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# Social media and non-university teachers from a gender perspective in Spain

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## Abstract

Non-university teaching staff must use social media platforms (SMP) to update themselves on educational matters. This study aims to analyze how these teachers in Spanish non-university education, differentiating between men and women, value and use SMPs to update themselves in educational matters. A total of 463 Spanish teachers participated in this survey-type study. The results show that the perception of usefulness, responsible use, and the role of educational institutions and agents remains medium or low. At the descriptive level, differences between men and women are detected in the perceptions of the teachers surveyed, with female teachers having a more favourable perception of the usefulness, use, and role of social media assumed by the institutions in which they work professionally compared to male teachers. It is concluded that there are three profiles of non-university teachers according to the variables analyzed that do not show differences according to the sex of the teachers. The implications of this study help to propose actions that help improve the scenario by 1) increasing the training channels, 2) increasing the levels of educational innovation through SMP, 3) increasing the effectiveness of teaching-learning strategies, and 4) promoting of skills that contribute to greater use and perception of these scenarios for the training of teachers and students.

**Keywords:** Non-university teacher, Social media platforms, Sex, Teacher education

## 1 Introduction

We are immersed in a society that pays increasing attention to the use of technologies (Castellanos *et al.*, 2017), which increases the need for teachers to be in continuous upskilling to be at the level that allows them to optimize the use of technological tools (Alcalá *et al.*, 2020). Social media platforms (SMP) have recently become the most revolutionary phenomenon within the media (Fernández *et al.*, 2019). Technological progress, the development of media and resources, and the ease of access to them show significant advances in communication associated with the Internet and digitization over time (Paredes-Chacín *et al.*, 2020).

Some factors contributing to this recent trend can be identified. On the one hand, there is the penetration of the SMP itself as a global, national, and regional communication channel. We live in an interconnected world supported by information and communication technologies, in which a large amount of knowledge is produced and

distributed at high speed, causing 'knowledge obsolescence' (González-Sanmamed et al., 2018, p. 28). Society changes so quickly that, generally, there is not the necessary space to reflect on these changes and their consequences. Of these transformations that occur, we find access to information and knowledge (Alsina & Rodríguez-Muñiz 2021).

On the other hand, the academic field is invited to consider the importance of disseminating research results to reach the public that can take advantage of it. An increasing number of teachers are consulting the SMP to access the knowledge and tools that others have developed (Aguilera-Mata & García 2021). The potential of social media at the informative and interactive level is evidenced in some research since they facilitate the exchange of information linked to professional interests (González et al., 2022). Undoubtedly, the SMP poses a new educational paradigm of access to knowledge (Torres-Lima 2017).

Teachers can make use of SMPs of different kinds. Based on a specificity criterion, some authors have classified them by distinguishing between generalist SMP (Facebook, Twitter, YouTube, Instagram, and others) and academic SMP (Researchgate, Academia, Mendeley & others) (Salinas et al., 2019). The latter is more used by university professors who disseminate the results of their research and contributions to scientific knowledge, although they seek visibility within the academic community (Meishar-Tal & Pieterse 2017). Non-university teachers use generalist SMP more (Finkler & Leon 2019) since there is a greater tendency to disseminate scientific knowledge through the diversity of SMP and the particular formats of each, for example, illustrated or unillustrated micro texts enriched with links, concise, medium- or long-duration videos, and interactive material or comics (Mayor 2020; Zaragoza & Roca 2020).

The use of social media platforms for scientific dissemination has significantly impacted the training of the research community, which primarily comprises university professors. This trend has been observed in studies investigating the application of social media in Higher Education, showing a decline in research at lower levels of education. The growing adoption of social media by university teaching staff is evident in scientific literature. Nevertheless, it is not exclusive, so this knowledge is disseminated to all professionals in education and non-university teachers. Bergviken et al. (2018) and Van Den Beemt et al. (2020) show the active presence of this teaching staff on social media. The educational contexts have been evolving in recent years, modifying their means of teaching and scientific dissemination due to technological progress and adapting to the various tools offered by the SMP. The SMP has led to changes in the classroom and teaching hours (Gil & Serna 2014). However, the use of technological applications is not always accompanied by the necessary preparation so that people, particularly teachers, can make optimal use of it in scientific communication, diffusion and dissemination. Despite the lack of preparation of teachers, international scientific literature reveals that social media promotes and enhances the professional development of those teachers who utilize them (Ostashewski et al., 2011; Van Den Beemt et al., 2020; Visser et al., 2014). This constitutes the scientific interest of this study, which examines teachers' perceptions of employing SMP in education in Spain.

Non-university teachers need to be trained in educational matters. They must access, promote, disseminate and offer scientific knowledge using the main communication channels and digital media, such as the Internet, search engines, SMP and various

platforms (González et al., 2022). Alsina and Rodríguez-Muñiz (2021) demonstrate that social media can serve as practical resources for teacher training. Specifically, they can be utilized to innovate in the planning and developing training courses for educators. The use of social media in this manner can significantly enhance the overall quality of teacher training programs. Aguilera-Mata and García (2021) have identified the necessary aspects for the SMP to be considered a teacher training tool in their continuous training. First, have quality material selection criteria; second, make an adequate adjustment to each professional's educational environment; and third, know how to differentiate the desire to learn from mere entertainment. Decisions about the type of training will depend on the teacher's needs, interests, or characteristics, and they will have to identify which sources are of sufficient quality.

The study at hand places significant emphasis on the role of sex as a reference variable in computer science, particularly in the context of human-computer interaction (Rai & Khanna 2012). This variable has been utilized in developing educational algorithms and mobile applications (Fosch-Villaronga et al., 2021). Furthermore, some studies have delved into the social media interaction between men and women, highlighting other differentiating factors (Vaast 2020). Given these points, the exploration of sex as a reference variable is a crucial aspect that demands attention and consideration. Rubio and Escofet (2013) state that experience with technology is more significant in men than women. The former have digital devices before them and use them more, and they use them more for leisure purposes, while the Internet for educational purposes is the same for men and women. If we focus on the education field, specifically on the non-university female teacher's group, studies are absent from a gender perspective. However, research does show the need to promote the dissemination of women and the creation of information systems that allow institutional research managers and policy-makers to detect gender inequalities in productivity and collaboration to establish action plans for making women's work visible within the academic-scientific field (De Nicola & D'Agostino 2021). Therefore, the training processes to train teachers to use social media for teaching and scientific dissemination purposes should consider existing gender gaps. It is necessary to encourage non-university teachers to access various tools with equal opportunities and to make good use of them (Cambronero-Saiz et al., 2021).

Based on the above, it is essential to examine how non-university educators in Spain, differentiating between male and female individuals, utilize the SMP for their professional development.

## 2 Methods and materials

This research aims to show profiles of the use of social media for access and scientific updating in educational matters for non-university teachers in Spain, differentiating between men and women. To this end, the following specific objectives (SO) are pursued:

- SO1. Analyze the perception that non-university teachers have regarding 1) the importance and usefulness of social media for access to the scientific research field; 2) the use of social media for consulting information and updates on educational matters through the SMP; 3) the responsible habits needed to consult information

on the SMP to update themselves on educational matters; and 4) the assessment of the role of educational institutions and their agents in training, both currently and prospectively.

- SO2. Classify non-university teaching staff based on their perceptions of the object of study and identify which variables are decisive in this classification of profiles differentiating between men and women.

The following research hypotheses (H) are proposed:

- H1. There are sex differences in the different perceptions of the teachers surveyed.
- H2. There are sex differences in the classifications of the teachers surveyed.

This study utilizes a quantitative, nonexperimental, ex post facto survey.

## 2.1 Population and sample

This research is framed within the results obtained of the project 'Communication and dissemination of science in education in Spain through social networks - Comscienciae-duspain' (Code number: FCT-20-15761), carried out with the collaboration of the Spanish Foundation for Science and Technology - Ministry of Science and Innovation and several Spanish universities. In which the entire teaching staff linked to the 29,330 Non-University Teaching Centers, registered by the Ministry of Education and Vocational Training of the Government of Spain in Spain for the 2021–2022 academic year, and requested the voluntary participation of members related to the population studied.

Simple random sampling ( $e = \pm 4.5$  and  $1-\alpha = 95\%$ ) was performed. Thus, of the 1,536 non-university professors who initially agreed to carry out the survey, a total of 463 made up the sample for this study. Of this total, 178 were men ( $e = \pm 7.3$  and  $1-\alpha = 95\%$ ), and 277 were women ( $e = \pm 5.9$  and  $1-\alpha = 95\%$ ).

Table 1 presents the respondents' profiles at a general level and distinguishes between men and women due to the focus of this work. It is essential to clarify that in this study, the sex variable is depicted as a binary variable, with its values determined by the biological sex of the teachers participating in the research. The options for this variable are limited to two categories: men and women.

## 2.2 Data collection instrument

The instruments for data collection are two questionnaires, one developed for university teachers and the other for non-university teachers. The questionnaire for non-university teachers comprised 40 questions that addressed aspects related to the socio-educational and academic traits of the analyzed population, employment status, the habits and use of social media, and the perceptions associated with these informal digital communications and learning scenarios.

A pilot was carried out with 96 non-university professors for the reliability analysis ( $\alpha = 0.9575$ ), and the pretest of the final survey was applied.

Eighteen items are selected and integrated into 4 Likert-type scales (Table 2).

Motivated by the readaptation, the new construct validity and reliability are calculated and presented, guaranteeing the rigour of this work's data collection. As seen in Table 3, the four selected scales are valid. The total variance explained was between 57.76% and 72.19%, with reliability between 0.74 and 0.84. The scales reach a reliability of 0.895.

**Table 1** Profile of the sample of general non-university teaching staff of men and women

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General profile	<ul style="list-style-type: none"> <li>■ Most respondents are women (40.17% men and 59.83% women)</li> <li>■ Average age 48 years</li> <li>■ More than 20 years since obtaining the bachelor's degree</li> <li>■ The majority (61%) have a Social and Legal Sciences and Arts and Humanities degree</li> <li>■ More than half have a master's degree (53.1%)</li> <li>■ The majority work as secondary school teachers in public schools, and 36.4% of those who work in private institutions do so in subsidized schools</li> </ul>
Profile men	<ul style="list-style-type: none"> <li>■ Average age 49 years</li> <li>■ Average of 24 years since obtaining the bachelor's degree, primarily associated with areas of knowledge related to titles from the Social and Legal Sciences and Arts and Humanities (51%)</li> <li>■ Average of 15 years from obtaining a master's degree, although only 45.2% have it and only 11.8% have a doctorate</li> <li>■ 57% of those surveyed work in public institutions</li> <li>■ 78% practice their profession in primary, secondary, and non-university baccalaureate institutions or higher</li> <li>■ 97% work under a daytime teaching modality (face-to-face)</li> </ul>
Profile women	<ul style="list-style-type: none"> <li>■ Average age 47 years</li> <li>■ The average of 24 years since obtaining the degree is primarily associated with areas of knowledge related to titles from the Social and Legal Sciences and Arts and Humanities (67.9%)</li> <li>■ On average, it has been 14 and 13 years since obtaining the master's degree and/or doctorate, and half (55.2%) of the sample does not have either of these educational levels</li> <li>■ 70% work in public non-university educational institutions</li> <li>■ 70% practice their profession at the secondary, baccalaureate or non-university higher education level</li> <li>■ 96% work under a daytime teaching modality (face-to-face)</li> </ul>

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### 2.3 Procedure and data analysis

The data collection instrument was designed with Question Pro and distributed online between November 2021 and January 2022. The data provided in the State Registry of Non-University Teaching Centers of the Ministry of Education and Vocational Training (2019) was used to extract emails at a national level. Information was used to send official project information and the formal request for support for access to this instrument by the teaching staff associated with these teaching–learning scenarios. The project, ‘Communication and dissemination of science in education in Spain through social networks - Comscienciaeduspain’ (Code number: FCT-20-15761), from which this article is passed meets the assessment of the ethical suitability of the research with the following code: (PI:015/2021) by the Ethics Committee of the International University of La Rioja (Spain).

Different statistical analyses of the data are carried out depending on the objectives. Descriptive mean and dispersion analyses (standard, minimum, and maximum deviation) are performed to respond to the first specific objective. For hypothesis contrasts, the Student's t-test was applied to determine the mean differences based on sex after Levene's test for the assumption or not of equal variances. An exploratory hierarchical cluster analysis is carried out to respond to the second specific objective, applying the link grouping method between groups and taking the squared Euclidean distance as the interval measure. Second, a dendrogram is extracted from this initial exploration to guide the number of groups used to apply the k-means cluster test, following the iterate and classify method. Pearson's chi-square test was applied to contrast the hypothesis of equal classification of groups based on sex. Finally, multivariate discriminant analysis was performed. An analysis of variance (ANOVA) and Box's M were applied to determine the test's suitability. To perform the discriminant, the Inclusion Method ‘Introduce independents together’ is used, obtaining the coefficients of the canonical discriminant

**Table 2** Scales and items selected from the initial questionnaire for non-university teachers

Scales	Codes	Items
Perception of the usefulness of the SMP	PU	<ul style="list-style-type: none"> <li>• PU1. 'I believe that social media provide teachers access to scientific knowledge in their field.'</li> <li>• PU2. 'I believe that social media are handy for teachers who want to improve their work based on scientific knowledge of their field.'</li> <li>• PU3. 'I prefer the scientific knowledge in educational matters that I obtain through social media due to the formats in which they are published (summaries, reviews, infographics, videos, podcasts).'</li> </ul>
Uses of the SMP	U	<ul style="list-style-type: none"> <li>• U1. 'I access educational news from scientific research through social media.'</li> <li>• U2. 'Social media are my main source of updates on educational matters based on scientific research.'</li> <li>• U3. 'When I get educational content from scientific research, I share it with fellow teachers, like it, and comment on it.'</li> <li>• U4. 'I adopt the research results and use them in teaching in my classroom.'</li> <li>• U5. 'Through social media, I exchange with other teachers what I consider useful for educational improvement, which is the product of scientific research.'</li> </ul>
Responsible use in the consultation of the SMP in educational matters	RES	<ul style="list-style-type: none"> <li>• RES1. 'I directly take the data that the social network distributes.'</li> <li>• RES2. 'I checked some data that the social network disclosed about the result of the investigation.'</li> <li>• RES3. 'I read extensively the article to which the social network refers.'</li> <li>• RES4. 'I adopt the research results and use them in teaching.'</li> <li>• RES5. 'I care about the repository in which the queried documents are located.'</li> <li>• RES6. 'I always consider some criteria of origin of the information to decide if I read it or use it in my teaching activity (Repositories, universities, other, database indexing).'</li> </ul>
The formative perspective of the SMP	PROS	<ul style="list-style-type: none"> <li>• PROS1. 'I consider it necessary to train university professors so that they know how to design their academic profiles on social media.'</li> <li>• PROS2. 'I would be interested in signing up for a training course that will help me improve my use and academic visibility on social media.'</li> <li>• PROS3. 'More information should be offered on the importance of social media in favour of academic growth.'</li> <li>• PROS4. 'University institutions in Spain promote plans and strategies that favour their assigned teachers' use of social media.'</li> </ul>

**Table 3** Construct validity and reliability of the readaptation of the initial questionnaire for non-university teachers

Scales	No. of Items	Construct validity		Reliability
		Principal component analysis		Cronbach's alpha
		Number of components (eigenvalue > a 1)	Total variance explained (%)	Cronbach's alpha
Scale 1 PU	3	1	72.189	.804
Scale 2 U	5	1	59.095	.835
Scale 3 RES	6	2 <sup>a</sup>	66.180	.768
Scale 4 PROS	4	1	57.764	.739

<sup>a</sup> Number of rotated components, Varimax rotation method

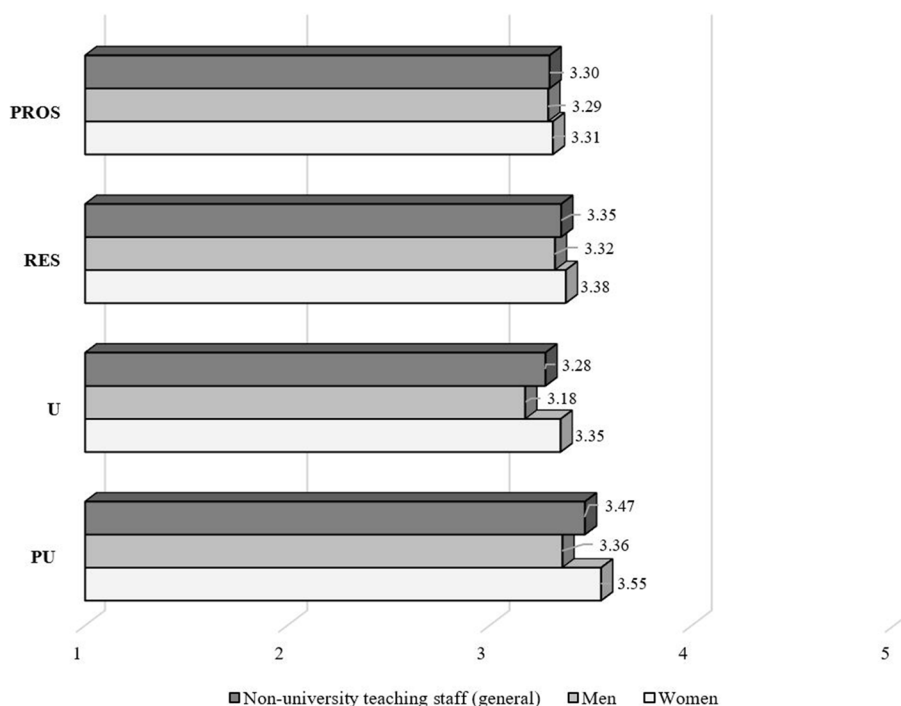
functions to assess their predictive power employing the percentage obtained in the Fisher classification Results test. The data collected to address the topic proposed in this research were processed and statistically analyzed using the statistical program SPSS V.26.

### 3 Findings

Below are the results that respond to SO1: 'Analyze the perception that non-university teachers have regarding 1) the importance and usefulness of social media for access to the scientific-research field; 2) the use of social media for consulting information and updates on educational matters through the SMP; 3) the responsible habits for consulting information on the SMP to update themselves on educational matters; and 4) the assessment of the role of educational institutions and their agents in training, both currently and prospectively.

Regarding the importance and usefulness of social media for access to scientific research, as shown in Fig. 1, this perception of usefulness (PU) presents a mean score in non-university teachers generally of 3.47 (standard deviation = ±0.87). In the case of men, the mean score is 3.35 (standard deviation = ±0.88), and in the case of women, it is 3.55 (standard deviation = ±0.86).

Regarding the Use (U) of teachers when they consult information and update themselves on educational matters through the SMP, the average assessment of non-university teachers is 3.27 (typical deviation = ±0.87). Men received a mean score of 3.17 (standard deviation = ±0.88), and women received a mean score of 3.35 (standard deviation = ±0.85).



**Fig. 1** Mean values of the PU, U, RES and PROS dimensions of the general non-university teaching staff, men and women

Regarding responsibility (RES), when teachers consult the information in the SMP to update themselves on educational matters, an average score of 3.35 (standard deviation =  $\pm 0.64$ ) is reached in university teachers in general. In the case of men, the mean is 3.32 (standard deviation =  $\pm 0.70$ ), and in the case of women, it is 3.37 (standard deviation =  $\pm 0.59$ ).

Finally, the assessment of non-university teachers on the role of educational institutions and their agents in training, currently and prospectively (PROS), presents an average score of 3.29 (deviation =  $\pm 0.74$ ). In the case of men, it is 3.28 (standard deviation =  $\pm 0.73$ ), and in the case of women, it is 3.31 (standard deviation =  $\pm 0.75$ ).

In all cases and dimensions, the average score reaches the highest value for the women, presenting a lower dispersion. In the three groups (general non-university teaching staff, men and women), the average scores of the PU, U and PROS dimensions oscillate between a minimum of one and a maximum of five. In the RES dimension, it oscillates between a minimum of one and a maximum of 4.83, reaching a minimum of 1.17 and a maximum of 4.67 and a minimum of 1 and a maximum of 4.84 in men and women, respectively.

Considering H1, 'There are sex differences in the different perceptions of the teachers surveyed', the following Table 4 only shows significant differences based on men and women ( $p$ -value < 0.05) in the perception of use (PU, next = 0.043). Likewise, both have a negative sign at the confidence interval limits, which does not mean the hypothesis is due to chance. In the rest of the cases, no differences were detected based on sex. In addition, one must be especially sensitive when interpreting these contrasts since there is a significant change in the confidence intervals, indicating that 0 could be a value at some point.

Below are the results that respond to SO2: 'Classify non-university teachers based on their perceptions of the proposed topic and identify which variables are decisive in this classification of profiles differentiating between men and women'. Before the classification of profiles applying the k-means cluster technique, an exploration is carried out through hierarchical cluster analysis. The results reveal that two groups naturally exist. The distance between teachers' perceptions is reduced, and the division of these into three groups is estimated. This finding determines the number of groups to apply the descriptive technique of k-means, where  $k = 3$ .

Thus, according to the results, three profiles of non-university teaching staff depend on the variables under study. Specifically, the characterization of these teacher profiles

**Table 4** Student's T-test for the equality of means considering the PU, U, RES and PROS

		Sig. (bilateral)	Difference of means	Standard error difference	95% confidence interval of the difference	
					Lower	Higher
PU	Equal variances are assumed	.043	-.19095	.09396	-.37573	-.00617
U	Equal variances are assumed	.63	-.17509	.09395	-.35985	.00967
RES	Equal variances are assumed	.451	-.05382	.07125	-.19412	.08649
PROS	Equal variances are assumed	.772	-.02321	.08010	-.18072	.13429



**Table 5** Final grouping clusters of non-university (general) teaching staff, according to the PU, U, RES and PROS dimensions

	1	2	3
PU	4.13	3.18	2.02
U	3.98	3.01	1.79
RES	3.70	3.31	2.32
PROS	3.72	3.11	2.49

is shown in Table 5. Cluster 1 is characterized by bringing together teachers who score the variables around the average score of 4. Specifically, in the PU, the assessment is 4.13, followed by U (3.98), RES (3.70) and PROS (3.72). In Cluster 2, there are those teachers who value approximately 3. The most valued variable is RES (3.31), followed by PU (3.18), PROS (3.11) and U (3.01). Finally, in Cluster 3, those teachers who score approximately two are classified. The teachers in this cluster register a higher valuation in the variable PROS (2.49), followed by RES (2.32), PU (2.02) and U (1.79).

In general, to determine the weight of the variables in said classification, the analysis of variance (ANOVA) reveals that the set of dimensions is significant ( $p$ -values  $< 0.05$ ) in the classification carried out, which indicates that they obtain different means for each classified group (Table 6).

However, Box's M test makes it possible to reject the null hypothesis of equal population covariance matrices (Table 7), revealing that the different groups' matrices differ.

As shown in Table 8, the same number of teachers in Clusters 1 and 2 is 44.10%. A total of 88.20% of the participants were in said conglomerates. A total of 11.80% of those surveyed are located in Cluster 3.

To determine if this classification consistently differentiates between men and women, that is, if there are differences based on sex in the teachers surveyed (H2) classifications, the Pearson chi-square hypothesis contrast test is performed. This test revealed

**Table 6** ANOVA

	Root mean square	gl	Root mean square	gl	F	Sig
PU	84.542	2	.294	353	287.268	.000
U	90.699	2	.239	353	379.838	.000
RES	32.090	2	.218	353	147.080	.000
PROS	30.867	2	.361	353	85.425	.000

F tests should only be used for descriptive purposes because the clusters have been chosen to maximize the differences between cases in different clusters. The observed significance levels are not corrected for this and, therefore, cannot be interpreted as testing the hypothesis that the cluster means are equal

**Table 7** Box M-Test results

m		122.781
F	approx	5.986
	gl1	20
	gl2	55477.592
	Sig	.000

**Table 8** Number of cases in each cluster, according to the PU, U, RES, and PROS

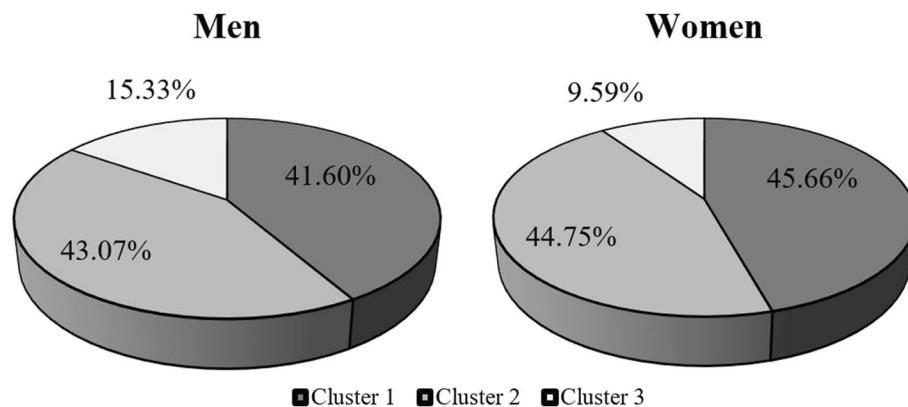
Cluster		
	1	44.10%
	2	44.10%
	3	11.80%

no differences ( $X^2 = 2.722$ ;  $df = 2$ ;  $p > 0.05$ ). The behaviour is the same for both biological sexes. However, at a descriptive level, we can speak of a slight difference between men and women that is not statistically significant. There is a tendency for women to situate themselves more in Clusters 1 and 2, those with more positive or neutral views, compared to Cluster 3, which had a more pessimistic view (Fig. 2).

Once both the significance of the variables under study and the distribution of the cases have been exposed, it is necessary to obtain canonical discriminant functions that predict the future positioning of cases based on the teachers' perceptions of the dimensions under study. In Table 9, the values of the coefficients of the canonical functions are presented.

Specifically, the canonical discriminant functions are:

- $Y_{\text{Perception\_Teachers\_General\_1}} = .521 \cdot \text{PU} + .593 \cdot \text{U} + .374 \cdot \text{RES} + .329 \cdot \text{PROS}$
- $Y_{\text{Perception\_Teachers\_General\_2}} = -.026 \cdot \text{PU} - .348 \cdot \text{U} + .932 \cdot \text{RES} - .416 \cdot \text{PROS}$



**Fig. 2** Distribution of non-university teaching staff differentiating between men and women in Clusters 1, 2 and 3

**Table 9** Standardized canonical discriminant function coefficients (general non-university teaching staff, men and women)

	General function		Men function		Women function	
	1	2	1	2	1	2
PU	.521	-.026	.559	-.295	.520	.171
U	.593	-.348	.555	-.367	.626	-.285
RES	.374	.932	.544	.846	.262	.868
PROS	.329	-.416	na <sup>a</sup>	na <sup>a</sup>	.409	-.622

In the case of men, the PROS variable does not enter into the analysis following the introduction method by steps since it does not minimize the global Wilks lambda, not obtaining partial F values, both minimum and maximum, necessary to enter or be eliminated, respectively

<sup>a</sup> na not applicable

**Table 10** Self-values (general non-university teaching staff, men and women)

	Function	Eigenvalue	% Variance	% Accumulated	Canonical correlation
General	1	4,387 <sup>a</sup>	98.8	98.8	.902
	2	.052 <sup>a</sup>	1.2	100	.223
Men	1	4,400 <sup>a</sup>	98.3	98.3	.903
	2	.076 <sup>a</sup>	1.7	100.0	.266
Women	1	4402 <sup>a</sup>	99.2	99.2	.903
	2	.033 <sup>a</sup>	0.8	100	.179

<sup>a</sup> The first two canonical discriminant functions were used in the analysis

**Table 11** Lambda de Wilks (general non-university faculty, men and women)

	Function test	Wilks' Lambda	Chi-squared	df	Sig
General	1 to 2	.176	609.808	8	.000
	2	.950	17.859	3	.000
Men	1 to 2	.172	234.063	6	.000
	2	.929	9.782	2	.008
Women	1 to 2	.179	368.831	8	.000
	2	.968	7.021	3	.071

- $Y_{\text{Perception\_Teachers\_Men\_1}} = .559*PU + .555*U + .544*RES$
- $Y_{\text{Perception\_Teachers\_Men\_2}} = -.295*PU - .367*U + .868*RES$
- $Y_{\text{Perception\_Teachers\_Women\_1}} = .520*PU + .626*U + .262*RES + .409*PROS$
- $Y_{\text{Perception\_Teachers\_Women\_2}} = .171*PU - .285*U + .868*RES - .622*PROS$

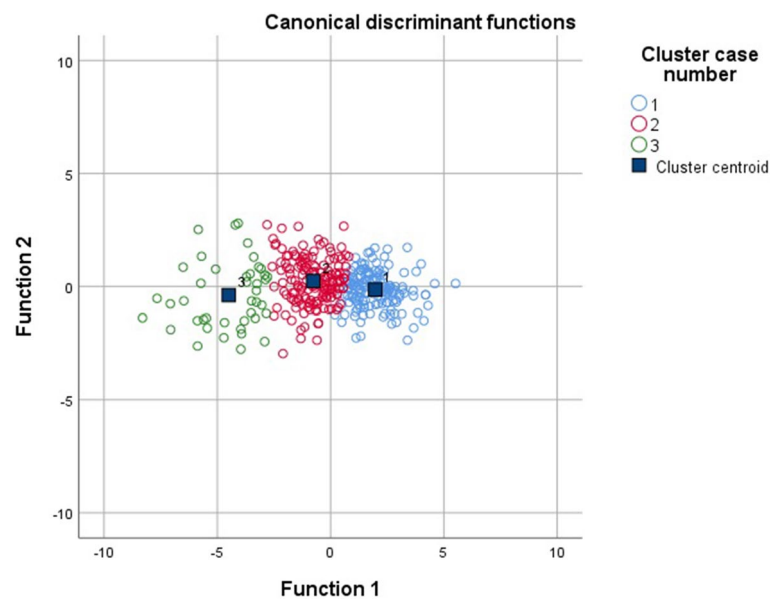
In the first canonical functions, the variables that have the most significant discriminant weight to predict future classifications are U and PU. The second function is RES. As specified in the note to Table 9, it is worth highlighting the disappearance of the PROS variable in the discriminant functions for men.

The first canonical function explains approximately 99% of the variance in all three cases, while the second only explains approximately 1% (Table 10). These functions are significant since the contrast statistic reveals  $p$ -values  $< 0.05$  (Table 11). However, in the case of the second canonical classification function for women, it is not statistically significant for discrimination,  $p$ -value  $> 0.05$ .

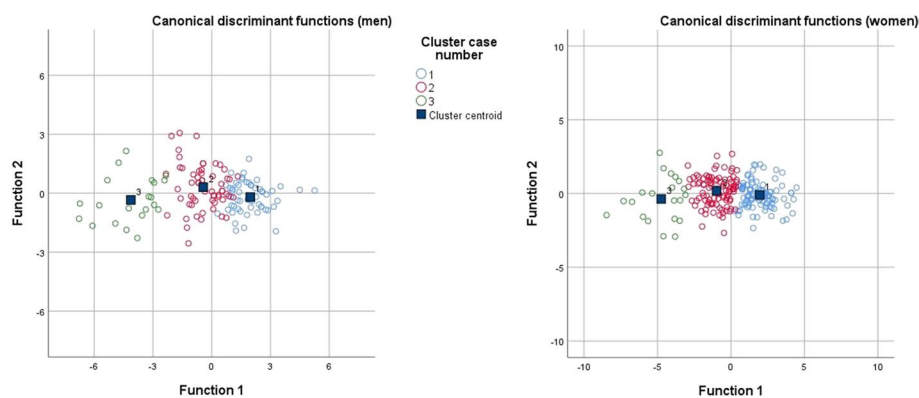
Once the intergroup differences have been determined, Figs. 3 and 4 show the distribution of the surveyed teachers based on the cluster they belong to and the canonical discriminant functions.

The previous figures confirm the parallelism between the classification and discrimination of the three emerged teaching staff profiles. It should be noted that the sample of women is higher than that of men, which means that more cases are grouped. In general, it is revealed that the three groups detected are close to each other, and occasionally, they include similar subjects.

Finally, the confusion matrices obtained for teachers are presented according to sex (Table 12) to assess the goodness of fit based on Fisher's linear function. The results reveal how the three classifications have been carried out correctly.



**Fig. 3** Grouping of non-university teaching staff in general (total) in Clusters 1, 2, and 3



**Fig. 4** Grouping of non-university teaching staff distributed by men and women in Clusters 1, 2, and 3

Table 12 indicates the analysis's goodness of fit for the general classifications and those disaggregated according to sex, indicating that the classification has been carried out correctly and discriminates between groups. Based on the perception of general teachers, 98.9% of the grouped cases were classified correctly. For teachers, it drops to 92.0%, and for female teachers, it rises to 99.1%, indicating that the best classification is obtained for women. These data of adequate profile classification prove the results' consistency.

#### 4 Conclusion and discussion

Beyond the growing use and influence of the SMP and the revolutionary impact they have had in our societies, as also pointed out by authors such as González-Sanmamed et al. (2018) and Fernández et al. (2019), the data shown in this work allow us to see how the perception of usefulness, responsible use and the role of educational institutions and

**Table 12** Classification results (general non-university teaching staff, men and women)

	Cluster number	Predicted group membership (%)			Total
		1	two	3	
General <sup>a</sup>	1	98.7	1.3	0.0	100
	2	0.6	98.7	0.6	
	3	0.0	0.0	100	
Men <sup>b</sup>	1	96.5	3.5	0.0	100
	2	11.9	86.4	1.7	
	3	0.0	4.8	95.2	
Women <sup>c</sup>	1	98.0	2.0	0.0	100
	2	0.0	100	0.0	
	3	0.0	0.0	100	

<sup>a</sup> 98.9% of original pooled cases are correctly classified

<sup>b</sup> 92.0% of original pooled cases correctly classified

<sup>c</sup> 98.9% of original pooled cases were correctly classified

agents, in favour of a better use of this type of resource among non-university teachers in Spain, continue to be at medium or low levels. What might affect the training capacity and professional work in charge of these days and the teachers' ability to take full advantage of these digital scenarios for reflection, the result of access to information and scientific knowledge associated with their professional work? This scenario contradicts the growing importance of disseminating research results and social media's role in contemporary societies in the terms exposed by authors such as Alsina and Rodríguez Muñoz (2021). Therefore, although authors such as Gil and Serna (2014), Bergviken et al. (2018), Van Den Beemt et al. (2020) and Aguilera-Mata and García (2022) have reported an increase in disturbances in the classroom, the growing active presence and use of this type of digital communication scenario, non-university teachers in Spain would find themselves in a techno-labour and training environment characterized by the underutilization of the latent capacities provided by the SMP for access to knowledge and tools. What would limit their ability to improve their teaching practice from the access, application and exchange of knowledge disclosed through these media? This also accounts for the path that remains to be advanced in an environment where the perception of usefulness and use of social media should be more significant and better than those shown in this study.

The context described thus far is not homogeneous among the teachers studied since female teachers have a more favourable perception of the usefulness, use and role of social media assumed from the institutions where they work professionally compared to male teachers (Casipit et al., 2022; Karimi et al., 2022). The statistically significant differences (although weak), from a biological sex perspective, are only in terms of perception of the use of social media and not in the rest of the variables considered in this study (U, RES, and PROS). These findings converge with previous studies revealing no significant differences between men and women using SMP (Manca & Ranieri 2016). These data led us to partially reject the H1 proposed in this work. The sex perspective could shed light on thinking about actions aimed at advancing the conversion process of social media as tools of continuous training and improvement in their daily work by the population studied in Spain. This is from an increase in the visibility and leadership of female

teachers and the application of mechanisms that help promote equal opportunities for them concerning men, as also pointed out by authors such as Cambronero-Saiz et al. (2021). This is even more the case given that they have, although not in a significant way, a greater and better perception of social media, which could well serve the purposes above.

The data also helped us to identify three profiles of non-university teaching staff based on each of the dimensions under study (PU, U, RES and PROS). The profiles do not present significant differences distinguishing between men and women. This conclusion leads us to reject the H2 proposed in this work, confirming no sex differences among the teachers surveyed in the variables under study.

#### 4.1 Implications for teacher education

The identification of the teacher profiles in this work does not mark appreciable differences between men and women based on the data shown. This leads us to emphasize the need to undertake actions that we could frame on various fronts or areas, in the first place, by taking advantage of those non-university professors who can be considered 'evangelizers' of the integration of the SMP in training and professional work, especially if we conceive of this group as potential leaders of the transformation processes required by the other professional peers associated with the rest of the profiles identified in this work. This role should be assumed under a framework that favours the visibility of female teachers and equal gender opportunities, when, for example, developing mentoring programmes that favour the role of teachers with this profile when promoting a better perception and use of the SMP at the level of their institutions and educational system, in general.

Second, actions should be undertaken focused on improving the perception of usefulness and use of social media by non-university teachers in Spain, based, for example, on greater integration of social media in the tasks in the classroom (e.g., increase the use of active teaching methodologies with students with the mediation of technologies). However, measures should be implemented, such as those indicated by Cambronero-Saiz et al. (2021), that increase the presence of programs for the training and development of practical guides for all members of the professional community analyzed for the improvement of the scenario described thus far, from the gender and equality perspective, already indicated opportunities.

Third, communication and institutional initiatives should be promoted to favour an increase and recognition of the advantages and challenges associated with the mediation of social media in the different tasks carried out by non-university professors; above all, when making visible the activities carried out at their educational centres, favouring more fluid communication between peers and other educational stakeholders (e.g., parents, legal guardians, companies or entities of the third sector of social action, among others). Additionally, activities aimed at building virtual learning networks that help the teachers themselves in their continuous training and the exercise of their work in the classroom should be promoted.

The implications of this study help this work go beyond merely describing the topic to proposing actions that help improve the scenario by 1) increasing the training channels,

2) increasing the levels of educational innovation through SMP, 3) increasing the effectiveness of teaching and learning strategies; and 4) promoting of skills and competencies that contribute to greater use and perception of these scenarios for the training of teachers and students. From the data shown here, this would be in line with what was stated by authors such as Zaragoza and Roca (2020), whose focus on reducing the shortcomings that teachers continue to experience would be achieved by establishing a better constructive relationship and employment with the different general and specialized SMP existing today.

#### 4.2 Limitations

We are aware of the main limitations of the work presented. The first is the scope of the data shown, which is focused on the study of perceptions and habits of use of the population studied around the proposed topic. Therefore, it is necessary to advance in new studies that complement the data shown here, through qualitative or mixed approaches, that help to understand better the motivations and logic associated with how the SMP is accessed or even aspects indicated by authors such as Aguilera-Mata and García (2021), to get the most out of this type of scenario for the training of the studied population, for example.

The second main limitation of this work is framed in the sample type. Despite the number of contacts made during data collection, the difficulty of participation and collaboration of the non-university teaching centres contacted prevented the design of a sample that would allow a stratified or conglomerate analysis of the population studied. This would have helped to increase the scope of the work proposed here.

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#### Authors' contributions

Conceptualization, Á.M.-G. and J.C.-J.; methodology, E.S.-H., Á.M.-G. and J.C.-J.; software, E.S.-H.; validation, J.C.-J., E.S.-H., and Á.M.-G.; formal analysis, Á.M.-G. and J.C.-J.; investigation, E.S.-H. and Á.M.-G.; resources, E.S.-H.; data curation, Á.M.-G., J.C.-J. and E.S.-H.; writing—original draft preparation, Á.M.-G., J.C.-J. and E.S.-H.; writing—review and editing, Á.M.-G., J.C.-J. and E.S.-H.; visualization, Á.M.-G.; supervision, Á.M.-G.; project administration, E.S.-H.; funding acquisition, E.S.-H.

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**Availability of data and materials**

The following website provides access to the data related to the project: <https://comscienciaeduspain.es>. However, the authors of the publication may be asked for any information they deem necessary.

**Declarations****Ethics approval and consent to participate**

The Research Ethics Committee of the International University of La Rioja (Spain) approved this research with the following code: (PI:015/2021). Informed consent was obtained from all individual participants included in the study.

**Consent for publication**

The authors declare their consent to the publication of this study. All authors have read and agreed to the published version of the manuscript.

**Competing interests**

The authors confirm that this work is original and has not been published elsewhere, nor is it currently under consideration for publication elsewhere. The authors no conflicts of interest to disclose.

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