UAE-based Teachers' Hindsight Judgments on Physics Education during the COVID-19 Pandemic

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ABSTRACT

The learning situation in the United Arab Emirates (UAE) education sector changed with the onset of COVID-19 in the country, with the number of cases rising to 52,600 locally by July 6, 2020. UAE became one of the few countries to not close schools. However, the UAE education system is now undergoing a transition from face-to-face classroom learning to online learning. A survey was conducted to examine the views of teachers with regard to the benefits and challenges of online education, including their retrospective experiences after four months of online teaching. Inferential statistics were used to analyze the findings. Utilizing online physics lessons to gauge learning outcomes. The results indicate that teachers in both the public and private school systems benefited from online learning but with a comparative advantage for the public-school teachers. The findings suggest that the two cohorts faced challenges with online learning in both the systems, with more significant effects on public school teachers as compared to private school teachers.

KEYWORDS: Hindsight judgments, Online learning, Physics education, Challenges of online learning, Benefits of online learning.

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1. INTRODUCTION

Coronavirus disease 2019 (COVID-19), being highly contagious, has brought about drastic changes in the education sector. Most standard procedures, habits, and routines have ceased, with everyone being forced to adapt to new methods and unfamiliar lifestyles. Physical attendance of classes is now deemed by many governments as high-risk, as this promotes the spread of the coronavirus. Given that the pandemic has affected every part of the world, the United Arab Emirates (UAE) has not been exempted. Schools have thus turned to online learning to continue with students' education during these challenging and trying times. All subjects on the curriculum must continue to be part of the education program.

Studying physics via distance or online learning has helped ensure that students are continuing to lead normal lives as they study theoretical and practical aspects of this subject (Fourie &Bothma, 2006). This approach helps ensure that students finish their studies as per schedule, continue to grapple with real-life issues, and get accepted into their preferred universities with the required and much necessary tertiary education (Fourie &Bothma, 2006). Therefore, St. Amant (2007) recommends that teachers should start expanding online education to help shape a universal image of technological communication.

In the context of this study, hindsight judgment is straightforward. After experiencing a phenomenon in all its aspects, the learner can make a judgment about said phenomenon based on actual practice (Hawkins & Hastie, 1990). According to the Cambridge English Dictionary, the word hindsight means "the ability to understand an event or situation only after it has happened" (Cambridge.org, 2020). The Merriam-Webster Dictionary defines hindsight as "perception of the nature of an event after it has happened" (Merriam-webster.com, 2020). However, the term "hindsight" is used more expansively by researchers, depending on the context and specific goal. For example, Roese and Vohs (2012) define hindsight as "people selectively recall information consistent with what they now know to be true and engage in sense-making to impose meaning on their knowledge and neglect of other reasonable explanations." In the context of this study, hindsight is defined as "the opportunity to judge or understand past events using the knowledge that you have gained

during actual practicing since then" (Hawkins & Hastie, 1990).

In this milieu, moreover, the UAE may have had an advantage compared to other nations, as the country had set up an online platform that facilitated research and study in the name of the madrassa. Started in 2018, the program aimed to provide reading material to students in a relatively straightforward and easily comprehended manner.

To date, several studies have explored the various factors underlying the effectiveness of online learning. However, no study categorized the aspects related to the hindsight of teachers' judgments in UAE context. Therefore, the primary objective was to assess teachers' hindsight judgment of the online physics- learning experience and assess whether there was a difference in attitudes across common public and private schools' groups.

1.1 *Purpose*

The COVID-19 pandemic has made it difficult for students to gather in a classroom, making it necessary for stakeholders in the education sector to find other methods of ensuring that students' learning does not halt. Additionally, teachers have found online classes especially challenging for subjects such as physics, which are both theoretical and practical. This, in turn, has caused most students to develop a negative attitude toward physics (Sarı, Hassan, Güven&Şen, 2017). Consequently, promoting virtual learning has become one of the latest trends in schools in the UAE. This is essential to understand the mental model of physics, because by using virtual learning, students will be able to participate in more related activities that can aid in the development of the mental model of physics (Aoude, 2015; Yaki, Saat, Sathasivam&Zulnaidi, 2019).

This study's significance lies in the fact that it is the first of its kind to be conducted in the UAE context. Therefore, the findings may provide a basis for identifying common challenges that UAE teachers encounter in teaching physics through online learning. It is hoped that these results will enable curriculum developers and physics teachers to improve their pedagogical resources and concepts when planning physics and other subject lessons. Therefore, this study aims to determine how physics can best be taught to high school students through online learning. Finally, this study explores teachers' hindsight on teaching physics through online learning in the UAE education system.

Considering the lack of research on teachers' hindsight judgment of online learning in the UAE context, this research attempts to explore the effectiveness of online learning in teaching physics at the high school level. Specifically, the study was guided by the following research questions:

1. What are the benefits of learning and teaching physics online during the COVID-19 pandemic from the perspective of UAE high school teachers?
2. What are the challenges of learning and teaching physics online during the COVID-19 pandemic from the perspective of UAE high school teachers?

1.2 Significance of the Study

The results of this study are expected to benefit many stakeholders in education in general and, specifically, in physics. These stakeholders include physics teachers, students, curriculum planners, and instructional material designers and developers. The study's findings can be beneficial to physics teachers because online learning helps demonstrate physics concepts with ease and makes teaching practicable. After this experience, teachers can develop their skills in online teaching as a practical alternative approach for effective teaching. It is hoped that online teaching will enable physics teachers to cover a wide range of topics within a relatively short period without much stress. It will also help the teacher arrange learning tasks from simple to complex. Thus, it is expected that this study's results may provide solutions for teachers at the high school level who are seeking to improve the quality of online learning.

2. Conceptual Framework

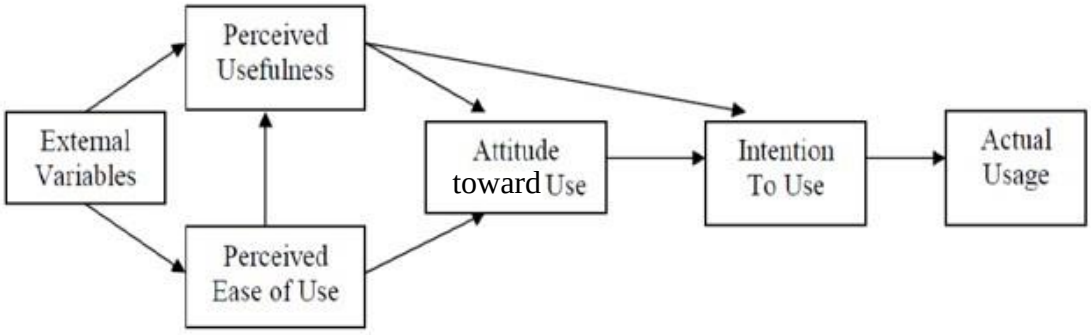

Figure 1: Technology Acceptance Model(Lai,2017)

This study draws on the UAE's research on teachers' hindsight toward online learning. It is crucial to examine theories and models related to learning and integrating technology to re-conceptualize this study. There are several theoretical frameworks related to technology integration in online learning, such as the Theory of Diffusion of Innovations, theTheory of Reasonable Action, and the Technology Acceptance Model (TAM) (Lai, 2017). This study was guided by the Davis's (1985) TAM (see Figure 1), which aims to anticipate the acceptance and rejection of modern technology.

TAM is applied in this study to provide a basis for determining the influence of external variables on the subjects' internal beliefs, abilities, and personal attitudes. TAM is an information system theory that delineates the stages information seekers or learners must follow when accepting, teaching, and using new technologies to achieve information literacy skills.

The theory outlines how the user comes to accept and use technology. The model consists of four constructs that impact online learning: external variables (EVs), teachers' perceived usefulness (U), teachers' perceived ease of use (EoU), and teachers' attitude (A). The basic TAM includes and tests two specific beliefs: perceived usefulness (PU) and perceived ease of use (PEU). PU is defined as potential users' anticipated benefit, i.e., how using a specific system will improve their behavior. PEU refers to the degree to which potential users expect their attempts to master a new skill to be manageable (Davis, 1989). People's beliefs about the system may be influenced by exogenous factors (Lai, 2017). The conceptual framework of this study is informed by TAM concepts, behavioral intent, and actual use of the system. Thus, based on the user's beliefs and various key variables, TAM helps determine the reasons for the adoption or rejection of online learning so that researchers can find appropriate corrective measures or explanations for such outcomes (Davis, Bagozzi&Warshaw, 1989; Turner et al., 2010). TAM is easy to expand and verify, while results gleaned from the extended TAM are often taken as accurate predictors of adoption and usage (Lai, 2017).

3. Literature Review

Various studies have examined online learning. For example, Jimoyiannis and Komis (2001) analyzed the effects of an online learning environment designed to increase teachers' learning potential and enhance student participation. The results showed that a flexible learning environment helps students understand different subjects better. Zheng (2015) conducted two experiments to evaluate the effectiveness of interactive online learning. His data showed that, compared to traditional classrooms and less interactive online learning environments, students in a fully interactive, multimedia-based online learning environment performed better and were more satisfied. Johnson (2007) explored students' perceptions of online learning on asynchronous discussion boards, holding that teachers should create a framework around the concept of online discussion and help learners access course materials.

Online learning opens up a new avenue of research to physics education, as it fundamentally changes the framework of understanding and application in physics teaching. Thus, online learning has played a significant role in ensuring the success of teaching physics. Oymak and Ogan-Bekiroglu (2017) conducted a study on students' conceptual knowledge and attitudes toward physics lessons using three different methods: technically supported teaching, laboratory teaching, and course instruction. The study

was conducted with 144 high school students. The results showed that if technology-based teaching is included, students' attitudes improved.

In the UAE context, Awan (2012) conducted a study to examine the impact of computers and laptops on the dynamics of the teaching environment. Questionnaires were distributed to teachers who were pursuing master's degrees to obtain their opinions on and experiences of using computers and laptops in the classroom. The results showed that teachers in the UAE's public and private sectors were able to identify critical issues relating to the advantages and disadvantages of using online learning in education.

In sum, the Internet is increasingly being used as an educational tool to support the learning process and help students participate in learning. The Internet is thus the most widely used educational resource, both in the classroom and outside the school (Chang & Hwang, 2018). Today, online learning aims to motivate teachers to participate in classrooms or even virtual labs, creating challenging, expensive, or time-consuming conditions (Mitchell & Forer, 2010).

4. Material and Methods

4.1 *Design and Context*

This study uses a cross-sectional approach. The purpose of cross-sectional research is to describe the community's characteristics, not to determine the causal relationship between the various variables (Olsen & George, 2004; Zheng, 2015). This approach is aimed at inferring potential relationships, recommending a practical framework for dealing with problems teachers face in online learning, and collecting preliminary data to support further research and experiments. A cross-sectional survey uses questionnaires to collect data from human participants. The method involves presenting data from a population at a specific point in time. In this study, an online cross-sectional survey was conducted to collect data from randomly selected teachers from public and private schools in one of the UAE's major cities. Participants had spent four months teaching online, from March 2020 to July 2020. The COVID-19 pandemic makes it difficult for people to gather information, so it is necessary to use online surveys to collect data.

4.2 *Sample of the Study*

This study's target population included all teachers of both genders who teach physics in private and public schools of a major city in UAE for the academic year 2019– 2020. Participants were selected according to their availability, while ensuring that they met the predefined criteria required for the study in terms of the language of instruction and instructional method. In addition, all teachers teach physics through online learning. The teachers' sample comprised 58 male and female teachers who responded to the online survey. Table 1 shows the distribution of this sample according to selected demographic characteristics: gender, number of years of experience, and professional training.

Table 1: Distributionof the Teachers'Sample Accordingto DemographicCharacteristics

		Public School		Private School	
Characteristics		N	Percentage (%)	N	Percentage (%)
Total sample		31	36.50	54	63.50
Gender	Female	15	17.70	37	43.50
	Male	16	18.80	17	20
Education level	Bachelor	18	21.10	49	57.60
	MA	11	13	5	5.90
	PhD	2	2.40	0	0
Grades taught	12	19	22.40	11	13
	11	6	7	6	7
	10	2	2.40	8	9.40

	9	4	4.70	29	34.10
Years of experience	<5 years	4	4.70	19	22.40
	5–10 years	1	1.20	16	18.80
	10–15 years	5	5.90	6	7
	>15 years	21	24.70	13	15.30
Received training on how to teach through online learning	Yes	24	28.20	34	40
	No	7	8.30	20	23.50
Hours spent per day on preparing online learning lessons	<1 hour	0	0	3	3.40
	1–2 hours	6	7	23	27.10
	2–3 hours	13	15.30	11	13
	>3 hours	12	14.20	17	20

4.3 Instrument and Procedures

This study utilized a survey research methodology to collect data about teacher hindsight judgment about online learning experience. The "Teachers' Hindsight Judgment on physics Education (THJ)" online survey was developed to collect data regarding teachers' online learning teaching throughout the 16-week semester. This 16-item survey from Kisanga and Ireson (2016) using a 5-point Likert scale was adapted for the study to solicit the teachers' views on factors affecting the online learning of physics in UAE. Modifications included the order of questions presented to the participants and the programs and methods used in the context of UAE online learning. The survey collected data regarding demographics and characteristics, challenges of online learning, benefits of online learning. Table 2 represents how questions were distributed among those areas.

Table 2:

ɛription	ʂtion
ɬlengesof onlinelearning	1, 2, 4, 5, 6, 14, 20, and 26
ɛfits ofonline learning	7, 10, 11, 12, 13, 17, 18, and 25

Distributionof Questions on the SurveyAreas

To ensure robust construct validity, the survey was reviewed for content, clarity, and brevity by a panel of experts in education, psychology, and research. The experts provided the researcher with comments and suggestions for deleting, adding, and rearranging some items. Most of their recommendations were incorporated in the final version of the survey. Additionally, most suggestions from experts and teachers were taken into consideration in designing the survey's final version (See Appendixes A).

The researcher also asked some teachers in the pilot sample to read the survey to ensure that they fully understood all the items. sixteen teachers were recruited to participate in the pilot study. The pilot study focused on the sentence construction and terminology used in the THJ survey to ensure participants correctly understood and responded to all the items. All respondents declared themselves responsible for online teaching and learning programs. The pilot study did not include a treatment or control group. Instead, the focus was on determining the reliability of the survey instrument. The researcher collected respondents through email requests. Along with the linked survey, demographic characteristics

and comments were requested. To ensure the reliability of the results, Cronbach's alpha coefficient was applied. The results are presented in Table 3.

Table 3: Reliability Coefficients for the Survey

Variable	Items number	Cronbach's alpha
Challenges of online learning	8	0.81
Benefits of online learning	8	0.79
All motivation scale	16	0.91

As illustrated in Table 3, the alpha coefficient of all 16 items was observed (0.91), and the scores of the 2 subscales were found reliable, as their mean scores ranged between 0 and 1 (0.81 and 0.79). This instrument was reliable and its internal consistency trustworthy.

4.4 Data Analysis

Before the analysis was conducted, a 5-dimensional Likert scale was adopted, with all responses coded as 1 = Strongly disagree, 2 = Disagree, 3 = Not sure, 4 = Agree, and 5= Strongly agree for positively worded items. Subsequently, responses were reverse coded as 1 = Strongly agree, 2 = Agree, 3 = Not sure, 4 = Disagree, and 5 = Strongly disagree for all negatively worded items (Balasubramanian, 2012). To determine the minimum and the maximum length of the 5-point Likert scale, the range is calculated by 5 − 1 = 4 and then divided by 5, as this is the highest value of the scale (4 ÷ 5 = 0.80). Afterwards, 1, which is the lowest value of the scale, was added to identify this cell's maximum. The length of the cells is determined as follows: 1–1.80 represents "Very little," 1.81–2.60 represents "Little," 2.61–3.40 represents "Moderate," 3.41–4.20 represents "High," and 4.21–5.00 represents "Very high" (Alsalhi, Eltahir& Al-Qatawneh, 2019). The researchers used the SPSS 25.0 program to answer the research questions. Descriptive statistics (Mean [M] and Standard Deviation [SD]) were calculated for the items and the three subscales: challenges of online learning, benefits of online learning, of the two groups of teachers. Percentages were used to compare participants from public schools with those from private schools.

5. Results

5.1 Demographic Data of Teachers

Demographic data were collected from teachers who taught online physics courses in private and public schools. As shown in Figure 2, a higher percentage of public-school female teachers answered the survey than male teachers (68.5% and 31.5%, respectively). However, in private schools, an almost equal percentage of male and female teachers responded (51.6% and 48.4%, respectively). Figure 3 represents teachers' responses to the questions about "receiving training on how to teach through online learning." The results showed that only a few teachers did not receive training on teaching through online learning (22.6% and 37% for private and public-school teachers, respectively). A significantly higher percentage of private school teachers received training than private school teachers (77.4% and 63%, respectively).

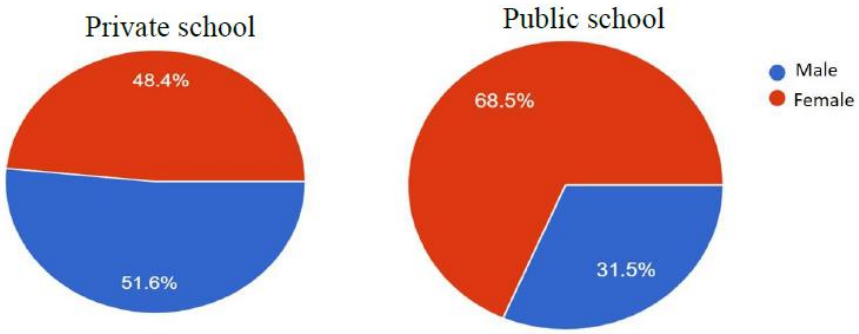

Figure 2: Percentage of Public and Private School Teachers Stratified by Gender

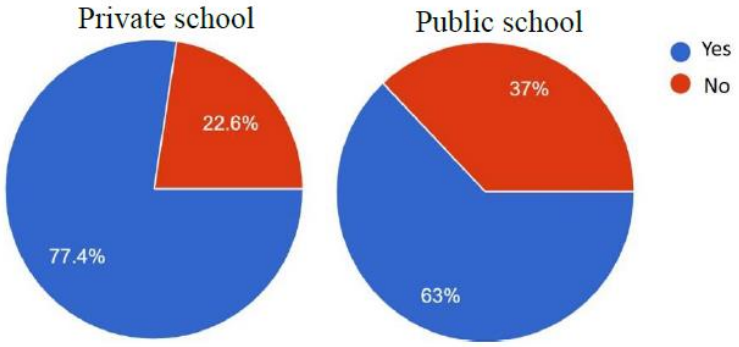

Figure 3: Percentage of Public and Private Schools Teachers Stratified by Receiving Training in Online learning

The responses given by the teachers to the question "Approximately how long do I spend on most days preparing my online learning lessons?" are shown in Figure 4. Most teachers from public and private schools stated that they spend over three hours preparing their online lessons (31.5% and 38.7%, respectively). By contrast, only 5.6% of public-school teachers and no private school teachers indicated that they spent less than one hour preparing online learning lessons. Thus, it appears that most teachers spend more than two hours preparing their online lessons.Additionally, Figure 5 shows teachers' responses to questions about their experience in online teaching and learning. The results indicated that a minority of teachers had less than five years of teaching experience (35.2% and 12.9% teachers in public and private schools, respectively). Most teachers had been teaching physics for over five years, with 67.7% and24.1% of private and public-school teachers having over 15 years of experience.

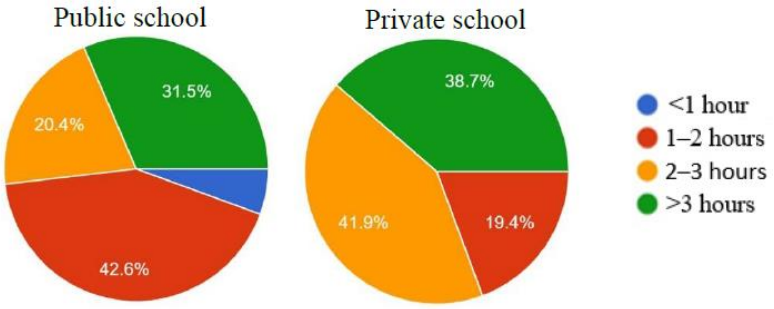

Figure 4: Percentage of Public and Private Schools Teachers Stratified by Hours Spent in Preparing Online Learning Lessons

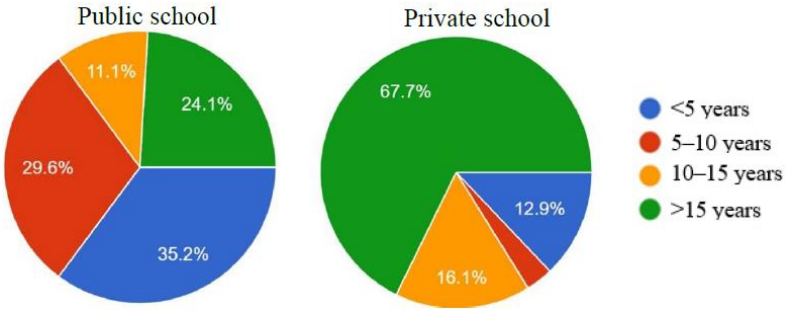

Figure 5: Percentage of Public and Private Schools Teachers Stratified by Years of Experience

With respect to teachers' qualifications, Figure 6 shows that 90.7% teachers in public schools and 64.5% teachers in private schools have a bachelor's degree. However, almost one-third (35.5%) of private school teachers have a master's degree (MA) as compared with public school teachers (5.6%), with 3.7% of public-school teachers holding a PhD as compared to no private school teachers holding a PhD.

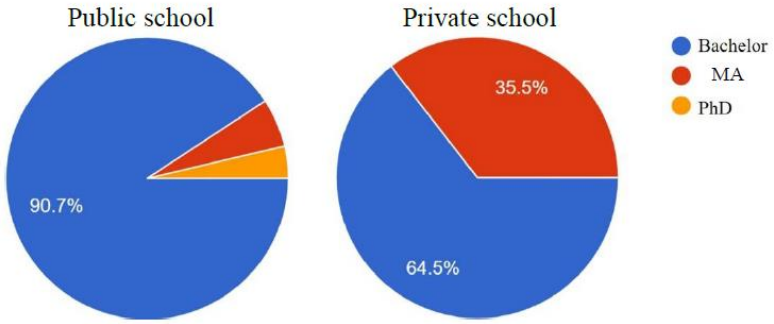

Figure 6: Percentage of Public and Private Schools Teachers Stratified by Qualifications

5.2 Findings Related to Research Question 1

The benefits of online learning in the public-school teachers and private school teachers' groups are presented in Table 6.Table 6 shows that most online learning benefits were reported as High for the public-school teachers' group. The means of the 8 items ranged between 1.60 and 4.45. Additionally, 6 benefits of online learning were reported above 3.40 and only 2 benefits of online learning were below this mean but still fell in the category of High online learning benefits. The most frequently cited benefit of online learning in the public-school teachers' group was "Online learning will provide me with better learning opportunities than traditional means of learning" with a mean of 4.66. The two least frequent benefits were "Online learning is very economical for educational institutions to adopt" (M = 1.70) and "I prefer reading lessons in online learning" (M = 1.60). With respect to the private school teachers' group, Table 4 shows a High benefit to "Online learning will provide me with better learning opportunities than traditional means of learning" (M = 4.65). The least frequent benefit of online learning was "I prefer reading lessons in online learning." The means of the eight items ranged between 1.20 and 4.56 (M = 3.21).

Table 4: Descriptive Statistics of Teachers'Benefits of OnlineLearning inthe Two Groups

Benefits of online learning	Public school teachers			Private school teachers		
	M	SD	Degree	Mean	SD	Degree
Online learning is very economical for educational institutions to adopt.	1.70	1.30	Very little	3.20	1.45	Moderate
I believe using online learning will improve the quality of my lessons.	4.10	1.11	High	3.12	1.32	Moderate
I prefer reading lessons in online learning.	1.60	0.81	Very little	1.20	1.14	Very little
It is easier to revise electronic study material than printed material.	3.32	0.98	Moderate	3.94	2.12	High
I prefer using a computer to prepare my lessons.	4.16	1.42	High	4.12	0.89	High

I believe using online learning technologies will improve my teaching.	4.18	0.78	High	2.11	1.04	Little
Online learning will increase my efficiency.	4.16	1.08	High	3.88	0.83	High
Online learning will provide me with better learning opportunities than traditional means of learning.	4.66	1.46	Very high	4.56	0.71	Very high
Overall scores	3.48	1.12	High	3.27	1.19	Moderate

*Veryhigh(4.21–5.0),High (3.41–4.20), Moderate(2.61–3.40), Little(1.81–2.60), andVery little(1.0–1.80)

In summary, the means in all online learning benefits were observed to be higher in the public-school teachers' group than the private school teachers' group. This suggests that public school teachers benefit from online learning more than private school teachers do. Additionally, the most and least frequent challenges were different in both groups.

5.3 Findings Related to Research Question 2

The results of online learning challenges in the public-school teachers' group and private school teachers' group are presented in Table 5.Table 5 shows that the group surveyed did not find online learning challenges especially onerous. The means of the 8 strategies ranged between 1.40 and 3.50. Additionally, 6 challenges of online learning were reported below 3.50, with only 2 challenges falling above 3.50, which is still in the category of minor challenges. The two significant challenges faced by the public-school teachers' group were "Online learning requires expensive technical support" (M = 3.50) and "Online learning is a threat to teachers' employment" (M = 3.80). The two least cited challenges were "Online learning reduces the quality of knowledge imparted" (M = 1.40) and "Interacting with the computer system is often frustrating" (M = 1.77).Regarding the private school teachers' group, 5 online learning challenges were reported as Moderate (M = 1.60–2.4) and only one challenge as difficult (M = 3.42). The means of the 8 items ranged between 1.60 and 3.42. The item that respondents found most challenging, with mean scores above 3.21, was "I feel uncomfortable reading a textbook on a computer screen" (M = 3.42). The item they found least challenging was "Discussions on online learning technologies are uninteresting" (M = 1.60).

Table 5: Descriptive Statistics of Challenges of Online Learning in the Two Groups ofTeachers

Challenges of online learning	Public school teachers			Private school teachers		
	M	SD	Degree	Mean	SD	Degree
feel uncomfortable reading a textbook on a computer screen.	2.80	0.98	Moderate	3.42	0.85	High
Online learning requires expensive technical support.	3.50	1.1	High	3.10	0.97	Moderate
Online learning reduces the quality of knowledge imparted.	1.40	1.21	Very little	1.80	1.20	Very little
Interacting with the computer system is often frustrating.	1.77	1.04	Very little	2.40	1.23	Little
A face-to-face method is more learner-centered than online learning methods.	2.00	1.30	Little	2.81	1.32	Moderate

Online learning increases learners' social isolation.	2.30	0.87	Little	2.50	1.03	Little
Discussions on online learning technologies are uninteresting.	1.91	0.91	Little	1.60	0.078	Little
Online learning is a threat to teachers' employment.	3.80	1.03	High	3.20	0.88	Moderate
Overall scores	2.44	1.06	Little	2.58	0.94	Little

*Veryhigh(4.21–5.0),High (3.41–4.20), Moderate(2.61–3.40), Little(1.81–2.60), andVery little(1.0–1.80)

Overall, the data show that the means in all challenges to online learning were higher in the public-school teachers' group than the private school teachers' group. This implies that public school teachers face greater difficulties in online learning than private school teachers. Moreover, the most and least frequent challenges were different in both groups.

6. Discussion

The core issue addressed in this research arose from different factors and perspectives. First, the study results harmonized with the TAM theoretical framework, which anticipates the acceptance and rejection of modern technology (Davis, 1985). TAM provides a basis for determining EVs' influence on internal beliefs, abilities, and personal attitudes, which improves attitudes directly and indirectly and positively impacts students' online learning competencies. Online learning also gives the opportunity for authentic learning that is inseparable from the learner's background, belief system, experiences, and attitudes (Bruner, 1966). Therefore, students learn by building knowledge through collaboration and variance activities.

The results showed that public school teachers reported High or Very little benefits of online learning in groups. For the private school teachers' group, most items were reported as High or Moderate online learning benefits. This result means that public school teachers benefit from online learning more than private school teachers. However, the least frequently observed online learning ("I prefer reading lessons in online learning") in both groups was the same. The High and Moderate benefits of online learning by teachers in both groups, as measured by the THJ, can be interpreted differently. For example, online learning provides flexibility, which may be considered a significant benefit. Online classes allow for the freedom to choose the place and time to schedule lessons. Thus, all participants are incorporated into the schedule in a manner convenient to them. Further, there is less travel involved and, being location independent, less time is wasted (Leask, 2004). In some cases, the learners can also engage in other self-building activities, as there is more free time, unlike in the traditional classroom scenario where students remain in the same room and environment for several hours at a stretch, even when no teaching activity is being conducted (Robertson et al., 2006).

Parallel advantages accrue to teachers. They can engage in other money generating activities during their free time, for example, which helps them earn a higher income. Therefore, this system is time-rich compared to standard classrooms. Further, as no fixed space is required, individuals can learn or teach from any location. Regardless of the distance, students and teachers can interact online, which is not the case in face-to-face class attendance (Laws, 2013).

Another interpretation of these results is that online learning provides a platform for learning opportunities and facilitates the sharing of information. As most of the learning platforms are hosted on online servers, one can easily access the platforms' needed information. If it is unavailable, one can conduct routine searches from the search engines. Unlike the classroom scenario, wherein one is limited to only books or fixed information sources, digital learning has more learning material. This arms the learners with more knowledge than traditional classroom learning, which only offers what is stipulated by the curriculum. Physics is a vast discipline that requires students to be well-informed about concepts and is thus especially suited for online education (Wallace, 2004).

Online learning is also less complicated, providing better interaction for teachers and students. In the traditional school scenario, large class sizes make it almost impossible for teachers to interact with every student one-on-one. This challenge is minimized in online learning, which allows teachers to interact with their students on an individual basis.

The students, in turn, get a better grasp of the concepts and mathematical expressions, which could have been more challenging in a classroom setting (Kitchenham, 2006). Online classes also favor shy students who rarely ask questions in real-world classes.

Technological advancements have allowed for experiments that were previously difficult to conduct in labs to now be efficiently conducted in simulators. Moreover, better and more accurate results are obtained from the simulators. Physical lab settings, which require high investment because of the apparatus and equipment needed, are more costly than the simulators (Leask, 2004). The simulators are, therefore, a more economical and viable option. They are fitted with automatic sensors and converters, which facilitate the accuracy and repeatability of results (Lowe &Vespestad, 1999). This data can be presented in the form of graphs and tables in real-time, unlike standard experimental procedures where data have to be compiled, tabulated, and analyzed.

Despite this interpretation, the results of this research question are supported by some researchers' findings (St. Amant, 2007; Chang & Hwang, 2018; Lynch et al., 2008; Brinson, 2015; Salmon 2012; Mitchell & Forer, 2010; Sun et al., 2008; Demetriadis&Pombortsis, 2007 Sangrà, Vlachopoulos& Cabrera, 2012; Smith, Lange & Huston, 2012).

The results showed that the public-school teachers group reported High–Moderate challenges in online learning. The private school teachers group had a similar response. Thus, it can be inferred that public and private school teachers face a challenge in online learning, the former more so. The High and Moderate online education challenges faced by teachers in both groups, as measured by the THJ, could be interpreted differently. For example, online learning is more subject to distractions, disturbances, and interruptions (Hillis & Munro, 2005). This affects the learner's concentration, making them miss some critical points and concepts, which makes it hard for them to understand or solve related problems (Kitchenham, 2006). Learners also tend to forget about the assignments given, increasing the ratio of tardy submissions.

The platforms also lower the quality of the content given as well as how it is delivered. Most teachers do an exemplary job when it comes to classroom interaction but prove less capable at online communication with their students. When learning physics, a deep understanding of the concepts is required to get good grades. This degradation of teaching quality is a massive blow for online learning, as quality is one of the most significant considerations for stakeholders in the education industry, especially for physicists who are an integral part of the world's technological advancements (Hrastinski, 2008).

While the cost of online learning is relatively low compared to traditional classrooms, online classes have many hidden costs. Some are one-time costs, while others are recurring. For instance, a stable and reliable Internet connection is essential, as is software (Nel & Wilkinson, 2006). Other expenses include the purchase of devices such as printers, which are quite costly. In the long run, systems require constant updates and power, which also costs money. This may prove burdensome to most students and could thus lead to them being left behind by their classmates or, worse, dropping out.

The technology used to achieve online learning is quite advanced, which might be a problem for most teachers (Nel & Wilkinson, 2006), especially so if this is their first time interacting with the platforms. The technology might also malfunction, which might suspend learning until the problem is fixed. The difficulties faced by first- timer users in navigating interfaces might lead to time wastage as they develop the skill to use the applications (Kitchenham, 2006). It is, therefore, unfavorable to some members and, accordingly, a less complicated system should be developed.

Despite this interpretation, it is beneficial to find that the results of this research question are supported partially or wholly by previous studies and statistics (Kim &Kankanhalli, 2009; Siegel, 2008; Pickering, 2009; Duin& Gurak, 2004).

7. Implementation and Recommendations

Online learning is a new paradigm that possesses several inherent features that foster progress in learning and other traits that hinder same. This new approach has excellent potential to become an established teaching method if the necessary measures are put in place and followed diligently to help better the "new normal," which, if well managed, could fully replace the traditional classroom system (Robertson et al, 2006). To improve the online system, stakeholders should consider tackling the problems that have arisen because of these new social developments.

Another major challenge is the lack of skill among users. Online platforms require a user to be adept at them. However, most users are first-timers, as they have been exposed only to standard classroom learning until now (Nancheva&Stoyanov, 2005).

If well organized, online learning could become more widespread and eventually replace the traditional classroom method. However, the research shows that one last change will have to be implemented at some point. Physics is considered to be among the most challenging topics for students, especially in online learning, as it requires the development of practical skills. Teachers and students have to understand the relationship between

experimental and theoretical work and how online learning is different from classroom learning. This will help develop better methods of teaching practical physics (Nancheva&Stoyanov, 2005). Physics courses require students to learn how to solve mathematical problems, which can be a very complicated process. Online learning can be useful when teaching physics, as it is more student-centered, enabling students to explore and obtain results.

Technology has become an essential part of education, as it makes school learning programs successful (Leask, 2004). As this has become the new normal, the UAE and the rest of the world should consider empowering and investing resources in this particular field, as it might gradually replace the current system (Hrastinski, 2008). The outcomes could be considerably negative, if the government turns a blind eye to the fact that there still exists a gap between the two worlds that requires addressing.

8. CONCLUSION

In the study, a clear and precise description is provided on how to foster online physics learning in the UAE. An explanation is provided about the benefits and challenges of online learning in comparison with the classroom scenario.The study gives a clear and in-depth insight on how online learning, especially in physics, corresponds to classroom learning. It also provides information on factors that can improve current online learning and make it better. It allows stakeholders to enhance online learning by considering the above factors.

Online learning has a significant dependency on technology. The government in the UAE should consider the fact that this could be slowly replacing traditional learning methods. Given its many advantages, most stakeholders might consider adopting the technique (Kim et al., 2001). This might prove helpful despite the enormous costs incurred from the transition of learning physics in school to online learning. However, the latter will face numerous challenges, especially when teaching the practical parts through a virtual laboratory and computer simulations. Online learning can be a success if these problems are overcome. Approximately 68.2% of the teachers' sample are well-acquainted with the Internet. However, the other 31.8% of high school teachers are facing issues and do not have the knowledge of using computer simulations for practical physics, which is a significant hindrance that needs to be addressed in the UAE (Adeyemo, 2010).

All the above measures and technological advancements have enabled the smooth functioning of high schools in the UAE, even during these trying times. However, it is not devoid of challenges, as most technological advancements always have room for improvement. Online learning, being new to almost everyone, has not been easy to adapt to, but most involved parties have tried their best to work within the new system.

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