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ORIGINAL

Influence of Age, Gender and Years of Experience on Teachers in Promoting Strategies for Digital Sustainability and Data Protection

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ABSTRACT

The aim of this research was to know how widespread the activities were, and to what extent they were being implemented, in relation to data protection and digital sustainability in Primary Education schools. This study also analyzed whether teachers' age, gender and years of experience in the profession influenced the development of this type of practices among students. To this end, the GAUBIPRO (4150516/6) questionnaire, registered at the Spanish Patent and Trademark Office, was sent out to 308 Spanish teachers in Primary Education in Spain. The investigation was conducted by applying three multivariate statistical procedures: chi-squared with Kendall's Tau-c coefficient, variance analysis using a single-factor ANOVA, and the HJ-Plot method, to find patterns of group behavior among the variables studied. The results showed that age, gender and years of experience were significant variables in the development of strategies for data protection and digital sustainability in Primary Education. For years of experience, the results showed that teachers with the highest mean number of years in the teaching profession were the least likely to apply data protection protocols. Male teachers were found to promote more general data protection strategies, while female teachers were more active in the design and use of activities in the classroom. In terms of age, the results clearly demonstrated that the higher the mean age of the teachers, the lower the rate of application of actions to promote data protection and digital security among young students, in three variables in particular: "foster strategies", "advise students" and "inform families".

Keywords DIGITAL SUSTAINABILITY, DATA PROTECTION, PRIMARY EDUCATION, COMPETENCY-BASED TEACHING, PROFESSIONAL TRAINING

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1 INTRODUCTION

The use and treatment of data relating to citizens' digital practices is one of the main challenges to achieve a fairer and more respectful society with the processes associated with our

digital fingerprint. Recognizing this, the "General Data Protection Regulation (GDPR)" was promoted in 2016 (European Commission, 2016) to update and support legislation that regulate the protection of citizens' data. Fomenting sustainable educational practices is a fundamental competence that teachers need to address in this 21st century, and the European Framework for the Digital Competence for Educators aims to tackle this very problem across a range of basic competences for teachers (Punie & Redecker, 2017). This study aimed to show how widespread the activities were that foment data protection and digital sustainability by analyzing the incidence of three basic variables: age, gender and years of professional experience as teachers in Primary Education. Knowledge of the influence of these three variables can help to improve the design of training for data protection and digital sustainability within the reference framework of teachers' digital competence (Ministerio de Educación y Formación Profesional, 2022). It is also essential that practices aimed at fostering the safe and ethical use of data, as well as learning strategies that promote a sustainable use of technology among young students, be implemented in the early years of Primary Education, which is when students first come into contact with digital devices and develop a digital fingerprint that they will carry with them throughout their life. So, data protection and promotion of safe and ethical educational practices in schools is a "must", as the digitization of society is "the 'lifeblood' of the 21^{st} century economy" (WEF, 2019, p. 8).

1.1 Digital Sustainability and Data Protection in Education

Ensuring a sustainable use of data is directly linked to SDG 4: "ensure inclusive and equitable quality education and promote lifelong learning opportunities for all" (UNESCO, 2015a, p. 20). Currently, the development of teaching and learning processes associated with digital resources, platforms and tools is a constant inside and outside the classroom. In this sense, different reports —Qingdao Declaration (UNESCO, 2015b); the Beijing Consensus on Artificial Intelligence and Education (UNESCO, 2019); congresses such as the World Data Forum on Sustainable Development (2023); and especially the Recommendation on the Ethics of Artificial Intelligence (UNESCO, 2021), that was adopted at the 41st session of the UNESCO General Conference in November 2021— have been highlighting the importance of facing teaching-learning processes based on technologies from solid ethical, safe and responsible principles.

New advances in artificial intelligence and learning analytics applied to education, among other things, to guide learning and encourage adaptive learning are promoting a data-driven educational future (Hoel & Chen, 2016; Sclater, 2016). The United Nations Development Group (UNDG) (2017) describes "personal information", as "data, in any form or medium, relating to an identified or identifiable individual who can be identified, directly or indirectly, by means reasonably likely to be used, including where an individual can be identified by linking the data to other information reasonably available". (UNDG, 2016, p. 10)

Concern surrounding data protection in education has grown in recent years due the vast array of digital apps and resources used by teachers and students inside and outside the

classroom; there is an increasing awareness that use of these devices must comply with basic principles established in legislation that guarantees the sustainability of these educational practices. This concern is not new, and already in the 1960s in the United States, a current began to warn about the misuse of the first computers, as they spoke of "the congeries of fears raised by the (mis)use of computers; putting, for the first time on the table, fundamental concepts such as: 'freedom', 'liberty' and 'autonomy'" (Bygrave, 2010, p.167). Currently, the DigComp 2.1 (European Commission, 2016) includes a specific area —Safety— with four competence sub-tasks that address, among others, the following aspects: 4.1. Protecting devices; 4.2. Protecting personal data and privacy; 4.3. Protecting health and well-being; and 4.4. Protecting the environment.

The UNESCO report (2022a, p. 7) states that "the use of data in education is a double-edged sword". Sensitive data belonging to underage pre-university students in the wrong hands could lead to the identification and labelling of students that might negatively affect their academic, personal and professional future, unless such data are treated ethically, with respect for their anonymity and with express permission for use from the students and their families. Data protection is a fundamental right of any citizen, although this is still not recognized by the United Nations. Information that is compiled and stored, and the treatment of these data, can in no way interfere with a person's identification, their capacities and competences; neither must a personal record identifying someone be created without express permission of those affected or their legal guardians, or without explicit mention as to how the complied personal data are to be stored, guarded, protected and, when necessary, destroyed.

At any time in the future, a young students' profile could be traced to their work, health and leisure activities, and for this reason each individual needs to be fully aware of how their data are treated, and to be able to authorize all possible uses of them. Appropriate use of information can have a positive effect on adaptive learning environments that enable students to improve their competences and help them take important decisions that will affect their academic and professional future; this, in turn, can improve social mobility, with the accreditation and recognition of the education they have acquired, and allow them to operate within a wider range of systems. All this requires strict enforcement of procedures on data treatment and storage to guarantee a sustainable use of information (UNESCO, 2022b). The design of algorithms and their verification by a bioethics committee is particularly important for guaranteeing the sustainability of all the educational processes related to the digital environment, based on a principle that UNESCO has established as fundamental, called "privacy by design", characterized by a proposal for a procedure in which the student, their legal guardians or family, are made fully aware of all the processes associated to the digital fingerprint, and the storage, treatment and management of these data.

Teaching-learning processes, and Pre-University Education in particular, need to consider the protocols on data protection and the safe, ethical and responsible use of technology from two perspectives: it is essential for teachers to establish safe practices for use both inside and outside the classroom when carrying out teaching-learning activities involving technology; with a transversal curricular approach, it is essential to encourage student learn-

ing in a safe, ethical and responsible use of technology from a personal, socio-educational and professional perspective.

In this sense, the training of students in digital competence should be carried out from the first years in which students approach the use of digital devices and, in particular, teachers must take into account that three types of data to guarantee sustainability in education: "(1) *Data given*: the data learners provide about themselves (e.g. name or date of birth) (or provided by their parents or educational institution). (2) *Data traces*: the data they leave online (e.g. through cookies, web beacons or device/browser fingerprinting, location data and other metadata). (3) *Inferred data*: the data derived from analyzing data given and data traces" (UNESCO, 2022a, p. 13). These data and the form of access to them is constantly changing with the advance of technology and processes are being incorporated that clearly interfere with the protection of children's data such as "biometric information", "fingerprints or eye scans", "data stemming from the IoT" (UNESCO, 2018, p. 36).

Studies addressing teacher competence in areas of network safety are still scarce. In this regard, Shin (2015) studied the ethical and safe use of ICT in Pre-Service Teacher Education and evidenced that pre-service teachers do not receive sufficient training in this area. The study by Šimandl and Vaníček (2017) on the influences on ICT teachers' knowledge and routines in a technical e-safety context showed the need for in-depth research on teaching digital safety, as well as for the promotion and inclusion of content on safety in university curricula. The study by Gallego-Arrufat et al. (2019, p. 1) shows that teachers "have good attitudes toward security but less knowledge and fewer skills and practices related to the safe and responsible use of the Internet".

The correct development of digital competence in teachers requires a responsible, critical and sustainable use of technology (Esteve, Gisbert, & Lázaro, 2016; Napal, Peñalva-Vélez, & Mendióroz, 2018). The concept of security in the teaching-learning processes is essential for preventing problems arising from inappropriate use, which can lead to poor academic performance or have a negative influence on socio-emotional aspects that affect students (Barrow & Heywood-Everett, 2006; Vázquez-Cano, Quero-Gervilla, Díez-Arcón, & Moscoso, 2023). Failing to equip students in the early years of education with the basic fundamental competences to interact with digital environments could generate a greater digital divide in the future, with the consequent dangers inherent in the inappropriate use of Internet. The teacher training systems in place for the pre-university setting and the continuous training for practicing teachers both still fail to integrate sufficiently the pathways necessary to guarantee safe, ethical and responsible teaching-learning environments; it is still not clear that students are sufficiently instructed on their journey through the Net on the basis of solid principles of digital sustainability, and which too often is an issue that is only tackled from a general perspective (Napal et al., 2018; Vázquez-Cano & Pascual-Moscoso, 2022).

To promote the appropriate training, the variables of age, gender and years of experience in the teaching profession need to be taken into account. Early-stage training programs for undergraduate and graduate student teachers must include subjects that enable them to develop teaching-learning processes based on the fundamental principles of online safety and data protection. At the same time, because technology is constantly changing,

such programs need to provide training pathways that guarantee instruction throughout the teacher's career that allows them to update their knowledge of all protocols related to the sustainability and ethical use of technology (Engen, Giæver, & Mifsud, 2015). In Spain, where this study is based, there are currently no systematized programs at national or regional level for training pathways in data protection or digital sustainability for working teachers; nor are there any study plans in place for undergraduate and graduate students to train teachers to work in Primary or Secondary Education that include subjects on these issues.

The research hypothesis of this study was that age, gender and years of experience as a working teacher are variables that influence the format and intensity of training programs in data protection and digital sustainability for teachers working in pre-university levels of education. The main aims of the study were to know how widespread the activities were, and how far they were being implemented, in relation to data protection and digital sustainability, and to analyze whether age, gender and years of experience as a working teacher influenced the format of this type of practices among students.

2 METHODS

The data analysis methodology was based on a combination of three multivariate statistical procedures applied to discover patterns of group behavior among the variables studied. In the first phase of analysis, the Pearson's chi-squared (X^2) test was applied by testing the significance of contingency tables. For the metric characteristics of the variables in this study, Kendall's T-coefficient was used to demonstrate the intensity of the association detected. The sign of the coefficient indicates the direction of the relation, and the absolute value shows the intensity, with values ranging between -1 and 1. The strongest relations are indicated by the extreme values (Pérez-López, 2011). The adjusted standardized residuals are the difference between the expected and observed frequency expressed as a standardized Z score. With a confidence level of 0.95, this shows that the adjusted standardized residuals that exceed 1.96 highlight the squares that contain more cases than should exist, supposing that the variables analyzed were independent; the opposite occurs with the residuals below -1.96. Thus, the adjusted standardized residuals, the chi-squared statistic and the indices that quantify them represent the most accurate option for explaining the association between the variables studied (Mateos-Aparicio & Hernández-Estrada, 2021; Pérez-López, 2011).

In the second phase, a variance analysis was performed using a single-factor ANOVA to enable us to compare various groups within a quantitative variable. The F-statistic, distributed via the Fisher-Snedecor F distribution model, allowed us to establish the extent of similarity between the means compared, and to contrast the equality of means hypothesis. Comparisons were also made using the Games-Howell post-hoc test (Mateos-Aparicio & Hernández-Estrada, 2021; Pérez-López, 2011). Later, in the third phase, another approach was applied, in the form of the HJ-Plot multivariate method, to provide a multivariate graph representation of the data of an Xnxp matrix, using the j1…jn markers for rows and h1…hp for columns (Galindo-Villardón, 1986) (Galindo & Cuadras, 1986). The representation of rows and columns with equal goodness of fit helped to interpret the position of the rows

and columns (Blázquez, 1998; Fernández-Gómez, 1995; Martín, 2001; Martín-Rodríguez, 1996; Nieto-Librero, 2015). HJ-Biplot confirmed the behavior patterns among the teachers interviewed, and the dimension of data protection, safety, and sustainability. The statistical analysis was performed using MultiBiplot software (Vicente-Villardón, 2020) in the programing suite designed for matrices.

2.1 Instrument

Firstly, in 2020/21 academic year, a questionnaire was designed and validated using the Delphi technique and the expert knowledge coefficient, and then registered with Spain's Patent and Trademark Office (number: M4150516, name: GAUBI-PRO). The selected items had been adapted from works by a range of authors (Table 1) and from previous research activities using focus groups with a selection of teachers using gamified apps.

Table 1 Dimensions of the questionnaire

Dimension	Variable	Attribute
Protection Personal data	PDAT1	To foment strategies for students to protect their personal data on their devices.
	PDAT2	To inform families of the digital devices and programs to be used in the classroom.
	PDAT3	The school center will have an anonymized account to register students in activities that require a digital register to be kept.
Sustainability	SUS1	To advise students on how to avoid bad habits in the use of technology that can be harmful both physically and psychologically.
	SUS2	To use a protocol with students to detect risk and addiction in technology use, and try to readjust their behavior when such cases occur.
	SUS3	To transmit, share and promote the need among students to use technology in a sustainable way.
	SUS4	Carry out didactic proposals with students aimed at recycling and reusing devices no longer used at school, to increase awareness of this issue.

The questionnaire was part of the research project "Gamification and ubiquitous learning in primary education. Elaboration of a map of competences and teaching, student and parent resources (GAUBI)" (RTI2018-099764-B-100). This dimension was tested for reliability (Cronbach's alpha .853) and was distributed in compliance with the standards for data protection and prior consent of the participants working at Spanish schools in the state, state-funded and private sectors via the official website of the school centers involved in the study. The link to the database of the dimensions analyzed in the questionnaire for this study can be found in the Harvard Dataverse repository: https://dataverse.harvard.edu/dataset.xhtml?persistentId=doi%3A10.7910%2FDVN%2FTARODQ&version=DRAFT

2.2 Sample

The study population consisted of Primary School teachers in the Spanish education system. The sample, which was non-probabilistic and intentional, was formed of 308 teachers who responded to the online questionnaire delivered to educational centers across Spain. The group was 74.2% women and 25.8% men, which was a representative sample of the gender disparity in this profession. The mean age of the subjects was 41.46 years, with a mean of 15.9 years' teaching experience. The sample was considered to be representative, given its size, age and gender distribution. For a total sample of 232,121 Primary Education teachers (EDUCAbase, 2022) with a margin of error of 10% and confidence level of 99%, 166 subjects were required.

The sample size was assumed to be normal, as confirmed by the Kolmogorov Smirnov test result. The sample subjects were drawn from state schools (78.6%), state-funded schools (15.3%) and private schools (6.1%), a proportion that broadly reflects student representation in education in Spain. It was noteworthy that 67.9% of those surveyed were already participating in ICT projects at their schools, which demonstrates the interest of the subjects in their own learning and skills improvement. The remaining 32.1% stated they were not involved in any ICT project. Another interesting fact was that 52.1% of the subjects were with the technological resources available at their centers, 31.5% believed they could be improved, and 16.2% stated that their digital resources were insufficient.

3 RESULTS

Table 2 presents the X^2 information, the measures of association and the adjusted standardized residuals for the variables statistically related to age in the sample.

Table 2 shows the information from the variance analysis of the variables analyzed and the age of the teachers interviewed. The F-test determines the variables that relate in a statistically significant way. The procedure can confirm the findings obtained by comparing the means of the different groups. The Games-Howell post-hoc test also enables us to confirm the statistically significant relation between the means. In this way, the "foster strategies", "advise students" and "inform families" variables clearly show that the means of the upper age range correspond to low levels of application of actions to promote data protection and digital security. The uses detection protocols variable shows heterogenous behavior in the means, as observed in the X^2 test. This variable is characterized by the development of activities by a group of young teachers and a group of older teachers. The results obtained confirm that age is a determining variable in promoting strategies for data protection and digital security.

Table 3 presents the relation between the gender of the participants in the survey and the variables related to data protection and digital security.

The X^2 value confirms the statistically significant relation between the variables. Cramer's V measure indicated that the association was weak, which advised caution when interpreting the relation. In terms of the "foster strategies" variable, this refers to a gamification strategy applied relatively more by male than by female teachers, whereas the

Table 2 Relationship between mean age and data protection processes, digital security, and sustainability.

Variables			Relationship between the variables		
Foster Strategies	**Age**		**Statistical**	**P.Value**	**Post-Hoc Tests**
Response category	**Mean**	**Stan. Dev.**	**F=6.097**	**0.000***	**Games-Howell**
1	48.86	11.18			2 (0.004*) 3 (0.005*) 4 (0.004*) 5(0.001).
2	40.27	8.04			1 (0.004*).
3	40.38	10.30			1 (0.005*).
4	41.02	8.91			1 (0.004*).
5	40.00	9.63			1 (0.001*).
Advise Students	**Age**		**Statistical**	**P.Value**	**Post-Hoc Tests**
Response category	Mean	Stan. Dev.	Welch= 9.733	0.000*	Games-Howell
1	51.28	9.517			3 (0.000*) 4 (0.006*) y 5 (0.004*).
2	42.10	11.747			
3	35.83	8.378			1 (0.000*). 4 (0.001*) y 5 (0.003*).
4	41.97	9.830			1 (0.006*) y 3 (0.001*).
5	41.48	8.458			1 (0.004*) y 3 (0.003*).
Uses Det. Protocols	**Age**		**Statistical**	**P.Value**	**Post-Hoc Tests**
Response category	Mean	Stan. Dev.	Welch= 2.700	0.000*	Games-Howell
1	42.67	11.492			
2	39.83	10.613			
3	39.10	9.965			5 (0.033*).
4	41.84	8.081			
5	44.33	7.925			3 (0.033*).
Inform Families	**Age**		**Statistical**	P.Value	Post-Hoc Tests
Response category	Mean	Stan. Dev.	F= 3.130	0.015*	Games-Howell
1	40.68	10.294			
2	47.14	9.782			3 (0.033*) y 5 (0.014*).
3	40.51	10.186			2 (0.033*).
4	42.02	9.168			
5	40.01	9.443			2 (0.014*).

Note[1]: Age, ≤30 (less than or equal to 30 years), [≥31 - ≤40] (equal to or more than 31 and less than or equal to 40 years), [≥41 - ≤50] (equal to or more than 41 and less than or equal to 50 years) y ≥51 (equal to or more than 51 years).
Note[2]: response scale between 1 and 5, where 1 is Not at all and 5 is Very much.
Note[3]: *P.V. (P-Value) <0.05.

behavior relating to the didactic proposals variable is the opposite, with women teachers taking the initiative to apply this strategy of safety in the classroom more than men. The data obtained show that the gender of the teacher is determinant in classroom activities to foment data protection and digital security. Table 4 shows the statistically significant relation between years of teaching experience and the promotion of data protection and digital security activities by teachers in the classroom.

Table 4 presents the findings from the variance analysis of teachers' years of experience in the profession and the variables analyzed. The F-test showed the statistically significant

Table 3 Relationship between sex and data protection processes, digital security, and sustainability.

Variable		Foster Strategies	Didactic Proposals
Sex	S.S.	X^2=10.568	X^2=11.655
		D.F.=4	D.F.=4
		P.V.=0.032	P.V.=0.020
	M.A.	Cr-V=0.185	Cr-V=0.195
	A.P.	Men & 1 (csr=-2.2)	Men & 2 (csr=2.3)
		Men & 2 (csr=-2.0)	Men & 4 (csr=-2.3)
		Woman & 1 (csr=2.2)	Woman & 2 (csr=-2.3)
		Woman & 2 (csr=2.0)	Woman & 4 (csr=2.3)

Table 4 Relationship between mean years of experience and data protection processes, digital security, and sustainability.

Variables			Relationship between the variables		
Foster Strategies	**Years of Experience**		**Statistical**	**P.Value**	**Post-Hoc Tests**
Response category	**Mean**	**Stan. Dev.**	**F=5.198**	**0.000***	**Games-Howell**
1	21.94	10.685			2(0.026*) 3(0.006*) 4(0.003*) 5(0.004*).
2	14.97	8.421			1(0.026*).
3	13.93	9.968			1(0.006*).
4	14.08	9.547			1(0.003*).
5	14.20	9.083			1(0.004*).
Advise Students	**Years of Experience**		**Statistical**	**P.Value**	**Post-Hoc Tests**
Response category	Mean	Stan. Dev.	Welch=6.934	0.000*	Games-Howell
1	22.39	9.912			3(0.001*), 5(0.044*).
2	15.98	12.431			
3	10.57	6.911			1(0.001*), 4(0.002*), 5(0.019*).
4	15.73	10.256			3(0.002*).
5	14.81	8.678			1(0.044*), 3(0.019*).
Uses Det. Protocols	**Years of Experience**		**Statistical**	**P.Value**	**Post-Hoc Tests**
Response category	Mean	Stan. Dev.	Welch=4.076	0.000*	Games-Howell
1	16.00	10.609			
2	14.89	10.937			
3	12.86	9.517			5(0.004*).
4	13.90	8.499			5(0.008*).
5	19.33	8.210			3(0.004*) 4(0.008*).

relation between the variables, while the Games-Howell post-hoc test showed the relation between the means for years of experience. In the "advise students" and "foster strategies" variables, it was confirmed that the teachers with the highest mean number of years in the profession were less inclined to carry out data protection and digital security activities in the classroom. The uses detection protocols variable again showed heterogenous behavior similar to the results in previous analyses here. The two groups of teachers with the highest means were situated at the extremes, that is, there was a group of teachers who were strong proponents of this strategy in the classroom, and another that were the opposite. The relevance of years of experience among the teachers was confirmed as a determining factor in the strategy to protect data and promote online security.

Figure 1 shows the relevance of teachers' application of data protection, digital security, and sustainability in relation to their age and years of professional experience. Any interpretation of HJ-Plots is supported by a set of rules used in other multivariate statistics reduction techniques, such as factor analysis, multidimensional scaling, correspondence analysis and classic biplots, which are based on geometric concepts on a plane representation of the Cartesian axes (Díaz-Faes, González-Albo, Galindo, & Bordons, 2013; Galindo & Cuadras, 1986; Galindo-Villardón, 1986). The main rules are as follow: the markers closest together are the most similar to each other, the length of the vectors indicates the typical deviation of each variable, the direction of the vectors shows where the variability of the marker columns increases, the acute angles indicate a positive correlation, while the right and obtuse demonstrate a null and negative correlation, respectively.

The results show that the age and years of experience variables form an acute angle between them (they are highly related) and a right angle with the rest of the variables (not related to the rest of the variables). Teachers in the blue cluster are the least likely to put into practice those recommendations for data protection and digital security (vectors / variables in opposite directions) and are more related to age and years of experience. The teachers in the green cluster are in an intermediate position. They are teachers with few years of experience in the profession but who, to a greater or lesser extent, apply the recommendations for data protection and professional ethics within the digital environments and resources used both inside and outside the classroom.

This investigation into the influence and application of data protection and digital sustainability protocols on education is ongoing, as it is a novel area of research that still lacks sufficient analysis of the effect of variables such as age, gender and years of experience in teaching on the use of such protocols in Pre-University Education. In terms of teachers' age, the results of this study clearly show that the older the teacher, the less inclined they are to undertake actions to foment data protection and digital sustainability, particularly in variables such as "foster strategies", "advise students" and "inform families".

When the age variable is related to novel didactic or organizational strategies, the results are significant for younger teachers, since their training is more focused on today's technological advances; the same occurs in other studies, which found that younger teachers have greater knowledge of data protection processes and digital identity management (Gallego-Arrufat et al., 2019). The results from a study by Napal et al. (2018, p. 9) showed a nega-

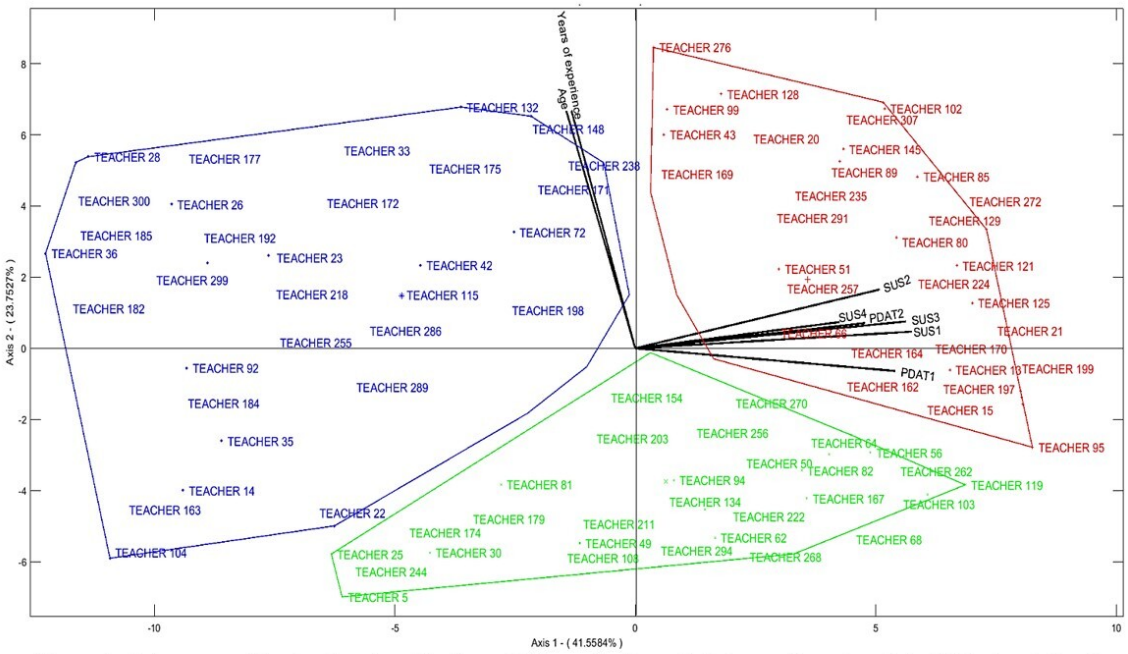

Figure 1. Relevance of the teachers' application of data protection, digital security and sustainability in relation to their age and years of professional experience.

Figure 1 Relevance of the teachers' application of data protection, digital security, and sustainability in relation to their age and years of professional experience.

tive correlation in the level of digital competence with age (rho = −0.140; p = 0.012), and research by Fernández-Cruz & Fernández-Díaz (2016, p. 102) found that the competences of teachers who work in Primary and Secondary School with "Generation Z" students tend to decline as they get older and accumulate more years of experience, especially over the age of 56 (ANOVA - p≤0.01=0.000 sig. /9.826 F in Age and 0.000 sig. /9.942 in Experience). The results of our study show that the more experienced the teacher is, the less they apply data protection protocols in the variables of advising students and fostering strategies, two fundamental strategies to ensure an ethical and sustainable use of technology inside and outside the classroom.

The results for gender and the variables related to data protection and digital security show that the fostering strategies variable is a strategy applied more by male than female teachers. The didactic proposals variable behaved in the opposite way, with the initiative to apply this digital safety strategy in the classroom coming more from female teachers. In the scientific literature, no significant differences have been found between male and female teachers (Fernández-Cruz & Fernández-Díaz, 2016; Gallego-Arrufat et al., 2019).

It is important to close the gap between male and female teachers by training and protocols that ensure that all teachers are equally committed, both inside and outside the classroom, to raising families' awareness and to providing students with advice, to allow them to act in full knowledge of the rights they are transferring (Burns, Gottschalk, & OCDE, 2019). Failure to do so could widen the digital divide and cause irreparable damage to students in

the use of their digital fingerprint (CNIL, 2021; Council of Europe, 2018, 2021). States and institutions that do not guarantee the appropriate protection of data and digital sustainability are endangering the development of teaching-learning processes online (Shiohira & Dale-Jones, 2019).

Educational authorities are increasingly aware of the need to regulate these digital educational apps and resources to ensure strict commitment to protecting citizens' personal data and, in particular, those of young people. The Consultative Committee of the Convention for the Protection of Individuals, with regard to automatic processing of personal data (Council of Europe, 2018, p. 32), recommends that "the protective measures applied to personal data should be based on a risk assessment following industry standards and best practice and using established technical guidance (such as the ISO 27000 series and others as appropriate)". Thus, "authentication should be robust and capable of ensuring data protection. The principles of purpose limitation and data minimization should also be part of the assessment of any authentication system" (Council of Europe, 2018, p. 33). This has led to protocols to check that the digital apps used in education strengthen data protection and guarantee, and that the servers do not store sensitive student data that could be used in the future for spurious interests (Vázquez-Cano & Pascual-Moscoso, 2022).

In the current socio-educational scenario, issues related to data protection and sustainable use of technology in education cover a range of actions and areas, such as ensuring that when teachers use digital apps and resources in the classroom they are complying with national and European regulations on data protection; there is also the question of the educational institution's internal protocols in which teachers work, and how these fit with European legislation on this issue (European Commission, 2016; Burns et al., 2019). Then there is the issue of access to enable data protection and digital sustainability, which must be provided by protocols that guarantee the anonymous use of apps when specifically requested by the student and/or family (Council of Europe, 2021). Third, all the adaptive learning processes based on learning analytics rooted in pathways that direct and determine student learning should be made anonymous, and that no sensitive data should be stored that can subsequently be used to identify, categorize or label any student (Aldowah, Al-Samarraie, & Fauzy, 2019; Altman, Wood, O'brien, & Gasser, 2018; Sclater, 2016). Fourth, the teacher training system should be equipped to inform them of all the norms and protocols of education both inside and outside the classroom (Shin, 2015). Fifth, families should be provided with good information and advice so they in turn can advise their children on the use of digital resources in a way that is safe, ethical and responsible, both at school and in their social lives (Ramos & Olivencia, 2012). Finally, students should receive training from an early age in the use of digital devices to ensure safe and responsible use in the classroom and outside, so that in the future they can develop a safe and healthy relationship with the Net.

4 CONCLUSION

The results of this study show that age, gender and years of teaching experience are significant and exert an influence on the application of protocols on data protection and digital sustainability inside and outside the classroom. Many states, including Spain, are developing educational strategies to reinforce teacher training in digital competences in response to the socio-educational challenges presented by the incursion of rapidly changing technologies in teaching-learning processes. The design of courses and training pathways must consider all relevant variables among teachers, such as age and years of experience in the profession, and adapt training to the real needs of working teachers. One of these competences is fundamental for the correct integration of technologies in the classroom, namely the promotion of processes that guarantee the protection and online safety of all young students. In this sense, it is essential to develop training programs that are solidly based on "policies and programs, driving transparent governance and better management of education systems, teachers' empowerment, personalized learning experiences, assessment and certifications" (UNESCO, 2022a, p. 7). Internal protocols need to be established in collaboration with other national and international institutions to promote proper use of the student's digital fingerprint, as well as delivering robust teacher training and advice to families, to ensure that the resources and platforms being used can guarantee the safe, ethical and responsible use and treatment of data, which are fundamental for a quality education.

5 AUTHORS' CONTRIBUTIONS

1. Esteban Vázquez-Cano: Funding acquisition and investigation (lead); conceptualization, data curation, writing-original draft preparation, review and editing (equal).
2. José Manuel Sáez-López: Methodology (supporting); conceptualization, writing-original draft preparation, review and editing (equal).
3. Rolando-Óscar Grimaldo-Santamaría: Methodology (lead); formal analysis (lead); writing-original draft preparation, review and editing (equal).
4. María-Pilar Quicios-García: Investigation (support); conceptualization, writing-original draft preparation, review and editing (equal).

6 ETHICAL STANDARDS AND INFORMED CONSENT

All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation [Spanish Autonomous Communities Education Committees] and with the Helsinki Declaration of 1975, as revised in 2000. As the participants in this study belong to 16 Spanish autonomous communities, the informed consent was obtained by each educational administration (Number: GAUBIPRO 4150516/6) and from all participants for being included in the study.

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