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REVISTA DE MEDIOS Y EDUCACIÓN
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Competency Profile of Andalusian Teachers in Digital Security: Evaluation of Data Protection and Privacy in accordance with the Digital Competencies Framework for Citizenship (DigComp 2.2)

Perfil Competencial del Profesorado Andaluz en Seguridad Digital: Evaluación de la Protección de Datos y Privacidad de acuerdo con el Marco de Competencias Digitales para la Ciudadanía (DigComp 2.2)

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RESUMEN
La incorporación de dispositivos electrónicos conectados a la red presenta desafíos y riesgos en términos de seguridad digital. Este artículo presenta los hallazgos de una investigación enfocada en la evaluación de la competencia digital de los educadores en lo que respecta a la salvaguarda de datos personales, conforme al marco europeo DigComp 2.2. En el estudio tomaron parte 497 docentes del sistema educativo andaluz a través de un cuestionario validado por expertos sobre Competencia en Seguridad Digital. Este instrumento, de enfoque integral y dividido en cuatro dimensiones, se centra en la Dimensión "Protección de Datos Personales", abarcando 15 ítems. Este enfoque nos posibilita comprender el nivel competencial de los docentes durante su desempeño. Se observan disparidades significativas en la salvaguarda de datos personales asociadas a la edad, la antigüedad docente y las horas de formación, indicando que aquellos de mayor edad, antigüedad y mayor formación obtienen calificaciones más elevadas. En resumen, los docentes andaluces que participan en este estudio exhiben una disposición favorable a la seguridad para proteger sus datos personales, aunque presentan carencias asociadas al trato seguro y responsable de estos durante la navegación por la red.

ABSTRACT
The integration of electronically connected devices poses challenges and risks in terms of digital security. This article presents the findings of a study focused on assessing the digital competence of educators regarding the safeguarding of personal data, in accordance with the European framework DigComp 2.2. A total of 497 teachers from the Andalusian educational system participated in the study, responding to a questionnaire validated by experts on Digital Security Competence. This instrument, with a comprehensive approach and divided into four dimensions, specifically centers on the "Protection of Personal Data" dimension, encompassing 15 items. This approach enables us to understand the competency level of teachers during their performance. Significant disparities are observed in personal data protection associated with age, teaching experience, and training hours, suggesting that those who are older, have more experience, and possess higher levels of training achieve higher scores. In summary, Andalusian teachers participating in this study demonstrate a positive attitude toward security in protecting their personal data, although they exhibit deficiencies in the secure and responsible handling of their personal data during internet navigation.

PALABRAS CLAVES · KEYWORDS
Competencia digital; privacidad; seguridad cibernética; protección de datos; docentes; DigComp 2.2.
Digital competence; privacy; cybersecurity; data protection; teachers; DigComp 2.2.

1. Introducción

The advancement of recent technologies and their increasing integration into the educational sphere pose various challenges concerning digital security. This underscores the imperative to foster adequate digital literacy today, alongside teacher training in this matter. In this context, the DigComp 2.2 (Digital Competence Framework for Citizens) and the European Framework for the Digital Competence of Educators (DigCompEdu) emphasize the evaluation and enhancement of pedagogical digital competence to ensure effective instruction that nurtures digitally competent young individuals (Marín et al., 2023).

1.1. Digital competence for digital security and responsibility in data protection and privacy.

While security and privacy are distinct concepts, they are closely interrelated when considered within the framework of data protection (Quan-Haase & Ho, 2020). Currently, the privacy of personal communication and personal data privacy are encompassed within information privacy, as most conversations are digitized and thus stored as information (Mutimukwe et al., 2020).

The training of teachers in safe, critical, and responsible use of digital technologies is a critical issue in digital security (Ferrari & Punie, 2013). Jin et al., (2018) identify this aspect as a priority of educational systems, emphasizing the need to train digitally confident and competent students.

Recent studies have unveiled low levels of digital security competence among university students (Antonopoulou et al., 2020) and trainee teachers (Gallego-Arrufat et al., 2019) with half of the latter exhibiting a medium digital risk due to unsafe practices. Muammar et al. (2023) note a limited understanding among users regarding the security of their personal information processing, leading them to entrust their privacy to online service providers. Illicit collection of personal data for commercial and political purposes represents one of the major contemporary challenges. Hence, there is a pressing need to educate society about these risks, protect their data, and raise awareness of their privacy rights while navigating the Internet (Hernández-Martín et al., 2021).

1.2. Education in data protection and privacy.

The integration of educational technologies has underscored the importance of digital literacy in the educational realm (Mendivil Caldentey et al., 2022). The adoption of interactive tools and other digital resources requires significant investments by educational institutions in technological infrastructure, which has facilitated management, research, and teaching in this domain (Estrada et al., 2022).

Heightened concerns about security in digital educational environments highlight the necessity for students and teachers to avoid risky practices, such as identity theft and unauthorized access to personal data. Therefore, incorporating behavioral prevention into digital literacy equips users against the perils of the digital age (Sonck et al., 2011). The escalating use of social networks in education has revolutionized teaching and learning. Consequently, teachers have expressed concerns about data privacy and their lack of

knowledge in this regard (Marín et al., 2023), as changes in digital learning have underscored the significance of data and the "datification" process in the educational sphere (Williamson et al., 2020).

Krutka et al. (2019) anticipated that teachers would need to address issues related to the use, application, and regulation of social networks in their classrooms; perhaps this future is already upon us. Furthermore, special attention should be paid to safeguarding the personal data of students and teachers, as data privacy is intricately linked to individuals' rights to control how their personal information is collected and used (Vartiainen et al., 2024). Given the increasing volume of personal information collected and shared on platforms and social networks, it is essential to consider the positive and negative stimuli that teachers perceive concerning data security and privacy.

Previous online experiences and privacy-related incidents influence people's concern for their privacy (Barroso & Feijóo, 2020). Implementing training programs on data processing has proven more effective than solely establishing regulations. Moreover, an optimal level of digital technology competence among teachers enables them to teach and learn in a safer and more effective manner. This level stems from employing appropriate didactic, pedagogical, and methodological criteria, while fostering critical consciousness, morality, and ethics (Tigelaar et al., 2004).

This study aims to: 1) Evaluate the digital competence in the security of personal data protection among active teachers in Andalusia. 2) Investigate disparities according to gender, age, and training in data protection to identify training gaps and strengthen digital competence in security.

2. Methodology

To achieve the objectives outlined in this research, a quantitative study was conducted employing a non-experimental research methodology of an exploratory-descriptive nature, utilizing the survey method as the primary technique for data collection.

2.1. Sample

The sample for this research comprised 497 participants, whom were teachers within the Andalusian educational system during the 2022/2023 academic year (n = 107,837). The sample was selected based on the formula for finite populations. Simple random sampling was employed with a confidence level of 95% and a margin of error of 5%. It is noteworthy that essential requirements for selection were considered, such as participants' access to and acceptance of the study, as well as their availability for the data collection process, ensuring maximum optimization and effectiveness.

Table 1

Sample characterization

Gender	
Men	33%
Women	65.6%
Prefer not to disclose	1.4%
Age	
Under 30 years	4.6%
30-34 years	10.3%
35-39 years	14.5%
40-44 years	14.5%
45-50 years	14.9%
50-54 years	11.3%
55-59 years	13.1%
Over 60 years	16.8%
Teaching seniority	
0-5 years	26.2%
6-10 years	15.3%
11-15 years	15.9%
16-20 years	17.1%
Over 21 years	25.6%
Training hours	
No training	8.9%
Less than 30 hours	18.3%
31-60 hours	28.6%
61-90 hours	15.7%
91-120 hours	11.1%
Over 120 hours	17.5%
Educational level	
Early Childhood Education	8.5%
Primary education	31.2%
Secondary education and Bachelor's	41%
Adult Education and other positions	6.2%

2.2. Data collection tool

Data collection utilized the survey method via the Competence in Digital Security questionnaire, known as “COSEDI” (https://lc.cx/eSw1Rh). This is a comprehensive instrument divided into four dimensions. Specifically, this study focuses on the “Device Protection” dimension, consisting of 15 Likert-type response items, with options ranging between 1 and 4 (1 indicating never, 2 rarely, 3 sometimes, and 4 always).

This instrument has demonstrated robust metric characteristics. Item analysis techniques revealed outstanding discriminative power, as evidenced by an appropriate distribution that enhances the ability to differentiate between distinct levels of latent variables. Concerning the internal consistency of the dimension examined in this study, "Device Protection," the Cronbach's alpha coefficient yielded a value of 0.859, surpassing the minimum threshold of 0.70, indicative of notable internal consistency of the instrument. Additionally, the Composite Reliability indicator produced a value of 0.885, reflecting very high reliability of the set of items.

2.3. Data analysis

SPSS statistics software (IBM-SPSS Statistics Version 28.0) was employed for data cleaning, tabulation, and statistical analysis. An initial descriptive and exploratory analysis of each variable and item was conducted utilizing centrality measures such as mean (M), median (Me), quartile 1 (P25), and quartile 3 (P75), as well as dispersion measures such as standard deviation (SD), interquartile range, and the minimum and maximum recorded values.

In the inferential analysis, either the Student t-test for independent samples or the Mann-Whitney U test was applied in scenarios with two segmentations. For situations with three or more segmented categories, one-way analysis of variance for independent samples (ANOVA) was performed in parametric contexts, and the Kruskal-Wallis test in non-parametric contexts. Post-hoc contrasts were conducted using the Tukey method (for parametric cases) and the Dwass-Steel procedure (non-parametric) for pairwise comparisons.

The effect size was determined using partial $\eta 2$ or $\epsilon 2$, interpreted based on the following criteria: Insignificant (<0.01), Small (<0.06), Medium (<0.14), and Large (>0.14).

3. Analysis and results

3.1. Competence Profile (Personal Data Protection and Privacy)

The responses and scores presented in Table 1 were evaluated using a Likert scale ranging from 1 to 4, where 1 indicates the lowest score and 4 the highest. This construct comprises 15 items; thus, the minimum score is 15 and the maximum 60.

Both the total score and the average of responses were scrutinized in detail. The results indicate that both total and average scores exhibit negative skewness of -0.35 and -0.43, respectively, along with a kurtosis of -0.46 and -0.38, respectively.

Normality analysis yielded highly significant p-values ($p < .001$), indicating that the distributions deviate from normality. In terms of centrality, the total scores have a mean of 45.25 and a median of 46.00, while the average scores have a mean of 3.05 and a median of 3.13.

Variability is observed within a range from 26 to 60 for total scores and from 1.75 to 3.94 for average scores. Likewise, the standard deviations are 7.07 for total scores and 0.46 for average scores, and the interquartile ranges (IQR) amount to 10.00 for total scores and 0.69 for average scores.

Considering the data and the mean and median values (45.25 and 46.00) within the range of possible scores (15-60), values are above P67; hence, in general, most observations have a high recorded score with respect to the sum or average.

Table 2

Exploratory and descriptive analysis. Variable: Scores recorded in Protection of personal data and privacy (PrDpP)

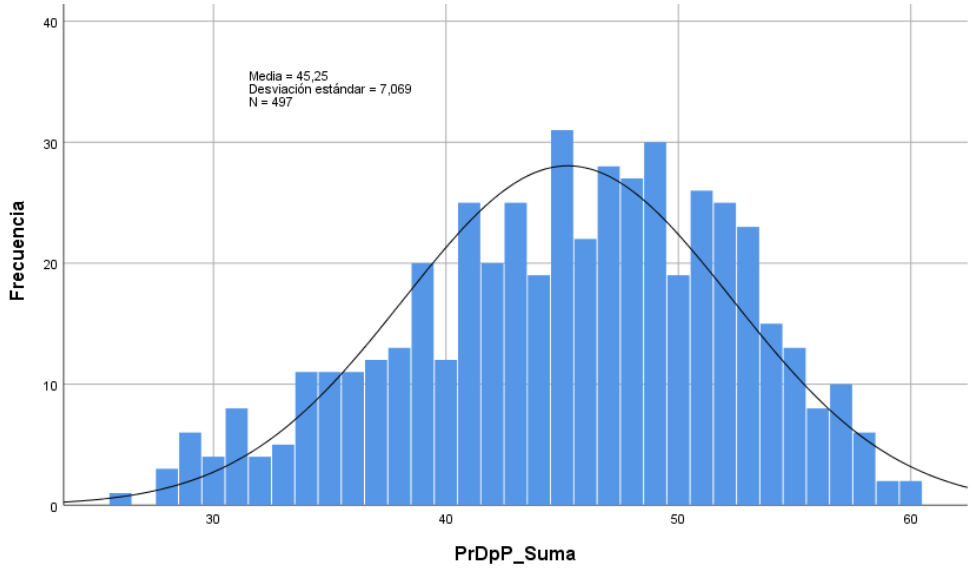
Variable *(497 answers recorded)*	**Exploration: Form**			**Centrality**		**Variability**		
	Asymmetry	**Kurtosis**	**Normal *p-value***	**Mean**	**Median**	**Range (Min/Max)**	**Std. deviation**	**Range IQR**
PrDpP (Sum)	-0.35	-0.46	**0.000***	45.25	46.00	26 / 60	7.07	10.00
PrDpP (Average)	-0.43	-0.38	**0.000***	3.05	3.13	1.75 / 3.94	0.46	0.69

^{NS} Not significant deviation; the variable follows a normal distribution* Significant deviation; the variable does not follow a normal distribution.

When n > 50, the normality test utilized was Kolmogorov-Smirnov; when n < 50, the Shapiro-Wilk test was employed.

Figure 1

Histogram of Items on Personal Data Protection and Privacy (PrDpP) with Overlay of Density Curve



3.2. Significant Relationships with Sociodemographic Variables

The latent dimension of Device Protection was evaluated by analyzing the accumulated scores of each item based on different sociodemographic segments. Through a series of non-parametric tests, this study aimed to ascertain if significant differences existed between the segments of interest.

3.2.1. Gender Differences

The hypothesis test using the Mann-Whitney U test indicated a trend towards statistical significance for the study variable (U = 1.95, p = 0.051), with a small effect size according to Cohen's d (d = 0.108). These results suggest possible differences between genders regarding the protection of personal data and privacy.

The observed mean difference of 1.36 between men and women regarding scores on the personal data protection and privacy questionnaire indicates significant variations in responses according to gender. The statistical value close to the level of significance (U = 1.95, p = 0.051) suggests differing trends in perception of privacy and data protection between men and women.

Table 3

Hypothesis Testing Contrasts by Gender for Personal Data Protection and Privacy (PrDpP).

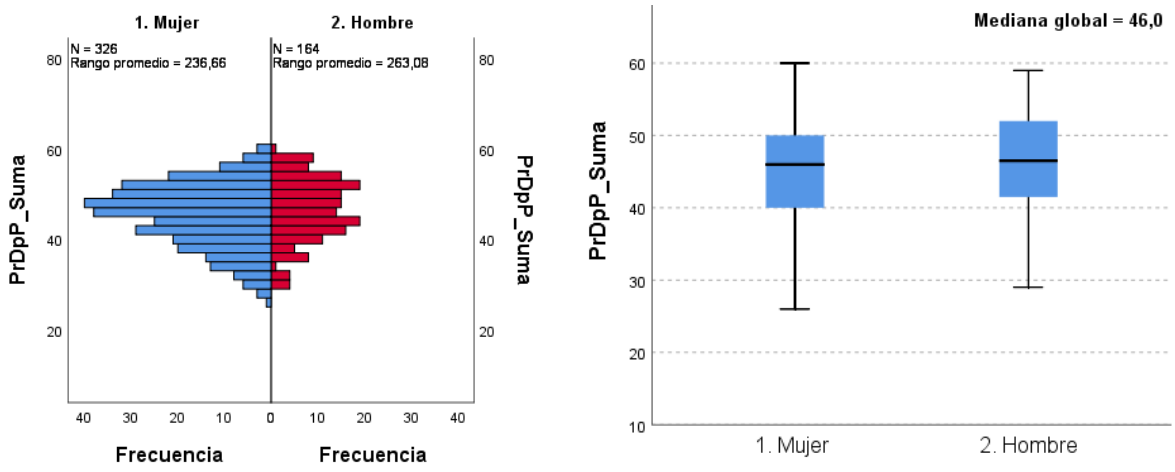
	Descriptive			Contrast test					
	Mean	**Std. dev.**	**Median**		**Std.**	**p-value**	**Diff. Means**	**Size Effect**	**Interpretation**
1. Women	44.8	6.99	46.0	*Student t*	**2.03***	**0.043**	**1.36**	**0.194**	**Very small**
2. Men	46.1	7.03	46.5	*Mann-Whitney U*	**1.95†**	**0.051**	**1.00**	**0.108**	**Very small**

*NS Not significant, † Almost significant (p<0.10); * Significant (p<0.05) and ** Highly significant (p<0.01)*

Statistical test/Contrast: Student's t-test (Parametric – Assuming normality), Mann-Whitney U test (Non-parametric).

Figure 2

Histogram and Boxplot by gender



3.2.2. Age-Related Differences

Highly significant differences were found between different age ranges (H = 16.90, p = .002, ε² = 0.034), with a small effect size. This suggests that age significantly affects perception in relation to the accumulated scores for the dimension of personal data protection and privacy.

No significant differences were observed in comparisons between the group under 30 years of age and the groups 30-39, 40-49, 50-59, and over 60 years (p > 0.05). However, comparisons between the groups 30-39 years and 50-59 years, as well as between 30-39 years and over 60 years, showed highly significant differences (p = 0.006 and p = 0.016, respectively), indicating statistically significant differences in questionnaire scores between these age ranges. Specifically, the negative mean differences (-2.94 and -5.06, respectively) suggest that individuals in the 30-39 age group tend to exhibit lower scores on personal data protection and privacy compared to those in the older age groups.

Table 4

Hypothesis Testing Contrasts by Age Ranges (Regrouping) for Personal Data Protection and Privacy (PrDpP)

(Number of observations)	Descriptive			Contrast test				
	Mean	**Std. dev.**	**Median**		**Std. (F and H)**	**p-value**	**Size Effect**	**Interpretation**
1. < de 30 (23)	44.6	4.7	45.0	*ANOVA*	**4.28****	**0.002**	**0.034**	**Small**
2. 30-39 (123)	43.5	7.0	43.0	*Kruskal-Wallis*	**16.90****	**0.002**	**0.034**	**Small**
3. 40-49 (205)	45.3	7.5	45.0					
4. 50-59 (121)	46.4	6.4	47.0					
5. Over 60 (25)	48.6	6.6	49.0					

NS *Not significant, † Almost significant (p<0.10); * Significant (p<0.05) and ** Highly significant (p<0.01)*

Statistical test/Contrast: ANOVA (Parametric – Assuming normality), Kruskal-Wallis test (Non-parametric).

Table 5

Post-Hoc Contrasts by Study Segments for the Variable Age (Regrouping) regarding Personal Data Protection and Privacy (PrDpP)

Group Comparison		Post-hoc contrast test				
		Parametric			Non-parametric	
Group A	**Group B**	**Diff. Means**	**T (std.)**	**p-value**	**W (std.)**	**p-value**
1. < 30	2. 30-39	1.06	0.67 NS	0.963	-0.69 NS	0.989
	3. 40-49	-0.69	-0.45 NS	0.992	0.97 NS	0.960
	4. 50-59	-1.88	-1.19 NS	0.760	2.57 NS	0.364
	5. Over 60	-3.99	-1.98 NS	0.277	3.41 NS	0.113
2. 30-39	3. 40-49	-1.75	2.19 NS	0.182	2.98 NS	0.216
	4. 50-59	**-2.94**	**-3.29****	**0.009**	**4.80****	**0.006**
	5. Over 60	**-5.06**	**-3.30****	**0.009**	**4.39***	**0.016**
3. 40-49	4. 50-59	-1.19	-1.49 NS	0.569	1.95 NS	0.643
	5. Over 60	-3.31	-2.24 NS	0.168	2.81 NS	0.271
4. 50-59	5. Over 60	-2.11	-1.38 NS	0.642	2.02 NS	0.611

NS *Not significant, † Almost significant (p<0.10); * Significant (p<0.05) and ** Highly significant (p<0.01)*

3.2.3. According to seniority range (as a teacher)

The examination of Personal Data Protection and Privacy revealed significant differences in questionnaire scores related to teaching seniority. Statistical analysis uncovered a highly significant difference in scores according to the seniority of the teachers ($H = 18.80$, $p < 0.001$), with a small effect size ($\varepsilon^2 = 0.038$).

Most comparisons between the different ranges of teaching seniority (0-5 years vs. 6-10, 11-15, and 16-20 years; 6-10 years vs. 11-15 and 16-20 years; 11-15 vs. 16-20 years; and 16-20 vs. 21 years or more) did not yield statistically significant differences.

However, highly significant differences emerged in comparisons between the group of teachers with 0-5 years of seniority and those with 21 or more years ($p < 0.001$), as well as between teachers with 11-15 years and those with 21 or more years of seniority ($p = 0.006$). These significant differences, as evidenced by the mean differences of -3.34 and -3.25, respectively, suggest that teachers with less seniority exhibit lower scores on the personal data protection and privacy questionnaire compared to those with more years of experience.

Table 6

Hypothesis Testing Contrasts by Seniority Range (as a teacher) for Personal Data Protection and Privacy (PrDpP)

(Number of observations)	Descriptive			Contrast test				
	Mean	**Std. dev.**	**Median**		**Std. (F and H)**	**p-value**	**Size Effect**	**Interpretation**
1. 0-5 years (130)	44.0	6.6	44.5	*ANOVA*	**4.56****	**<0.001**	**0.036**	**Small**
2. 6-10 years (76)	44.8	7.7	45.5	*Kruskal-Wallis*	**18.80****	**<0.001**	**0.038**	**Small**
3. 11-15 years (79)	44.1	7.0	45.0					
4. 16-20 years (85)	45.4	7.4	46.0					
5. 21 o + years (127)	47.4	6.6	48.0					

NS *Not significant,* † *Almost significant (p<0.10);* * *Significant (p<0.05) and* ** *Highly significant (p<0.01)*

Statistical test/Contrast: ANOVA (Parametric – Assuming normality), Kruskal-Wallis test (Non-parametric).

Table 7

Post-Hoc Contrasts by Study Segments for Seniority Range (as a teacher) regarding Personal Data Protection and Privacy (PrDpP)

Group Comparison		Post-hoc contrast test				
		Parametric			Non-parametric	
Group A	**Group B**	**Diff. Means**	**T (std.)**	**p-value**	**W (std.)**	**p-value**
1. 0-5 years	2. 6-10 years	-0.74	-0.74 NS	.948	1.00 NS	0.955
	3. 11-15 years	-0.09	-0.09 NS	1.000	0.14 NS	0.999
	4. 16-20 years	-1.41	-1.45 NS	0.594	2.18 NS	0.535
	5. 21 o + years	**-3.34**	**-3.84****	**0.001**	**5.62****	**< 0.001**
2. 6-10 years	3. 11-15 years	0.65	0.58 NS	0.978	-0.90 NS	0.970
	4. 16-20 years	-0.67	-0.61 NS	0.973	0.82 NS	0.978
	5. 21 or + years	-2.60	-2.57 NS	0.077	3.41 NS	0.113
3. 11-15 years	4. 16-20 years	-1.32	-1.21 NS	0.744	1.79 NS	0.714
	5. 21 or + years	**-3.25**	**-3.25***	**0.011**	**4.79****	**0.006**
4. 16-20 years	5. 21 or + years	-1.93	-1.97 NS	0.281	2.60 NS	0.350

NS *Not significant,* † *Almost significant (p<0.10); * Significant (p<0.05) and ** Highly significant (p<0.01)*

3.2.4. According to type of center

The homogeneity in personal data protection and privacy practices among different types of educational centers is confirmed by the Kruskal-Wallis test (H = 1.85, p = .604, ε^2 = .004), indicating the absence of significant differences between groups. This suggests that these practices constitute a uniformly applied standard, regardless of the nature or classification of the educational center.

Table 8

Hypothesis Testing Contrasts by Type of Center (Regrouping) for Personal Data Protection and Privacy (PrDpP)

(Number of observations)	Descriptive			Contrast test				
	Mean	**Std. dev.**	**Median**		**Std. (F and H)**	**p-value**	**Size Effect**	**Interpretation**
1. ECPE + PEC + RPC + CEE (227)	44.8	7.1	45.0	*Anova*	0.60 NS	0.611	0.004	Insignificant
2. CCE + ERS (31)	46.2	7.5	48.0	*Kruskal-Wallis*	1.85 NS	0.604	0.004	Insignificant
3. SEMID + OLS (26)	45.5	6.0	46.0					
4. SEI (213)	45.5	7.1	46.0					

NS *Not significant,* † *Almost significant (p<0.10); * Significant (p<0.05) and ** Highly significant (p<0.01)*

Table 9

Post-Hoc Contrasts by Study Segments for Type of Center (Regrouping) regarding Personal Data Protection and Privacy (PrDpP)

Group Comparison		**Post-hoc contrast test**				
		Parametric			**Non-parametric**	
Group A	**Group B**	**Diff. Means**	**T (std.)**	**p-value**	**W (std.)**	**p-value**
1. ECPE + CCE + RPC + CEE	2. CCE + ERS	-1.36	-1.00 NS	0.750	1.64 NS	0.655
	3. PEFSE + OLS	-0.73	-0.50 NS	0.959	0.42 NS	0.991
	4. SEI	-0.74	-1.09 NS	0.694	1.35 NS	0.775
2. CCE + ERS	3. PEFSE + OLS	0.62	0.33 NS	0.987	-1.08 NS	0.872
	4. SEI	0.62	0.45 NS	0.969	-0.95 NS	0.909
3. PEFSE + OLS	4. SEI	-0.01	-0.01 NS	0.999	0.26 NS	0.998

NS *Not significant,* † *Almost significant (p<0.10); * Significant (p<0.05) and ** Highly significant (p<0.01)*

ECPE: Early Childhood and Primary Education Center; PEC: Primary Education Center; RPC: Rural Public Center; CEE: Special Education Center; CCE: Center for Continuing Education; ERS: Continuing Education Section; PEFSE: Primary Education and first cycle of Secondary Education; OLS: Official Language Schools; SEI: Secondary Education Institutes

3.2.5. According to location of the center

Statistical analysis reveals that the geographical location of educational centers is not a significant predictor of differences in the protection of personal data and privacy (H = 3.77, p = 0.152, ε² = 0.008). This finding could suggest that privacy and data protection policies and regulations have a uniform scope and application, irrespective of the geographical location of educational centers.

Table 10

Hypothesis Testing Contrasts by Type of Center (Regrouping) for Personal Data Protection and Privacy (PrDpP)

(Number of observations)	Descriptive			Contrast test				
	Mean	**Std. dev.**	**Median**		**Std. (F and H)**	**p-value**	**Size Effect**	**Interpretation**
1. Urban Center (221)	45.8	7.1	46.0	*ANOVA*	1.87 NS	0.154	0.007	Not significant
2. City periphery (134)	44.3	7.0	45.0	*Kruskal-Wallis*	3.77 NS	0.152	0.008	Not significant
3. Rural area (142)	45.2	7.0	46.0					

NS *Not significant,* † *Almost significant (p<0.10); * Significant (p<0.05) and ** Highly significant (p<0.01)*

Table 11

Post-Hoc Contrasts by Study Segments for Type of Center (Regrouping) regarding Personal Data Protection and Privacy (PrDpP)

Group Comparison		Post-hoc contrast test				
		Parametric			Non-parametric	
Group A	Group B	Diff. Means	T (std.)	p-value	W (std.)	p-value
1. Urban Center	2. City periphery	1.50	1.94 NS	0.130	-2.71 NS	0.135
	3. Rural area	0.61	0.81 NS	0.699	-0.94 NS	0.785
2. City periphery	3. Rural area	-0.88	1.04 NS	0.553	1.74 NS	0.437

NS *Not significant,* † *Almost significant (p<0.10); * Significant (p<0.05) and ** Highly significant (p<0.01)*

3.2.6. According to educational stage

The hypothesis testing for the educational stage does not support the existence of significant differences in the protection of personal data and privacy (H = 4.73, p = 0.449, ε^2 = 0.010). This result indicates that sensitivity towards data privacy and its protection is not segmented by educational levels for teachers. This could reflect a culture of privacy protection well integrated into the education system or suggest that data protection measures are robust enough to maintain a uniform standard across various educational stages from the perspective of the surveyed teachers.

Table 12

Hypothesis Testing Contrasts by Educational Stage (Regrouping) for Personal Data Protection and Privacy (PrDpP)

(Number of observations)	Descriptive			Contrast test				
	Mean	Std. dev.	Median		Std. (F and H)	p-value	Size Effect	Interpretation
1. Only Child Ed. (42)	44.9	8.6	45.0	*ANOVA*	0.91 NS	0.481	0.009	Not significant
2. Only Primary Ed. (155)	44.4	6.7	45.0	*Kruskal-Wallis*	4.73 NS	0.449	0.010	Not significant
3. Child Ed. + Primary Ed. (33)	45.7	6.5	46.0					
4. Secondary Ed. and/or Bachelor's and/or Vocational Training (204)	45.6	7.1	46.0					

(Number of observations)	Descriptive			Contrast test			
	Mean	Std. dev.	Median	Std. (F and H)	p-value	Size Effect	Interpretation
5. Only Adult Education (31)	46.9	7.6	48.0				
6. Other/Various (32)	45.1	6.4	46.5				

NS *Not significant,* † *Almost significant (p<0.10); * Significant (p<0.05) and ** Highly significant (p<0.01)*

Table 13

Post-Hoc Contrasts by Study Segments for Educational Stage (Regrouping) regarding Personal Data Protection and Privacy (PrDpP)

Group Comparison		Post-hoc contrast test				
		Parametric			Non-parametric	
Group A	Group B	Diff. Means	T (std.)	p-value	W (std.)	p-value
1. Only Child Ed.	2. Only Primary Ed.	0.44	0.36 NS	0.999	-0.72 NS	0.996
	3. CE + PE	-0.82	-0.50 NS	0.996	0.51 NS	0.999
	4. SE and/or Bachelor's and/or VT	-0.75	-0.62 NS	0.989	0.51 NS	0.999
	5. Only Adult Ed.	-2.05	-1.23 NS	0.824	1.46 NS	0.907
	6. Other/Various	-0.21	-0.13 NS	0.999	-0.05 NS	0.999
2. Only Primary Ed.	3. Child Ed. + Primary Ed.	-1.26	-0.93 NS	0.939	1.15 NS	0.966
	4. SE and/or Bachelor's and/or Vocational Training	-1.19	-1.58 NS	0.614	2.10 NS	0.672
	5. Only Adult Ed.	-2.50	-1.79 NS	0.470	2.74 NS	0.379
	6. Other/Various	-0.66	-0.48 NS	0.997	0.61 NS	0.998
3. Child Ed. + Primary Ed.	4. SE and/or Bachelor's and/or Vocational Training	0.07	0.05 NS	0.999	0.04 NS	0.999
	5. Only Adult Education	-1.24	-0.70 NS	0.982	1.47 NS	0.904
	6. Other/Various	0.60	0.34 NS	0.999	-0.42 NS	0.999
4. SE and/or Bachelor's and/or VT	5. Only Adult Education	-1.31	-0.96 NS	0.930	1.64 NS	0.856
	6. Other/Various	0.53	0.40 NS	0.999	-0.61 NS	0.998
5. Only Adult Education	6. Other/Various	1.84	1.03 NS	0.907	-1.72 NS	0.828

NS *Not significant,* † *Almost significant (p<0.10); * Significant (p<0.05) and ** Highly significant (p<0.01)*

3.2.7. According to hours of teacher training

The statistically significant association between training hours and the protection of personal data and privacy (H = 14.60, p < 0.001, ε² = 0.029) underscores the influence that training has in this area. Although the effect size is small, the statistical significance should not be underestimated, as it highlights the relevance of continuous training in improving privacy and data protection practices. This link supports the idea that investing in training may result in increased awareness and, therefore, the adoption of behaviors that promote greater protection of personal information. Training emerges as a key tool to strengthen data privacy and security in the educational sector.

The analyses revealed no statistically significant differences in personal data protection and privacy scores between teachers who have not received training and those who have received less than 60 hours of training (mean difference = -1.43; t = 1.39, p = 0.588).

However, significant differences were observed when teachers without training were compared with those who have received over 60 hours of training (mean difference = -3.55; t = 3.78, p = 0.020). This indicates that teachers with more training score significantly higher on the questionnaire.

Furthermore, highly significant differences were found between teachers with less than 60 hours of training and those with over 60 hours (mean difference = -2.12; t = 4.74, p = 0.002). This suggests that the greater the quantity of hours of training, the better the personal data protection and privacy practices.

Table 14

Hypothesis Testing Contrasts by Hours of Teacher Training (Regrouping) for Personal Data Protection and Privacy (PrDpP)

(Number of observations)	Descriptive			Contrast test				
	Mean	**Std. dev.**	**Median**		**Std. (F and H)**	**p-value**	**Size Effect**	**Interpretation**
1. No training (44)	43.0	8.1	43.5	*ANOVA*	**7.30****	**<0.001**	**0.030**	**Small**
2. Less than 60 h (233)	44.4	6.9	45.0	*Kruskal-Wallis*	**14.60****	**<0.001**	**0.029**	**Small**
3. Over 60 h (220)	46.6	6.8	47.0					

NS *Not significant,* † *Almost significant (p<0.10);* * *Significant (p<0.05) and* ** *Highly significant (p<0.01)*

Statistical test/Contrast: ANOVA (Parametric – Assuming normality), Kruskal-Wallis test (Non-parametric).

Table 15

Post-Hoc Contrasts by Study Segments for Hours of Teacher Training (Regrouping) regarding Personal Data Protection and Privacy (PrDpP)

Group Comparison		Post-hoc contrast test				
		Parametric			Non-parametric	
Group A	Group B	Diff. Means	T (std.)	p-value	W (std.)	p-value
1. No training	2. Less than 60 h	-1.43	-1.25 NS	0.424	1.39 NS	0.588
	3. Over 60 h	**-3.55**	**-3.09****	**0.006**	**3.78***	**0.020**
2. Less than 60 h	3. Over 60 h	**-2.12**	**-3.23****	**0.004**	**4.74****	**0.002**

NS *Not significant,* † *Almost significant (p<0.10); * Significant (p<0.05) and ** Highly significant (p<0.01)*

4. Discussion and conclusions

The inferential analysis of information on the protection of personal data and privacy among teachers, along with sociodemographic variables such as gender, age, and teaching seniority, revealed varying degrees of association. Gender approached statistical significance, with a small effect size, consistent with prior research that did not report significant differences related to the protection of personal data (Vuorikari Rina et al., 2022).

Age and teaching experience exhibited statistically significant differences with small effect sizes. This corresponds with previous research demonstrating a significant correlation between age (Cabezas González et al., 2017; Gallego-Arrufat et al., 2019), particularly teaching seniority, linking greater seniority with a higher level of digital competence (Rodríguez Espinosa et al., 2016; Sánchez et al., 2020).

Regarding contextual variables such as type of center and location, no significant statistical differences were observed, indicating consistent data protection practices irrespective of institutional characteristics. Similarly, there were no significant disparities dependent on educational stage. This contrasts with other research suggesting that educational stage could significantly impact the level of digital competence (Fuentes et al., 2019). The results may be attributed to the widespread adoption of training linked to digital competence for teachers offered by the Andalusian Ministry of Education in response to the exceptional circumstances during the COVID-19 pandemic in 2020.

Conversely, training hours were significantly associated with data protection. Post-hoc analyses revealed that teachers with over 60 hours of training differed significantly from those with less or no training, emphasizing the importance of extensive training. No significant differences were found between untrained teachers and those with less than 60 hours of training. This could indicate a training threshold necessary to influence behavior

related to data protection and privacy. This observation aligns with concerns raised by individuals regarding the adequacy of security and personal data protection training provided to prospective teachers, supporting the notion of insufficient training on internet security issues.

Regarding implications, this study aims to contribute to delineating levels of digital security competence among teachers in Andalusia, specifically concerning the protection of personal data during internet browsing.

In conclusion, observations suggest that competency in digital security highlights the challenges in managing personal data protection and safeguarding identity, not only impeding the assurance of protection in information management on the network but also hindering progress in digital literacy.

The findings underscore the importance of conducting more in-depth research in the future, particularly to better understand the relationship between training and data protection. Likewise, certain methodological limitations are acknowledged herein, as the sample consisted solely of volunteer teachers from the Andalusian educational system during the 2022/23 academic year.

Contribution of the authors

Conceptualización, V.C.-R y M. R.-J.; **análisis formal,** M.A.-M. y V.C.-R.; **investigación,** V.C.-R, R.M.-J y M.A.-M.**; metodología,** M.A.-M.; **software,** M.A.-M.; **supervisión,** V.C.-R y R.M.-J.; **validación,** M.A.-M; **visualización,** V.C.-R y R.M.-J.; **escritura: preparación del borrador original,** V.C.-R y R.M.-J.; **redacción: revisión y edición,** V.C.-R, R.M.-J. y M.A.-M.

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Aplicaciones tecnológicas relacionadas con la edad temprana infantil

Technology applications related to early childhood

Coordinadora:

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Spain

Introducción

Decir que las aplicaciones tecnológicas están relacionadas con la primera infancia es quedarse corto.

La primera infancia es un estadio de desarrollo que mejora la vida escolar. Es la etapa más importante para cambiar la vida futura de un niño. La educación de un niño empieza en casa.

La tecnología determina la calidad de la educación temprana de un individuo. La educación infantil mejora los conocimientos, las habilidades y desarrolla la personalidad y la actitud de los niños. Sobre todo, la tecnología en la primera infancia afecta la familia del niño.

Un niño con un alto grado de ayudas tecnológicas aumenta su capacidad de desarrollo.

En este monográfico sobre la importancia de las aplicaciones tecnológicas relacionadas con la primera infancia, discutiremos su valor en la escuela y la familia.

To say that Technology applications related to early childhood is an understatement.

Early childhood is a weapon to improve school life. It is the most important stage for changing future lives. A child's education begins at home.

Technology certainly determines the quality of an individual's early education. Early childhood education improves knowledge, skills and develops personality and attitude of children. Most notably, early childhood technology affects a child's family.

A child with a high level of technological aids increases their developmental capacity.

This monograph on the importance of technology applications related to early childhood will tell you about its value in school and family.

Alcance

El monográfico **Aplicaciones tecnológicas relacionadas con la edad temprana infantil** abordará intervenciones tecnológicas tempranas para niños con necesidades especiales, modelos de atención integral que proporcionan servicios tecnológicos y apoyos de manera holística, abordando las necesidades del niño y su familia de manera coordinada, avances tecnológicos en el diagnóstico precoz con la colaboración de distintos profesionales (médicos, terapeutas, educadores y trabajadores sociales), e investigaciones tecnológicas recientes obre educación temprana

*The monograph **Technology applications related to early childhood** will address early technology interventions for children with special needs, integrated care models that provide technology services and supports holistically, addressing the needs of the child and family in a coordinated way, technology advances in early diagnosis with the collaboration of different professionals (doctors, therapists, educators and social workers), and recent technology research on early education.*

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- Guía para padres y madres sobre edad temprana
- Uso de tecnologías digitales para educación temprana
- Educación informática integrada en tecnología para la primera infancia
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