

# Attitudes of Teachers and Students in Private Schools in UAE towards Using Virtual Labs in Scientific Courses

Prepared by:

Khaled Younis Alderbashi

Associate Professor, Department Chair - Professional Postgraduate Diploma in Teaching, City University  
College of Ajman

Ajman, UAE

[k.derbashi@cuca.ae](mailto:k.derbashi@cuca.ae)

<https://orcid.org/0000-0002-8900-9284>

**Abstract:** This study explored the attitudes of teachers and students in private schools in UAE towards using virtual labs in scientific courses. The researcher adopted a descriptive analytical approach. In fact, he used two questionnaires to obtain data. One of the questionnaires is for teachers and the other one is for students. The population involves all the teachers and students in private schools in UAE. The researcher used the purposive sampling method. He chose 80 teachers and 260 students were chosen from five schools in Sharjah, Ajman, Dubai and Abu Dhabi. Questionnaire forms were passed to them via WhatsApp. 58 forms were retrieved from teachers and 208 forms were retrieved from students. It was found that the attitudes of teachers and students in private schools in UAE towards using virtual labs in scientific courses are positive. According to students, using virtual labs in scientific courses improves my critical thinking and problem solving and creative thinking skills. It improves students' searching, observation and exploration skills. According to teachers, it promotes autonomy, a sense of innovation and a deep understanding for the material among students. It raises students' retention of information, satisfaction with the teaching process and academic achievement. The researcher recommends adding virtual lab-related activities to the curricula of scientific courses in UAE.

**Keywords:** Attitudes, virtual labs, scientific courses, private schools, UAE

## 1. Introduction

Teaching scientific courses requires carrying out laboratory activities. That is because scientific courses shed a light on natural phenomena that involve inquiry and discovery through experiments conducted under the guidance and supervision of the teachers. The laboratory activities are very important. For instance, they enable students to develop their technical skills and acquire a better conceptual understanding for the material. They enable students to retain information in the long term memory and acquire learning experiences (Irwanto, 2017)

There are various learning patterns. Such patterns include: the flipped learning mode (Al-Derbashi, 2017) and the blended learning mode. The blended learning mode refers to the use of the online learning mode in addition to the conventional learning mode. It also refers to the use technology in classroom for teaching students (Al-Derbashi and Abed, 2017). During the academic year 2021/2022, the management of Emirati schools adopted the blended learning approach to teach students. This measure was taken in response to the Coronavirus crisis. Thus, teachers of scientific courses in many Emirati schools started using virtual labs after taking this measure. During this period, virtual labs served as an alternative to conventional labs in order to meet the learning needs of students and cover the material of scientific courses. According to Irwanto

(2017), virtual labs refer to the labs that use simulations, computerized models and various other instructional technologies in order to carry out the activities and experiments carried out at conventional labs.

Using virtual labs has several benefits. For instance, it positively affects students' engagement and skills. It expands students' knowledge and promotes innovation among students (Alneyadi, 2019). It allows students to acquire a better conceptual understanding for the material (Faour & Ayoubi, 2018). It develops the learning processes and allow students to acquire more concepts (Ibrahim, 2014). It positively affects the students' achievement (Adi, 2017). It develops students' creative thinking skills (Algasham, and Alhamadi, 2017). It improves students' attitudes towards the course (Ratamun, and Osman, 2018).

Using virtual labs improves students' critical thinking, and problem solving skills. It promotes creativity among students. It instills a better conceptual understanding. It raises their motivation to learn and interest in the material being taught. It enhance the learning outcomes and raises the quality of the teaching process (Irwanto, 2017). It improves the students' skills in observation (Al-Hayawi and Hussain, 2020). It fosters students' scientific imagination (Al-Masa'eed, 2013). It improves the students' theoretical and practice performance in scientific courses (Al-Bawi et al., 2016).

Due to having many merits for using virtual labs, the researcher suggests that it's necessary to explore the effectiveness of using such labs in scientific courses in UAE. He found it necessary to explore such effectiveness because the use of such labs in UAE increased much after facing the Coronavirus crisis. He found it necessary to explore such effectiveness because using technologies in teaching has become an urgent need as it's suggested by (Alderbashi and Khadragy (2018) and Alderbashi (2021). Therefore, he explored the effectiveness of using virtual labs in scientific courses from the perspective of students and teachers in private schools in UAE.

## 2. Objectives

This study aimed to

- a)- Identify the attitudes of students in private schools in UAE towards using virtual labs in scientific courses
- b)- Identify the attitudes of teachers in private schools in UAE towards using virtual labs in scientific courses

## 3. Questions

This study investigated the following questions:

- Q.1)- What are the attitudes of students in UAE towards using virtual labs in scientific courses?
- Q.2)- What are the attitudes of teachers in UAE towards using virtual labs in scientific courses?

## 4. Significance of the study

This article is significant due to the reasons below:

- This article offer beneficial results to the academic leaders in UAE.
- This article offers researchers a theoretical framework on virtual labs.
- This article offers beneficial results to the officials working at the Ministry of Education in UAE.
- This article provides researchers and book authors with two instruments that can be used to conduct investigations.
- This article can be used as a reference when writing books, and conducting studies.

## 5. **Limits**

- Temporal limits: This study was carried out during the second semester of the academic year 2021/2022
- Spatial limits: This study targets the private schools in UAE
- Human limits: This study targets the teachers and students in private schools in UAE

## 6. **Limitations**

The results can't be generalized to all school students and teachers in private schools in UAE. That's because the results are affected by the size and characteristics of the sample. It's because the results are affected by the instruments and their reliability and validity.

## 7. **Definition of Terms**

### 7.1. **Theoretical definitions:**

-Attitude: It is represented in a judgment that has an evaluative nature. It also involves one's reactions in addition to response on the affective and cognitive levels towards a specific person or something (Crano and Prislin, 2006, p.347).

-Virtual labs: They refer the labs that use simulations, computerized models and various other instructional technologies in order to carry out the activities and experiments carried out at conventional labs (Irwanto, 2017)

### 7.2. **Operational definitions:**

-Attitudes: They refer to the attitudes of teachers and students in private schools in UAE towards using virtual labs in scientific courses.

-Virtual labs: They refer to the use of labs that employ simulations, computerized models and various other instructional technologies. In this study, they refer to the virtual labs used in private schools in UAE to prevent the Coronavirus from spreading. They are employed to carry out the activities and experiments carried out at conventional labs.

## 8. **Theoretical framework**

Using virtual labs offers students more security. It allows educators to carry out experimental with incurring lower costs by the educational institution. It allow students to repeat the experiment carried out in a wrong manner. It allows students to carry out the experiment independently. It allows students to carry out the experiment collaboratively (Irwanto, 2017)..

Using virtual labs improves students' critical thinking, and problem solving skills. It promotes creativity among students. It instils a better conceptual understanding. It raises their motivation to learn (Irwanto, 2017). Using virtual labs positively affects students' knowledge, innovation, attitudes, skills and achievement. It positively affects students' engagement and motivation (Alneyadi, 2019).

According to Ahmad (2019), it contributes to developing the professional skills of students. It contributes to developing students practical skills in conducting experiments. It develops students' thinking skills and

promotes positive attitudes towards using the lab. It expands students' knowledge and instils a better understanding for abstract concepts. It enables students to imagine the operations and experiments that are difficult to imagine. It offers much safety and security (Ahmad, 2019).

According to Koehler (2021), using virtual labs contributes to improving students' attitudes towards the course. It contributes to promoting interest in the course being taught. It reduces the fear and anxiety associated with learning. It raises students' satisfaction with the teaching process (Koehler, 2021).

## 9. Empirical studies:

The researcher reviewed the articles that are mentioned below. Those articles are arranged in accordance with their publication year (from the oldest to the latest)

Al-Masa'eed (2013) explored the impact of using virtual labs on the achievement and scientific imagination in physics among the students enrolled in Jordanian universities. He used a test consisting from 40 items. He sampled 80 students from physics course. It was found that using virtual labs has a positive impact on the achievement and scientific imagination in physics among the students enrolled in Jordanian universities.

Ibrahim (2014) explored the impact of using virtual labs in carrying out science experiments on the development of the learning processes and acquisitions of concepts among fifth grade students. She chose 40 female Palestinian students through the purposive method of sampling. She used a test. Those students were divided equally into experimental and control groups. The researcher found that employing virtual labs in carrying out science experiments has a positive significant impact on the development of the learning processes and acquisitions of concepts among fifth grade students

Al-Bawi et al. (2016) identified the impact of using virtual labs on the scientific theoretical and practice performance of fifth grade students in Iraq. They used a test. They sampled 54 students. The control group involves 29 students and the experimental one involves 25 students. The researchers found that using virtual labs has a positive significant impact on the scientific theoretical and practice performance of fifth grade students.

Adi (2017) explored the effect of using the virtual laboratory on the achievement and motivation of ninth-grade students toward science. He used a test. He sampled 34 students. The control group involves 17 students and the experimental one involves 17 students. The researcher found that using the virtual laboratory has a positive impact on the achievement and motivation of ninth-grade students toward science

Elayyan, and Al-Ghatam (2017) identified the training needs of science teachers in Al-Ahsa, Saudi Arabia in terms of using virtual labs from the perspective of those teachers. They adopted a descriptive survey-based approach. They used a survey. They sampled 101 science teachers from Al-Ahsa, Saudi Arabia. They used SPSS software for analysis. Respondents show a major need for receiving training on the following aspects: using computer in teaching science, using Windows programs, choosing the suitable programs for teaching, and using CDs, data show device and scanner. The also show a major need for receiving training on the following aspects: making, organizing and managing files and recognizing the tools and mechanism of virtual labs, ability to identify the academic performance of each students when using such labs, and ability to check the ability of each student in using such labs.

Algasham, and Alhamadi (2017) explored the impact of using virtual laboratories on developing the creative thinking skills of talented students at Jamal Abdalnaser high school in Sanaa, Yemen. 52 secondary school students were chosen. They were divided equally into experimental and control groups. The researchers used a test. It was found that using virtual laboratories has a positive impact on developing the creative thinking skills of talented students. That applies to all the dimensions of such skills. Those dimensions include: (fluency, flexibility, originality, elaboration and sensitivity towards problems)

Ratamun, and Osman (2018) explored the impact of using virtual and conventional labs on students' attitudes towards chemistry. They adopted a quasi-experimental research approach. 147 students were sampled from 3 schools in Malaysia. Pre-survey and post-survey were used. Two-way analysis of variance (ANCOVA) was carried out. It was found that using virtual lab has the same impact of conventional labs on students' attitudes towards chemistry.

Faour & Ayoubi (2018) explored the effect of using virtual laboratory on 10th grade students' conceptual understanding. They explored the effect of such use on students' attitudes towards physics. They sampled 50 students. They were divided equally into experimental and control groups. Pre-test and post-test were used. A survey was used. It was found that there isn't any significant difference between both groups in terms of attitudes towards physics. However, using virtual laboratory has a positive significant impact on 10th grade students' conceptual understanding.

Irwanto (2017) explored the effect of using virtual labs on improving the thinking abilities, skills and scientific attitudes of students. He reviewed 23 articles. He found several results. For instance, using such labs improves students' critical thinking, and problem solving skills. It promotes creativity among students. It instils a better conceptual understanding. It improves the skills of processing scientific processes. It improves students' lab skills and raises their motivation to learn. It promotes interest in the material. It improves the learning outcomes and enhance students' attitudes towards the material. It improves the quality of the teaching process.

Alneyadi (2019) explored the impact of using virtual labs in scientific courses in Emirati schools. He interviewed 45 teachers chosen from ten schools. He reached several results. Using such labs has a positive impact on students' knowledge, innovation, attitudes, skills and achievement. It positively affects students' engagement and motivation. However, virtual labs aren't widely used in Emirati schools

Abed (2019) explored the impact of using virtual lab on the academic achievement of the first intermediate school female students in physics. 40 students were sampled and divided into two groups (control and experimental groups). 25 teachers were sampled. The random sampling method was used. A survey was used to obtain data from teachers. A test was used to obtain data from students. The researcher found that using virtual labs has a positive significant impact on the academic achievement of the first intermediate school female students in physics. Teachers also support the use of such labs and believe that using internet is easy.

Al-Hayawi and Hussain (2020) explored the effect of using the virtual laboratory of physics on developing the intensity of observation and academic achievement of the fourth year students enrolled at the college of education for pure sciences. A test was used for meeting this goal. 30 female and male students were chosen from the latter college. They were divided equally into experimental and control groups. It was found using the virtual laboratory of physics has a positive effect on developing the intensity of observation and academic achievement of those students.

Al-Anzi, and Metwali (2020) investigated the perceptions of academics and educators in Kuwait towards virtual education for handling the problem of the suspension of face to face education during the Coronavirus. They used a survey to obtain data from 568 academics and educators chosen from the Ministry of Education, Kuwait University and the Public Authority for Applied Education and Training (PAAET). 43.7% of the respondents have prior knowledge about virtual labs and 53.5% of the respondents have prior knowledge about virtual libraries. Virtual education offers an environment that promotes innovation and eliminate temporal and spatial limitations. It improves students' abilities in exploration and searching. It contributes to raising up a generation who shows autonomy in learning. It suits learners of various learning styles and age categories. It enables students to learn at their own pace. It raises students' motivation to learn. It enables unlimited number of students to enrol in educational institutions. It instils a deep understanding for the material. It enables students to acquire concepts, including abstract concepts. It offers solutions for problems (e.g. scarcity of qualified teachers). It encourages students to adopt the ongoing learning approach.

However, according to Al-Anzi, and Metwali (2020), there are problems facing the use of such labs. Such problems include: the low number of experts in virtual education, difficulty faced by some students in using the programs of virtual education and scarcity of the financial resources needed for such education. They include: unavailability of e-curricula of some courses and resistance of some students towards receiving such education.

## 10. Methodology:

### 10.1. Approach:

The researcher adopted a descriptive analytical approach

### 10.2. Sample and population

The population involves all the teachers and students in private schools in UAE. The researcher used the purposive sampling method. He chose 80 teachers and 260 students were chosen from five schools in Sharjah, Ajman, Dubai and Abu Dhabi. Questionnaire forms were passed to them via WhatsApp.

58 forms were retrieved from teachers and 208 forms were retrieved from students. The response rate of teachers is 72.5%. The response rate of students is 80%.

Data about the sampled students is shown below

Table (1): Data about the sampled students

Variable	Category	Frequency	Percentage
Gender	Male	141	67.78846
	Female	67	32.21154
Grade	7 <sup>th</sup>	53	25.48077
	8 <sup>th</sup>	50	24.03846
	9 <sup>th</sup>	40	19.23077
	10 <sup>th</sup>	15	7.211538
	11 <sup>th</sup>	28	13.46154
	12 <sup>th</sup>	22	10.57692

N=208

Data about the sampled teachers is shown below

Table (2): Data about the sampled teachers

Variable	Category	Frequency	Percentage
Gender	Male	38	65.51724

	Female	20	34.48276
Experience	Less than 5 years	22	37.93103
	5-10 years	16	27.58621
	more than 10 years	20	34.48276

N=58

### 10.3. Instrument

The researcher employed two survey. The student survey was designed by the researcher after reviewing the studies conducted by: Ibrahim (2014), Algasham, and Alhamadi (2017), Al-Bawi et al. (2016), Al-Anzi, and Metwali (2020) and Irwanto (2017). The teacher survey was designed by the researcher after reviewing the studies conducted by: Ibrahim (2014), Alneyadi (2019), Adi (2017), Faour & Ayoubi (2018), Alneyadi (2019), Al-Hayawi and Hussain (2020), Irwanto (2017) and Al-Anzi, and Metwali (2020). The five point Likert scale was used in both questionnaires

### 10.4. Validity of the Instrument

The validity of the two surveys were checked through passing them to three faculty members working at UAE. Those faculty members were asked to assess the surveys in terms of language, clarity and relevancy. They were asked to make the needed amendments. They suggested that both surveys are clear, free from language mistakes and relevant to the study's goals. One of the faculty members recommended collecting data about the experience of teachers. Thus, changes were made and the final version was drafted.

### 10.5. Reliability of the Instrument

The Cronbach coefficient value of the student survey is 0.721. The Cronbach coefficient value of the teacher survey is 0.773. Based on those values, both surveys are very reliable. That's because those values are higher than 0.70 as it's suggested by Salehi & Farhang (2019)

### 10.6. Analysis Criteria:

For classifying the means, the criteria displayed below were adopted:

Table (1): The criteria employed for analyzing and classifying means

Range	Level	Attitude
2.33 or less	Low	Negative

2.34-3.66	Moderate	Neutral
3.67 or more	High	Positive

\*Source: (Alderbashi, 2021)

The five point Likert scale consists from 5 rating categories. Those categories are shown below

Table (4): The categories and scores of the five point Likert scale

Category	Score
Strongly agree	5
Agree	4
Neutral	3
Disagree	2
Strongly disagree	1

\*Source: (Al-Derbashi and Moussa, 2022)

## 11. Results and discussion

### 11.1. First question

Q.1)- What are the attitudes of students in private schools in UAE E towards using virtual labs in scientific courses?

Table (5): Means and standard deviations of the attitudes of students in private schools in UAE towards using virtual labs in scientific courses

No.	Statement	Mean	Std.	Level	Attitude
1.	I have excellent abilities and skills in using virtual labs	3.95	.979	High	Positive
2.	Using virtual labs in scientific courses enables me to acquire more concepts	4.28	.884	High	Positive
3.	Using virtual labs in scientific courses develops my creative thinking skills	4.19	.937	High	Positive
4.	Using virtual labs in scientific courses raises my theoretical performance in such courses	4.25	.882	High	Positive

5.	Using virtual labs in scientific courses raises my practical performance in such courses	4.23	.893	High	Positive
6.	Using virtual labs in scientific courses develops my skills in observation	4.24	.932	High	Positive
7.	Using virtual labs in scientific courses improves my abilities and skills in exploration	4.25	.929	High	Positive
8.	Using virtual labs in scientific courses improves my abilities and skills in searching	4.17	.971	High	Positive
9.	Using virtual labs in scientific courses enables me to learn at my own pace	4.13	1.016	High	Positive
10.	Using virtual labs in scientific courses eliminates the temporal and spatial limitations hindering me from learning	4.20	.926	High	Positive
11.	Using virtual labs in scientific courses improves my attitudes towards such courses	4.19	.937	High	Positive
12.	Using virtual labs in scientific courses improves my critical thinking skills	4.06	1.039	High	Positive
13.	Using virtual labs in scientific courses improves my problem solving skills	4.34	.859	High	Positive
	Overall	4.19	0.93	High	Positive

The attitudes of students in private schools in UAE towards using virtual labs in scientific courses are positive, because the overall mean is 4.19. It was found that students have excellent abilities and skills in using virtual labs, because the relevant mean is 3.95. It was found that using virtual labs in scientific courses enables students to acquire more concepts because the relevant mean is 4.28. The latter result is in agreement with the one reached by Ibrahim (2014). That's because virtual labs illustrates the meaning of concepts to students.

It was found that using virtual labs in scientific courses develops students' creative thinking skills, because the relevant mean is 4.19. The latter result is in agreement with the one reached by Algasham, and Alhamadi (2017). It's attributed to the fact that such labs offer students new experiences that may be difficult to engage in when using conventional labs. It was found that using virtual labs in scientific courses raises students' theoretical performance in such courses, because the relevant mean is 4.25. It's attributed to the fact that doing experiments in such labs shall allow students to memorize information for a longer period. That shall improve the achievement of students in exams. The latter result is in agreement with the one reached by Al-Bawi et al. (2016).

It was found that using virtual labs in scientific courses raises students' practical performance in such courses, because the relevant mean is 4.23. The latter result is in agreement with the one reached by Al-Bawi et al. (2016). It's attributed to the fact that such labs allow students to see the way of applying knowledge to virtual reality. It was found that using virtual labs in scientific courses develops students' skills in observation,

because the relevant mean is 4.24. It's attributed to the fact that using such labs requires employing the sight and hearing senses and the observation skills and paying attention to visual and auditory detail.

It was found that using virtual labs in scientific courses improves students' abilities and skills in exploration because the relevant mean is 4.25. It's attributed to the fact that using such labs allows students to explore materials and interactions between materials. The latter result is in agreement with the one reached by Al-Anzi, and Metwali (2020). It was found that using virtual labs in scientific courses improves students' abilities and skills in searching because the relevant mean is 4.17. The latter result is in agreement with the one reached by Al-Anzi, and Metwali (2020).

It was found that using virtual labs in scientific courses enables students' to learn at their own pace because the relevant mean is 4.13. It's attributed to the fact that such labs allow students to repeat the experiments till achieving the targeted goal. It was found that using virtual labs in scientific courses eliminates the temporal and spatial limitations hindering students from learning, because the relevant mean is 4.20. The latter result is in agreement with the one reached by Al-Anzi, and Metwali (2020). It was found that using virtual labs in scientific courses improves students' attitudes towards such courses because the relevant mean is 4.19. The latter result is in agreement with the one reached by Irwanto (2017)

It was found that using virtual labs in scientific courses improves students' critical thinking skills because the relevant mean is 4.06. The latter result is in agreement with the one reached by Irwanto (2017). It's because using such labs offer students opportunities to think about the reasons of the failure of a specific experiment. It's because using such labs offer students opportunities to think about the chemical interactions that occur in environments.

It was found that using virtual labs in scientific courses improves students' problem solving skills because the relevant mean is 4.34. The latter result is in agreement with the one reached by Irwanto (2017). It's attributed to the fact that students may face problems while doing virtual experiments. In such a case, students must come up with solutions to such problems. Thus, using such labs offer opportunities to employ the problem solving skills

## 11.2. Second question

Q.2)- What are the attitudes of teachers in private schools in UAE towards using virtual labs in scientific courses?

Table (6): Means and standard deviations of the attitudes of teachers in private schools in UAE towards using virtual labs in scientific courses

No.	Statement	Mean	Std.	Level	Attitude
1.	I can identify the academic performance of each students when using virtual labs in scientific courses	4.21	.554	High	Positive
2.	Using virtual labs in scientific courses improves students' learning processes	4.52	.504	High	Positive
3.	Using virtual labs in scientific courses is effective for teaching talented students	4.41	.497	High	Positive
4.	Using virtual labs in scientific courses raises students' motivation to learn	4.45	.626	High	Positive

5.	Using virtual labs in scientific courses suits students of all learning styles	4.14	.634	High	Positive
6.	Using virtual labs in scientific courses suits students of all age categories	4.14	.634	High	Positive
7.	Using virtual labs in scientific courses promotes a deep understanding for the material among students	4.38	.616	High	Positive
8.	Using virtual labs in scientific courses promotes a sense of innovation among students	4.34	.762	High	Positive
9.	Using virtual labs in scientific courses raises students' academic achievement level	4.34	.664	High	Positive
10.	Using virtual labs in scientific courses promotes autonomy in learning among students	4.28	.586	High	Positive
11.	Using virtual labs in scientific courses enables students to retain information for a longer time	4.38	.557	High	Positive
12.	Using virtual labs in scientific courses raises students' satisfaction with the teaching process	4.24	.630	High	Positive
13.	Using virtual labs in scientific courses improves the learning outcomes of students	4.34	.479	High	Positive
14.	Using virtual labs in scientific courses raises the quality of the teaching process	4.41	.497	High	Positive
	Overall	4.32	0.58	High	Positive

It was found that the attitudes of teachers in private schools in UAE towards using virtual labs in scientific courses are positive, because the overall mean is 4.32. It was found that teachers can identify the academic performance of each student when using virtual labs in scientific courses because the overall mean is 4.21. It was found that using virtual labs in scientific courses improves students' learning processes, because the overall mean is 4.52. The latter result is in agreement with the one reached by Ibrahim (2014)

It was found that using virtual labs in scientific courses is effective for teaching talented students because the overall mean is 4.41. It was found that using virtual labs in scientific courses raises students' motivation to learn because the overall mean is 4.45. The latter result is in agreement with the one reached by Al-Anzi, and Metwali (2020), Alneyadi (2019) and Adi (2017). It's attributed to the fact that students enjoy using technology in the learning process, because technology makes the process of learning enjoyable and more fun

It was found that using virtual labs in scientific courses suits students of all learning styles because the overall mean is 4.14. The latter result is in agreement with the one reached by Al-Anzi, and Metwali (2020). It's attributed to the fact that auditory and visual learners can benefit much from such labs. For instance, such labs let students employ their hearing and sight senses to learn. It was found that using virtual labs in scientific courses suits students of all age categories because the overall mean is 4.14. It's attributed to the fact that such labs can be used for making advanced and simple virtual experiments.

It was found that using virtual labs in scientific courses promotes a deep understanding for the material among students, because the overall mean is 4.38. The latter result is in agreement with the one reached by Faour & Ayoubi (2018) and Irwanto (2017). It's attributed to the fact that using such labs offer opportunities to see the way of implementing knowledge to virtual reality. That shall make information clearer and easier to understand.

It was found that using virtual labs in scientific courses promotes a sense of innovation among students because the overall mean is 4.34. The latter result is in agreement with the one reached by Alneyadi (2019). It's attributed to the fact that such labs offer students opportunities to carry out new experiments that may be difficult to do in conventional labs. It's because using such labs let students think out of the box and come up with new ideas. It's because using such labs let students think about the way of benefiting from the results of the virtual experiments in their lives.

It was found that using virtual labs in scientific courses raises students' academic achievement level because the overall mean is 4.34. The latter result is in agreement with the one reached by Al-Hayawi and Hussain (2020). It's because using such labs contributes to illustrating complicated information through virtual reality. Thus, answering the exam questions related to complex information shall become easier. It was found that using virtual labs in scientific courses promotes autonomy in learning among students because the overall mean is 4.28. The latter result is in agreement with the one reached by Al-Anzi, and Metwali (2020). It's because such labs teach students the way of doing experiments by themselves.

It was found that using virtual labs in scientific courses enables students to retain information for a longer time because the overall mean is 4.38. The latter result is in agreement with the one reached by Irwanto (2017). It's because using such labs employ effects and multimedia that makes it easier to retain information for a longer period in mind. It was found that using virtual labs in scientific courses raises students' satisfaction with the teaching process because the overall mean is 4.24. The latter result is in agreement with the one reached by Koehler (2021). It's attributed to the fact that using such labs enable students to do dangerous experiments that may be difficult to do in conventional labs. It's because using such labs enable students to do costly experiments.

It was found that using virtual labs in scientific courses improves the learning outcomes of students because the overall mean is 4.34. It was found that using virtual labs in scientific courses raises the quality of the teaching process because the overall mean is 4.41. The latter result is in agreement with the one reached by Irwanto (2017). It's because using technology in the teaching process makes students capable of keeping up with the latest technological developments.

## 12. Conclusion

It was found that the attitudes of students in private schools in UAE towards using virtual labs in scientific courses are positive. According to the surveyed students, using virtual labs in scientific courses improves my critical thinking and problem solving and creative thinking skills. It improves students' searching, observation and exploration skills.

It was found that the attitudes of teachers in private schools in UAE towards using virtual labs in scientific courses are positive. According to the surveyed teachers, using virtual labs in scientific courses promotes autonomy, a sense of innovation and a deep understanding for the material among students. It raises students' retention of information, satisfaction with the teaching process and academic achievement

## 13. Recommendations

The researcher recommends

- a) Promoting awareness among teachers, parents and students about the benefits of using such labs in education. That can be done through holding training courses and passing materials to them.

- b) Purchasing advanced software by Emirati schools for employing virtual labs
- c) Holding courses for teachers and students at Emirati schools to teach them the way of using the software of virtual labs
- d) Adding virtual lab-related activities to the curricula of scientific courses in UAE.

#### 14. Suggestions for Researchers

The researcher recommends

- a) Conducting studies that aim to explore the attitudes of faculty members and university students in UAE towards using such labs
- b) Conducting studies that explore the problems hindering the use of such labs in schools in UAE
- c) Conducting a similar study with exploring the impact of gender, and grade on students' attitudes and the impact of gender and experience on teachers' attitudes.

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## Appendices

### Appendix No. 1:

Student Survey

Dear Student,

The researcher is working on a study that aims to explore the attitudes of teachers and students in private schools in UAE towards using virtual labs in scientific courses. Conducting this study requires collecting

data from you. Such data shall be used only for meeting the goals of this study. It shall remain confidential. Please, dedicate time to read the items of this questionnaire and answer them. This questionnaire consists from 15 items.

Please note that virtual labs can be defined as the labs that use simulations, computerized models and various other instructional technologies in order to carry out the activities and experiments are carried out at conventional labs (Irwanto<sup>1</sup>, 2017)

Part one:

1)- Gender

Male

Female

2)- The grades I teach

7<sup>th</sup> grade

8<sup>th</sup> grade

9<sup>th</sup> grade

10<sup>th</sup> grade

11<sup>th</sup> grade

12<sup>th</sup> grade

3)- place of the school

-Ajman

-Sharjah

-Dubai

-Abu Dhabi

Part two:

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Irwanto, I. (2017). Using virtual labs to enhance students' thinking abilities, skills and <sup>1</sup> scientific attitudes. *International Conference on Educational Research and Innovation*.494-499 <https://doi.org/10.31227/osf.io/vqnkz>

No.	Statement	Strongly agree	Agree	Neutral	disagree	Strongly disagree
1	I have excellent abilities and skills in using virtual labs					
2	Using virtual labs in scientific courses enables me to acquire more concepts					
3	Using virtual labs in scientific courses develops my creative thinking skills					
4	Using virtual labs in scientific courses raises my theoretical performance in such courses					
5	Using virtual labs in scientific courses raises my practical performance in such courses					
6	Using virtual labs in scientific courses develops my skills in observation					
7	Using virtual labs in scientific courses improves my abilities and skills in exploration					
8	Using virtual labs in scientific courses improves my abilities and skills in searching					
9	Using virtual labs in scientific courses enables me to learn at my own pace					
10	Using virtual labs in scientific courses eliminates the temporal and spatial limitations hindering me from learning					
11	Using virtual labs in scientific courses improves my attitudes towards such courses					
12	Using virtual labs in scientific courses improves my critical thinking skills					
13	Using virtual labs in scientific courses improves my problem solving skills					

Thank you for your time and cooperation ☺

**Appendix No. 2:**

The Teacher Survey

Dear Teacher,

The researcher is working on a study that aims to explore the attitudes of teachers and students in private schools in UAE towards using virtual labs in scientific courses. Conducting this study requires collecting data from you. Such data shall be used only for meeting the goals of this study. It shall remain confidential. Please, dedicate time to read the items of this questionnaire and answer them. This questionnaire consists from 17 items.

Please note that virtual labs can be defined as the labs that use simulations, computerized models and various other instructional technologies in order to carry out the activities and experiments are carried out at conventional labs (Irwanto<sup>2</sup>, 2017)

Part one:

1)- Gender

Male

Female

2)- The grades I teach

7<sup>th</sup> grade

8<sup>th</sup> grade

9<sup>th</sup> grade

10<sup>th</sup> grade

11<sup>th</sup> grade

12<sup>th</sup> grade

3)- place of the school

-Ajman

-Sharjah

-Dubai

-Abu Dhabi

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Irwanto, I. (2017). Using virtual labs to enhance students' thinking abilities, skills and <sup>2</sup> scientific attitudes. *International Conference on Educational Research and Innovation*.494-499 <https://doi.org/10.31227/osf.io/vqnkz>

4)- Academic qualification

-BA degree-

- Postgraduate professional diploma in teaching degree

-MA degree

-PhD degree

5)- Experience in the teaching field:

- Less than 5 years

- 5 - 10 years

-More than 10 years

Part two

No.	Statement	Strongly agree	Agree	Neutral	disagree	Strongly disagree
1	I can identify the academic performance of each students when using virtual labs in scientific courses					
2	Using virtual labs in scientific courses improves students' learning processes					
3	Using virtual labs in scientific courses is effective for teaching talented students					
4	Using virtual labs in scientific courses raises students' motivation to learn					
5	Using virtual labs in scientific courses suits students of all learning styles					
6	Using virtual labs in scientific courses suits students of all age categories					
7	Using virtual labs in scientific courses promotes a deep understanding for the material among students					
8	Using virtual labs in scientific courses promotes a sense of innovation among students					
9	Using virtual labs in scientific courses raises students' academic achievement level					

10	Using virtual labs in scientific courses promotes autonomy in learning among students					
11	Using virtual labs in scientific courses enables students to retain information for a longer time					
12	Using virtual labs in scientific courses raises students' satisfaction with the teaching process					
13	Using virtual labs in scientific courses improves the learning outcomes of students					
14	Using virtual labs in scientific courses raises the quality of the teaching process					

Thank you for your time and cooperation 😊