

# Cyber information security awareness of university students (Central Anatolia region example)

Aysun Düşmez <sup>1</sup>, Alev Orhan <sup>2</sup>, Elif Orhan <sup>3</sup>

<sup>1</sup> MoNE, Sivas, Türkiye; <sup>2</sup> Yıldızeli Vocational School, Sivas Cumhuriyet University, Sivas, Türkiye; <sup>3</sup> Faculty of Science, Gazi University, Ankara, Türkiye

## ABSTRACT

The objective of this study is to ascertain the cyber information security awareness and cyberbullying proclivities of pre-service teachers enrolled at the faculty of education. This will be done with a view to establishing whether there are any correlations between information security awareness levels and cyberbullying tendencies, and to identify any differences in these proclivities according to gender, grade level and time spent online. The study employed the relational survey model, which is one of the quantitative research methods. In order to obtain quantitative data, criterion sampling was employed as a basis for the study, which involved the interviewing of 301 students enrolled in the faculties of education at three different universities. The data were collected utilizing three instruments: the Information Security Awareness Scale for Teachers, the Cyberbullying Attitude Scale and the Personal Information Form. The data were analysed using the SPSS 23.0 programmed. The findings indicated that the information security awareness of pre-service teachers was at a medium level, while their tendency to engage in cyberbullying was at a low level. The study demonstrated that the information security awareness and cyberbullying proclivities of pre-service teachers exhibited no notable variation according to grade level. Nevertheless, a noteworthy distinction was identified in these factors in accordance with the duration of internet use.

## ARTICLE HISTORY

Received 25 April 2025

Accepted 10 June 2025

## KEYWORDS

Information security  
Cyberbullying  
Prospective teachers  
Higher education  
Information security awareness

## CORRESPONDENCE

Alev Orhan



## Introduction

The contemporary period is regarded as the advent of a new epoch, characterized by the advent of novel information technologies and associated developments. The advent of new information technologies has given rise to a multitude of innovations and developments across a diverse range of sectors, including the economy, trade, health, education, tourism and entertainment. The confluence of technological advancement and globalization has precipitated profound shifts in our lived experience (Aydınbaş, 2023). Information sharing is at the forefront of these transformations. This ease of information sharing raises concerns about the security of information containing personal details such as name, surname, credit card information and bank account information (Talib, 2014). The term "information security" is typically understood to encompass the protection, storage, and access of personal data in the digital environment when considered from an individual perspective. In organizational terms, information security can be defined as the protection of information devices, the maintenance of data, the assurance of security and the implementation of measures against risky activities (Eminağaoğlu & Gökşen, 2009).

The subjects under discussion are cybersecurity and internet access. The objective is to ensure the protection of data, as well as computer devices and programs, against cyber threats. It has been asserted that the data in question pertains to the institution, organization, or other entity. The security of organizations that establish a connection with the network of organizations is predicated on the following

principles: confidentiality and integrity. As posited by Kaur and Ramkumar (2022), the term "cybersecurity" is used to denote the concept of ensuring accessibility. The primary objective of information security is to safeguard the security principles of confidentiality, integrity, and availability. The protection of information within the framework is paramount, as is the prevention of data loss through the preservation of data and security measures. Despite the numerous similarities between the concepts of cybersecurity and information security, there are some notable distinctions between them. There are discrepancies in certain aspects. The following elements are to be considered: internet networks, information devices, and digital data. The preservation of information through the implementation of protective measures is referred to as "cyber security." In the domain of information security, the distinction between virtual and non-virtual data is inconsequential. The salient issue is the necessity to safeguard data irrespective of its location is paramount. Indeed, both terms are intended to safeguard data (Sagiroglu & Alkan, 2018).

The growing prevalence of social media has contributed to the emergence of cyberbullying as a pervasive phenomenon. Cyberbullying is defined as intentional, repetitive hostile behaviours carried out by means of information technology tools against an individual or group of individuals who are unable to protect themselves (Aboujaoude, Savage, Starcevic, & Salame, 2015; Ortega-Barón, Buelga, Ayllón, Martínez-Ferrer & Cava, 2019).

Advancements in the domains of information and technology have precipitated the transition of physical bullying to the virtual realm. As posited by Dadvar and De Jong (2012), bullying is a salient issue. According to Willard (2007), the term "cyberbullying" can be defined as the following: Engaging in arguments within a virtual environment, obtaining unauthorized access to individuals' data, maltreating, harming, or spreading false news, defaming an individual, expelling individuals from social groups, using someone else's personal data under false pretenses, preying on others by impersonating someone else, harassing individuals on social media accounts, evidence suggests the presence of a variety of types. Cyberbullying can be defined as a form of aggression that is perpetrated with the intention of causing harm to others through the use of information and communication technologies. The occurrence of cyberbullying has been linked to the emergence of psychological issues and the exacerbation of existing problems (Lam, Jensen, Hovey, & Roley-Roberts, 2022).

Information security issues are addressed in the curricula of computer science and software engineering courses at the university level. Nevertheless, the majority of the other departments do not incorporate related course content. Those engaged in the transfer of educational and training objectives to students and the nurturing of future generations would be well advised to possess a working knowledge of information security, to exercise caution in the face of potential dangers inherent to the digital realm and to be mindful of the risks associated with cyberbullying. The principal objective of this research is to ascertain the perspectives of prospective educators enrolled at the Faculty of Education with regard to cyberbullying and information security.

In the literature review, Gökmen and Akgün (2015) examined the competencies of pre-service teachers studying in the field of computer and instructional technologies to provide information security training. Canoğulları's (2021) study examined teachers' awareness of information security. In a 2022 study, Ulutaş examined the cyber security education given to first-year education faculty students in terms of various variables. Metin (2017) conducted a study to determine the level of exposure that secondary school educators experience with regard to cyberbullying. Yardim (2022) sought to elucidate the prevalence of cyberbullying and victimization among university students in the context of online games. A review of the extant literature reveals that the majority of studies in this field have been conducted on teachers. A series of studies were conducted with a sample of university students, the results of which indicated that a significant proportion of the sample studied in departments related to computer science and technology or participated in experimental studies. This research was conducted with a sample of pre-service teachers from three different universities in order to determine the information security awareness of pre-service teachers. This entails determining the extent of cyber information security awareness and cyberbullying tendencies, the challenges encountered in this process, and the recommendations for addressing these issues. In addition to our primary objective, we also sought answers to the following sub-problems:

1. 1.What is the level of information security awareness among pre-service teachers enrolled in Faculties of Education?
2. 2.The present study aims to investigate the information security awareness levels of prospective teachers studying in Faculties of Education. In order to gain a comprehensive understanding of the subject matter, the following variables have been identified as potential factors that may influence the observed differences:
  - a. Gender
  - b. Class levels

3. What is the level of awareness of cyberbullying among pre-service teachers enrolled in education faculties?
4. This study examines the cyberbullying awareness levels of pre-service teachers enrolled in Faculties of Education at four distinct levels.
  - a. Gender
  - b. Class levels
5. Does a significant relationship exist between information security awareness levels and cyberbullying tendencies among prospective teachers enrolled in the Faculty of Education?

## Method

### Research methodology

This research was designed as a retrospective case study. A case study is a qualitative research design that the relational survey model, a general survey model, was selected for the study. The relational survey model is a data analysis method that is employed to ascertain the existence of a relationship between two or more variables (Karasar, 2016). The rationale for selecting this methodology in the research project is to investigate the interrelationship between the variables of cyberbullying and information security.

### Population and sampling

The study group comprises pre-service teachers enrolled in faculties of education during the 2022–2023 academic year. A progressive sampling design was employed to ascertain the identity of the pre-service teachers who were engaged in the study. The research employed the criterion sampling method as its primary data collection technique. In order to establish a suitable sample, it was decided that the universities in question should be located in the Central Anatolia Region, possess a faculty of education and be state-run. A total of 18 universities were identified as meeting the specified criteria. In the second stage of the progressive sampling method, the convenience sampling method was selected, and three universities were selected from a total of 18 universities. In the easily accessible sampling method, the researcher selects a sufficient number of items that can be reached with relative ease from the existing items and determines them as the sample (Singleton & Straits, 2005). Akbulut and Çapık (2022) posit that, for each variable, a sample size between five and ten times the number of variables is sufficient. In order to obtain the requisite quantitative data, a total of 301 students enrolled in the faculties of education at these universities took part in the study. For the purposes of analysis, the universities were coded as A, B, and C. 105 pre-service teachers from University A, 103 from University B and 93 from University C participated in the study. A subsequent analysis of the distribution of pre-service teachers according to gender reveals that 66.4% of the pre-service teachers participating in the study were female (f=200) and 33.6% were male (f=101). A subsequent analysis of the distribution of pre-service teachers according to their grade levels reveals that 31.2% (f=94) were at the 1st grade level, 31.2% (f=94) were at the 2nd grade level, 15.9% (f=48) were at the 3rd grade level, and 21.6% (f=65) were at the 4th grade level.

### Data collection tools

This document was received from the Ethics Commission of Gazi University on 10 March 2023 and is numbered E.608679. The following data collection instruments were employed in the study: the 'Personal Information Form', the 'Information Security Awareness Scale for Teachers' and the 'Cyberbullying Scale'. The scale, as employed by Keser, Güldüren and Çetinkaya, and others (2017) in their study of teachers, comprises 48 items and does not include any items with a reverse scoring. The scale is comprised of three sub-factors, and the total variance it can explain was found to be 61.74%. Additionally, the Cronbach's Alpha internal consistency coefficient was found to be 0.980. Türkoğlu (2013) developed the 'Cyberbullying Attitude Scale'. This consists of 50 items and four sub-dimensions. It can be used to determine the cyberbullying tendencies of prospective teachers. As such, the total variance has been measured at 45.744% and Cronbach's alpha internal consistency coefficient was found to be 0.925.

## Findings and discussion

In order to ascertain the reliability of the scale in question, an internal consistency test was conducted as part of the data collection process. The conclusions of the internal consistency coefficient analysis are presented in Table 1.

Table 1. A critical examination of the internal consistency coefficients of the scales is presented herewith

Scales	Internal Consistency Coefficient	Number of Items
Information Security Awareness	0,97	48

Cyber Bullying	0,91	50
----------------	------	----

Upon examination of the findings from the reliability tests of the scales utilized in this research, The internal consistency coefficient of the Information Security Awareness Scale was found to be 0.97, while that of the Cyberbullying Attitude Scale was 0.91. The aforementioned values demonstrate that the scales utilized in the study exhibit an exceptionally high degree of reliability. Following the reliability analysis, an investigation was conducted to ascertain whether the data to be utilized for analysis exhibited a normal distribution. The findings obtained are presented in Table 2. Given that the sample size exceeded 50, the results of the Kolmogorov–Smirnov test were subjected to further analysis.

Table 2. Results of normality distribution analysis

Scales	Kolmogorov–Smirnov Test				
	Statistics	df	p	Skewness	Kurtosis
Information Security Awareness	0,03	301	0,20	-0,01	0,18
Cyberbullying	0,14	301	0,00	0,92	-0,11

Although the Kolmogorov–Smirnov analysis in Table 2 indicates that some of the data do not exhibit a normal distribution, The skewness value for the Information Security Awareness Scale was determined to be -0.01. The skewness value for the Information Security Awareness Scale was found to be -0.01, while the kurtosis value was 0.18. In contrast, the skewness value for the Cyberbullying Attitude Scale was 0.92, with a kurtosis value of -0.11. A review of the literature reveals that, in accordance with the Kolmogorov–Smirnov analysis, if the p-value is less than 0.05 and the skewness and kurtosis values fall within the range of -1.5 to +1.5, it is necessary to apply parametric tests on the assumption that the data exhibit a normal distribution (Tabachnick & Fidell, 2013). Given that the skewness and kurtosis values of the data set fall within the specified range, the data were analysed using parametric tests.

As indicated in Table 3, the initial sub–problem of the study provides an overview of the information security awareness of the pre–service teachers participating in the study.

Table 3. Information on information security awareness of prospective teachers

Scales	N	$\bar{x}$	Ss	Min	Max
Information Security Awareness	301	152,45	36,60	48	240

The data presented in Table 3 indicates that the information security awareness scores of pre–service teachers are at a moderate level. The minimum score that can be attained on the scale is 48, while the maximum is 240. The mean score is 152.45. Table 4 presents the information security awareness sub–dimensions and total scores of pre–service teachers studying at three different universities, classified according to university type.

Table 4. ANOVA results of pre–service teachers' information security awareness scores according to university type variable

Dimensions	University	N	X	Ss	Sd	F	P	Difference
Mobile Devices, Privacy and Communication	A	103	43,65	8,15	2	2,238	,108	-
	B	105	45,94	9,83				
	C	93	43,38	10,41				
Attacks and threats	A	103	45,88	13,46	2	4,040	,019*	B>A
	B	105	51,61	15,42				
	C	93	47,96	15,26				
General Security	A	103	41,68	11,07	2	,960	,384	-
	B	105	43,82	11,35				
	C	93	42,39	11,60				
Information Security Awareness Total Score	A	103	147,51	33,17	2	2,67	,071	-
	B	105	158,84	36,68				
	C	93	150,70	39,38				

\* $p < 0,05$

Table 4 presents the results of a one–way analysis of variance (ANOVA) of information security awareness scores among prospective teachers, disaggregated by university. The analysis of the mean scores on the Information Security Awareness Scale, disaggregated by university, indicates that there is no discernible statistical difference in information security awareness ( $p > 0.05$ ). Nevertheless, the cohort of pre–service teachers at University A demonstrated a comparatively diminished level of proficiency in the domain of information security awareness when contrasted with the performance of their counterparts at other academic establishments. With regard to the 'Attacks and Threats' sub–dimension of the scale, a notable discrepancy was observed between the pre–service teachers at University B and those at University A. No notable discrepancy was identified in the remaining subdivisions of the scale ( $p > 0.05$ ). A medium level of awareness of information security was identified among the pre–service teachers. The findings indicate

that the knowledge and perceptions of security issues pertaining to cyber-attacks and threats, data breaches and privacy, and unauthorized access among pre-service teachers are at the intermediate level and exhibit no discernible variation across universities. The results demonstrate that prospective teachers from three distinct universities exhibit a deficiency in their awareness of information security concerns. The results indicate that prospective teachers at three universities demonstrate comparable attitudes with regard to the protection of information and the reduction of security risks. Similarly, Özbek (2019), Akgün and Topal (2015), who conducted their research with students in the Faculty of Education, concluded that students demonstrated a medium level of information security awareness. It is hypothesized that this discrepancy can be attributed to the variations in the curricula and pedagogical approaches employed by different faculties of education.

As indicated by Table 5, the distribution of information security awareness among pre-service teachers participating in the study is shown according to gender.

Table 5. Independent sample t-test results of information security awareness scores according to gender variable

Dimensions	Gender	N	X	Ss	Sd	t	P
Mobile Devices, Privacy and Communication	Woman	200	43,6	8,80	299	-1,85	0,062
	Man	101	45,8	10,71			
Attacks and Threats	Woman	200	47,2	13,80	299	-2,068	0,040*
	Man	101	51,0	16,58			
General Security	Woman	200	41,9	10,23	299	-1,455	0,147
	Man	101	43,9	13,20			
Information Security Awareness Total Score	Woman	200	149,6	33,50	299	-1,85	0,03*
	Man	101	157,03	41,72			

\*p<0,05

Table 5 presents the results of the independent sample t-test for the sub-dimensions and total scores of pre-service teachers' information security awareness, stratified by gender. The 'Mobile devices, Privacy and Communication' and 'General Security' sub-dimensions did not differ according to gender (p>0.05). However, the 'Attacks and Threats' sub-dimension was found to differ in favor of males (p<0.05). Table 8 shows the results of the independent sample t-test for the sub-dimensions and total scores of pre-service teachers' information security awareness according to gender variable. The male participants achieved significantly higher scores than the female participants. The total score for information security awareness demonstrated a statistically significant difference according to the gender variable, with male pre-service teachers exhibiting higher scores than their female counterparts (p<0.05). In examining the information security awareness of pre-service teachers studying in faculties of education according to gender, the second sub-problem of the research revealed that the sub-dimensions of 'Mobile devices, Privacy and Communication' and 'General Security' exhibited no gender-based differences. However, the sub-dimension of 'Attacks and Threats' demonstrated a gender-based discrepancy, with males displaying a higher level of awareness in this area. The results demonstrated a statistically significant discrepancy in the total scores achieved by male and female pre-service teachers on the assessment scale. In accordance with the aforementioned findings, studies have revealed that male pre-service teachers exhibit superior information security awareness levels compared to their female counterparts (Gökmen & Akgün, 2015; Güldüren, Çetinkaya & Keser, 2016; Özbek, 2019; Solmaz, 2020). The findings presented thus far are not universally applicable, as there are studies that have not identified a significant difference between the information security awareness of male and female students (Karacı, Akyüz & Bilgici, 2017; Semerci, 2019; Yiğit & Seferoğlu, 2019). In contrast with the aforementioned findings, other studies have indicated that female teachers demonstrate a higher level of information security awareness than their male counterparts. This is based on research conducted with teachers (Altıner, 2021; Kavas, Özbudak & Çetkin, 2022; Yavuz, 2023). A review of the literature reveals a discrepancy in findings pertaining to gender. It is hypothesized that the elevated mean scores of male pre-service teachers in the 'Attacks and Threats' sub-dimension and the total scale are indicative of a heightened awareness of digital attacks among this demographic. Table 6 presents the results of the information security awareness survey of prospective teachers participating in the research, disaggregated by grade level.

Table 6. ANOVA results of prospective teachers' information security awareness scores according to class level variable

Dimensions	University Level (Grade)	N	X	Ss	Sd	F	P	Difference
Mobile Devices, Privacy and Communication	1st	94	43,73	9,44	3	1,087	,35	-
	2nd	94	44,35	8,94				
	3rd	48	43,27	10,01				
	4th	65	46,12	10,05				
Attacks and Threats	1st	94	48,57	15,44	3	1,649	,17	-
	2nd	94	46,88	14,55				
	3rd	48	47,10	13,21				

General Security	4th	65	51,89	15,42	3	1,339	,26	-
	1st	94	42,39	11,61				
	2nd	94	42,85	10,98				
	3rd	48	40,25	11,02				
Information Security Awareness Total Score	4th	65	44,52	11,57	3	1,51	,21	-
	1st	94	151,76	37,76				
	2nd	94	150,77	34,39				
	3rd	48	146,46	34,67				
4th	65	160,31	38,89					

\*p<0,05

Table 6 depicts the results of a one-way analysis of variance (ANOVA) of prospective teachers' information security awareness sub-dimensions and total scores, classified according to grade level. The findings demonstrate that there is no statistically significant discrepancy in the scale scores of prospective teachers according to their grade levels ( $p>0.05$ ). In terms of the overall information security awareness score, third graders demonstrated the lowest level of proficiency in this area, when compared to other grade levels. Furthermore, third graders demonstrated the lowest performance across all sub-dimensions, with the exception of the 'Attacks and Threats' sub-dimension, in comparison to other grade levels. The findings indicate that the information security awareness of pre-service teachers is not significantly different according to their grade levels. The mean scores for information security awareness indicate that the participants exhibited a similar level of knowledge and understanding across all grade levels. However, a slight discrepancy was observed in the mean scores for the third graders, who demonstrated a slightly lower average compared to the other grade levels. The lack of a notable discrepancy can be attributed to the proximity of the class mean scores. A review of the literature reveals that, similarly, studies indicate that the information security awareness of pre-service teachers does not differ according to their grade levels (Karacı et al., 2017; Özbek, 2019; Yavuz, 2023; Zorlu, 2023). Seferoğlu and Yiğit (2019) observed that students' information security awareness exhibited variation according to the level of education. Table 7 presents the results of the study, which examined the cyberbullying tendencies of pre-service teachers.

Table 7. Information security awareness of prospective teachers and information on cyberbullying

Scales	N	$\bar{x}$	Ss	Min	Max
Cyber Bullying	301	112,27	25,02	78	178

The results presented in Table 7 indicate that the cyberbullying scores of pre-service teachers are relatively low. The mean score is 112.27, with a minimum score of 50 and a maximum score of 250. Furthermore, the present study examined the prevalence of cyberbullying tendencies among pre-service teachers, with particular attention paid to the university context in which they were studying. Table 8 illustrates the cyberbullying tendencies of pre-service teachers at various universities.

Table 8. ANOVA results of prospective teachers' cyberbullying scores according to university type variable

Dimensions	University	N	X	Ss	Sd	F	P	Differences
Identity Hiding	A	103	27,86	4,58	2	2,548	,080	-
	B	105	29,21	6,32				
	C	93	27,65	4,96				
Enjoyment	A	103	32,71	6,33	2	2,754	,065	-
	B	105	34,75	7,50				
	C	93	32,67	7,84				
Confirmation	A	103	36,98	8,96	2	1,651	,194	-
	B	105	39,39	9,65				
	C	93	38,05	10,15				
Concern	A	103	26,08	6,65	2	,970	,380	-
	B	105	27,40	6,99				
	C	93	26,71	6,99				
Cyberbullying Total Score	A	103	111,50	24,34	2	,028	,075	-
	B	105	113,76	24,89				
	C	93	111,44	26,10				

\*p<0,05

Table 8 presents the findings of a one-way analysis of variance (ANOVA) examining the cyberbullying tendencies of pre-service teachers across different universities, as well as the sub-dimensions and total scores. The study was conducted with the participation of pre-service teachers enrolled in the faculties of education at three different universities. The analysis revealed no statistically significant difference in cyberbullying tendencies among pre-service teachers at universities A, B, and C ( $p > 0.05$ ). Nevertheless, the total score for cyberbullying on the scale revealed that the pre-service teachers at C University exhibited lower levels of this behavior than those at other universities. Furthermore, an examination of the various

sub-dimensions of the cyberbullying scale reveals no statistically significant differences according to the type of university in question ( $p > 0.05$ ). In the studies on cyberbullying awareness, several studies have determined that students demonstrate a high level of awareness regarding cyberbullying (Dikmen & Çağlar, 2017; Zorlu, 2023). It has been observed that there is a discrepancy in the manner in which students' awareness of cyberbullying is reported. It could be argued that this situation is contingent upon the particular sample group and measurement instrument employed in the course of the research.

The fourth sub-problem of the study is addressed in Table 9, which presents the results of the cyberbullying tendencies of the pre-service teachers participating in the study in terms of gender variable.

Table 9. Independent sample t-test results of cyberbullying scores according to gender variable

Dimensions	Gender	N	X	Ss	Sd	t	P
Identity Hiding	Woman	200	27,8	5,01	299	-2,03	0,04*
	Man	101	29,1	5,99			
Enjoyment	Woman	200	32,7	6,71	299	-2,33	0,02*
	Man	101	34,78	8,14			
Confirmation	Woman	200	37,62	8,84	299	-1,35	0,17
	Man	101	39,20	10,93			
Concern	Woman	200	26,22	6,29	299	-1,75	0,08
	Man	101	27,69	7,84			
Cyberbullying Total Score	Woman	200	107,6	22,08	299	-4,64	0,00*
	Man	101	121,4	27,96			

\* $p < 0,05$

Table 9 presents the results of an independent sample t-test examining the sub-dimensions and total scores of cyberbullying tendencies among pre-service teachers, stratified by gender. The data indicate that there is no significant difference in the prevalence of cyberbullying tendencies between males and females with regard to the sub-dimensions of 'Confirmation' and 'Worry' ( $p > 0.05$ ). However, a significant difference is observed with regard to the sub-dimensions of 'Identity Hiding' and 'Enjoyment', with males exhibiting a higher tendency towards cyberbullying than females ( $p < 0.05$ ). The total score for cyberbullying tendency revealed significant differences between the sexes, with males exhibiting higher scores than females ( $p < 0.05$ ). In the context of the fourth sub-problem of the research, it was established that male pre-service teachers exhibited a greater proclivity for cyberbullying than their female counterparts. Furthermore, while there is no discernible difference in the prevalence of cyberbullying tendencies between genders with respect to the sub-dimensions of 'Confirmation' and 'Concern', there is a notable divergence in favor of males with regard to the sub-dimensions of 'Identity Concealment' and 'Enjoyment'. Similarly, Türkoğlu (2013) and Elmas (2016) asserted in their studies that male pre-service teachers exhibited a greater proclivity for engaging in cyberbullying than their female counterparts. Furthermore, Souza, Ferreira, Veiga Simão, and Falla (2022) reached the conclusion that male students exhibit a greater proclivity for engaging in bullying behavior than their female counterparts at universities in Portugal and Brazil. In contrast with the aforementioned findings, several studies have failed to identify a statistically significant correlation between cyberbullying tendencies and gender variables (Güngör, Tingiş & Sarol, 2020; Zorlu, 2023). Table 10 illustrates the results pertaining to the cyberbullying proclivities of the pre-service teachers who participated in the study, with the data organized according to the participants' grade levels.

Table 10. ANOVA results of prospective teachers' cyberbullying scores according to class level variable

Dimensions	University Level (Grade)	N	X	Ss	Sd	F	P	Differences
Identity Hiding	1st	94	28,48	5,75	3	,107	,95	-
	2nd	94	28,04	5,27				
	3rd	48	28,29	5,46				
	4th	65	28,27	5,06				
Enjoyment	1st	94	32,62	7,32	3	1,616	,18	-
	2nd	94	33,30	6,83				
	3rd	48	32,89	7,53				
	4th	65	35,09	7,52				
Confirmation	1st	94	38,60	9,55	3	1,262	,28	-
	2nd	94	37,65	8,79				
	3rd	48	36,27	9,68				
	4th	65	39,60	10,63				
Concern	1st	94	26,50	6,91	3	1,724	,16	-
	2nd	94	26,96	6,67				
	3rd	48	25,02	6,93				

	4th	65	27,92	6,96				
Cyberbullying Total Score	1st	94	112,99	26,95				
	2nd	94	110,89	22,33	3	,193	,90	-
	3rd	48	113,94	24,45				
	4th	65	111,98	26,66				

\*p<0,05

Table 10 presents the results of a one-way analysis of variance (ANOVA) of the sub-dimensions and total scores of pre-service teachers' cyberbullying tendencies, classified according to grade level. The findings indicate that there is no statistically significant difference in the prevalence of cyberbullying tendencies among pre-service teachers across different grade levels ( $p>0.05$ ). Nevertheless, the total score for cyberbullying demonstrated that second graders exhibited a lower level of engagement than students in other grade levels. Upon analysis of the sub-dimensions, no significant distinction was observed between cyberbullying and classroom-level phenomena.

The fifth sub-problem of the research is designed to address the question of whether there is a significant difference between the information security awareness and cyberbullying tendencies of pre-service teachers studying in Faculties of Education. Table 11 illustrates the correlation between information security and cyberbullying proclivities among the prospective teachers who participated in the research.

Table 11. The correlation relationship between information security awareness and cyberbullying scores of prospective teachers

	Information Security Awareness	Cyberbullying
Information Security Awareness	1	0,04
Cyberbullying	0,04	1

Table 11 presents the findings of the correlation analysis between the scores of pre-service teachers' information security awareness and their levels of cyberbullying tendency. The results indicate a positive, albeit weak and statistically insignificant ( $r=0.04$  and  $p>0.05$ ) correlation between information security awareness and cyberbullying tendencies among the pre-service teachers who participated in the study. The relationship between information security awareness and cyberbullying tendency is influenced by a number of factors. The effects of digital literacy extend beyond mere technical proficiency; they encompass a range of social, psychological, and personal outcomes. These include students' digital literacy level, social interaction, self-esteem, and psychological characteristics. It follows that, given the differing levels of these effects across the sample groups, the direction and level of the relationship will also differ. While Zorlu (2023) discovered a positive correlation between students' proclivity towards cyberbullying and their awareness of cyber information security, he asserted that the relationship was moderate, contrary to the findings of the aforementioned study. It was therefore determined that as students' awareness of cyber information security increases, so too does their awareness of cyberbullying. In their research, Dikmen and Çağlar (2017) found that the cyber information security awareness of pre-service teachers in the Department of Computer Education and Instructional Technologies is high. Furthermore, they determined that these prospective educators possess the skills necessary to take the requisite precautions against cyberbullying and the knowledge to guide their students in this regard.

## Results

It can be posited that the information security awareness of pre-service teachers pursuing their studies in faculties of education is situated at a medium level. The analysis of the average scores for information security awareness according to universities revealed no statistically significant differences. Nevertheless, the pre-service teachers from University A demonstrated a lower overall proficiency in information security awareness than their counterparts from other academic institutions. In the sub-dimension of 'Attacks and Threats', a significant difference was identified between the pre-service teachers of University B and those of University A. No notable distinction was observed in the remaining sub-dimensions of the scale.

Upon examining the information security awareness of prospective teachers across the sub-dimensions of the scale, no statistically significant difference was identified between the sub-dimensions of 'Mobile Devices, Privacy and Communication' and 'General Security' with respect to gender. Upon examining the information security awareness of prospective teachers across the sub-dimensions of the scale, no statistically significant difference was identified between the sub-dimensions of 'Mobile Devices, Privacy and Communication' and 'General Security' with respect to gender. A significant difference was identified in the total score for information security awareness according to gender. Male pre-service teachers exhibited a higher score than female pre-service teachers.

The analysis revealed that there was no statistically significant difference in the sub-dimensions and total score of information security awareness among pre-service teachers according to the grade level variable. In terms of the overall information security awareness score, third graders demonstrated the lowest level of proficiency in this area, when compared to other grade levels. Furthermore, third graders exhibited the lowest performance across all sub-dimensions, with the exception of the 'Attacks and Threats' sub-dimension, in comparison to other grade levels.

The extant research findings indicate that the prevalence of cyberbullying tendencies among pre-service teachers is minimal. Furthermore, an examination of the cyberbullying tendencies of pre-service teachers was conducted within the context of their respective universities. The investigation revealed that there was no significant discrepancy in the cyberbullying tendencies of pre-service teachers across different universities, as evidenced by the absence of substantial variation in sub-dimensions and overall scores. However, when the cyberbullying total score was considered, pre-service teachers from C University demonstrated lower scores compared to their counterparts from other universities.

The examination of cyberbullying tendencies among pre-service teachers according to gender revealed no statistically meaningful differentiation between boys and girls with respect to the 'Approval' and 'Interest' sub-dimensions. However, a significant difference was observed in the sub-dimensions of 'Identity Hiding' and 'Enjoyment' in favor of males. The total score for cyberbullying revealed significant differences between the participants' scores according to gender. In this regard, males exhibited significantly higher scores than females.

The analysis of the cyberbullying tendencies of pre-service teachers according to the grade level variable revealed no significant differences in the sub-dimensions or total score. Nevertheless, the total score for cyberbullying demonstrated that second graders exhibited a lower level of engagement than students in other grade levels.

Upon examination of the information security awareness and cyberbullying tendencies of pre-service teachers, it was determined that there was a positive, albeit weak and insignificant correlation between information security and cyberbullying tendencies. The results indicate that there is a very weak correlation between pre-service teachers' information security awareness and their tendencies towards cyberbullying.

## **Recommendations**

It is only through education that individuals can become aware of the potential attacks and dangers that may occur in the digital environment and thus take the necessary precautions to ensure their safety. It is imperative that our educators possess a comprehensive understanding of information security and cyberbullying, and that they disseminate this knowledge to their students. It is therefore recommended that faculties of education should include elective courses on cyber and information security in their curricula. It is possible to create public service announcements and corporate social responsibility projects on the subject of cyber information security and awareness, with the intention of reaching all segments of society. Institutional support may be extended to research projects pertaining to the awareness of information security and the phenomenon of cyberbullying. Support services are available free of charge to individuals who have been exposed to cyberbullying. In our study, the research sample consists only of students in the faculty of education. In this context, the research population and sample can be modified, thereby facilitating a contribution to the field through the implementation of a more comprehensive study.

## **Declarations**

### **Authors' contributions**

Aysun Düşmez: As she is a thesis student, she took part in every stage. Alev Orhan: She took part in the data collection process of the study and was responsible for the methodology, data analysis, and writing the findings and conclusion section. Elif Orhan: She took part in the data collection process of the study and was responsible for the discussion and recommendation sections.

### **Ethics statements**

The research requires ethics committee approval and was found appropriate in terms of scientific research ethics principles with the decision of Gazi University Institute of Science and Technology dated 10.03.2023 and numbered E.608679.

### **Competing interests**

Authors declare no conflict of interest.

## Acknowledgments

This publication is derived from the thesis.

## References

- Aboujaoude, E., Savage, M. W., Starcevic, V., & Salame, W. O. (2015). Cyberbullying: Review of an old problem gone viral. *Journal of Adolescent Health, 57*(1), 10–18. <https://doi.org/10.1016/j.jadohealth.2015.04.002>
- Akbulut, Ö., & Çapık, C. (2022). Çok değişkenli istatistiksel analizler için örneklem büyüklüğü [Sample size for multivariate statistical analysis]. *Journal of Nursology, 25*(2), 111–116. <https://doi.org/10.5152/JANHS.2022.970637>
- Akgün, Ö. E., & Topal, M. (2015). Eğitim fakültesi son sınıf öğrencilerinin bilişim güvenliği farkındalıkları: Sakarya Üniversitesi eğitim fakültesi örneği. [Information security awareness of final year education faculty students: The case of Sakarya University Faculty of Education]. *Sakarya University Journal of Faculty of Education, 5*(2), 98–121. <https://doi.org/10.19126/suje.73391>
- Altınar, İ. (2021). Öğretmenlerin kişisel siber güvenlik farkındalık düzeylerinin farklı değişkenlere göre değerlendirilmesi [Evaluation of teachers' personal cyber security awareness levels according to different variables]. (Unpublished Master Thesis), Ankara University, Institute of Educational Sciences, Ankara.
- Aydınbaş, G. (2023). Bilişim teknolojileri ve Türkiye ekonomisindeki yeri üzerine bir inceleme. [A study on information technologies and its place in the Turkish economy]. *International Journal of Social, Political and Financial Research, 3*(1), 18–32.
- Canoğulları, E. (2021). Öğretmenlerin bilgi güvenliği konusundaki farkındalıklarının incelenmesi [Examining teachers' awareness of information security]. *Kalem Journal of Education and Human Sciences, 11*(2), 651–679. <https://doi.org/10.23863/kalem.2021.219>
- Dadvar, M., & De Jong, F. (2012). Cyberbullying detection: a step toward a safer internet yard. *In Proceedings of the 21st International Conference on World Wide Web, Netherlands, 121–126.* <https://doi.org/10.1145/2187980.2187995>
- Dikmen, M., & Çağlar, A. (2017). Öğretmen adaylarının siber zorbalığa yönelik duyarlılıklarının farklı değişkenler açısından incelenmesi [Investigation of pre-service teachers' sensitivity towards cyberbullying in terms of different variables]. *Firat University Journal of Social Sciences, 27*(2), 101–112. <https://doi.org/10.18069/firatsbed.346489>
- Elmas, B. (2016). Öğretmen adaylarının siber zorbalık ve siber mağduriyet algı düzeylerinin incelenmesi [Examining the cyberbullying and cyber victimisation perception levels of prospective teachers]. (Unpublished Master Thesis), Afyon Kocatepe University, Institute of Science and Technology, Afyon.
- Eminağaoğlu, M., & Gökşen, Y. (2009). Bilgi güvenliği nedir, ne değildir? Türkiye'de bilgi güvenliği sorunları ve çözüm önerileri [What is information security and what is not? Information security problems and solution proposals in Turkey]. *Dokuz Eylül University Institute of Social Sciences Dergisi, 11*(4), 1–15.
- Gökmen, Ö. F., & Akgün, Ö. E. (2015). Bilgisayar ve öğretim teknolojileri eğitimi öğretmen adaylarının bilişim güvenliği eğitimi verebilmeye yönelik yeterlilik algılarının incelenmesi [Investigation of computer and instructional technology education teacher candidates' perceptions of competence to provide information security education]. *Primary Education Online, 14*(4), 1208–1221. <https://doi.org/10.17051/io.2015.04635>
- Güldüren, C., Çetinkaya, L., & Keser, H. (2016). Ortaöğretim öğrencilerine yönelik bilgi güvenliği farkındalık ölçeği (BGFÖ) geliştirme çalışması [Information security awareness scale (ISAS) development study for secondary school students]. *Primary Education Online, 15*(2), 682–695. <https://doi.org/10.17051/io.2016.27218>
- Güngör, B., Tingiş, E., & Sarol, B. (2020). Sosyal bilgiler öğretmen adaylarının siber zorbalık düzeylerinin incelenmesi [Investigation of cyberbullying levels of prospective social studies teachers]. *Journal of Innovative Research in Social Studies, 3*(2), 147–160. <https://doi.org/10.47503/jirss.826393>
- Karacı, A., Akyüz, H. İ., & Bilgici, G. (2017). Üniversite öğrencilerinin siber güvenlik davranışlarının incelenmesi [Investigation of university students' cyber security behaviours]. *Kastamonu Education Journal, 25*(6), 2079–2094. <https://doi.org/10.24106/kefdergi.351517>
- Karasar, N. (2016). *Karasar, N. (2016). Bilimsel irade algı çerçevesi ile bilimsel araştırma yöntemi kavramlar ilkeler teknikler [Scientific research method with scientific will perception framework concepts principles techniques]. Nobel Publications.*

- Kaur, J., & Ramkumar, K. R. (2022). The recent trends in cyber security: A review. *Journal of King Saud University Computer and Information Sciences*, 34(8), 5766–5781. <https://doi.org/10.1016/j.jksuci.2021.01.018>
- Kavas, Z., Özbudak, S., & Çetkin, E. (2022). Investigation of teachers' cyber security. *International Social Sciences Studies Journal*, 8(106), 4505–4510. <https://doi.org/10.29228/sssj.66215>
- Keser, H., Güldüren, C., & Çetinkaya, L. (2017). Öğretmenler için bilgi güvenliği farkındalık ölçeği (BGFÖ) geliştirme çalışması [Information security awareness scale (ISAS) development study for teachers]. *Journal of National Education*, 2(16), 33–52. <https://doi.org/10.17051/io.2016.27218>
- Lam, T. N., Jensen, D. B., Hovey, J. D., & Roley–Roberts, M. E. (2022). College students and cyberbullying: How social media use affects social anxiety and social comparison. *Heliyon*, 8(12), e12556. <https://doi.org/10.1016/j.heliyon.2022.e12556>
- Metin, K. E. (2017). Ortaokul öğretmenlerinin siber zorbalık yaşama düzeyleri ve siber zorbalıkla başa çıkma stratejileri [Secondary school teachers' levels of cyberbullying and their coping strategies with cyberbullying]. *Journal of Education and Society Research*, 4(2), 33–49.
- Ortega–Barón, J., Buelga, S., Ayllón, E., Martínez–Ferrer, B., & Cava, M. J. (2019). Effects of intervention program Prev@cib on traditional bullying and cyberbullying. *International Journal of Environmental Research and Public Health*, 16(4), 527. <https://doi.org/10.3390/ijerph16040527>
- Özbek, Y. (2019). Öğretmen adaylarının siber güvenlik farkındalıklarının incelenmesi [Investigation of cyber security awareness of prospective teachers]. (Unpublished Master Thesis), Necmettin Erbakan University, Institute of Educational Sciences, Konya.
- Sağiroğlu, Ş. (2018). *Siber güvenlik ve savunma: önem, tanımlar, unsurlar ve önlemler* [Cyber security and defense: importance, definitions, elements and measures]. Grafiker Publishing House.
- Semerci, A. (2019). Eğitim fakültesi öğrencileri ile diğer fakültelerdeki öğrencilerin siber güvenlik farkındalıklarının karşılaştırılması [Comparison of cyber security awareness of education faculty students and students in other faculties]. *Mediterranean Journal of Educational Research*, 13(29), 138–156. <https://doi.org/10.29329/mjer.2019.210.8>
- Singleton, R. A. ve Straits, B. C. (2005). *Approaches to social research* (4th ed.). Oxford University Press
- Solmaz, M. (2020). Öğretmen adaylarının siber bilgi güvenliği farkındalıklarının ve dijital vatandaşlık düzeylerinin farklı değişkenler açısından incelenmesi [Investigation of cyber information security awareness and digital citizenship levels of prospective teachers in terms of different variables]. (Unpublished Master Thesis), Mersin University, Institute of Educational Sciences, Mersin.
- Souza, S. B., Ferreira, P. C., Veiga Simão, A. M., & Falla, D. (2022). The dynamic of cyberbullying in university students: Moderating effects of gender and culture. *Multidisciplinary Journal of Educational Research*, 12(3), 322–347. <https://doi.org/10.17583/remie.8999>
- Tabachnick, L. S., & Fidell, B. G. (2013). *Using multivariate statistics* (6th ed.). Pearson Education Publishing.
- Talib, S. (2014). *Personalising information security education* (Doctoral dissertation). University of Plymouth, Faculty of Science and Technology, Malaysia.
- Türkoğlu, S. (2013). Ergenlerin problemleri internet kullanımları ile siber zorbalık eğilimleri arasındaki ilişkinin incelenmesi [Examining the relationship between adolescents' problematic internet use and cyberbullying tendencies]. (Unpublished Master Thesis), Marmara University, Institute of Educational Sciences, İstanbul.
- Ulutaş, A. (2022). *Siber güvenlik eğitiminin öğretmen adaylarının farkındalık, bilgi ve davranış düzeylerine etkisi* [The effect of cyber security education on the awareness, knowledge and behavior levels of prospective teachers]. (Doctoral Dissertation), Gazi University/Institute of Educational Sciences, Ankara.
- Willard, N. E. (2007). Cyberbullying and cyberthreats: Responding to the challenge of online social aggression, threats, and distress. *Illinois: Research Press*, 2–10.
- Yardım, T.E. (2022). Çevrimiçi oyun oynayan üniversite öğrencilerinin siber zorbalık/mağduriyet düzeyleri ile empati arasındaki ilişkinin incelenmesi [Examining the relationship between cyberbullying/victimization levels of university students who play online games and empathy]. (Master's Thesis), İstanbul Gelisim University Graduate School of Education, İstanbul.
- Yavuz, F. (2023). Öğretmenlerin dijital okuryazarlık düzeyleri ile kişisel siber güvenliği sağlama davranışları arasındaki ilişkinin incelenmesi [Examining the relationship between teachers' digital literacy levels and personal cyber security behaviours]. (Unpublished Master Thesis), Fırat University, Institute of Educational Sciences, Elazığ.
- Yiğit, M. F., & Seferoğlu, S. S. (2019). Öğrencilerin siber güvenlik davranışlarının beş faktör kişilik özellikleri ve çeşitli diğer değişkenlere göre incelenmesi [Investigation of students' cyber security behaviours

- according to five-factor personality traits and various other variables]. *Mersin University Journal of Faculty of Education*, 15(1), 186–215. <https://doi.org/10.17860/mersinefd.437610>
- Zorlu, E. (2023). An examination of the relationship between college students' cyberbullying awareness and ability to ensure their personal cybersecurity. *Journal of Learning and Teaching in Digital Age*, 8(1), 55–70. <https://doi.org/10.53850/joltida.1087377>