Determination of cyber security ensuring behaviours of pre-service teachers

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Abstract

As cyber security attack rates increase, so do cyber security concerns. Cyber security is the collection of tools, policies, security concepts, security measures, risk management approaches, actions, education, applications, security and technologies that can be used in order to protect the cyber environment and user rights. The aim of this study is to determine the behaviours of pre-service teachers as this study's objective is to determine the behaviours of pre-service teachers regarding cyber security. This study is designed according to the quantitative research method and the Personal Cyber Security Ensuring Scale has been used. 144 pre-service teachers of two different universities who took up instructional technologies and material design courses in the 2019–2020 spring semester participated in the study. It has been observed that the participants frequently took measures when they noticed unreliable people and situations in the internet environment but took occasional measures in terms of not leaving any trace, taking precautions and protecting personal privacy.

Keywords: Cyber attack, cyber security, personal cyber security, pre-service teachers

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1. Introduction

Internet access and usage are gaining speed in every area. According to the Turkish Statistics Institute's report published in 2019, households with internet access were 42% in 2011, while the ratio increased to 88% in 2018 (TUIK, 2019). Thanks to the internet and technology usage, opportunities for knowledge production, sharing of produced knowledge, storage and easy access to information have proliferated. As a result, easy, cheap and rapid access to knowledge created change in the role of technology in human life (Gozgu & Mutioglu, 2012). In addition to the positive developments of increasing internet usage in human lives, it equally jeopardises personal information protection (Ogun & Kaya, 2013). Retrieval of information from the ssystems where information is stored and used, damaging the systems and making them unusable are threats in the digital environment called IT/cybercrimes (Pro-G, 2003).

Cyber security behaviours have become a cause of concern for everyone (Dodel & Mesch, 2019). As cyber attacks increase, so do cyber security concerns (Sedjelmaci, Hadji & Ansari, 2019). Cyber attacks are realised with the help of security gaps in the systems. Security gaps can be in the form of viruses, which can damage the orderly operation of computer systems, malware, junk mails, tracing software or attacks directed at computer users and cyber threats, including online identity theft. Such cyber attacks can be for financial or social gains (Arachchilage & Love, 2014).

Although it is usually employed to imply the same meaning as 'information security', the term 'cyber security' is related to the protection of all assets, including people (Von Solms & Niekerk, 2013). According to Yilmaz and Sagiroglu (2013), cyber security is the whole of tools, policies, concepts, activities, training, applications and technologies which are used to protect the information in the cyber environment.

In order to guard against cyber attack damages, awareness of cyber security has to be created. For cyber security awareness to be developed in individuals, the necessary education has to be given since early childhood, the subject of cyber security has to be included in the course curricula at schools, and various education and information activities have to be supported with mass media. Today, safe computer and internet usage of students is quite essential. The most crucial role in informing students and taking necessary security measures lies with the teachers (Mart, 2012; Onacan & Atan, 2016). Similarly, the results of Yigit and Seferoglu's (2019) studies show that attending information security training significantly contributes to cyber security behaviours. In addition, it can be suggested that the subject of cyber security should be covered in the curricula of the relevant departments of universities.

Security skills is a field of teaching bear vital importance for every individual (Sirin & Tekin-Iftar, 2016). Teaching security skills requires a systematic process, just like teaching other skills (Tekin-Iftar et al., 2019). On the other hand, security skills is a field of teaching that has not been given the necessary importance (Brown-Lavoie, Viecili & Weiss, 2014). Sirin and Tekin-Iftar (2016) explained this negligence by emphasising that security skills teaching requires various resources and that teachers do not have adequate equipment for selecting appropriate teaching applications. At this point, teachers' importance in creating cyber security awareness comes to the fore, and the requirement that teachers' cyber security behaviours should be at an adequate level emerges.

When studies in the literature are examined, it can be seen that senior students of education faculty have usually developed an awareness for IT security; it has also been displayed that they have inadequate knowledge as regards some aspects of this area. For example, students who claimed that they were knowledgeable about username and password security stated that they used the same username and password in different systems and shared their usernames and passwords with third parties (Akgun & Topal, 2015).

In the study conducted by Yilmaz et al. (2014) on education faculty students, it was revealed that pre-service teachers generally displayed certain behaviours regarding usage of information technologies but did not take any security measures other than using antivirus programmes.

Gokmen and Akgun (2016) displayed that education faculty students suffered from a lack of knowledge regarding the definition and scope of informatics security.

When studies in the literature were examined, no study was detected on the determination of cyber security behaviours of education faculty students studing in Cyprus.

This study aims to examine the cyber security behaviours of pre-service teachers from the perspective of different variables. Answers have been sought to the following questions in order to realise this objective:

- How are the cyber security behaviours of pre-service teachers?
- Is there any difference between cyber security behaviours of pre-service teachers by their gender?
- Is there any difference between the cyber security behaviours of pre-service teachers by their daily internet usage hours?

2. Method

In this study, the screening research method was used regarding the main aim of the study. To determine the cyber security ensuring pre-service teachers' behaviours, the scale developed by Erol, Sahin, Yilmaz and Haseski (2015) was used to collect quantitative data. The study was conducted at the education faculties of two universities in Cyprus. After receiving the necessary permits, the scales were applied to the pre-service teachers. The application of a scale took approximately 10 minutes. The collected data were entered into the SPSS database, and the necessary analyses were carried out.

2.1. Participants

A total of 144 university students who studied at the education faculty participated in the study. The students' average age was 22 years, and it was found out that the youngest was 18 years old and the oldest was 40 years old. 63.9% of the students were female, and 36.1% were male. This distribution reflects the gender distribution in the department.

Table 1. Demographic features of pre-service teachers

		F	%
Gender	Female	92	63.9
	Male	52	36.1
Nationality	TRNC	23	16
	TC	120	83.3
	Other	1	0.7
Daily internet usage	Less than 1 hour	4	2.8
	1–2 hour(s)	24	16.7
	3–4 hours	59	41
	5 hours and above	57	39.6

As seen in Table 1, most pre-service teachers (80.6%) use the internet for more than 3 hours a day.

2.2. Data collection tool

The Cyber Security Ensuring Behaviours Determination Scale is in 5-point Likert type scale. The used scale consists of 25 items and five dimensions. There are nine negative expressions on the scale. As for positive expressions, 'never' represents 1 point, and 'always' represents 5 points. The scoring was

done in reverse for negative expressions. In the original version of the scale, Cronbach's alpha coefficient (α) was 0.735, whereas it was found as 0.701 in this study. In the 'protecting personal privacy' dimension, Cronbach' alpha coefficient for the entire scale was 0.735 in the original version and 0.680 in this study. In the 'avoiding the untrusted' dimension, it was 0.771 in the original version and 0.780 in this study. The 'taking precautions' dimension was 0.704 in the original version and 0.670 in this paper. The 'protecting payment information' dimension was 0.829 in the original version and 0.789 in this paper. Regarding the last dimension, which is 'leaving no trace', it was calculated as 0.557 in the original and 0.587 in this paper. When evaluating the scores obtained from the scale, the intervals given in Table 2 were taken into consideration.

Table 2. Score intervals

Never	1.00–1.80
Rarely	1.81–2.60
Occasionally	2.61–3.40
Frequently	3.41–4.20
Always	4.21–5.00

3. Findings

3.1. Cyber security behaviours of pre-service teachers

The scores obtained by pre-service teachers from the Cyber Security Ensuring Behaviours Scale are given in Table 3.

Table 3. SDG score mean values of pre-service teachers

Dimension	Min	Max	Mean	SS
Protecting personal privacy	2.20	4.30	3.11	0.348
Avoiding the untrusted	1.00	5.00	3.42	1.184
Taking precautions	1.60	4.60	3.07	0.636
Protecting payment information	1.00	5.00	3.61	1.215
Leaving no trace	1.00	4.50.	2.61	0.695

When Table 3 is examined, it can be seen that pre-service teachers took measures occasionally at protecting personal privacy, taking precautions and leaving no traces dimensions. However, it was found out that they frequently took measures as regards avoiding the untrusted and protecting payment information. According to this obtained data, it can be stated that some behaviours of pre-service teachers directed towards cyber security are not capable of ensuring cyber security. When cyber security behaviours are examined according to the sub-dimensions, it was found out that they did not take necessary measures as regards making live communication with people they do not know, incoming e-mail attachments and passwords within the scope of protecting personal privacy dimension. Regarding avoiding the untrusted dimension, it was determined that they were careful occasionally in money and unit, etc., requests made through the internet and logging off the session safely on computers used.

Regarding taking precautions, they stated that they occasionally checked the security certificates of webpages and web browsers' security settings. As regards the protecting payment information dimension, it has been found out that pre-service teachers carried out online shopping on their personal computers. Regarding not leaving any trace in the digital environment, it has been determined that they occasionally took precautions such as not saving information when computers

other than personal computers are used, cleaning web history, logging off when leaving social networks and changing their passwords.

3.2. Cyber security behaviours of pre-service teachers by their gender

An independent *t*-test was applied to the scores obtained from the scale to determine whether pre-service teachers' cyber security behaviours varied by their gender. The obtained findings are presented in Table 4.

Table 4. Cyber security behaviours of pre-service teachers by their gender

Factor	Gender	N	Mean	Std. dev.	t	SD	p
Protecting personal privacy	Female	92	3.1304	0.31334	0.842	142	0.402
	Male	52	3.0769	0.39289			
Avoiding the untrusted	Female	92	3.4212	1.23086	−0.105	142	0.919
	Male	52	3.4423	1.10991			
Taking precautions	Female	92	2.9739	0.64499	−2.622	142	0.008
	Male	52	3.2577	0.58388			
Protecting Payment Information	Female	92	3.6087	1.18560	−0.077	142	0.940
	Male	52	3.6250	1.27907			
Leaving no Trace	Female	92	2.6386	0.76349	0.424	142	0.672
	Male	52	2.5913	0.56236			
Cyber Security Scale	Female	92	3.105	0.31084	0.602	142	0.549
	Male	52	3.1377	0.31150			

A general examination of pre-service teachers by their gender shows that female and male students' cyber security behaviour is similar and that there is no statistically significant difference. It has been determined that female and male students' behaviour female and male students' behaviours in protecting personal privacy, avoiding the untrusted, protecting payment information and leaving no trace as similar dimensions. On the contrary, it has been found that male students' behaviours are more positive in taking precautions in relation to cyber security in online media. When evaluated based on statements, while male students frequently update their software, female students occasionally update them. Most male students have antivirus software downloaded on their computers, whereas this ratio is lower for female students.

3.3. Cyber security behaviours of pre-service teachers by their daily Internet usage hours

To display the cyber security behaviours of pre-service teachers by daily internet usage hours, one-way analysis of variance (ANOVA) was conducted on the study's data collected from the working group.

Cyber security behaviour levels of pre-service teachers by their daily internet usage hours are given in Table 5.

Table 5. Mean and standard deviation scores by daily Internet usage hours

Usage hours	N	Mean	SD
1–2 hour(s)	28	3.0464	0.41319
3–4 hours	59	3.1610	0.31624
5 hours and above	57	3.0912	0.33289
1–2 hour(s)	28	3.3214	1.20158

3–4 hours	59	3.5254	1.25404
5 hours and above	57	3.3816	1.11414
1-2 hour(s)	28	3.1071	0.64975
3-4 hours	59	3.0576	0.62040
5 hours and above	57	3.0807	0.65668
1-2 hour(s)	28	3.2857	1.45569
3-4 hours	59	3.8898	1.00029
5 hours and above	57	3.4912	1.25175
1-2 hour(s)	28	2.7143	0.80137
3-4 hours	59	2.5042	0.70327
5 hours and above	57	2.6974	0.62453

As shown in Table 5, students' cyber security behaviours by daily internet usage hours are close to each other. However, one-way ANOVA was conducted to display whether these findings are differentiated statistically. The findings obtained from the analysis are presented in Table 6.

Table 6. One-way ANOVA results by daily internet usage hours

	Source of variance	Sum of squares	SD	Mean of squares	f	p
Protecting personal privacy	Intergroup	0.287	2	0.143	1.216	0.299
	Intragroup	16.616	141	0.118		
	Total	16.902	143			
Avoiding the untrusted	Intergroup	1.001	2	0.128	0.353	0.703
	Intragroup	199.707	141	0.347		
	Total	200.708	143			
Taking precautions	Intergroup	0.048	2	0.128	0.059	0.943
	Intragroup	57.871	141	0.347		
	Total	57.920	143			
Protecting payment information	Intergroup	8.366	2	0.128	2.905	0.058
	Intragroup	202.994	141	0.347		
	Total	211.359	143			
Leaving no trace	Intergroup	1.380	2	0.128	1.434	0.242
	Intragroup	67.868	141	0.347		
	Total	69.248	143			

When Table 6 is examined, it can be seen that no significant difference has been found between cyber security behaviour levels of pre-service teachers by their daily internet usage hours. Depending on these findings, it can be claimed that daily internet usage hours do not affect cyber security behaviour levels.

4. Conclusion and discussion

In this paper, cyber security behaviours of pre-service teachers studying in the education faculty are evaluated based on different variables. A total of 144 preservice teachers participated in the study which was conducted in the 2019–2020 academic year. Considering that pre-service teachers raise the generations of the future, it can be said that their behaviours as regards securing the information of their students and themselves are essential. For this reason, the Cyber Security Behaviours Determination Scale was applied to the volunteering pre-service teachers.

When pre-service teachers' cyber security behaviours are examined in general, it has been determined that they did not always take the necessary precautions in the internet environment. It

has been observed that preservice teachers occasionally took measures in leaving no trace, taking precautions and protecting personal privacy. It has been determined that they frequently took measures to avoid untrusted and protecting payment information. It was also found that they frequently took the necessary measures when they carry out online payments and banking transactions. Similarly, Karaci, Akyuz and Bilgici (2017) carried out a study on two different computer departments at the university level regarding cyberbullying behaviours. It has been found that they are successful in protecting personal privacy, avoiding untrusted applications, taking precautions to ensure security, protecting payment information and leaving no trace on the internet. It is thought that the computer department students are more successful than special education students in leaving no trace on the internet, taking precautions and protecting personal privacy because of their area of study and being more knowledgeable in technology. When other studies in the literature are examined, it can be seen that education faculty students do not have adequate information in terms of the definition and content of cyber security (Akgun & Topal, 2015; Gokmen & Akgun, 2016; Pusey & Sadera, 2011).

Another conclusion is that the cyber security behaviours of pre-service teachers are similar according to gender. According to the results obtained related to gender, it can be seen that male students show more conscious behaviours as regards the taking precaution dimension. It can be said that male students adequately protect their computers and other devices with internet connection against viruses. Similarly, Karaci, Akyuz and Bilgici (2017) stated that there is no difference in cyber behaviours according to the gender of university students, although there is a significant difference between computer teaching and computer engineering students in the protecting personal privacy dimension. Yigit and Seferoglu (2019) also found in their research that the cyber security behaviours of university students do not differ according to gender. In another study which was conducted with the education faculty students, Akgun and Topal (2015) concluded that male students took more risks than female students in connecting wireless networks with an unknown source.

Another obtained result is that daily internet usage does not affect cyber security behaviours. Short-term internet usage and long-term internet usage do not change the cyber security behaviours of pre-service teachers. This finding is different from the findings of Akgun and Topal (2015), who stated that students who used the internet above average displayed more pirated software usage. On the other hand, Yigit and Seferoglu (2019) stated that students with longer weekly internet usage periods had better cyber security behaviours.

Like in all studies, this study has its limitations. The limitation of this study is that it only examines the behaviours of the education faculty students. The education faculty students were preferred as teachers play an essential role in children's learning to protect themselves. However, future research should examine the cyber security behaviours of students in all university departments. Besides, based on the obtained findings, training activities can be organised in the required subjects, and such deficiencies of pre-service teachers can be remedied.

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