Teacher's awareness to develop student cyber security: A Case Study

Osman Sirajeldeen Ahmed [1], Saeed Ameen Nasef [2], Alaa Zuhir Al Rawashdeh [3], Mohd. Elmagzoub Eltahir[4]

[1] Department of sociology, Ajman University, Ajman, UAE
[2]Department of sociology, Ajman University, Ajman, UAE
[3]Department of sociology, Ajman University, Ajman, UAE
[4] Department of education, Ajman University, Ajman, UAE
o.ahmed@ajman.ac.ae[1], s.nasef@ajman.ac.ae[2], alaa.a@ajman.ac.ae[3], m.babiker@ajman.ac.ae[4]

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Abstract: This study aims to investigate the awareness level among school teachers of their students' cybersecurity. The teachers' perception of their students' cybersecurity awareness was examined based on a case study of the emirate of Ajman private schools in UAE. A survey was conducted of a sample of school teachers at 29 private schools in Ajman. Stratified random sample for schools in the Emirate of Ajman have been used and then a systematic random sample of 172 teachers in the schools were chosen as the target population representation. Results of the study indicate that the level of awareness of school teachers towards their students' protection and safety in 13 variables that had been studied is increased and this awareness has decreased in eight other variables, the study also reveals that there is a statistically significant relationship between the variable of specialization, and teachers' awareness towards their students' cybersecurity driven mainly by the significant differences between the average responses of mathematics teachers and the Arabic language in favor of mathematics teachers, and the difference between the average responses of social science teachers and the Arabic language in favor of social science teachers, and the difference between the average responses of social science teachers and the English language in favor of social science teachers.

Keywords: Awareness, Cybersecurity, School's Teacher, Student, UAE

1. Introduction

Most countries around the world, including Arab countries, moved towards distance education during the breakout of the COVID-19 pandemic (UNESCO, 2020a; 2020b; 2020c; 2020d). This shift to distance education has continuously increased the number of internet users in Arab countries, especially among school teachers and students, and access to the internet network and eLearning applications and tools have become available to them (Statista, 2020; UNICEF, 2020). However, in Arab countries, the majority of internet users in general and school students in particular are not receiving appropriate education regarding the safe use of the internet, which exposes these students to a number of serious cyber threats, such as bullying, fraud, sexual harassment, and privacy violation. Therefore, it is extremely important that all students understand how to use the internet correctly and safely (Aboul Enein, 2017; Arishee, 2019).

Notably, the United Arab Emirates is one of the most developed and prosperous countries among the Arab countries in terms of population, economy, and global impact (World Bank, 2019). Today, the UAE is home to 9.6 million people according to 2018 World Bank data (up from only 1.3 million in 2000), with 14% of the population under the age of fifteen. Give the economic growth, many investors and workers travel to the UAE for employment opportunities, to increase their global contact, and make the most of the benefits (Abdulla, 2017). UAE growth places them among the world's fastest growing economies (Alshehhi, 2017). The adoption of technology also continues to increase, along with the ownership of mobile devices and the use of social media (Statista, 2020; Chandra, Sharma, & Liaqat, 2019).

Alongside this rapid economic growth, digitization comes with new risks and weaknesses that could undermine the UAE's progress. The most important of them is the global rise in cybercrime. As most UAE sectors have moved online, the education sector also did so during the spread of the COVID-19 (Almuraqab, 2020). Students and their computer systems become attractive targets for growing professional cadres of cybercriminals (Chebyshev, Sinitsyn, & Parinov, 2018; Chandra, Sharma, & Liaqat, 2019). For UAE to reach its full potential, policymakers must implement effective policies and initiatives that raise awareness to stem the growing tide of cyber threats. Unfortunately, policymakers, technicians, and other experts in most sectors, especially the education sector, have long noted the lack of detailed and reliable information about threats related to cybercrime in educational institutions (Al Neaimi, & Lutaaya, 2017; Chandra, Sharma, & Liaqat, 2019).

2. Significance and aim of the study:

There are only a few studies and initiatives to ensure the safe use of the cyberspace among students in UAE educational institutions. The aim of this research was to investigate this gap by shedding light on this social and educational problem and develop a culture of cybersecurity among teachers and students in the Arab countries, especially the UAE. The teachers' perception of their students' cybersecurity awareness was examined based on a case study of the emirate of Ajman private schools in UAE.

Questions of the study:

In order to achieve the aim of this study the researchers sought to address the following research questions:

SQ1. To what extent are teachers aware of the importance of cybersecurity for students?

SQ2. Is there any significant relationship at the level of significance ($\alpha \leq 0.05$) in the degree of teachers' awareness of the importance of cybersecurity for students due to the study variables (gender, age, specialization, experience)?

Previous Study:

The problem of cybersecurity is not limited to Internet users from school students in the Arab countries only, but it is an international issue that affects Internet users around the world, especially adolescents who do not have sufficient experience to deal with such an issue (Chandra, Sharma, & Liaqat, 2019).

In the study of Chiua, & Hob, (2019) aimed to investigate the level of cybersecurity awareness and practices for Taiwanese school teachers. the study used the quantitative design and a questionnaire was distributed to 250 Taiwanese school teachers. The results of the study show that teachers were not familiar with many cybersecurity activities. The study also investigated the difference on cybersecurity awareness among teachers with different age, teaching seniority, and school location, the results indicated that there were no significant differences on cybersecurity awareness among teachers by through the three variables. Another study by Ismailova and Mamadijanova (2016), aimed to measure the awareness of information security among students in the Kyrgyz Republic. A survey was conducted on a sample of (172) students from different departments of the Kyrgyz University. The study showed that despite the large number of reports of computer crimes on the Internet, knowledge of cybercrime is very low among students and is often unaware of many aspects of computer crime. The study concluded that although information technology is widely used, students must be taught topics related to the safe use of the information network to prevent them from becoming victims of electronic crime.

In another study by Sezer, Yilmaz, and Yilmaz (2015) study on setting teacher awareness levels in Turkish schools regarding bullying. Teacher awareness levels were generally measured, with regard to the issue of personal cybersecurity in their daily lives and the precautions that could be taken in this context. The researchers used the survey method by distributing questionnaires to 184 teachers in different Turkish schools. Study results showed that teachers in the study sample group had an average level of awareness of cyberbullying in general. According to the results of the study, there are statistically significant differences between levels of teachers' awareness of bullying online based on the gender variable and frequency of Internet use.

As for the Arab world, there are few studies that have concerned with the issue of awareness of teachers and school students on cybersecurity.

In a study of Albarashdia (2019) entitled Facebook and electronic crime in Oman: is there a relationship? It showed that most cybercrime is linked to the use of social media, especially Facebook. The study relied on the qualitative approach, whereby the statistics related to cyber-crime were analyzed from the Center for Information Safety at the Information Technology Authority in the Sultanate of Oman, in addition to conducting interviews with (30) information security experts. The study concluded that more studies are necessary to understand the causes of the increase in cybercrime, and to develop radical solutions to address the problem in the future.

Alotaibi, Furnell, Stengel, & Papadaki, study (2016) which, relied on a quantitative online based survey to gather information related to cyber security awareness in Saudi Arabia. The results of the study indicated that participants' awareness of the risks associated with cybercrime and cybersecurity practices is very limited, despite their good knowledge of information technology.

The results also indicated that despite the rise in cybercrime, a specific approach is not taken to increase awareness of cyber security in the region except for the CERT regulations and online information on government websites. In addition, the statistical results indicated that Internet skills have an impact on cybersecurity practices on the part of users and there is a link between the skill level and the security measures that are implemented by

organizations in the region. The study recommended that there is an immediate need to develop a model to create cybersecurity awareness in the region in order to combat cybercrime. While, Al-Janabi, & Al-Shourbaji, (2016) in their study to analyze information security awareness among faculty, researchers, undergraduate students, and employees within educational environments in different countries in the Middle East. The study was based on a questionnaire distributed electronically to 985 participants. The results reveal that the participants do not have the necessary knowledge and understanding of the importance of information security principles and their practical application in their daily work. The study recommended that comprehensive awareness and training programs be conducted at all levels of the institution.

Through previous studies, we can conclude that the increasing use of the Internet among different groups of society, especially students, exposes them to threats of cyber-crime, which reflects the importance of the current study and its goal in exploring cybersecurity behavior among school students, and educating those in charge of the educational process of the risks of unsafe use of the cyber-space.

3. Methodology

Study Sample

This study uses descriptive survey approach; a survey was conducted of a sample of school teachers at 29 private schools in the Emirates of Ajman. Stratified random sample for schools in the Emirate of Ajman had been used then a sample size formula by Yamane (1967) n = N/1 + N (e2) was used to calculated the sample size. Where n is sample size, e is level of error tolerance and N is the population size which consisting of 300 teachers. Thus, n obtained was 172 teachers as the target population representation. A total of 145 valid questionnaires were returned. Table 1 shows the demographic information for the participants.

Study instrument

A two parts survey has been developed based on previous studies (Sezer, Yilmaz, and Yilmaz 2015; Al-Janabi, & Al-Shourbaji, 2016; Chiua, & Hob, 2019). The first part of the questionnaire includes the demographic information of the participants of the study. In second part consists of 21 three-level Likert Scale items to investigate the awareness level among teachers of their students' cybersecurity. Then those answers categorized into equal three range levels through following equation: the length of category = (maximum value - minimum value) ÷ number of alternatives = (3-1) ÷ 3 = 0.66, as Shown in table 2.

Table 1. *Demographic Information*

Variables	Categories	Number	percentage
Gender	Male	53	36.6
	Female	92	63.4
Adage	20-30 year	22	15.2
	31-41 years	75	51.7
	Above 41 years	48	33.1
Nationality	UAE	46	31.7
	Arab Gulf States	7	4.8
	Other Arab countries	92	63.4
	Foreign countries	0	0.0
Qualification	BA	115	79.3
	HD	20	13.8
	M.A	8	5.5
	PhD	2	1.4
Experience	less than one year	4	2.8
	1-3 years	19	13.1
	4-7 years	29	20.0
	Above 7 years	93	64.1

	Arabic Language	25	17.2
	English Language	18	12.4
	Mathematics	27	18.6
	Social science	18	12.4
	IT	3	2.1
	Art &Music	2	1.4
Specialization	Others	52	35.9
Total		**145**	**100.0**

Table 2. *Distribution of categories.*

Response	Grades	Extent of Mean
Agree	3	2.34 - 3.00
Undecided	2	1.67 - 2.33
Disagree	1	1.00 - 1.66

Validity of the study instrument

The study tool was sent to a panel of raters to review the items, which consist of six scholars specialized in Computer science, educational psychology, educational technology, and education measurement to validate it. The items were adjusted according to their comments and recommendations. Then it had been reviewed and approved by the University's Research Ethics Committee (REC),

Reliability of study instrument

The researchers verified the reliability of the tool by applying it to a pilot sample consists of 20 teachers from outside of the study using Cronbach's alpha coefficient method. The Cronbach's alpha coefficient was calculated for the entire tool using Statistical Package for the Social Sciences (SPSS), which resulted in a value of 0.88, indicating a good level of internal consistency.

4. Results & Discussion

For data analysis, researchers used SPSS to perform descriptive analyzes (number, percentage, average, and standard deviation), as well as T-test for independent samples, The one-way analysis of variance (ANOVA) and Fisher's least significant difference post-hoc test (LSD). Levene's test was used to assess the homogeneous of variances.

Findings Related to SQ1

To answer the first study question (To what extent are school teachers aware of the importance of cybersecurity for students?) mean scores and standard deviations for the teachers' responses to each of the questionnaire items 1−21 were calculated, as shown in Table 3.

Table 3. *Participants' aware of the importance of cybersecurity for students*

S.N.	Items	Mean	S.D.	Response
1	I don't allow to my students to use their smartphones in the class	2.40	0.749	Agree
2	I do notice the interaction of my students with specific sites on the Internet	2.30	0.891	Undecided
3	I am willing to know the sites my students browse	2.48	0.698	Agree
4	I am aware and interested in the safety of my students	2.41	0.846	Agree
5	I am aware of the social media applications that my students interact with	2.36	0.805	Agree
6	I think security measures for my students are necessary	2.68	0.714	Agree

7	I think my students will never be threatened due to the Internet usage	1. 64	0.877	Disagree
8	I have information about the UAE's rights of the Child law “Wadimah Law"	1.86	0.846	Undecided
9	I have received training program about cybersecurity for my students	1.64	0.881	Disagree
10	I am willing to teach myself about cybersecurity	2.73	0.445	Agree
11	I am aware of the cybercrime that my students may be exposed to	2.38	0.890	Agree
12	I have information about the UAE's IT crime law	2.58	0.495	Agree
13	School students should be taught thoroughly about cyber security	2.92	0.266	Agree
14	I allow my students to use the internet with all available means (a mobile smartphone or any type of smart device)	1.65	0.886	Disagree
15	I am reviewing what has been reviewed by my students on the internet browser	2.14	0.732	Undecided
16	I do agree to use any type of program that monitors or limits students ’access to certain websites, or downloads of applications	2.72	0.651	Agree
17	I have noticed behavioral changes on some of my students due to the internet use	2.10	0.593	Undecided
18	I don’t have any problems with downloading educational resources from untrusted websites to give to my students	2.38	0.890	Agree
19	I do you support limiting the hours of students' use of the Internet in my school	2.95	0.215	Agree
20	I am aware of the internet safe use policy in my school	2.14	0.652	Undecided
21	I Know to whom I report if I face cyber security problems in my school.	1.81	0.612	Undecided
Overall mean for all items		2.331		Agree
Standard deviation		0.6968		

The results reported in Table 3 indicate that most of the teachers had an average level of awareness of the importance of cybersecurity for their students with overall mean (2.33) and standard deviation (0.69) for all items. This finding is consistent with previous studies (Sezer, Yilmaz, and Yilmaz, 2015; Alotaibi, Furnell, Stengel, & Papadaki, 2016; Chiua, & Hob, 2019). However, most teachers answered "undecided" when asked about their aware of the internet safe use policy in their school. These responses indicate that teachers are not well versed in their school's internet safe use policy. Another item that participants are not well known is to whom they report if they face cyber security problems in their school. (item 21), and this is because of the lack of training programs for school teachers on cybersecurity (item 9) This result is consistent with the studies of (Al-Janabi, & Al-Shourbaji, 2016; Chiua, & Hob, 2019), which their results emphasize that the participants were not familiar with many cybersecurity activities and do not have the necessary knowledge and understanding of the importance of information security principles and their practical application. It is also evident from Table 3 that the responses to item 7 (Do you think your students will never be threatened due to the Internet usage?), had the lowest average (1.64), which shows that the majority of respondents believed that internet is not safe for their students.

Findings Related to SQ2

To answer the second study question (Is there any significant relationship at the level of significance ($\alpha \leq 0.05$) in the degree of school teachers' awareness of the importance of cybersecurity for school students due to the study variables gender, age, and specialization, experience)? an independent T-test and one-way ANOVA test were used to find out the significance of the differences between the averages. LCD test for post-hoc comparisons was also

conducted to find out the significance of the differences between the means. The results are detailed in the following section.

Gender

Levene's test was used to assess the homogeneous of variances. Table 4 below shows that Levene's test for homogeneity of variances was not significant ($p > 0.05$), so we can accept The null hypothesis that there is no difference in the variances between the two groups.

Table 4. *Levene's Test of Variances between Teachers' genders.*

	F	Sig.
Equal variances assumed	.000	0.986
Equal variances not assumed		

the result in table 5 shows that there was no significant relationship at the level of significance ($\alpha \leq 0.05$) in the mean of the degree of school teachers' awareness of the importance of cybersecurity for their students between Male and Female Teachers. Male (Mean = 2.46, SD = 0.227) and Female (Mean = 2.40, SD= 0.235), P value = $0.986 > 0.05$.

Table 5. *Mean of post-test statistics for Male and Female student*

Gender	N	Mean	Std. Deviation	T. Value	Sig. level
Male	53	2.46	0.227	1.31	0.986
Female	92	2.40	0.235		

Age

One-way Analysis of Variance (ANOVA) was used to find out the significance of the differences between the averages of the teachers' responses, according to the age variable.

Results in table 6 indicates that there are no statistically significant differences at the level of significance ($\alpha \leq 0.05$) in the degree of school teachers' awareness of the importance of cybersecurity for their students, due to age variable with a level of significance of (0.742) which is greater than the level of significance ($\alpha \leq 0.05$).

Table 6. *One Way ANOVA Analysis of variance according to the age variable*

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.033	2	.016	.299	.742
Within Groups	7.788	142	.055		
Total	7.821	144			

Experience

The one-way ANOVA test in table 7 indicated that there were no statistically significant differences at the level of significance ($\alpha \leq 0.05$) in the teachers' responses, according to the experience variable with a level of significance =0.280, which is greater than the level of significance ($\alpha \leq 0.05$).

Table 7. *One Way ANOVA of teachers' responses, according to the experience variable*

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.209	3	.070	1.291	.280
Within Groups	7.612	141	.054		
Total	7.821	144			

Specialization

One-way ANOVA test was used to analyze the teachers' responses according to their experience. Table 8 shows that there are statistically significant differences in the teachers' responses, according to the variable experience at the level of 0.00, which is less than the required level of statistical significance (0.05). To determine the source of these differences, a LSD test was conducted for the comparisons reported in Table 9.

Table 8. *One Way ANOVA of teachers' responses, according to the Specialization variable*

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.689	6	.115	2.221	.045
Within Groups	7.132	138	.052		
Total	7.821	144			

The result of multiple comparisons (LSD test) in the table 10 showed that the significant differences in the teachers' responses, according to the experience variable were driven mainly by the significant differences between the average responses of mathematics teachers and the Arabic language in favor of mathematics teachers, with mean difference = 0.134, and level of significance = 0.035. And the difference between the average responses of social science teachers and the Arabic language in favor of social science teachers, with mean difference = 0.183, and level of significance = 0.010. And the difference between the average responses of social science teachers and the English language in favor of social science teachers, with mean difference = 0.161 and level of significance = 0.035.

Table 10. *Multiple Comparisons – LSD Test*

(I) Specialization	(J) Specialization	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Arabic Lang.	Eng. Lang.	-.02212	.07027	.753	-.1611	.1168
	Mathematics	-.13411*	.06310	.035	-.2589	-.0093
	Social Science	-.18349*	.07027	.010	-.3224	-.0445
	IT	-.19937	.13890	.153	-.4740	.0753
	Others	-.03667	.05533	.509	-.1461	.0727
Eng. Lang.	Arabic Lang.	.02212	.07027	.753	-.1168	.1611
	Mathematics	-.11199	.06918	.108	-.2488	.0248
	Social Science	-.16138*	.07578	.035	-.3112	-.0115
	IT	-.17725	.14177	.213	-.4576	.1031
	Others	-.01455	.06217	.815	-.1375	.1084
Mathematics	Arabic Lang.	.13411*	.06310	.035	.0093	.2589
	Eng. Lang.	.11199	.06918	.108	-.0248	.2488
	Social Science	-.04938	.06918	.477	-.1862	.0874
	IT	-.06526	.13835	.638	-.3388	.2083
	Others	.09744	.05393	.073	-.0092	.2041
Social Science	Arabic Lang.	.18349*	.07027	.010	.0445	.3224
	Eng. Lang.	.16138*	.07578	.035	.0115	.3112
	Mathematics	.04938	.06918	.477	-.0874	.1862
	IT	-.01587	.14177	.911	-.2962	.2644
	Others	.14683*	.06217	.020	.0239	.2698

*. The mean difference is significant at the 0.05 level.

5. Conclusions

The survey conducted through this study revealed the importance of determining the level of school teachers 'awareness of cybersecurity for their students in light of the increasing importance of cybersecurity, and its serious threats, as well as its important role in preserving our children, our families and our community.

UAE school students have high Internet access capabilities, which must be matched by a high level of teacher awareness regarding cybersecurity for students. The research concluded that there is acceptable awareness among school teachers of cybersecurity for students. On the other hand, the study results concluded that there are a number of variables in which statistical measurements indicates the poor awareness of teachers of the importance of cybersecurity for their students, such as they are not well aware of the policy for the safe use of the Internet in their school, and they are not familiar with the measures individuals should take or report if they face cyber security problems in their schools, due to the lack of training programs for school teachers on Cyber security.

The study also concluded that there was a statistically significant relationship between specialization and teacher 'awareness of cybersecurity for their students driven mainly by the significant differences between the average responses of mathematics teachers and the Arabic language in favor of mathematics teachers, and the difference between the average responses of social science teachers and the Arabic language in favor of social science teachers, and the difference between the average responses of social science teachers and the English language in favor of social science teachers.

6. Recommendations

In light of study results the researchers recommend necessary policy measures should to be taken by the Ministry of education to ensure all teachers have same level of cyber security awareness.

We strongly recommend that cybersecurity education should be implemented as part of schools' curriculum in UAE Schools and in the Arab world in general. Conduct cybersecurity awareness training programs for all school teachers should be priority for the training programs that will be conducted by the ministry of education.

By obtaining this type of training program from time to time for school teachers, school students will have sufficient awareness of the safe use of the Internet and reduce risks of cybercrimes .the researchers also recommend that future studies can focus in developing a cybersecurity curriculum models for students.

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