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Teachers' and Students' Attitudes Toward Online Physics Education During the COVID-19 Pandemic in UAE

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Since the detection of first cases of Covid-19 in the United Arab Emirates (UAE) the education system has faced drastic changes after schools' closure in response to the pandemic. UAE schools started teaching online as an alternative measure without stoppage to limit exposure. This study uses a cross-sectional descriptive design to examine teachers' and students' attitudes toward online Physics education in the UAE after four months of teaching and learning online. Cross-sectional participants included 418 secondary school students and 58 physics teachers who had to rely on online education to deliver their instruction during the 2020-2021 academic year in one of the major cities in the UAE. Using comparative method to compare the attitudes of students and physics teachers, based on various categorical groups, indicated that statistically significant differences in attitudes exist between public and private schools' students. However, there were no statistically significant differences in attitudes of physics teachers' groups toward using online education to deliver their instruction. On the other hand, there were statistically significant differences in attitudes among students based on gender. The findings of this study were discussed within the recent educational reforms introduced in the UAE and they are likely expected to impact not only physic teaching and learning but also future online educational practices in general.

Keywords: online learning, physics education, teachers' attitudes, students' attitudes, secondary school learning

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INTRODUCTION

The pandemic of Covid-19 has led to several dramatic global implications across several sectors, including the education sector. Due to the high infectious nature of this virus, all educational institutions were obliged to apply strict social isolation measures. In an attempt to minimize physical interaction between the working staff, teachers, and students to the maximum possible extent, a wide-spread campaign to implement online teaching was enacted which would affect all schools in the country. Much earlier, St. Amant (2007) noted that schools should consider a more serious exploitation in online education to help shape the technical communication's universal face. Unexpectedly, the current crisis has made digital communication not only a stressing coping strategy, but also an indispensable need.

The UAE has engaged in online education to cope with the challenges caused by the pandemic. Due to the abstract nature of physics concepts which may require high cognitive ability to comprehend as suggested by Tairab et al. (2020), physics content would be more difficult for students to master through online learning. In addition, Sari et al. (2019) argued that the mathematical complexity of physics can quickly overwhelm students' intuition. This problem is likely to increase when students are suddenly deprived from their normal schooling because of the pandemic.

Generally, the effective use of online education for teaching facilitates opportunities that enhance the education environment (Chang & Hwang, 2018; Hazaymeh, 2021). This is mainly because technology enables students to access information quickly and use visual learning aids that cannot be easily provided in other ways (Lynch et al., 2008; Gjelaj et al., 2020). Such efficiency in terms of information flow and usage became even much more evident in recent years with the advent of the era of big data. Therein, researchers investigating the role of online learning in the education system believe it is the best option to deal with restrictions on access to education (Dennison, 2014; Lynch et al., 2008). Besides, online learning can improve effectiveness, quality, time, and educational attainment for all (Al Soub et al., 2021; Brinson, 2015).

Another key advantage of online learning is compromising the students' personal learning style in addition to providing the maximum individual support through control over learning activities (Demetriadis & Pombortsis, 2007; Sebnmen, 2015). As a result, the avenues of online learning start to increasingly receive a prevailing acceptance and preference as an 'unconventional' mode of education (Altbach et al., 2019; Suarsana et al., 2019; Mitchell & Forer, 2010). Regardless of the heated debate on the effectiveness of online education, raising concerns on how to take full advantage of it, would remain significant.

The success of online learning depends mainly on teachers' and students' attitudes toward online learning systems (Van Raaij & Schepers, 2008; Demetriadis & Pombortsis, 2007; Lynch et al., 2008). According to Pyatt and Sims (2012), attitudes toward specific instructional medium and teaching methods are essential factors influencing learning. This study used Schwaz's (2007) definition of "an attitude" as a positive or negative evaluative of an entity based on affect, perception, or behavioral

experience. This study also defines attitudes procedurally as the degree that students and teachers obtained from the attitude assessment scale prepared for this purpose.

To the best of our knowledge, the current study is among the first of its kind within the UAE context to address the impact of the pandemic on participants' attitudes towards online Physics instruction. It is believed that the findings would provide an exhaustive account on UAE attitudes of secondary schools' teachers and students toward online physics instruction as a first step to maximize future productive engagement with online physics learning during the Covid-19 pandemic. Furthermore, the findings can be used as a foundation to improve students' relevant practice-based skills, which in turn, serves as a guidance for more effective physics lessons delivery, both for curriculum developers and physics teachers.

In addition, two main contributions of the current research can be achieved; (1) encouraging the adoption of online learning during the COVID-19 pandemic through providing a framework for improving essential skills in students through practice, (2) defining certain measures to reconcile the differences in the attitudes toward online learning between students and their teachers. Defining such measures requires greater exertion by physics teachers in making students aware of the value of having the right attitude toward the subject. In addition, teachers should include creative and innovative activities when implementing online instruction to make physics learning relevant and meaningful.

Purpose and Research Questions

Currently there is a lack of research on teacher's and students' attitudes towards online education in the UAE context with particular focus on secondary school physics learning. Hence the primary objective of the present study was to assess the UAE physics teachers' and students' attitudes towards online learning as well as to assess whether there were gender differences in attitudes across public schools and private schools' students. Specifically, the study is guided by the following research questions:

1. What is the overall level of attitudes towards online Physics education for Secondary school UAE students and teachers?

2. Are there any statistically significant differences in attitudes between UAE public and private school students who studied Physics via online learning during COVID-19?

3. Are there any statistically significant differences in attitudes between UAE public and private school teachers who taught Physics via online learning during COVID-19?

4. Are there any gender differences among students' and teachers' attitudes towards online Physics learning during COVID-19?

Conceptual Framework

The study employs Davis's et al. (1989) Model of Technical Acceptance (TAM) which is an information system theory that determined factors contributing to acceptance and rejection of modern technology and find appropriate corrective measures or

explanations for the user's decision (Davis, 1989; Turner et al., 2010). Hence, it provides a basis for determining external variables' influence on internal beliefs, abilities, and personal attitudes, which increases students' attitudes directly and indirectly along with positively impacting students' online learning competencies. According to this model, people's opinions about the system may be influenced by many factors, named as External Variables (Lai, 2017). These influencing factors have an impact on the learners perceived Usefulness, meaning the users' potential of how using a specific system will improve their behavior, and on their perceived Ease of Use which refers to the degree to which the potential users expect the goal of a plan to be comfortable (Davis, 1989). Consequently, these perceptions direct the learners' attitude toward online learning, and therefore their behavioral intent and actual use of the system, either positively or negatively (see Figure 1).

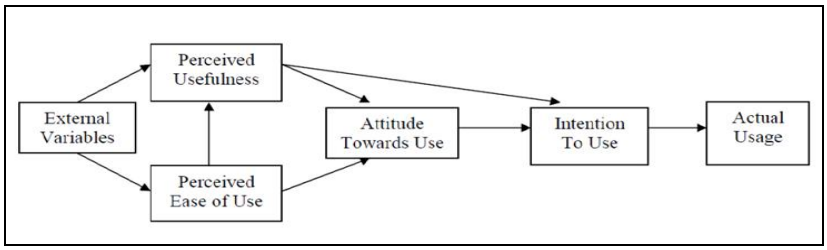

Figure 1
Technology acceptance model (TAM) (Lai, 2017).

Literature Review

Literature on online learning has a long tradition in terms of scope and foci. Recently, the internet has increasingly become a valuable educational tool being utilized for reinforcing the learning process and augmenting students' engagement. Whether it is web-based learning, online learning, or virtual labs, they all refer to using the "network" as a source of information, making the internet one of the most used educational methods, both at the schools, university, and higher education level (Chang & Hwang, 2018). It is apparent, though, that online learning grants students the opportunities of authentic learning that is hardly separable from their unique backgrounds, culture, experience, and orientations (Tan et al., 2017).

Focusing on the impacts of online learning, a number of research studies examined the effect of designed online learning environments on users learning potential and engagement. For instance, Jimoyiannis and Komis (2001) reported that flexible learning environments positively contribute on students understanding across different subjects. Similarly, Fung (2004) argued that if learners can easily use learning resources, they will participate more effectively in collaborative discussions over the Internet. Martin (2013) and Awan (2012) aimed to evaluate the level of participation of Emirati higher education students in digital technologies compared to the international model, indicated that students have better access to digital technologies than many other countries. Furthermore, large body of literature over the past two decades developed different attitude scales towards online learning and web-based learning resources (e.g., Morse et

al., 2011; Hernández-Ramos et al., 2014; Scager et al., 2016). These resources emphasized the importance of considering students' motivations and attitudes when integrating learning technology.

Findings in this respect provide positive evidence that interactive features of online courses can help learners grasp advanced concepts, regardless of whether group members have similar or different backgrounds. On the other hand, lack of direct communication between learners was reported as impeding factor that reduce the learner's positive attitudes towards online collaborative learning (Ling & Ku, 2006). In contrast, Scager et al. (2016) found that online collaboration for social purposes is more beneficial than building knowledge and online discussions are constructive to initiate conversations. Oymak and Ogan-Bekiroglu (2017) analyzed and compared 144 students' conceptual knowledge and attitudes in the context of high school Physics lessons using technically supported teaching. Results showed that students' attitudes are improved as a result of the inclusion of technology-based education. Likewise, the effect of virtual labs on attitude towards adolescent students' Physics was explored by Kattayat et al. (2016). They found that achievement scores in Physics of students who were taught using virtual labs and others who followed traditional lecture methods were correlated separately using Pearson 'r' with the scores obtained by administering the Physics attitude scale. Results yielded a significant positive correlation between the achievements in Physics of adolescent students exposed to virtual lab instruction and their attitude towards Physics.

Concerning gender differences in attitudes toward online learning, previous studies on gender suggested that male students had more positive attitudes toward online learning than female students (Liaw & Huang, 2011; Papaioannou & Charalambous, 2011). In contrast, Egbo et al. (2011) and Asleitner and Steinberg (2005) found that female students were more accepting of online learning than their male counterparts. Other research reported that there is no significant differences in attitudes toward online learning between boys and girls (Alsalhi et al., 2019; Li et al., 2018).

METHOD

Research Design

The study adapted an exploratory cross-sectional descriptive design technique in an attempt to assess student's and teacher's attitudes toward online learning of physics. Such a design allows us to describe the community's attitudinal orientation, and hence the level of attitudes among the participants (Zheng, 2015).

Sample and Data Collection

The target population was physics teachers and their students (average age 16 years old) from secondary public and private schools (grade 9 to grade 12) in one of the major cities in UAE. Participants were purposefully selected to ensure they meet the predefined criteria placed for this research in terms of the target subject, grade level, language of instruction, and instructional method. The students' sample consisted of 418 male and female students whereas the teachers' sample consisted of 58 male and female teachers. The demographics of both the student's and teacher's sample vary across

participants as shown in table 1 and table 2. The study was conducted during the second semester of the academic year 2019/2020 (starting from March 2020 and ending in July 2020) where online learning was fully implemented.

Table1
Distribution of the students' sample according to the demographic characteristics

		Public School		Private School	
Characteristics		N	Percentage	N	Percentage
Total Sample		351	49.5	211	50.5
Gender	Female	64	15.3	122	29.2
	Male	143	34.2	89	21.3
Grade	12	166	39.7	52	12.4
	11	36	8.6	87	20.8
	10	4	0.1	42	10.0
	9	1	0.02	30	7.2
Received training on effective online learning	Yes	159	38.0	140	33.5
	No	48	11.5	71	17.0
Hours (h) spend per day on online learning	< 1.0 h	34	8.1	24	5.7
	1.0 h to less than 2.0 h	79	18.9	57	13.6
	2.0 h to less than 3.0 h	32	7.7	46	11.0
	More than 3.0 h	62	14.8	84	20.1

Table 2
Distribution of the teachers' sample according to the demographic characteristics

		Public School		Private School	
Characteristics		N	Percentage	N	Percentage
Total Sample		31	36.5	54	63.5
Gender	Female	15	17.7	37	43.5
	Male	16	18.8	17	20.0
The educational level	Bachelor	18	21.1	49	57.6
	M A	11	13.0	5	5.9
	PhD	2	2.40	0	0.0
Taught grades	12	19	22.4	11	13.0
	11	6	7.00	6	7.00
	10	2	2.40	8	9.4
	9	4	4.70	29	34.1
Years of experience	<5 years	4	4.70	19	22.4
	5 to less than 10	1	1.20	16	18.8
	10 to less than 15	5	5.90	6	7.00
	15 years and over	21	24.7	13	15.3
Received training on how to teach through online learning	Yes	24	28.2	34	40.0
	No	7	8.30	20	23.5
Hours per day allocated for preparing online learning lessons	< 1.0 h	0	0.0	3	3.40
	1.0 h to less than 2.0 h	6	7.00	23	27.1
	2.0 h to less than 3.0 h	13	15.3	11	13.0
	More than 3.0 h	12	14.2	17	20.0

Survey instrument "Teachers' and Students' Attitudes toward Physics Education (TSAPE) online questionnaire" was utilized to assess students and teachers' attitudes toward their online education experience. The questionnaire was adapted to from Kisanga and Ireson (2016). The questionnaire consists of 12-items against a five-point Likert scale. A group of educators, psychologists and researchers edited the content and format of the TSAPE questionnaire. According to their recommendations, the final version of the questionnaire was reimagined and redesigned to ensure construct validity. Furthermore, 20 students and 16 teachers were recruited to participate in a pilot study to ensure the target population could correctly understand and respond to the intended items. Minor changes had been applied specifically into the wording of the items as per the participant's suggestions. Moreover, to ensure the reliability of the results for TSAPE instrument, Cronbach's Alpha coefficient was calculated and showed the reliability coefficients to be 0.74 for the student's questionnaire and 0.82 for the teacher's questionnaire, thus, these indices were considered reliable measure.

Data Analysis

Descriptive statistics Mean (M), and Standard Deviation (SD) were calculated for the items of the two groups of students and teachers. Percentages were used to compare participants from public schools with those from private schools. Moreover, to investigate the significance of attitudes toward online physics lessons, a nonparametric Mann–Whitney independent samples test was used to compare the mean scores obtained by participants of the public-school students' group with scores obtained by participants of the private school students' group.

FINDINGS

Findings related to research question one "Students' attitudes toward online physics education".

The results of the first research question are reported in table 3 and 4. As can be seen in table 3, analysis of student's attitudes toward online education shows that students in public-school reported having high or moderate degree for most items. With the range of the means for the 12 items extending from 2.2 to 4.39. In contrast with the group of private-school students, five items suggested high attitudes towards online Physics education, ranging between 3.48 and 3.88, and four items were reported as moderate ranging between 2.84 and 3.21. The means of all items varied between 1.95 and 3.88. Thus, the means in all attitudes towards online Physics education for the public-school group tended to exceed that of private-school one. To add, both groups varied in terms of the frequency range of challenges.

Table 3
Descriptive statistics of students' attitudes toward online education

Attitudes toward online learning	Public school students			Private school students		
	Mean	SD	Degree*	Mean	SD	Degree
Computers make physics more interesting.	3.54	1.11	High	3.71	1.08	High
I enjoy studying physics by using computers.	2.55	1.21	Little	3.48	0.87	High
Receiving physics lessons through electronic technologies is very difficult.	2.84	1.12	Moderate	3.10	2.01	Moderate
Communicating through social networks is fun.	3.75	0.98	High	3.88	1.05	High
Studying physics through online learning is tiresome.	3.3	0.95	Moderate	2.40	1.9	Little
The physics topics have enough teaching-learning resources to carry out online learning.	4.2	0.87	High	3.84	1.04	High
I like discussing new online learning innovations.	4.15	0.95	High	2.84	1.12	Moderate
It will be difficult for me to become skillful in the use of online learning tools.	2.65	0.65	Moderate	3.10	2.01	Moderate
Using a computer at home is very frustrating.	2.2	0.96	Little	3.21	1.03	Moderate
Using online learning technologies will allow me to accomplish more work than would otherwise be possible.	4.39	0.72	High	3.63	.123	High
I find online computer interaction unexciting.	3.97	0.97	High	2.42	0.98	Little
Communicating through electronic mails is annoying.	3.74	1.14	High	1.95	1.03	Little
Overall scores	3.44	0.97	High	3.13	1.19	Moderate

*Very high (4.21- 5.0), High (3.41-4.20), Moderate (2.61-3.4), Little (1.81- 2.60) and very little (1.0- 1.80) (Alsalhi et al., 2019)

Findings related to research question one "Teachers' attitudes toward online physics education".

Table 4 shows that most attitudes towards online Physics education, whose means extended between 1.20 and 4.56, were reportedly high for the group of public-school teachers. Regarding the private school teachers' group, results show that the means of all items ranged between 2.20 and 4.62. Also, it is found that the physics curriculum, being sufficiently resourced for online instruction and learning, reportedly scored very high (M = 4.62). Therefore, unlike the public-school teachers' group, means in all attitudes towards online Physics education tended to be greater for the private-school teachers' group.

Table 4
Descriptive statistics of teachers' attitudes toward online education

Attitudes toward online learning	Public school teachers			Private school teachers		
	Mean	SD	Degree	Mean	SD	Degree
Computers make physics more interesting.	3.94	2.12	High	4.16	1.42	High
I enjoy teaching physics by using computers.	2.11	1.04	Little	3.32	0.98	Moderate
Sending physics lessons through electronic technologies is very difficult.	1.20	1.14	Very little	2.20	1.01	Little
Communicating through social networks is fun.	3.12	1.32	Moderate	4.16	1.42	High
Teaching physics through online learning is tiresome.	4.16	1.08	High	4.12	0.89	High
The physics topics have enough teaching-learning resources to carry out online learning.	4.50	1.22	Very high	4.62	0.91	Very high
I like discussing new online learning innovations.	2.45	.69	Little	3.12	1.32	Moderate
It will be difficult for me to become skillful in the use of online learning tools.	4.16	1.42	High	3.12	1.32	Moderate
Using a computer at home is very frustrating.	4.56	0.71	Very high	3.88	0.83	High
Using online learning technologies will allow me to accomplish more work than would otherwise be possible.	3.2	1.45	Moderate	4.10	1.11	High
I find online computer interaction unexciting.	3.48	1.12	High	4.18	0.78	High
Communicating through electronic mails is annoying.	3.62	.77	High	4.10	1.06	High
Overall scores	3.38	1.17	Moderate	3.76	1.09	High

Findings related to research question two "Are there any statistically significant differences in attitudes between UAE public and private school students who studied Physics by online learning during COVID-19?". Given that the data collected violated the parametric test assumptions (homogeneity); the next step taken was performing a test on the hypothesis using the Mann-Whitney independent sample test to compare the mean scores obtained by the participants of the public-school teachers group to those obtained by the private school teachers group (Table 5).

Table 5
Students attitudes ranks calculated by Mann-Whitney U test

	Ranks		
Attitudes toward online learning	N	Mean Rank	Sum of Ranks
Public school students	207	184.70	38232.00
Private school students	211	233.83	49339.00
Total	418		
	Test Statistics		
			Post Score
Mann-Whitney U			16704.000
Wilcoxon W			38232.000
			-4.162
Asymp. Sig. (2-tailed)			.000

Students' attitudes results from the Mann-Whitney Test showed that the two groups' medians are different: (38232.00), and (49339.00). The obtained Mann-Whitney U statistic is (16704.000). When corrected for tied rankings and converted to a z-score (critical ratio test), this value is statistically significant at the 0.05 level. (U = 16704.000, p = 0.000) $p < 0.05$, meaning that the medians are statistically different. Therefore, the two medians' probability for the two groups being the same is small.

Findings related to research question Three "Are there any statistically significant differences in attitudes between UAE public and private school teachers who taught Physics by online learning during COVID-19?". Given that the data collected violated the parametric test assumptions (homogeneity); the next step taken was performing a test on the hypothesis using the Mann-Whitney independent sample test to compare the mean scores obtained by the participants of the public-school teachers group to those obtained by the private school teachers group (Table 6).

Table 6
Teachers attitudes ranks calculated by Mann-Whitney U test

	Ranks		
Attitudes toward online learning	N	Mean Rank	Sum of Ranks
Teachers from Public schools	31	38.18	1183.50
Teachers from Private schools	54	45.77	2471.50
Total	85		
	Test Statistics		
Mann-Whitney U			Post Score
			687.500
Wilcoxon W			1183.500
Z			-1.370
Asymp. Sig. (2-tailed)			.171

Teachers' attitudes results from the Mann-Whitney test showed that the two groups' medians vary significantly: (1183.50), and (2471.50). The obtained Mann-Whitney U statistic is (687.500). When corrected for tied rankings and converted to a z-score (critical ratio test), this value is not statistically significant at the 0.05 level. (U = 687.500, p = 0.171) $p > 0.05$. This result means that the two medians' probability for the two groups being the same is very high. Thus, it can be concluded that there is no statistically significant difference between the median scores of the public-school teachers and the private school teachers in their attitudes towards online Physics education.

Findings related to research question four

In reporting results relating to research question four (*Are there any gender differences among students' and teachers' attitudes towards online Physics learning during COVID-19?*), table 7 shows the means and standard deviations of each group based on their gender.

Table 7
Descriptive statistics of teachers and students stratified by gender

Participants	Male		Female		Total	
	Mean	SD	Mean	SD	Mean	SD
Public school student	2.8730	.90883	2.7733	1.02501	2.8286	.96236
Private school student	2.7259	.94200	3.0294	1.03763	2.9006	1.00713
Public school teacher	2.1875	.85174	2.0056	.85534	2.0995	.84421
Private school teacher	2.0980	.80160	2.6104	1.07673	2.4491	1.01939

Gender differences in student attitudes toward online physics education

Table 8 and 9 below presents results of an independent-sample t-test that compares the mean scores of the TSAPE to determine whether the two genders were comparable after practice online physics education for students' group. It was found that attitudes score at p- level < 0.05 were significantly different between the two groups (t (210) = -2.188, p = 0.030). This result indicates that female students (M = 3.0294, SD = 1.037) attitudes towards online Physics education is significantly higher than male students (M = 2.7259, SD = 0.942) in private schools. However, the attitudes scores were not significantly different between the two genders for the public schools (t (205) = 1.053, p = 0.293). Therefore, there is no difference in attitudes between the female students (M = 2.77, SD = 1.025) and the male students (M = 2.8730, SD = 0.90883).

Table 8
An independent-samples t-test of the attitudes scores of private school students'

	Groups	N	Mean	SD	t	df	Sig.
Private School Students'	Male	89	2.7259	.94200	-2.188	210	.030
	Female	122	3.0294	1.03763			

Table 9
An independent-samples t-test of the attitudes scores of public-school students'

	Groups	N	Mean	SD	t	df	Sig.
Public-School Students'	Male	143	2.8730	.90883	1.053	205	.293
	Female	64	2.7733	1.02501			

Gender differences in teacher's attitudes toward online physics education

Table 10 and 11 below presents results of an independent-sample t-test that compares the mean scores of the TSAPE to determine whether the two genders were comparable after practice online physics education for teachers' group. It was found that for the private schools' teachers, attitudes, whose score at p-level was < 0.05, demonstrated insignificant variance for the two groups: (t (52) = -1.748, p = 0.086), indicating there is no statistically significant difference in attitudes between the female teachers (M = 2.6104, SD = 1.07673) and the male teachers (M = 2.0980, SD = 0.80160). For the public schools' teachers, the attitudes scores were not significantly different between the two groups (t (29) = 0.593, p = 0.558), indicating no statistically significant difference in attitudes between the female teachers (M = 2.0056, SD = 0.85534) and the male teachers (M = 2.1875, SD = 0.85174) in public schools.

Table 10
An independent-samples t-test of the attitudes scores of private school teachers'

	Groups	N	Mean	SD	t	df	Sig.
Private School Teachers'	Male	17	2.0980	.80160	-1.748	52	.086
	Female	37	2.6104	1.07673			

Table 11
An independent-samples t-test of the attitudes scores of public-school teachers'

	Groups	N	Mean	SD	t	df	Sig.
Public-School Teachers'	Male	16	2.1875	.85174	.593	29	.558
	Female	15	2.0056	.85534			

DISCUSSION

Overall, findings showed that students' attitudes towards online Physics education are significantly higher in private and public-school students. Additionally, the most and least frequent attitudes towards online Physics learning were different in both groups. This result can be explained by the fact that most of the sample of public-school students chosen, were from the twelfth grade, which constitutes the essential class; therefore, requires students to research and learn from the online learning more often. For the teachers' group, results showed that private school teachers' level of attitudes towards online Physics education are more positive than public school teachers' attitudes. There are different interpretations for both groups' high and moderate attitudes towards online Physics education as measured by the TSAPE. One of the contributing reasons was "flexibility" in the sense that it affords place and time options for the teaching schedule, which reduces travel hassle and time waste and relaxes the restrictions of instruction venues. Another reason for student's high positive attitudes toward online physics learning has to do with the ability to engage in other self-building activities and learning resources at their convenience (Yaki et al., 2019). Robertson et al. (2006) explained this feature is advantageous compared to the standard classroom scenario. Likewise, there is ample time for teachers in this learning system. Additionally, results also showed that the dynamic online interaction experience contributes to the participant's high attitudes toward online learning, which is an aspect that is lacking in face-to-face class environment (Laws, 2013) as it requires both the teacher and the students to avail themselves in class and in time, which might prove tedious to some members as they might require intensive travel.

Results also indicated that participants have high level of positive attitudes toward physics online learning due to the reason that the digital learning has more learning material as the online learning platforms along the search engines can provide extended opportunities of accessing and sharing information. The classroom situation is restricted to bookish learning and prescribed sources of information. This seemed to be very true given the case of practical experiments as many of the experiments that are hard to carry out on campus can alternatively be conducted via different simulators yielding, thanks to their automatic sensors and converters, more accurate results, giving ample room for productive experimentation and reproducibility (Lowe & Vespestad, 1999).

In contrast, results showed that there is no statistically significant difference in attitudes towards online Physics education between the public and private school teachers as concluded by the nonparametric Mann-Whitney Test, ($U = 687.500$, $p = 0.171$) $p > 0.05$. At this point, it is important to bear in mind that all the teachers in all schools, regardless their specializations, displayed awareness and understanding of online learning during the Covid-19 pandemic era because of training initiatives put forward by the UAE Ministry of Education. Extensive training and support had been provided to all teachers within the UAE prior to, as well as during the implementation of the distance learning programs (Kuzbor, 2019). Much earlier, and as part of requirements for the future compulsory teaching license in the country, teachers are expected to have a good mastery of computer technology (Awan, 2012).

Finally, our findings found that in public schools, online Physics education attitudes are more significant in females than in male students. However, no difference in attitudes between the male and female teachers was found between private and public schools. Likewise, this could be explained because all the teachers, generally, are well qualified and most public and private schools' teachers underwent professional development courses on online instruction techniques, as was indicated by the responses of the relevant demographic question that 77.4% of participating teachers form public schools 63% of private school's teachers have received training on online teaching-learning.

Overall, the findings of this research go in harmony with other researcher's findings such as those conducted by Demetriadis and Pombortsis (2007), Lynch et al. (2008), Pyatt and Sims (2012), Morse et al. (2011), Hernández-Ramos et al. (2014), Oymak and Ogan-Bekiroglu (2017), Kattayat et al. (2016), Martin (2013), and Kurniawan et al. (2019). Additionally, the findings are in line also with TAM's theoretical framework for predicting acceptance and rejection of modern technology (Davis et al., 1989). TAM provides the foundation for determining the impact of External Variables on inner beliefs, abilities, and private attitudes. This directly and indirectly improves student attitudes and has a positive impact on students' online learning skills.

CONCLUSION

Online Physics learning, which may have been underestimated as a method for teaching in the past, has now gained large popularity and acceptance within the education fraternity, so much so that it could be deemed an important and necessary part of Physics instruction. The paper examines the UAE secondary school teachers and student's attitudes toward online Physics learning and how this has been implemented and activated within the UAE school education system due to the global Covid-19 pandemic. Furthermore, the current findings discussed the benefits and challenges of physics online learning compared to the traditional classroom scenario, as well as factors that can make this approach more effective. Virtual labs and computer simulations practically present challenges to online learning of Physics. Statistically speaking, 71.5% of the students' sample and 68.2% of the teachers' sample received training on effective online learning and teaching; on the other hand, the remaining 28.5% of students and 31.8% of secondary school teachers struggled and didn't receive

any training at Physics-related online learning and teaching. This poses a significant obstacle inviting immediate remediation (Adeyemo, 2010).

RECOMMENDATION

The recent adaptation of online learning as a consequence of the current paramedic of Covid-19, has excellent potential to become a success if the necessary measures are put in place and followed rigorously to help improve this new norm (Robertson et al., 2006). In doing so, stakeholders should consider tackling the arisen concerns and problems. Taken the school context, which are considered both academic and social centers, the online community needs to be incorporated in a way that enables both the learners and the teachers to occupy a specific responsive position in the communal chain (Hrastinski, 2008). Hence, allowing for the convenience of all stakeholders.

LIMITATION

This study has some limitations. First, the participants in this study were physics teachers and their students (age ranged between 15-18 years old) from schools in one city in the UAE. Although participants were purposefully selected, the size of the sample might have impacted the findings across students' grade, teachers, and type of teaching (i.e., public or private). Moreover, although the students studied the same topic included in the same textbook and followed the same study plan, they were taught by different teachers (i.e., male and female teachers) which may have influenced the results. Finally, another limitation is that the study was conducted using materials which is not designed specifically for the UAE curriculum. For example, the objects and the graphs were not consistent with curriculum. This may influence the results.

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