Measuring the Need of Using Virtual Laboratory Based on Multimedia Technology as a Teaching and Learning Tool for Colleges Students at Tikrit University

Heba Hani Rahim[1], Qusay Abboodi Ali[2]

[1]College of Dentistry, Tikrit University, Iraq.

[2]Blended Learning Department, College of Administration and Economics, Tikrit University-Iraq.

heba.h.raheem22ms@st.tu.edu.iq , dr.qusay.a.ali@tu.edu.iq

ABSTRACT

Over the years, virtual reality has become an essential part of education. Therefore, to determine the advantages and strengths of this technique and technology is understanding how can developed it and measured is crucial. In the same context, there has been changes in the educational field, Changing from the traditional lab environment to a virtual lab. Therefore, this study focuses on virtual laboratories. Indeed, the use of VL to remotely is to understand the practical part in an effective education. In other words, this study focused on educational research and student profiling in the virtual laboratory by making a qualitative analysis. So far, there is no research that provides student data connectivity in virtual labs and learning analytics. To develop this concept, the analysis for active learners and their learning understandings and knowledge was conducted at differents colleges of Tikrit University by using a qualitative method (discussion). To achieve that, this study aims to examine whether virtual laboratory is required in Tikrit University colleges to supporting traditional lab in the learning process. Finally, the results show that there is a strong need for the virtual lab to process the difficult practical aspects for some of the students in the sciences field such as medicine, dental, biology, and chemistry.

Keywords: Virtual laboratories, Remote laboratories, Learning analytics, learner analytics, Distance education.

INTRODUCTION

The virtual lab has the advantages of unlimited time, instant feedback, repeated tests, and security for students and experiments [1]. Students' experiences with virtual and simulated experiments help them prepare for physical education with effective problem-solving skills. In this context, the virtual laboratory is often considered a viable alternative to the traditional laboratory to teach students and professionals the necessary skills and has a positive effect on students' learning [2]. As an innovative technology, virtual laboratory provides a dynamic, comprehensive and secure way for supporting awareness and education as well as clifying the limitations of experiential education [3]. Virtual lab relies on the notion of remote access to simulation and virtual talent processes. Virtual labs can create digital beacons to monitor students' learning and identify learning strategies. Evidence of student

interaction with the virtual lab has shown an increase in students' problem solving, critical thinking, and experimentation and knowledge acquisition skills [4]. To use this knowledge, the field of "educational analytics" is a strategy to provide insight into learning by analyzing various data produced by students [5].

Therefore, virtual labs are at most used for providing a 3D or 4D environment for users to experience real or imaginary data and allow them interacting with this data in real time. In other words, it allows users experiencing a real lab environment in the virtual world, facilitating problem solving similar to a physical lab. VL-based technologies provide great prospectives for both learning and labs. However, VL is still an emerging technology with a few educational applications [6]. From other side, there are a lot of materials on the practical part that includes the use of chemical or physical materials that are dangerous to the student in the practical experiment. In addition, some students have an intense fear of entering into surgical operations in medical colleges, and others [7, 8]. In the same context, there are many studies that focus only on design, without focusing on user experience or user needs and situation analysis on learners using virtual labs [8, 9, 10]. Therefore, this study examines the need of Tikrit University for a virtual laboratory in the learning process. To overcome difficult materials that pose a phobia or danger to the student in traditional laboratories, such as blood in surgeries, or gaseous materials, chemicals materials, and others.

LITERATURE REVIEW

Some studies on VL are conducted in the academic field. Recently, Jensen and Konradsen (2018) [11] provided a comprehensive review on the VL use. They assessed user experience in VL in addition to various learning outcomes. They presented (21) differences in writing quality and a set of analyzes that lead to students' learning and knowledge. Compared to less efficient technologies, this article shows that HMDs have limitations in their performance in analytical work and operations. However, due to the poor quality of the studies included, the truth about VL use is difficult to find [11].

An experiment of virtual simulation was conducted at Pendelikon Indonesia University in Indonesia, indicating the effectiveness of laboratory-based learning in the subject of chemistry because of lacking laboratory facilities and equipment in some colleges. A virtual lab test consisting of (20) questions of multiple choice was presented to the target group, which included students of sophomore science at Bulukumba Regency High School in South Sulawesi, Indonesia. The experiment mainly aimed at evaluating the effectiveness of VL in chemistry laboratories. Choose 10 boys and 20 girls from the group to conduct the experiment. After the test was completed, the students' average test scores were 42.5 and 81.33, respectively. The graduation rate is 83, with 25 students scoring 75 and above. 33% Finally, all analyzed data met the above performance requirements. In other words, the virtual laboratory is used effectively in the laboratory environment [12].

In accordance with a study conducted in Nigeria, some students are working with volumetric analysis and answering questions. The results revealed significant differences between physical and virtual chemical test participants. Students working in a chemistry lab performed better than students working in a real chemistry lab. This shows that the 3D interaction is very good and efficient and does the core business of the job. The virtual chemistry lab solves the problem of insufficient facilities. Therefore, practice in a virtual laboratory of chemistry is more useful with respect to improving student understanding and success [13].

A chemistry VL distance-learning course called VL2E2C was designed for developing the skills of public and high school students by providing intensive training in the theory and application of

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chemistry. In this process, there is an optional laboratory where students with disabilities can easily perform clinical trials by reducing their routine or experimental use. There are three ways for running the program including the assignment of an intelligent user-controlled robot to perform tasks that can be performed independently [14].

Users can also view the results in real time. This system shows that the latest VL technology can assist traditional teaching of chemistry through providing effective results for distance education [14].
In 2021, a study was conducted about the lack of collaboration between distant learners and teachers in higher education. Learners should have a basic and advanced knowledge in order to complete the tasks of laboratory. As experienced in COVID-19, people worldwide stayed in remote places and performed tasks online including remote testing. Therefore, the method of modifying the communication was used to improve communication and the experimental machine was used to compare the traditional laboratory with the teleactive platform. When integrating the platform with systematic learning, many users completed their tasks within short time and their scores increased by more than 200% [15].

Additionally, a report was published on the effectiveness of e-learning in virtual labs, taking into account the 2020 pandemic. This report aimed at understanding the effectiveness of virtual reality laboratories in education. The aim of this study is to explore how virtual labs can improve the learning skills and abilities of students in a school in Chennai. This study also aims to determine whether virtual labs help students improve their personal learning. Observation and expert interviews were used in the conduct of the research. The survey results show that the percentage of students are aware of and satisfied with the virtual lab. According to the report, schools should use virtual labs to encourage students to think outside the box [16].

METHODOLOGY

This work was applied to different colleges at Tikrit University, including (20) respondents as shown in Figure 2.
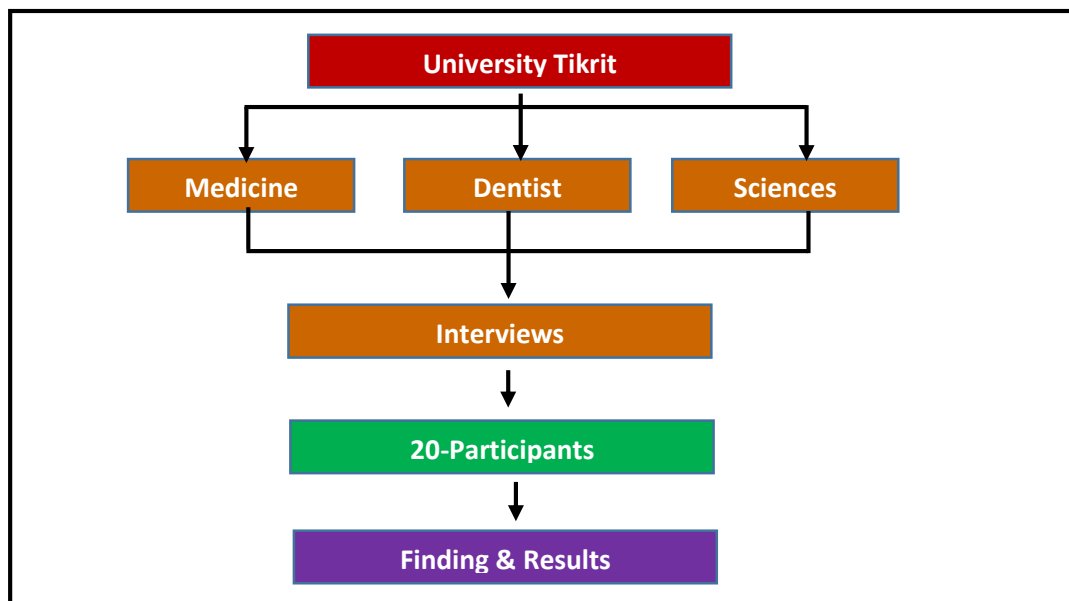

Figure 2: Research Method Approach

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DATA ANALYSIS AND RESULTS

The participants were as: (a) 12 Undergraduates, (b) 1 Master and 2 PhD, and (c) 5 Lecturers. An announcement was posted in the colleges of Tikrit University about virtual Lab. The interviews were utilized by face-to-face. Demographic information for each participant (e.g., gender, age, occupation and specialty) was collected as stated in Table (1).

Table 1: Participants Information

Respondents	Occupation	Gender	Age	Nationality	Interview	Specialty	Classroom Subject
P1	Bachelor Student	M	22	IRAQI	Face to Face	Medicine	Anatomy
P2	Bachelor Student	F	23	IRAQI	Face to Face	Medicine	Embryology
P3	Ph.D. Student	F	30	IRAQI	Face to Face	Dentist	Embryology and Oral Tissues
P4	Ph.D. Student	M	34	IRAQI	Face to Face	Dentist	Dental Anatomy and Morphology
P5	Prof	M	48	IRAQI	Face to Face	Dentist	Pharmacology
P6	Ass. Prof.	M	36	IRAQI	Face to Face	Medicine	Embryology
P7	Lecturer	F	34	IRAQI	Face to Face	Biology	DNA
P8	Prof	M	53	IRAQI	Face to Face	Chemistry	Physical Chemistry
P9	Prof	F	43	IRAQI	Face to Face	Physical	Physiology
P10	Bachelor Student	F	22	IRAQI	Face to Face	Medicine	heart
P11	Bachelor Student	F	22	IRAQI	Face to Face	Biology	Embryology
P12	Bachelor Student	M	23	IRAQI	Face to Face	Medicine	Cerebral analysis
P13	Bachelor Student	F	20	IRAQI	Face to Face	Mathematics	statistics
P14	Master student	M	25	IRAQI	Face to Face	Chemistry	Analytical Chemistry
P15	Bachelor Student	M	22	IRAQI	Face to Face	Medicine	Surgeries
P16	Bachelor Student	F	22	IRAQI	Face to Face	Dentist	Anatomy
P17	Bachelor Student	M	24	IRAQI	Face to Face r	Biology	Blood Analyses
P18	Bachelor Student	M	21	IRAQI	Face to Face	Physical	Physiology
P19	Bachelor Student	M	22	IRAQI	Face to Face	Chemistry	Physical Chemistry
P20	Bachelor Student	F	23	IRAQI	Face to Face	Biology	Bacteria

Furthermore, the participants were interviewed to investigate the needs of Tikrit University for virtual Lab to support the traditional lab. Every interview took from 30 minutes to an hour. All of the interviews are written based on six questions. The interviews have provided information about the participants'

opinions on certain issues such as traditional lab, factors affecting the practical side, such as blood phobia and operations, and the virtual Lab as in traditional classroom.

CONCLUSION AND RECOMMENDATIONS

Based on the findings of this research, which aims to understand the impact of the combination of 4D virtual labs with reality on the learning process of university students, simulation-based virtual lab equipment is a better learning method than traditional methods. In addition, after creating a virtual laboratory with a simple and flexible graphical interface, students' interest and motivation towards experimenting increases, while normal learning does not affect students' learning. This makes their training difficult. It goes without saying that the tools used in virtual labs are more interesting and fun than tools used in clinical labs. This means that the use of virtual labs today allows students to participate in the learning process, to improve their learning by repeating experiments, thereby encouraging learning at their heart

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AUTHORS PROFILE

[1]**Heba Hani Rahim** obtained a bachelor's degree in computer science in 2005 from the University of Tikrit - Iraq, and is currently a master's student in computer science, majoring in multimedia. In addition, she is an employee at the University of Tikrit in the College of Dentistry and is in charge of the e-learning unit in the college. I have experience in my career field for more than 16 years. His research interests include multimedia and online learning. He can be contacted at the e-mail: heba.h.raheem22ms@st.tu.edu.iq

[2]**Qusay Abboodi Ali** received the B.Sc, in computer sciences in 2004 from Tikrit University- Iraq, and M.Sc, degrees in Information technology from Utara University - Malaysia, in 2012. In addition, to the Ph.D, degree in Multimedia from Utara University, Malaysia in 2018. He has more than 9 years of experience as a lecturer for undergraduate and postgraduate. He is currently a director of blended learning unit and lecturer at college of administration and economics at Tikrit University. His research interests include the intelligent applications of Multimedia, Interaction Design, Blended Learning, Online Learning and Java Programming. He can be contacted at email: Dr.qusay.a.ali@tu.edu.iq.