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Knowledge and Use of Social Networks in University Students from Mexico and Spain

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Abstract: It is unclear how social networks can be utilized in educational settings. An exploratory study was conducted to examine the differences between university students in Mexico and Spain in terms of their perceptions of knowledge and utilization of networks in the university environment. An overall sample of 378 students was collected from two public universities, one in Mexico and one in Spain. This study utilized descriptive statistics as part of a contingency analysis, X^2 with correction was used for the analysis of differences, Mann-Whitney U for the analysis of independence, Mantel-Haenszel test for association degree, Cramer's V for strength of association, Spearman's correlation coefficient for correlations. According to the results, the use of social networks is clearly related to country of origin, but not to gender. It seems that Instagram is a platform widely used by both Mexican and Spanish students, but it is not used in educational environments. Therefore, the use of social networks in higher education contexts differs by country, as does the knowledge of social bookmarking and the distribution of content to share information and resources.

Keywords: *Comparative study, higher education, ICT, university students, social networks.*

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Introduction

The use of social networks is becoming increasingly prevalent in society, with the younger generation (Álvarez Álvarez & Pulido-Álvarez, 2022; Gil-Fernández & Calderón-Garrido, 2021; Gursoy & Oner Ozkan, 2023; Loos & Ivan, 2024; Mark et al., 2023; West et al., 2024) particularly embracing this mode of communication. However, social networks are not simply a conduit for communication; they offer a multitude of possibilities, including in the educational context. In this context, teachers and students are increasingly utilising social networks in the educational field (Guerra Santana et al., 2021; Pérez Alcalá et al., 2015). Consequently, the utilisation of social networks in the educational context presents a number of advantages (Masalimova et al., 2023), with the reinforcement of knowledge and learning emerging as a significant benefit, facilitating the accessibility of a vast array of content to users (Pérez Alcalá et al., 2015).

Another beneficial outcome of utilising social networks in educational contexts is the development of critical thinking (Cheng et al., 2024). A study conducted by Shieh and Nasongkhla (2024) found a positive correlation between motivation to use social networks and the advancement of critical thinking. On the other hand, if the student enjoys online learning, it has important benefits (Supriyadi et al., 2024).

However, not all outcomes are beneficial. It is evident that social networks can be utilised in the educational context, yet certain obstacles must be overcome. One such obstacle is the fact that social networks are primarily resources associated with leisure (Sanz Arazuri et al., 2018). This is because the origins of social networks in the academic context are found in their use in communication processes (De La Hoz et al., 2015), rather than as an educational tool. A number of the social networks most commonly used by young people, which originated in the communication process, are Facebook and Instagram (De La Hoz et al., 2015; Min & Hashim, 2022; Oliva, 2017). Additionally, according to Lobato de Sa et al. (2021), WhatsApp is the most frequently used social network by teachers in the educational context (Oliva, 2017).

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The use of social networks, apps and new media by students presents three challenges, according to Pérez Escoda (2018). In his analysis of these disadvantages, Pérez Escoda summarises them as:

- Social interaction, linked to excessive exposure to screens.
- Cognitive challenges, linked to the "genetic predisposition to technologies" (Prensky, 2013, as cited in Pérez Escoda, 2018, p. 82).
- Competence dimension, linked to the management of information and communication technology (ICT).

In addition to these issues, there are other factors that affect the use of social networks, beyond their benefits in the educational context. One of these factors is gender. It can be observed that technology is traditionally associated with the male gender (Arispe Alburqueque & Yangali Vicente, 2022; Prendes-Espinosa et al., 2020). Various studies have focused their results on the female gender linked to communication technology (Valencia-Ortiz et al., 2020), while studies on the male gender seem to be more linked to video games (Fernández de la Iglesia et al., 2020; Valencia-Ortiz et al., 2020). This leads us to hypothesize that technologies, as well as social networks, may be linked to gender in the educational context. Conversely, there are a series of less well-known computer tools with great potential in educational contexts. Some of these tools are social bookmarks, which allow users to organize, store and share links quickly and easily. People interact and collaborate more easily through a complex web of relationships. In educational contexts, they are employed less frequently than other information storage tools, as evidenced by García Martínez et al. (2021). However, they also present significant potential.

The integration of ICT tools into the classroom is not merely a matter of incorporating them; rather, it is essential to understand how they should be used. This leads to a pivotal concept in contemporary teaching: digital competence. The definition of digital competence from European Commission (2019, p. 10) is: "Digital competence involves the confident, critical and responsible use of, and engagement with, digital technologies for learning, at work, and for participation in society. It includes information and data literacy, communication and collaboration, media literacy, digital content creation (including programming), safety (including digital well-being and competences related to cybersecurity), intellectual property related questions, problem solving and critical thinking". In its 2018 Council Recommendation, the European Union (2018) identified digital skills training as a fundamental element in the development of key competences for lifelong learning.

Digital literacy is essential for personal and professional success today (Reddy et al., 2022). Teachers and students are increasingly using social networks in education (Pérez Alcalá et al., 2015).

This concept is in line with the Sustainable Development Goals (SDGs). In particular, SDGs 4 and 9 emphasise the importance of quality education, industrial innovation and infrastructure, highlighting the role of information and communication technologies. Therefore, the use of ICT, regardless of the specific type, within classrooms contributes to the inclusion of students and provides quality education (Ghanem, 2020). This makes the inclusion of these resources in classrooms at all educational levels even more relevant (Cabrera Yeto et al., 2023; Montero Caro, 2021).

In the context of the pandemic, all educational institutions in all countries have had to address the challenge of using ICT as a fundamental and indispensable tool to maintain educational systems. Consequently, social networks, content syndicates, and other computer tools have become the primary mode of communication and educational tool for students and teachers worldwide. The adaptation was rapid for all educational institutions, but their success has varied considerably. This has led to significant differences based on the previous level of digital competence.

The Organisation for Economic Co-operation and Development (OECD, 2020) talks about this trend towards digitalisation, but also points to the need to reduce inequalities resulting from difficulties in accessing ICTs. Therefore, countries with higher poverty rates tend to have more difficulties with the digital literacy of their population. In this sense, the poverty rates of Mexico and Spain are very different, just as it is foreseeable that the possibilities of access, especially to the Internet, will be different. All this seems to indicate that there may be greater difficulties in the students' own perception of their digitalisation process in the educational context.

As we have seen, digital literacy is now essential for personal and professional success (Reddy et al., 2022). Therefore, and taking into account the above, the purpose of this study was to determine the differences in knowledge and perception of the use of social networks among education students based on their perceived relevance in the classroom.

Literature Review

A review of Web of Science was conducted using the keywords "social media" and "university students" to determine the status of this issue. The search was refined from 2019 to the present, as well as the scientific field taking "Education Educational Research" and/or "Education Science Disciplines". Finally, those that fall into the "article" category are now part of the "open access" category. The total number of articles found was 1624.

Adding the keyword "social networks" results in 185 articles. There is no doubt that social networks are at an incipient stage in higher education, and their relevance should be further explored.

The term "social networks" is linked to a number of concepts that are relevant, including country, age, and gender. It is also associated with specific age groups, namely adolescents and young people. An analysis of other terms in Figure 1 reveals that three social networks, namely Twitter, Instagram, and Facebook, appear with particular frequency. These three applications are linked to terms such as learning, motivation, and teaching.

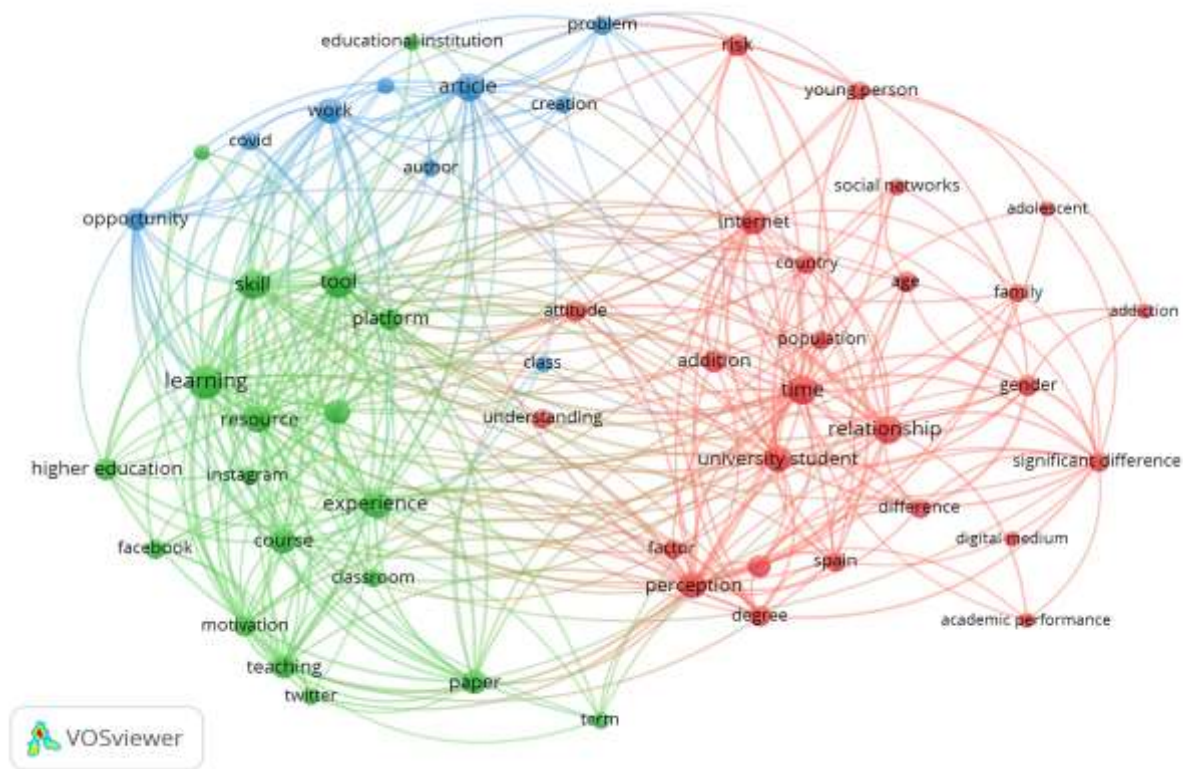


Figure 1. VOSviewer Co-occurrence Map

Comesaña-Comesaña et al. (2022) found that 162 university students, mostly female (62.3%), mainly in the 20-23 age group, experienced difficulties with learning and assimilation because newspapers and manual writing were less frequent. As Venter (2019, p. 254) notes, "The mere presence of an online learning platform does not necessarily equate to students' access to collaborative learning opportunities." Consequently, social networks can also benefit higher education students (Cabero Almenara et al., 2019). Student engagement can be positively influenced by Facebook and Twitter, according to Schindler et al. (2017). Similarly, Chugh and Ruhi (2018) identified numerous benefits from utilizing Facebook for teaching and learning, including increased teacher-student and student-student interaction, improved performance, convenience of learning, and increased engagement.

A notable finding from the recent study conducted by Cheng et al. (2024), which involved 300 students from three Chinese universities, is the extent to which social networks are relied upon and the level of critical thinking skills demonstrated. As the authors of the study emphasise, social networks can be a double-edged sword, necessitating appropriate use and management to ensure that the benefits of such use are positive.

Methodology

Research Design

With the objective of knowing the differences between university students from Mexico and Spain in the perceived knowledge and use of networks in the university context, a descriptive and comparative study is presented. The purpose of this study is to answer the following research questions:

- Are there differences between Mexican university students and Spanish university students in their perceptions of social networks in higher education contexts?
- Are these differences due to country of origin or gender?

Sample and Data Collection

To obtain a representative sample of both universities, a non-probabilistic convenience sampling was used, taking a total of 378 male and female students belonging to the Mexican University (N= 251; 66.4%), and to the Spanish University (N=

127; 33.6%). The age range of the students ranges from 17 to 55 years, with an average age of 21.8 years (DT = 5.31). By gender, 65.9% of the sample are women compared to 66.4% of men. In turn, most students were studying for undergraduate degrees at the time of the study (98.9%). Regarding the specific area of study, the majority belong to Business (68.5%), compared to 31.2% in the health area (Nurse).

A normality analysis was conducted, with $p < .001$ as the result, indicating that the sample is assumed to have a non-normal distribution. In relation to homoscedasticity, the Levene's test revealed that this principle is fulfilled. (Levene's Test = .870; $p = .352$). In turn, an effect size of $\delta \geq .5$ was obtained, assuming the two-tailed criterion for detection of a maximum type I error = .05 for groups with a minimum of 86 sample units so that the size of the groups is considered adequate.

Variables

As independent variables, gender, country of origin, difficulties accessing the Internet, and previous ICT training were taken. As dependent variables were analyzed, the perception of knowledge and use of social media networks, knowledge about social bookmarking and content syndication to share information and resources, and management of online publishing tools.

The knowledge variable about social bookmarking and content syndication to share information and resources is made up, in turn, of two sub-variables that have also been analysed dependent variables. The first of the sub-variables refers to the perception of the use of Delicious, Mister Wong and Diigo; and the second of the sub-variables refers to the perception of the use of Netvibes, FeedReader, DiggReader and RSS Owl.

Regarding the last of the variables, management of online publishing tools, this also contains sub-variables that are taken as the dependent variables separately. These are, specifically, Picassa, Pinterest, Instagram, Flickr and SlideShare.

Instruments

To measure the variables, the instrument for evaluating digital skills in higher education teachers by Agreda Montoro et al. (2016) was used. The instrument is made up of four dimensions, of which 8 specific items on social networks included in dimension 1 were used. More specifically, Knowledge and use of social networks (item 1), Knowledge of social bookmarking and content syndication to share information and resources (item 2, in particular Delicious, Mester Wong and Diigo; and Netvibesm FeedReader, DiggReader, RRSS Owl), management and online publishing tools (Picassa, Pinterest, Instagram, Flickr, Slideshare)

It is a Likert-type scale with 4 options, from "strongly disagree" (1) to "strongly agree" (4) with the use of the different tools consulted. These items were selected because they refer to social networks and other tools and correspond to items 4, 7, and 8, and the corresponding subitems of the original test.

This instrument was used in other investigations, validating them all. Riquelme-Plaza et al. (2022) validated this instrument in Chile with a sample of more than a thousand teachers. For their part, Chávez-Melo et al. (2022), conducted a study with 978 Mexican teachers, obtaining an acceptable reliability index. In the Spanish context, Tourón et al. (2018) and, more recently, Latorre-Coscolluela et al. (2023) used this same instrument, obtaining high-reliability indices.

Likewise, the reliability study yielded a Cronbach's alpha of .79. The exploratory factor analysis confirms this result (KMO = .734; Bartlett's sphericity test ($X^2(28) = 1631$; $p < .001$). This instrument can be determined to be acceptable.

Although it is true that it is an instrument originally designed for teachers, given that the selected items talk about the perception of knowledge and the use of social networks, there is no evidence that it has a specific link to the teaching function. Likewise, it was determined that reliability and confirmatory factor analysis indicate that it is an adequate instrument.

Procedure

To carry out the study, in October 2021, the evaluation instrument was sent to the students via Google Forms, which was mandatory to accept informed consent. Data processing was carried out exclusively by the research team, following the General Data Protection Regulation (EU) 2016/679, as well as the international ethical criteria included in the Declaration of Helsinki.

Analysis of Data

The results obtained were analysed using the statistical software Jamovi 2.2.5, using descriptive statistics through contingency analysis. The differences are analyzed using X^2 with correction, independence analysis with Mann-Whitney U, degree of association according to the Mantel-Haenszel Test, strength of association through Cramer's V, and correlations through Spearman's correlation coefficient.

The selection of such statistics is due to the results indicated in the previous section, which indicate that the results on compliance with the principles of normality and homoscedasticity are not fulfilled. This implies the necessity to employ non-parametric statistics, as well as the type of variables tested, which in this case is ordinal, in accordance with the selected correlation coefficient.

Findings/Results

The results are presented in a grouped format according to the different variables, with comparisons made between countries and genders. This allows the attitudes of students towards ICT in general to be exposed, as well as the relationship between knowledge and use of social networks and internet access and previous ICT training. The items presented are as follows: Item 1. Knowledge and use of social networks by country and gender; Item 2. The survey also included questions on social bookmarking and content syndication, which are methods of sharing information and resources online. These included web bookmarks (such as Delicious, Mester Wong, and Diigo), and readers of syndicated news networks (such as Netvibesm FeedReader, DiggReader, and RSS Owl).

Finally, the survey included questions on the management of online publishing tools. In addition, the survey included questions on the independence of the study and the correlation of all the variables analysed.

Attitude of Students Towards ICT in General

As far as attitudes towards ICTs are concerned, Mexican and Spanish students' attitudes on the subject are similar, with neither group scoring "strongly disagree" with the use of ICTs in the classroom context, and the majority of the students agreeing with the statement (59.8% of Mexican students and 59.1% of Spanish students). The values of students who "strongly agree" and "disagree" are also similar for both countries (35.9% of Mexican students "strongly agree" compared to 40.2% of Spanish students; and 4.4% of Mexican students "disagree" compared to 0.8% of Spanish students). Additionally, there is no significant difference between Mexican and Spanish students in terms of their attitudes towards information and communication technology (Fisher's exact test $>.05$). Therefore, both Mexican and Spanish students are positive towards ICT.

Relationship Between Knowledge and Use of Social Networks and Internet Access and Previous ICT Training

To know the starting point of the students, the difficulty of accessing the Internet and previous ICT training were analysed. In relation to the first variable, this type of difficulty is more common among Mexican students. Mexican students have 37.5% no difficulties access was indicating, 55.8% have encountered them occasionally, and 6.8% have never had difficulties. In the case of Spanish students, 83.5% have not had any difficulties, 15.7% have had occasional difficulties, and only .8% have not had any difficulties. Focusing on the difficulties of accessing the Internet according to gender, it was determined that there are no major differences between genders, in such a way that 55% of women indicate that they do not have difficulties accessing the Internet compared to 48.8% of men. ; 4.6% of women admit to having difficulties occasionally compared to 45.7% of men; and 4.4% of women report having difficulties compared to 5.4% of men. On the basis of the entire sample, 52.9% of students indicate that they have difficulty accessing the Internet, 42.3% indicate that they have occasional difficulties, and 4.8% indicate that they have no difficulty accessing the Internet.

In any case, there is evidence of a significant relationship between difficulties in accessing the Internet and the country ($X^2(2) = 72$; $p <.001$); This was not the case with respect to difficulties in accessing the Internet and gender ($X^2(2) = 1.33$; $p = .540$).

Focusing on prior ICT training, it is determined that the percentages by country are clearly far from each other. While 45.4% of Mexican students have previous ICT training, only 19.7% of Spanish students were training. These differences do not occur when the variable is observed according to gender .35.7% of women have previous ICT training, compared to 38.8% of men.

Regarding whether there are significant differences between the variable prior to ICT training and the gender and country variables, there are differences with the country variable ($X^2(1) = 24.0$; $p <.001$), but not with the gender variable ($X^2(1) = .333$; $p = .564$).

Item 1. Knowledge and Use of Social Networks by Country and Gender

The percentages obtained by Mexican and Spanish students regarding "knowledge and use of social networks" were similar. In both cases, most students have positioned themselves as "strongly in agreement" (66.4% of the Mexican student body, and 65.4% of the Spanish student body). The rest of the values are also similar (3.3% of Mexicans indicate that they agree against 28.3% of Spaniards; 2.4% of Mexican students indicate that they disagree with 5.5% of Spanish students; and only 1.6% of Mexican students and .8% of Spanish students indicate that they strongly disagree).

In turn, no significant differences ($X^2(3) = 2.91$; $p = .405$) were found in this item depending on the country. In turn, there is no association between both variables (Mantel-Haenszel Test=.074; $df = 1$; $p = .781$).

Evaluating this same item against gender, instead of assessing it against country, it is observed that the percentages are not very different, and are equally similar (66.3% of women indicate that they strongly agree compared to 64.3% of men; 29.3% of women indicate that they agree compared to 3.2% of men; 3.6% of women indicate that they disagree compared to 3.1% of men; and .8% of women indicate that they strongly agree with disagreement compared to 2.3% of men). As in the previous item, there are no significant differences ($X^2(3) = 1.63$; $p = .653$). There are no gender differences within each country. That is, there are no differences between men and women in Mexico ($X^2(3) = .441$; $p = .932$), nor between men and women in Spain ($X^2(3) = 4.073$; $p = .254$).

Considering the differences between Spanish women and Mexican women, and between Spanish men and Mexican men, it is observed that there are no differences in any of the cases ($X^2(3) = 3.951$; $p = .267$ for women; and $X^2(3) = 506$ ($p = .918$) for men).

Item 2. Knowledge of Social Bookmarking and Content Syndication to Share Information and Resources

Item 2 consists of two subitems: specific knowledge of Delicious, Mester Wong, and Diigo and Netvibes FeedReader, DiggReader, and RRSS Owl. The first subitem deals with specific web bookmarks, while the second refers to syndicated news readers.

Bearing this in mind, firstly, the results of the item in general are presented, and then the specific data of each subitem are indicated.

Focusing on contingency data, it is observed that data are similar between men and women. Thus, the majority, both men and women, strongly agree (66.3% of women compared to 64.3% of men), with 65.6% of the total sample analysed. The percentage of women who agree and the percentage of men who agree represented 29.3% and 3.2%, respectively. With respect to those who are "disagree," it was found 3.6% women, in comparison to 3.1% men, representing 3.4% of the sample. In addition, 1.3% of the total sample of respondents described themselves as "strongly disagreeing," as opposed to 2.3% of men and .8% of women.

According to the contingency analysis, which takes into account the country of origin, 66.4% of Mexican students are in agreement, compared to 33.6% of Spanish students.

Considering the knowledge about social bookmarking and content syndication to share information and resources, it is determined that there are no differences by country ($X^2(3) = 43.70$; $p < .001$); nor according to gender ($X^2(3) = 1.68$; $p = .642$). Thus, an association is found in the country variable (Mantel- Haenszel Test=28.45; $df=1$; $p < .001$), but not with the gender variable (Mantel- Haenszel Test=1.065; $df=1$; $p=.302$). In relation to association strength, it is considered weak in both cases (Cramer's V for country=4.340; and Cramer's V for gender =.066).

Observing the differences between genders within the same country, there are no differences between women and men in Mexico ($X^2(3) = 5.74$; $p = .125$), nor between women and men in Spain. ($X^2(3) = 2.22$; $p = .528$). Regarding the association between both variables, no association was found in the case of students from Mexico (Mantel- Haenszel Test=.290; $df=1$; $p=.865$), or in the case of students from Spain (Mantel- Haenszel Test=.320; $df=1$; $p=.858$). Taking the gender differences based on the country of origin, differences are found, both in women ($X^2(3) = 4.53$; $p < .001$) and in men ($X^2(3) = 8.64$; $p = .034$).

Web Bookmarks (Delicious, Mester Wong and Diigo)

When the students were asked if they agreed with the use of web bookmarks, specifically Delicious, Mester Wong, and Diigo, 2.8% of the Mexican students indicated that they strongly agreed, compared to 3.9% of the students. Spanish, 3.3% of Mexican students have indicated that they agree compared to 13.4% of Spanish students; 43.4% of Mexican students have indicated that they disagree with the use of this type of tools compared to 26.8% of Spanish students; and 23.5% of Mexican students have indicated that they firmly disagree compared to 55.9% of Spanish students. When evaluating this same item according to gender, it is observed that the results between female students and male students are practically similar (2% of women strongly agree compared to 5.4% of men; 24.9% of women compared to 24.0% of men agree; 36.5% women vs. 4.3% men disagree; and 36.5% women vs. 3.2% men deeply disagree). As can be seen, in this item there are pronounced differences depending on the country, with a significant result ($X^2(3) = 42.1$; $p < .001$). Likewise, it is determined that the association between both variables is significant (Mantel- Haenszel Test=26.0; $df=1$; $p < .001$), with a medium strength of association between this variable and country (Cramer's V = .334). On the contrary, this variable does not show significance with respect to gender ($X^2(3) = 4.46$; $p = .216$), nor is there any association (Mantel- Haenszel Test=1.78; $df=1$; $p = .181$). Regarding the strength of the association between both variables, it is very weak (Cramer's V = .108).

In turn, there are also significant differences between Mexican women and Spanish women ($X^2(3) = 38.80$; $p < .001$). However, male gender differences are not between Mexican and Spanish men ($X^2(3) = 6.11$; $p = .107$). Likewise, despite this, there are associations between Delicious, Mester Wong and Diigo and the gender variable (Mantel- Haenszel Test=2.66; $df=1$; $p < .001$) in the case of women; (Mantel- Haenszel Test=4.25; $df=1$; $p = .039$ in the case of men)

Focusing on gender differences within each country, they are not observed, neither in Mexican students ($X^2(3) = 6.973$; $p = .073$), nor in Spanish students ($X^2(3) = .497$; $p = .919$).

Table 1. Differences Based on Gender

χ^2 Tests	χ^2	df	p
Item 1. Knowledge and use of social networks	1.63	3	.653
Item 2. Knowledge of social bookmarking and content syndication to share information and resources	1.68	3	.642
Delicious, Mester Wong and Diigo	4.46	3	.216
Netvibesm FeedReader, DiggReader	1.70	3	.637
Item 4. Management of online publishing tools	5.97	3	.113
Picassa	2.60	3	.457
Pinterest	44.3	3	< .001
Instagram	12.4	3	.006
Flickr	9.01	3	.029
Slideshare	2.68	3	.443

Readers of Syndicated News Networks (Netvibesm FeedReader, DiggReader, RRSS Owl)

Regarding Netvibesm applications FeedReader, DiggReader, and RRSS Owl (readers of syndicated news networks), it can be seen that the percentages differ by country. 3.2% of Mexican students indicate that they strongly agree, compared to 3.1% of Spanish students; 31.1% of Mexican students indicate that they agree compared to 15% of Spanish students; 42.6% of Mexican students indicate that they disagree compared to 26% of Spanish students; and 23.1% of Mexican students strongly disagree with 55.9% of Spanish students.

Making the comparison according to gender, the students scored as high as they did in disagreement (35.3% of women against 31.8% men), in disagreement (36.9% of women against 37.2% of men) and agreed (25.3% of women versus 26.4% men). The option "strongly agree" is the minority of students of both countries (2.4% women and 4.7% men). As can be seen, the results obtained from this item are similar for students of both genders.

No significant differences were found in the use of Netvibesm FeedReader, DiggReader, RRSS Owl according to gender ($X^2(3) = 1.70$; $p = .637$), but according to country ($X^2(3) = 41.4$; $p < .001$). Regarding the association between the variables, no association was found with gender (Mantel- Haenszel Test = .968; $df=1$; $p=.325$), but with the country (Mantel- Haenszel Test = 27.9; $df=1$; $p < .001$). Likewise, there is a medium strength association associated with the country variable (Cramer's V = .331), but not with the gender variable (Cramer's V = .067).

Focusing on the existence of gender differences within the same country, it can be seen that they are not observed in Mexico ($X^2(3) = 5.35$; $p = .148$), nor in Spain ($X^2(3) = 1.49$, $p = .691$).

Observing the differences between Mexican women and Spanish women in the knowledge and use of Netvibesm, FeedReader, DiggReader, and RRSS Owl, it is determined that there are significant differences ($X^2(3) = 37.65$; $p < .001$). Men also have significant differences, although at a lower significance level ($X^2(3) = 8.06$; $p = .045$).

Item 4: Management Online Publishing Tools

Due to the fact that this item has four subitems, similar to the previous case, it has first been analyzed as to what the differences are in general, and then the differences among each subitem were considered.

In general, the data collected from online tools (Picassa, Pinterest, Instagram, Flickr, Slideshare) do not indicate a gender-specific dependency on these tools ($X^2(3) = 5.97$; $p < .113$), but there is dependence on the country ($X^2(3) = 9.16$; $p < .027$). In turn, there is no association between the variable and country (Mantel- Haenszel Test = 2.45; $df=1$; $p < .118$), although there are significant associations with the gender variable (Mantel- Haenszel Test = 5.12; $df = 1$, $p = .024$).

Regarding the management of online publication tools, it is evident that there are significant differences between Mexican men and Spanish men ($X^2(3) = 1.35$; $p = .016$), but not women ($X^2(3) = 3.29$; $p = .350$). Both in the United States as well as in Mexico, there are not significant differences between the two countries ($X^2(3) = 4.75$; $p = .191$), nor in Spain ($X^2(3) = 5.20$; $p = .158$).

Picassa and Flickr are two tools that are most used by Mexican students, compared to Instagram, which is better known by Spanish students (68.5% as "I strongly agree" compared to 39.8% of Mexican students; 23, 6% "agree" versus 45.4% of Mexican students; 5.5% "disagree" versus 9.6% of Mexican students; and 2.4% "strongly disagree" versus 5.2% of students Mexican).

On the basis of the entire sample, it appears that there is a strong dependency on the country ($X^2(3) = 27.8; p < .001$), as well as the gender, based on the Instagram application ($X^2(3) = 12.4; p = .006$). In turn, there are no significant differences by gender in Mexican students ($X^2(3) = 5.40; p = .145$); but it was in the group of Spanish students ($X^2(3) = 3; p = .006$). In turn, there is no association between Instagram and gender (Mantel- Haenszel Test = 1.87; $df=1; p < .001$).

The Flickr application presents dependency, both with the country ($X^2(3) = 5.7; p < .001$) and with the gender ($X^2(3) = 9.01; p = .029$). Regarding the association between both variables, it was determined that there is a significant association in both cases (Mantel- Haenszel Test = 31.91; $df=1; p < .001$ in the country variable; Mantel- Haenszel Test = 7.859; $df = 1; p = .005$ for the gender variable).

Comparing the variable Flickr based on gender and depending on the country, it is observed that there are differences in both cases ($X^2(3) = 29.7; p < .001$ for Mexican women vs. Spanish women; ($X^2(3) = 19.3; p < .001$ Mexican men and Spanish men).

According to the results of the research, the use of Pinterest in Mexico and the use of Pinterest in Spain are not significantly different when it comes to the knowledge and the use of Pinterest ($X^2(3) = 7.38; p = .061$). In spite of this, there are significant differences based on the gender of the respondents ($X^2(3) = 44.3; p < .001$). In turn, although there was no association with the country variable (Mantel- Haenszel Test = 3.81; $df=1; p = .051$), there was an association with the gender variable (Mantel- Haenszel Test = 35.8; $df=1; p < .001$).

When analysing the knowledge and use of the SlideShare application according to countries, it is determined that the results are quite similar for students from both countries. 18.3% of Mexican students strongly agree compared to 16.5% of Spanish students and 4.6% of Mexican students.

No significant relationships were found between knowledge and use of the SlideShare application and country ($X^2(3) = 7.62; p = .054$), and gender ($X^2(3) = 2.68; p = .44$). Regarding the country of origin, there are no differences between Spanish and Mexican women ($X^2(3) = 3.70; p = .296$), as well as between Mexican and Spanish men ($X^2(3) = 7.74; p = .052$), in the perception of knowledge and use of Slideshare. Regarding gender, there are no gender differences in the perception of knowledge and use of SlideShare neither in Mexican students ($X^2(3) = 1.14; p = .768$), nor in Spanish students ($X^2(3) = 4.89; p = .180$).

Regarding Picassa, the results are similar. Thus, there are no significant differences between gender ($X^2(3) = 2.60; p = .457$), but there are differences by country ($X^2(3) = 42.7; p < .001$). Regarding the strength of the association between Picassa and gender variables, it is not significant (Mantel- Haenszel Test = 2.02; $df=1; p = .155$). In turn, the strength of association between both variables is very low (Cramer's V = .083). Observing the possible differences between genders within each country, it is evident that there are no differences between Mexican students ($X^2(3) = 1.75; p = .625$) nor among Spanish students ($X^2(3) = 2.58; p = .457$).

Independence Study

Analysing the independence of each item of the instrument based on gender, Table 2 shows independence with the variables Pinterest, Instagram, Flickr, and management of online publishing tools. The rest of the items analysed do not show dependency.

Table 2. Independence Based on Gender

Item	Mann-Whitney U	p
Item 1. Knowledge and use of social networks	15701	.668
Delicious, Mister Wong and Diigo	14920	.230
Netvibes, FeedReader, DiggReader, RSS Owl	15218	.376
Item 2. Knowledge of social bookmarking and content syndication to share information and resources	15161	.342
Picassa	14670	.147
Pinterest	10117	< .001
Instagram	12862	< .001
Flickr	13287	.004
SlideShare	14630	.135
Item 3. Management of online publishing tools	13836	.021

Carrying out the analysis of independence with respect to the country variable, it was determined that there is a dependence on the variables' difficulty of access to the Internet; previous training in ICT; Delicious, Mister Wong, and Diigo; Netvibes, FeedReader, DiggReader, RSS Owl; knowledge about social bookmarking and content syndication to share information and resources; Picassa; Pinterest; Instagram; and Flickr (Table 3).

Table 3. Independence Depending on the Country

Items	Mann-Whitney U	p
Internet access difficulty	8505	< .001
Previous training in ICT	11837	< .001
Item 1. Knowledge and use of social networks	15765	.835
Delicious, Mister Wong and Diigo	10693	< .001
Netvibes, FeedReader, DiggReader, RSS Owl	10603	< .001
Item 2. Knowledge of social bookmarking and content syndication to share information and resources	10500	< .001
Picassa	10070	< .001
Pinterest	13807	.025
Instagram	11376	< .001
Flickr	10102	< .001
SlideShare	15083	.370
Item 3. Management of online publishing tools	14655	.180

Correlational Study

Correlations were identified between the country variable and the variables "difficulty in accessing the Internet", "previous training in ICT", and with the tools "Picassa", "Pinterest", "Instagram", and "Flickr" (Table 4). All these variables, except for the "Instagram" variable, indicate a greater tendency of Mexican students to use these tools. Consequently, Mexican students are more likely to have knowledge and use of Picassa and Flickr, whereas Spanish students are associated with Instagram.

In addition, the gender variable is found to correlate with the use of the social media platforms "Pinterest" (Spearman's $\rho = -.321$; $p < .001$), "Instagram" (Spearman's $\rho = -.180$; $p < .001$), "Flickr" (Spearman's $\rho = .150$; $p < .003$), and with "management of online publishing tools" (item 3) (Spearman's $\rho = -.119$; $p < .020$). This indicates that there is a correlation in favour of the female gender in the perception of the use of Pinterest, Instagram and management of online publishing tools, while in the case of Flickr, the correlation is towards the male gender. Other relevant correlations in Table 4 are "access difficulties" and "knowledge and use of social networks".

Table 4. Correlations

		Gender	Country	Internet access difficulty	Previous training in ICT	Item 1.	Delicious, Mister Wong and Diigo	Netvibes, FeedReader, DiggReader, RSS Owl	Item 2.	Picassa	Pinterest	Instagram	Flickr	SlideShare
Country	spearman's rho	-.205***	—											
	p-value	< .001	—											
Internet access difficulty	spearman's rho	.059	-.433***	—										
	p-value	.250	< .001	—										
Previous training in ICT	spearman's rho	.030	-.252***	.038	—									
	p-value	.565	< .001	.458	—									
Item 1.	spearman's rho	-.022	-.011	-.139***	.102	—								
	p-value	.668	.835	.007	.048	—								
Delicious, Mister Wong and Diigo	spearman's rho	.062	-.285***	.105	.126*	-.052	—							
	p-value	.231	< .001	.042	.014	.317	—							
Netvibes, FeedReader, DiggReader, RSS Owl	spearman's rho	.046	-.290***	.098	.116*	-.076	.914***	—						
	p-value	.377	< .001	.057	.024	.139	< .001	—						
Item 2.	spearman's rho	.049	-.297***	.099	.122*	-.069	.969***	.972***	—					
	p-value	.342	< .001	.055	.018	.181*	< .001	< .001	—					
Picassa	spearman's rho	.075	-.316***	.039	.194***	.041	.581***	.595***	.607***	—				
	p-value	.147	< .001	.455	< .001	.423	< .001	< .001	< .001	—				
Pinterest	spearman's rho	-.321***	.115*	-.139**	.139**	.301***	.024	.040	.040	.263***	—			
	p-value	< .001	.025	.007	.007	< .001	.642	.434	.442	< .001	—			
Instagram	spearman's rho	-.180***	.258***	-.240***	.048	.376***	-.114*	-.118*	-.112*	.005	.594***	—		
	p-value	< .001	< .001	< .001	.357	< .001	.027	.021	.029	.929	< .001	—		
Flickr	spearman's rho	.150**	-.317***	.031	.157**	.055	.575***	.590***	.604***	.795***	.236***	.021	—	
	p-value	.003	< .001	.542	.002	.283	< .001	< .001	< .001	< .001	< .001	.687	—	
SlideShare	spearman's rho	-.077	-.046	-.067	.115*	.153**	.264***	.261***	.268***	.475***	.431	.263***	.518***	—
	p-value	.135	.370	.196	.025	.003	< .001	< .001	< .001	< .001	< .001***	< .001	< .001	—
Item 3.	spearman's rho	-.119*	-.069	-.079	.175	.195***	.270***	.264***	.278***	.583***	.627***	.314***	.571***	.847***
	p-value	.020	.180	.125	< .001***	< .001	< .001	< .001	< .001	< .001	< .001	< .001	< .001	< .001

Note. * p < .05, ** p < .01, *** p < .001

Discussion

Country of residence, as well as previous ICT training, are the variables that show the highest levels of dependency on the variables analysed. It is noteworthy that the highest levels of association occur with the country variable. The country of residence, as well as previous ICT training, are the variables that show the highest levels of dependence on the variables analyzed. It is striking that the highest levels of association occur with the country variable.

Both countries show high scores in social media knowledge, as do both genders, as well as both countries. As a consequence of young people's habitual use of social networks, this is totally logical. It is a common means of communication among young people to use this medium. Certainly, these results are consistent with the findings of Abelaïras-Etxebarria and Mentxaka Arana (2020), who state that university students use social networks in their personal context and are likely to be willing to use them when it comes to educational needs. According to Chowdhury (2024), social networking encourages the exchange of information and educational content, benefiting the educational process.

Social networks are determined by the cultural and social context, establishing substantial differences between Mexican university students and Spanish university students. Although there is a large amount of data, knowledge, and other exchanges as a result of globalization that this can entail, the geographical location in which one resides and its cultural context can determine the use of social networks in the educational context (Meza Cano et al., 2022). Similar studies comparing the use of social networks by education students propose that there are differences due to context, such as Tur et al. (2017). These researchers demonstrated that the American student uses Twitter as an application for exchanging information, while the Spanish student uses it to search for information. An issue that could be behind this factor is the promotion of social networks and ICT in general by teachers. Considering the observed data, the Mexican case would exhibit a greater trend. The results obtained from this study suggest that there is a greater perception of knowledge of social networks when asking about generic social networks compared to specific social networks when asking about specific social networks.

As reported by several authors (Çelik et al., 2023; Fuentes Cancell et al., 2021), Instagram is the most used social network among students. Our study reveals that women are the ones who use this social network the most, like other previous studies (Ballesta Pagán et al., 2021; Çelik et al., 2023). Likewise, there seems to be some truth to social media and gender. Such is the case of Valencia-Ortiz et al. (2020) or Espinoza Guillén and Chávez Vera (2021), whose study shows that men use social networks more frequently. For their part, Espinoza Guillén and Chávez Vera have also found a significant relationship between the gender variable and the use of social networks.

Pinterest is a platform that was designed to allow users to collaborate, so it is understandable that it can also be used effectively in educational settings (Huntington, 2022). There are fewer studies that include this tool as a learning tool; however, it is considered a tool with significant potential for the student himself and with great potential as an educational resource (Schoper, 2015).

There is no regular use of web bookmarks. However, it is true that there is a much more marked trend of use among Mexican students than among Spanish students. Ramírez-Gil et al. (2021) link access to social bookmarks with advanced ICT knowledge. Mexican students tend to know readers of syndicated news better than Spanish students. Likewise, the fact that women achieve higher correlations in general, both in the perception of knowledge and in the use of social networks, could be motivated by the fact that women have advanced skills in the creation of digital content (Pozo Sánchez et al., 2020).

Coinciding with Girón Escudero et al. (2019), the need to promote digital skills improvement is clear. The absence of solid initial training in this sense leaves the future graduate unprotected against the current needs in the classroom (Fraga-Varela & Rodríguez-Groba, 2017).

Conclusion

The objective of this study was to ascertain discrepancies in the understanding and perception of the use of social networks among education students, with a particular focus on the relevance of such platforms in the classroom setting. Additionally, the study aimed to identify any gender and country-specific differences.

In this sense, there are no differences between students from both countries in terms of knowledge and use of social networks. A relationship can be seen between the use of social networks in higher education contexts depending on the country where the students belong.

In addition to this, the data indicate that there is a clear cultural influence on the relationship, which points us in the direction of the challenge of establishing, for future studies, the extent to which each of these variables impacts the outcome of the relationship. This fact can be linked to the lack of recognition of the value of social networks in the academic context, given that there are no differences between the groups according to the factor variables, in addition to the fact that the bulk of the sample has indicated that it is strongly disagreed or disagreed.

Thus, there is a perception of the knowledge and use of Pinterest and Instagram, as well as a greater perception of management of online publishing tools, by women compared to men. For their part, men are associated with Flickr.

This is a question that emerges from the results of this first study. However, on which it is necessary to deepen, to establish clear relationships between social networks and learning processes in higher education and in comparative education.

Recommendations

With the use of social networks at a general level in today's society, it is essential to promote the proper use of social networks in the classroom, through specific training for students and teachers alike. In order to achieve SDG 4, public administrations should assume this responsibility as a means of improving the quality of educational processes.

Universities must train students and teachers in technological tools, as well as in the correct use of the Internet. Gender differences in the use of these tools are probably conditioned by a lack of knowledge of their educational potential, so this training will not only have an impact on the quality of higher education and its adaptation to the current technological context but is also a decisive factor in reducing the gender gap in the use of ICTs.

Limitations

A limitation is a difference in the use of social networks and other tools analysed in the context of higher education, taking into account differences between genders and countries. In light of the academic gap that exists in this subject, it appears necessary to continue researching it.

It would be beneficial to include further information in subsequent studies, such as the utilisation of different tools in accordance with the specific type of study and area in question. This would assist in determining whether any differences exist.

Although the effect size of the groups analysed was optimal for comparison, it is necessary to expand the study with more homogeneous samples to obtain results closer to reality and to allow for a greater range of statistical tests. Furthermore, the results were taken at the time of the COVID-19 pandemic, which could have influenced the results to a significant extent.

Ethics Statements

This is a descriptive study of surveys with an adult population, anonymous and without personal or psychological data. Consent is required, as well as a privacy notice and consent for the completion of the questionnaire. Therefore, in compliance with the Declaration of Helsinki and data protection regulations, it does not require an Ethics Committee.

Authorship Contribution Statement

Lema-Moreira: Concept and design, data analysis / interpretation, drafting manuscript, critical revision of manuscript, statistical analysis, securing funding, technical or material support, supervision, final approval. Ramos-Monsiváis: Concept and design, data acquisition, drafting manuscript, critical revision of manuscript, securing funding, admin, technical or material support, supervision, final approval. Del Río-Urenda: Concept and design, data acquisition, critical revision of manuscript, securing funding, admin, technical or material support, supervision, final approval.

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