For these reasons, the obstacles came in large numbers.

THE RESULTS RELATED TO THE THIRD QUESTION: “Does the extent of the use of the virtual laboratory in teaching science in the southern region differ according to the variables: (gender, educational qualification, and job experience).”

To answer this question, a t-test was used, with two independent curses, to know the extent to which teachers use the virtual laboratory in teaching science, according to the gender variable (male/female), and table (5) shows the results.

In order to find out the extent to which teachers use the virtual laboratory in teaching science, according to the educational qualification variable (Bachelor/Master/PhD) and the job experience variable (less than 5 years/from 5 to 10 years/11 years and over), the one-way analysis of variance was used (One Way ANOVA), and Table (5) shows the results.

Table (5) Results of the (t) test for the sex variable

Variable		Arithmetic Mean	Standard Deviation	T Value	Sig Value
Sex	Male	3.56	0.98	0.34	0.109
	Female	3.49	0.76		

It is clear from Table (5) that there are no statistically significant differences for the extent of using the virtual laboratory in teaching sciences according to the gender variable, where the significance value was greater than (0.05), and therefore the null hypothesis was accepted, that is, there was no difference.

The researcher attributes the result: that the equality of opportunities available between male and female teachers' schools in dealing with the virtual laboratory in teaching science, in addition to their interest in what saves time and effort and at the same time fun for students, achieve the desired goals, and create opportunities to repeat the experiment more than once and in an interesting manner. Therefore, the answers of the male and female teachers did not differ, and the answers were similar.

Table (6) Results of One Way ANOVA for the two variables: educational qualification and work experience

	Contrast Source	Squares Sum	Freedom Degree	Squares Mean	F Value	Sig Value
Qualification	Within Groups	0.90	2	0.45	1.407	40.25
	Inside Groups	17.02	213	0.32		
	Total	17.92	215			
Job Experience	Within Groups	0.65	2	0.32		
	Inside Groups	17.27	213	0.32	**1.004**	**0.373**
	Total	17.92	215			

Table (6) shows that there are no statistically significant differences for the extent of the use of the virtual laboratory according to the variables of educational qualification and job experience, where the significance value was greater than (0.05) and therefore the null hypothesis was accepted, that is, there was no difference.

The researcher attributes this to the teachers' full conviction in the virtual laboratory, its importance and its requirements, and their interaction with the technological development imposed by the information and communication revolution encouraged teachers to keep pace with development regardless of their experience and scientific qualification.

RECOMMENDATIONS:

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

1. Holding courses and workshops for teachers and students alike, to develop the use of the virtual laboratory, and to train them on how to use it.
2. Interest in providing virtual laboratories to include all schools, linking all schools to the Internet and providing computers in proportion to the number of students in schools.
3. Modifying science curricula to match its application in the virtual laboratory.
4. Dissolving all obstacles in the virtual laboratory, in terms of providing Internet labs in schools in proportion to the number of students and academic courses.
5. Conducting more educational studies on the virtual laboratory in terms of dimensions and applications in educational and other institutions.

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