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Use of Instagram as an Educational Tool with Pre-Service Teachers and the Impact on Digital Competence in Communication and Collaboration

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Abstract: The rise of social media is transforming education by replacing traditional materials and promoting digital competence, a key area of focus in current training. Platforms like Instagram facilitate collaboration, access to learning, and content creation, becoming essential tools for the development of students and future educators in digital environments. This study aimed to enhance the digital competence of pre-service teachers, particularly in communication and collaboration, through Instagram as an educational tool. A quasi-experimental study with pretest and post-test measures was conducted, involving 391 students from the University of Granada. The results indicated an intermediate level of digital competence with improvements in both groups, though no significant differences were found between them. However, significant effects were observed in the intragroup analysis. The experimental group, which used Instagram as an educational tool for 11 weeks, showed improvements in communication and collaboration, digital content creation, and security. The control group also demonstrated progress, mainly in information search and problem-solving. These improvements align with previous studies, though the progress in the control group may be attributed to factors such as content focused on educational technology, student motivation, and engagement. This study confirms that social media can enhance digital competence as a learning tool.

Keywords: Instagram; social media; digital competence; higher education



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1. Introduction

The increasing use of digital platforms, social networks, and technological tools is transforming teaching and learning methods, driving the replacement of traditional materials, such as paper, with more sustainable and digital alternatives. This transition not only contributes to reducing the ecological footprint but also enables educators to promote environmentally friendly practices by integrating digital materials into their classes (Gil-Quintana et al., 2020).

In this context, digital competence has become essential not only in the educational field but also in professional and personal spheres, as it facilitates communication, learning, and the exchange of information through platforms such as Instagram, Facebook, TikTok, and Twitter, which are widely preferred by students for social interaction (Jashari et al., 2022).

Digital competence is understood as a multifaceted ability encompassing the knowledge, skills, and attitudes essential for the effective use of information and communication technologies. This competence involves not only the technical ability to manage digital

tools but also the proactive willingness and attitude to use them competently in various contexts (Kallas & Pedaste, 2022).

Similarly, the impact of social networks on education is undeniable, as they have democratised access to educational content (Sobaih et al., 2022). Social networks are digital platforms that facilitate the creation of networks, communication, collaboration, and the exchange of user-generated content such as images, videos, and debates on public topics (Papademetriou et al., 2022).

Today, students can access school information in diverse formats, such as infographics, videos, animated images, and more, via the internet. Although the use of these tools offers new opportunities, it also presents logistical challenges, such as the preparation of electronic devices and the need for internet access and equipment like computers and projectors. However, platforms such as Facebook, with their intuitive design and ease of access via smartphones, optimise interaction without requiring complex infrastructure (Galván-Orozco et al., 2022).

Since the emergence of social networks, relationships between teachers and students have undergone significant changes. These platforms provide an ideal environment for creating educational content and fostering collaboration, allowing students to share and discuss ideas more dynamically (Rodríguez-Moreno et al., 2021). In particular, Instagram, launched in 2010 as an application for sharing images and videos, has established itself as an innovative educational tool. Its visual nature and ease of use make it a novel resource for education (Romero-Rodríguez et al., 2020). It also facilitates the creation and distribution of educational content, as demonstrated in an activity where students created posts about sustainable development using Instagram profiles and hashtags to increase the visibility of their posts (Robles-Moral & Fernández-Díaz, 2021). Moreover, Instagram facilitates the connection between skills developed in the classroom and literacy practices applied in real contexts, promoting creativity and the development of writing competences while offering a multimodal learning experience (Nasution, 2023).

To make effective use of social networks for learning purposes, digital competence is required. Consequently, there has been a significant increase in research focusing on digital competence in vocational training, prospective teachers, and university students (Barboudis & Stiakakis, 2023; Estanyol et al., 2023; Guillén-Gámez & Mayorga-Fernández, 2020; McGarr & McDonagh, 2020; Palomeque-Córdova, 2020; Pegalajar-Palomino & Rodríguez-Torres, 2023; Sánchez-Caballé et al., 2020; Vásquez-Peñañiel et al., 2023).

As social network usage among the population grows, so does research exploring how these platforms can be leveraged for educational purposes (Pineda-Martínez & Puente-Torre, 2022). Social networks are increasingly being considered virtual learning environments where students can acquire and enhance their digital competence (Gil-Fernández & Calderón, 2021; Martínez-Sala & Alemany-Martínez, 2022). Studies also examine their use to promote digital competence and learning among future teachers, highlighting their growing relevance in educational training (Robles-Moral & Fernández-Díaz, 2021).

As noted, social networks are becoming more prominent in education, as they enable increased communication and collaboration, as well as the creation of content within teaching. They serve as learning tools and foster the use of information and communication technology (ICT) (Ansari & Khan, 2020; Haque et al., 2023). Additionally, collaborative work using social networks to improve digital competence promotes a more student-centred learning approach, enabling synchronous and asynchronous interaction and learning, which enhances motivation and academic performance (Cendrero-Ramos & Valverde-Berrocoso, 2024).

Thus, the link between the use of social networks and digital competence is of interest for investigation, with studies corroborating the increase in digital competence levels after

using social networks as collaborative learning tools, highlighting Instagram as a tool (Fardiah et al., 2023; Liu et al., 2022).

Therefore, these networks are employed linked to Area 2 of the Digital Competence Framework for Citizenship in its version 2.2 (DigComp 2.2), focused on communication and collaboration through digital technologies. It should be noted that this framework includes five areas—searching and managing information and data (formerly known as information and media literacy); communication and collaboration; content creation; safety; and problem-solving (Vuorikari et al., 2022)—as well as Area 6.2, “communication, collaboration, and digital citizenship” in the Marco de Referencia de la Competencia Digital Docente 2022 [Framework of Reference for the Digital Teaching Competence] (MRCDD) (INTEF, 2022).

Aligned with the growing use of social networks in education, the objective of this study was to develop the level of digital competence, primarily in communication and collaboration, of pre-service teachers through the use of Instagram as an educational tool.

In line with the literature, the hypothesis is proposed that the use of Instagram as an educational tool in the initial teacher training will significantly improve the digital competence of the students in the experimental group compared to the control group, particularly in the areas of communication and collaboration.

2. Method

This study employed a quantitative research method, applying a quasi-experimental design with pretest and post-test measurements and a non-equivalent control group (Waddington et al., 2022). The variables considered in this study were (a) the independent variable, which was the participation or non-participation in practical sessions using Instagram as a techno-pedagogical tool; (b) the dependent variable, which was the digital competence of the participants; and (c) the descriptive variables, including sociodemographic aspects (age, sex) and issues regarding the use of social networks and ICT (time spent on social media for educational or non-educational purposes, followed accounts on social networks, prior ICT training, and age of starting social media use).

The sample was selected through a non-probability procedure, specifically using a convenience method (Andrade, 2021). The groups included in this study have a natural composition, as they correspond to the eight groups that make up the second year of the Primary Education degree at the University of Granada. The treatment assignment, i.e., the implementation of the sessions through Instagram, was carried out in three experimental groups, selected based on their accessibility.

Thus, it was ensured that the groups were comparable, as similar groups can be compared (Grimes & Schulz, 2002). To reduce the risk of selection bias due to convenience sampling in a quasi-experimental non-probabilistic study, the groups were compared based on key aspects: age range, sex, course, subject, content, and pretest results.

2.1. Participants

The sample consisted of students from the Primary Education Degree at the University of Granada enrolled in the course “Technological Resources Applied to Primary Education”, which took place in the first semester of the 2023/2024 academic year. They were asked to complete a questionnaire that included questions about sociodemographic characteristics and a self-assessment test to evaluate their digital competence. Before starting, they received information about the purpose of this study and the confidentiality of their data. They were also asked for informed consent to participate. This study was approved by the Ethics Committee of the University of Granada (registration number: 3474/CEIH/2023). Data collection took place between September and December 2023.

Specifically, the final sample consisted of 391 participants, with 286 women (EG = 125; CG = 161) and 105 men (EG = 47; CG = 58), aged between 18 and 25 years ($M = 19.36$; $SD = 1.135$). For the classification of age in this study, two categories were defined according to the World Health Organisation (WHO, 2024): adolescents, including those aged 19 or younger, and young adults, aged 20 to 25 years. Table 1 provides additional details about the sociodemographic characteristics of the participants.

Table 1. Sociodemographic data.

| Variables | Total | | EG | | CG | |
|---|----------|------|----------|------|----------|------|
| | <i>n</i> | % | <i>n</i> | % | <i>n</i> | % |
| Sex | | | | | | |
| Male | 105 | 26.9 | 47 | 27.3 | 58 | 26.5 |
| Female | 286 | 73.1 | 125 | 72.7 | 161 | 73.5 |
| Age | | | | | | |
| ≤19 | 289 | 73.9 | 138 | 80.2 | 151 | 68.9 |
| 20–25 | 102 | 26.1 | 34 | 19.8 | 68 | 31.1 |
| Daily social media use | | | | | | |
| No social media use | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1 h or less | 12 | 3.1 | 6 | 3.5 | 6 | 2.7 |
| Between 1 and less than 4 h | 172 | 44 | 77 | 44.8 | 95 | 43.4 |
| Between 4 and less than 6 h | 140 | 35.8 | 52 | 30.2 | 88 | 40.2 |
| Between 6 and less than 8 h | 56 | 14.3 | 31 | 18.0 | 25 | 11.4 |
| More than 8 h | 11 | 2.8 | 6 | 3.5 | 5 | 2.3 |
| Daily social media use for educational purposes | | | | | | |
| No social media use for educational purposes | 30 | 7.7 | 13 | 7.6 | 17 | 7.8 |
| 1 h or less | 235 | 60.1 | 107 | 62.2 | 128 | 58.4 |
| Between 1 and less than 4 h | 107 | 27.4 | 43 | 25.0 | 64 | 29.2 |
| Between 4 and less than 6 h | 16 | 4.1 | 8 | 4.7 | 8 | 3.7 |
| Between 6 and less than 8 h | 2 | 0.5 | 1 | 0.6 | 1 | 0.5 |
| More than 8 h | 1 | 0.3 | 0.0 | 0.0 | 1 | 0.5 |
| Follows educational content accounts on social media | | | | | | |
| Yes | 159 | 40.7 | 68 | 39.5 | 91 | 41.6 |
| No | 232 | 59.3 | 104 | 60.5 | 128 | 58.4 |
| Has prior ICT training | | | | | | |
| Yes | 129 | 33 | 48 | 27.9 | 81 | 37 |
| No | 262 | 67 | 124 | 72.1 | 138 | 63 |
| Age of starting social media use | | | | | | |
| 6–12 | 176 | 45 | 77 | 44.8 | 99 | 45.2 |
| 13–15 | 196 | 50.1 | 88 | 51.2 | 108 | 49.3 |
| 16–18 | 19 | 4.9 | 7 | 4.1 | 12 | 5.5 |

Note. The age classification for the use of social media follows the educational stage categories in Spain: Primary Education (6–12 years), Secondary Education (13–15 years), and High School (16–18 years) (Ministerio de Educación, Formación Profesional y Deportes [Ministry of Education, Vocational Training, and Sports], 2023).

2.2. Data Collection Instrument

The pretest and post-test evaluation of digital competence was carried out using the self-assessment test of digital competences for citizens in Andalusia, developed by the Digital Agency of the [Junta de Andalucía \(2018\)](#). This instrument is aligned with the principles of the DigComp 2.2 framework, which identifies five key areas of digital

competence: information and data management (formerly known as information and media literacy), communication and collaboration, content creation, security, and problem-solving. These areas are the same ones addressed in the test, which is organised into five main competence blocks.

The test consists of 21 competences distributed across various tasks, ranging from 21 to 63 items. These tasks include different types of questions, such as multiple-choice, image selection, scales, drag-and-drop, matching, sorting, and practical simulations. The item scores are scaled from 1 to 4, corresponding to competence levels, so the results of the test can range from 21 to 84 points, where higher scores indicate a higher level of digital competence. To classify the results, the scores are grouped into four levels: preliminary, initial, intermediate, and advanced.

This instrument has been previously used in other studies, where it showed good psychometric properties and internal consistency (Contreras-Germán et al., 2019; Ibáñez-Cubillas, 2021). In this study, reliability was tested using Cronbach's alpha coefficient for the pretest measures (CG $\alpha = 0.708$; EG $\alpha = 0.754$) and post-test (CG $\alpha = 0.754$; EG $\alpha = 0.786$), which indicates adequate reliability.

2.3. Procedures and Materials

The intervention with Instagram carried out with the experimental group was developed over 11 weeks during the weekly, in-person practical sessions of the course, although some tasks also continued outside the classroom to encourage the educational use of social media. The purpose of the sessions was to carry out the practical tasks specific to the course, using Instagram as an educational tool.

Regarding the duration of the intervention, various studies on the use of social networks with a positive impact on learning indicate that an optimal period ranges between 4 and 12 weeks to ensure the effectiveness of such initiatives (Salas-Rueda & Salas-Rueda, 2019; Zulkifli et al., 2018).

On the other hand, the intervention was structured in different phases, following the approach commonly used in many studies that integrate social networks into educational contexts (Alexiou & Paraskeva, 2020; Almarzouki et al., 2022).

Thus, the activities were designed based on the book by Aznar-Díaz et al. (2021), adapting them in line with research highlighting the suitability of social networks as technopedagogical tools (Almarzouki et al., 2022; Gómez-García et al., 2015). Furthermore, the inclusion of reflections, comments, and debates developed through the social network was prioritised (Demirbilek & Talan, 2018; Pérez-Suasnavas & Cela, 2022).

Similarly, the intervention was structured in two phases:

- Phase 1 (Week 1): workgroups were formed, and training was provided on the educational use of Instagram. Additionally, the Instagram account for the course was presented, where weekly tasks were incorporated. Students also created Instagram accounts, assigning them a name and group number, and optimised their visual presentation (Figure 1).
- Phase 2 (Weeks 2–11): students worked collaboratively using Instagram to complete tasks related to the course content from the book by Aznar-Díaz et al. (2021). This phase encouraged debates, content creation in different formats, feedback, and reflection, with Instagram being the only tool used for activities.

The control group worked on the same content from the book by Aznar-Díaz et al. (2021), carrying out corresponding practical activities through collaborative work, but without using social networks. These activities consisted of solving practical problems related to course content, searching for information, and writing theoretical papers, as well as classroom debates, conducted through the use of traditional text writing tools or

PowerPoint presentations or similar tools. Feedback was provided directly by the teacher during practical sessions.

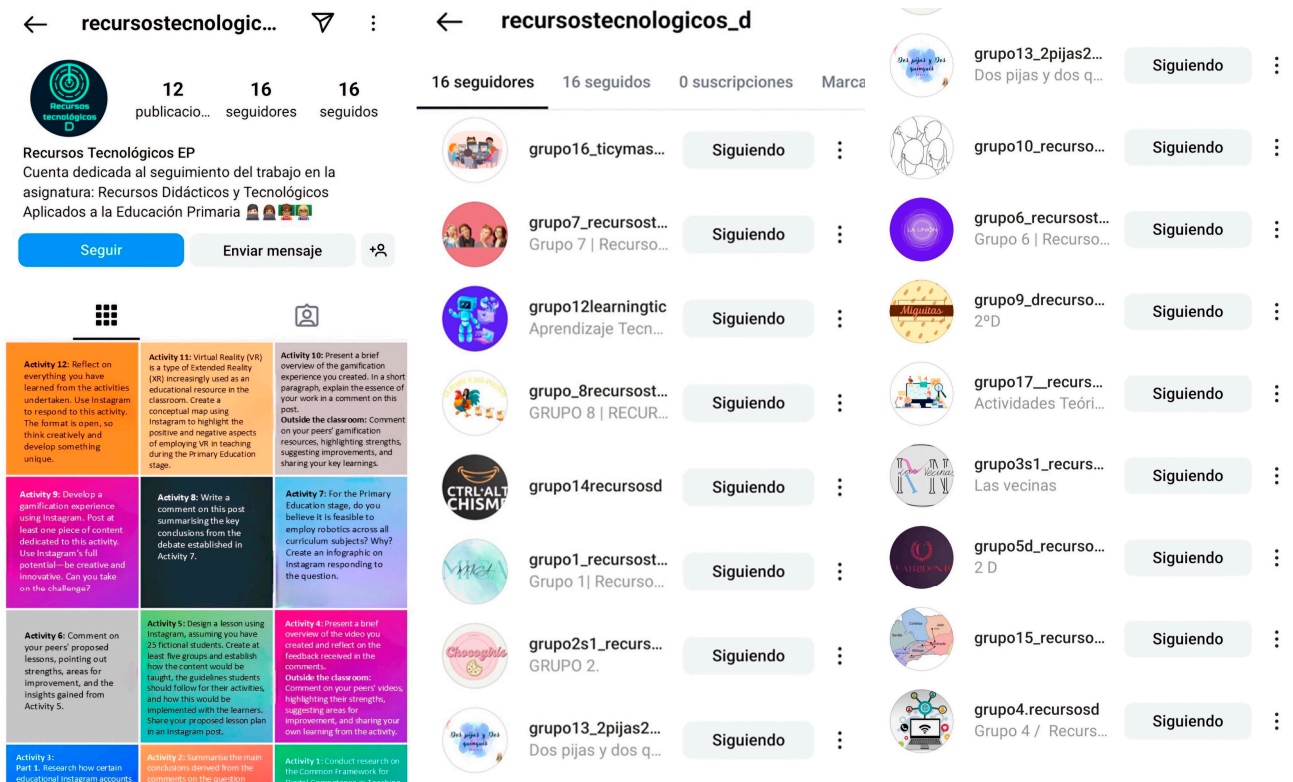


Figure 1. Evidence of the course Instagram account and student accounts.

The sessions and timing for the control group were identical to those of the experimental group, with a weekly structure that included a two-hour practical session. To ensure comparable conditions between the groups, the same content, duration, and format of activities were maintained in both cases, with the only difference being the use of the Instagram social network as an educational tool in the experimental group.

Measures were taken to minimise contamination between the groups. Students were not explicitly informed about the specific objectives of this study related to the use of Instagram to avoid bias. Moreover, it was not indicated whether they belonged to the control or experimental group.

It should be noted that, before starting the sessions, both groups took the pretest, which took place on 21 September 2023. Then, at the end of the practical sessions, the post-test was applied on 14 December 2023.

2.4. Data Analysis

For the data analysis, IBM SPSS version 28 was used. The normality of the distribution of scores was first assessed using the Kolmogorov–Smirnov test, with the Lilliefors significance correction, which allowed us to determine whether the variables followed a normal distribution.

Next, the relevant descriptive statistics, such as means and standard deviations, were calculated to provide an overview of the data. Significant differences between sociodemographic factors were also investigated using the Mann–Whitney U test for dichotomous variables (sex, number of social networks, educational account subscriptions, and prior training) and the Kruskal–Wallis H test for variables with more than two categories (age, social media use, age of starting social media use).

To test the proposed hypothesis, statistical tests were applied for group comparisons, with the Mann–Whitney U test being used for pretest and post-test to determine whether there were differences between the control and experimental groups. For intragroup comparisons, the Wilcoxon signed-rank test was used to compare the scores obtained by the groups at the two evaluation points.

3. Results

The normality analysis using the Kolmogorov–Smirnov test, adjusted with the Lilliefors significance correction, showed that the data did not follow a normal distribution, as the p -value was less than 0.05 for both the pretest measurement (K-S = 0.099; $df = 391$; $p \leq 0.001$) and the post-test (K-S = 0.065; $df = 391$; $p \leq 0.001$).

The results obtained from the comparisons between student groups based on their sociodemographic factors in the pretest phase indicate that, overall, no significant differences were identified in most of the variables assessed (Table 2). However, several prominent patterns were observed in the groups. Men in the experimental group obtained the highest mean score ($M = 46.87$), followed by men in the control group ($M = 44.91$). Regarding age, students in the experimental group aged 19 or younger had a higher mean score ($M = 45.22$), while in the control group, those aged 20–25 recorded the highest score ($M = 45.31$). Additionally, students in the experimental group who used social media between 4 and 6 h a day obtained the highest scores, particularly in educational use ($M = 48.63$). It was also noted that students with prior training in technology in the experimental group had a significantly higher score ($M = 49.25$). The mean scores of the experimental and control groups based on age of starting social media use were higher for those aged 16 to 18, with the experimental group having higher scores ($M = 49.86$).

Table 2. Differences between groups based on their sociodemographic factors.

| Sociodemographic Data/Group | <i>n</i> | <i>M</i> | <i>SD</i> | U/H | <i>p</i> |
|-------------------------------|----------|----------|-----------|------------|----------|
| Sex | | | | | |
| Experimental | | | | | |
| Male | 47 | 46.87 | 10.350 | U = 2498 | 0.130 |
| Female | 125 | 44.58 | 7.363 | | |
| Control | | | | | |
| Male | 58 | 44.91 | 6.926 | U = 4040.5 | 0.131 |
| Female | 161 | 43.86 | 8.140 | | |
| Age | | | | | |
| Experimental | | | | | |
| ≤19 | 138 | 45.22 | 8.035 | U = 2342.5 | 0.989 |
| 20–25 | 34 | 45.15 | 9.510 | | |
| Control | | | | | |
| ≤19 | 151 | 43.61 | 7.826 | U = 4434 | 0.106 |
| 20–25 | 68 | 45.31 | 7.785 | | |
| Daily social media use | | | | | |
| Experimental | | | | | |
| No use | 0 | 0.00 | 0.000 | H = 3.443 | 0.487 |
| 1 h or less | 6 | 45.00 | 2.530 | | |
| Between 1 and less than 4 h | 77 | 44.47 | 8.021 | | |
| Between 4 and less than 6 h | 52 | 46.65 | 9.154 | | |
| Between 6 and less than 8 h | 31 | 45.29 | 8.715 | | |
| More than 8 h | 6 | 41.83 | 5.231 | | |

Table 2. Cont.

| Sociodemographic Data/Group | <i>n</i> | <i>M</i> | <i>SD</i> | <i>U/H</i> | <i>p</i> |
|---|----------|----------|-----------|------------|----------|
| Control | | | | | |
| No use | 0 | 0.00 | 0.000 | | |
| 1 h or less | 6 | 45.17 | 4.956 | | |
| Between 1 and less than 4 h | 95 | 43.83 | 8.870 | H = 1.289 | 0.863 |
| Between 4 and less than 6 h | 88 | 44.58 | 7.342 | | |
| Between 6 and less than 8 h | 25 | 43.36 | 6.714 | | |
| More than 8 h | 5 | 44.80 | 3.347 | | |
| Daily social media use for educational purposes | | | | | |
| Experimental | | | | | |
| No use | 13 | 43.62 | 6.923 | | |
| 1 h or less | 107 | 45.25 | 7.581 | | |
| Between 1 and less than 4 h | 43 | 45.00 | 10.095 | H = 1.863 | 0.761 |
| Between 4 and less than 6 h | 8 | 48.63 | 10.309 | | |
| Between 6 and less than 8 h | 1 | | | | |
| More than 8 h | 0 | 0.00 | 0.000 | | |
| Control | | | | | |
| No use | 17 | 46.24 | 11.654 | | |
| 1 h or less | 128 | 44.45 | 6.964 | | |
| Between 1 and less than 4 h | 64 | 43.27 | 8.463 | H = 3.101 | 0.684 |
| Between 4 and less than 6 h | 8 | 42.88 | 6.917 | | |
| Between 6 and less than 8 h | 1 | | | | |
| More than 8 h | 1 | | | | |
| Follows educational content accounts on social media | | | | | |
| Experimental | | | | | |
| Yes | 68 | 45.81 | 9.987 | U = 3392.5 | 0.653 |
| No | 104 | 44.81 | 7.041 | | |
| Control | | | | | |
| Yes | 91 | 43.95 | 7.466 | U = 5796.5 | 0.952 |
| No | 128 | 44.27 | 8.114 | | |
| Has prior ICT training | | | | | |
| Experimental | | | | | |
| Yes | 48 | 49.25 | 10.708 | U = 2083.5 | 0.002 ** |
| No | 124 | 43.64 | 6.596 | | |
| Control | | | | | |
| Yes | 81 | 45.32 | 7.247 | U = 4743.5 | 0.061 |
| No | 138 | 43.44 | 8.106 | | |
| Age of starting social media use | | | | | |
| Experimental | | | | | |
| 6–12 | 77 | 45.26 | 8.614 | H = 2.496 | 0.287 |
| 13–15 | 88 | 44.78 | 7.959 | | |
| 16–18 | 7 | 49.86 | 9.245 | | |
| Control | | | | | |
| 6–12 | 99 | 43.96 | 7.170 | H = 0.148 | 0.928 |
| 13–15 | 108 | 44.23 | 8.705 | | |
| 16–18 | 12 | 44.75 | 4.575 | | |

Note. Significance level: ** $p < 0.01$.

For the intragroup comparison in the experimental group, the mean score increased from ($M = 45.20$) in the pretest to ($M = 52.23$) in the post-test, while in the control group, it increased from ($M = 44.14$) in the pretest to ($M = 51.71$) in the post-test, with the effect size being slightly greater in the experimental group ($r = -1.226$) compared to the control

group ($r = -1.225$). These results indicate an intermediate level of digital competence. As for the hypothesis, it can be partially accepted, as the mean score has increased, although no significant intergroup differences were found (Table 3).

Table 3. Intragroup and intergroup comparisons.

| Group/Measure | <i>n</i> | <i>M</i> | <i>SD</i> | <i>z</i> | <i>p</i> | <i>r</i> |
|---------------------|----------|----------|-----------|----------|------------|----------|
| Intragroup | | | | | | |
| Experimental | | | | | | |
| Pretest | 172 | 45.20 | 8.317 | | | |
| Post-test | 172 | 52.23 | 9.486 | −16.077 | <0.001 *** | −1.226 |
| Control | | | | | | |
| Pretest | 219 | 44.14 | 7.835 | −18.139 | <0.001 *** | −1.225 |
| Post-test | 219 | 51.71 | 8.855 | | | |
| Intergroup | | | | | | |
| Pretest | | | | | | |
| Experimental | 172 | 45.20 | 8.317 | −0.714 | 0.474 | −0.036 |
| Control | 219 | 44.14 | 7.835 | | | |
| Post-test | | | | | | |
| Experimental | 172 | 52.23 | 9.486 | −0.374 | 0.708 | −0.034 |
| Control | 219 | 51.71 | 8.855 | | | |

Note. Significance level: *** $p < 0.001$.

The mean scores obtained in the post-test were higher than those in the pretest in the experimental group, indicating an improvement in digital competence following the intervention with Instagram. Although the final score of the experimental group was higher than that of the control group, both groups experienced an increase in their scores, but this increase was not significant in either case (Figure 2).

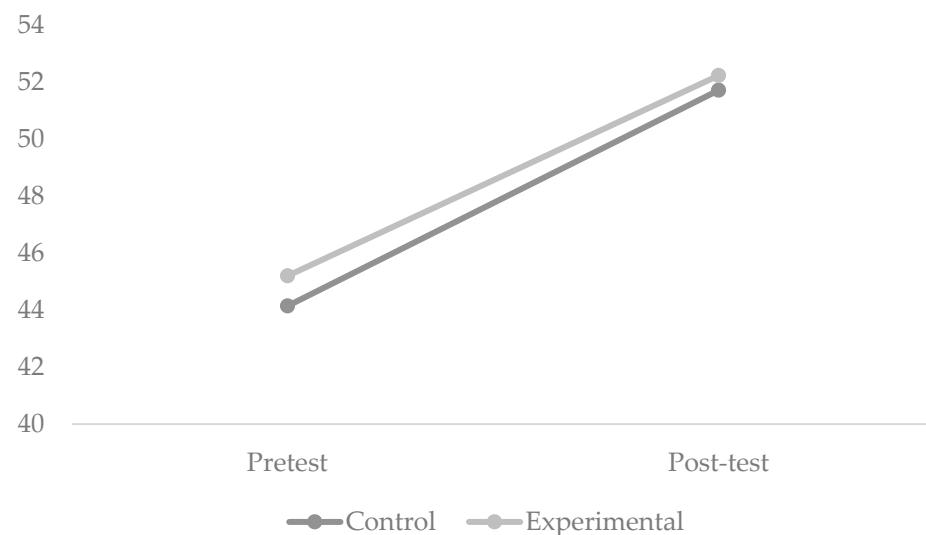


Figure 2. Comparison of the digital competence level between pretest and post-test measurements of the Instagram intervention.

In relation to the mean scores for each competence area, the highest values were observed in the following areas: Area 1 (information and data management) in the control group ($M = 7.36$); Area 2 (communication and collaboration) in the experimental group ($M = 14.40$); Area 3 (content creation) in the experimental group ($M = 10.25$); Area 4 (security) in the experimental group ($M = 10.72$); and Area 5 (problem-solving) in the control

group ($M = 9.94$). Significant differences were observed in Area 1, where the control group achieved a higher score than the experimental group ($p = 0.011$), while no significant differences were found in the other areas between the groups (Table 4).

Table 4. Intergroup comparisons by each dimension.

| Competence Area | <i>n</i> | <i>M</i> | <i>SD</i> | <i>z</i> | <i>p</i> | <i>r</i> |
|-----------------|----------|----------|-----------|----------|----------|----------|
| Area 1 | | | | | | |
| Experimental | 172 | 6.96 | 2.098 | −2.528 | 0.011 * | 0.128 |
| Control | 219 | 7.36 | 1.895 | | | |
| Area 2 | | | | | | |
| Experimental | 172 | 14.40 | 3.534 | −0.484 | 0.629 | 0.024 |
| Control | 219 | 14.16 | 3.476 | | | |
| Area 3 | | | | | | |
| Experimental | 172 | 10.25 | 2.654 | −1.445 | 0.149 | 0.073 |
| Control | 219 | 9.81 | 2.468 | | | |
| Area 4 | | | | | | |
| Experimental | 172 | 10.72 | 2.439 | −1.230 | 0.219 | 0.062 |
| Control | 219 | 10.43 | 2.528 | | | |
| Area 5 | | | | | | |
| Experimental | 172 | 9.90 | 2.339 | −0.213 | 0.831 | 0.011 |
| Control | 219 | 9.94 | 2.281 | | | |

Note. Significance level: * $p < 0.05$. Area 1 = information and data management (formerly known as information and media literacy); Area 2 = communication and collaboration; Area 3 = content creation; Area 4 = security; Area 5 = problem-solving.

4. Discussion

Digital competence results linked to sociodemographic factors present relevant data, focusing on age, sex, social media usage time, and prior ICT training. Regarding sex, male students show a slightly higher score compared to female students, consistent with previous studies (Pegalajar-Palomino & Rodríguez-Torres, 2023), although there are also studies where no difference is found between males and females (Estanyol et al., 2023). In terms of age, no significant differences were found, suggesting that the use of Instagram as an educational tool could be equally effective for university students, particularly those within the age range of 14 to 25 years, who are most active on social media (Robles-Moral & Fernández-Díaz, 2021).

However, the analysis of social media usage hours revealed that students in the experimental group who used Instagram between 4 and 6 h a day obtained the highest scores, in line with the results of the study by Mayor-Buzón et al. (2019), which identifies the intensity of social media use as an influential factor in competence.

In particular, students with prior training in the use of technology showed higher digital competence scores. This result aligns with studies that determine that prior knowledge of technology positively influences the educational use of digital tools, including social media (Barboutidis & Stiakakis, 2023).

In light of the results, an intermediate level of digital competence is identified both in the pretest and post-test after the intervention, although with higher scores. This level of competence is in line with research analysing the digital competence of university students (Guillén-Gámez & Mayorga-Fernández, 2020; Palomeque-Córdova, 2020; Sánchez-Caballé et al., 2020; Vásquez-Peñañiel et al., 2023). Meanwhile, some results indicate low digital competence among students who use social networks (McGarr & McDonagh, 2020).

The results obtained following the intervention with Instagram revealed that both the experimental group, which used Instagram, and the control group, which did not, experienced an improvement in their digital competence after the intervention. However, the scores of the experimental group were higher, and the effect size in the intragroup comparison was slightly higher and significant. Nevertheless, despite the increase in average scores in both groups, no significant differences were found in the intergroup comparison, suggesting that while the intervention might have had a positive impact, it was not robust enough to be statistically significant. For this reason, the hypothesis can be partially accepted.

In line with the improvement in digital competence, studies highlight that the experimental group, which used social media as a learning tool, improved their digital competence compared to the control group. Furthermore, the results verified the effectiveness of the designed teaching practices, especially in the experimental group, where collaboration and the use of Edmodo facilitated the cooperative and effective acquisition of digital competences (Martínez-Sala & Alemany-Martínez, 2022). Similarly, Rodríguez-Moreno et al. (2021) identified the improvement of digital competence in pre-service teachers using social media in learning, with collaborative work in networks being key (Cendrero-Ramos & Valverde-Berrocso, 2024; Galván-Orozco et al., 2022).

Moreover, Robles-Moral and Fernández-Díaz (2021) indicated that better learning outcomes were achieved after using Instagram, identifying it as essential for acquiring digital competence, and highlighting it as a learning tool that improved the participation of students who took a more active role (Pineda-Martínez & Puente-Torre, 2022). In this regard, Sobaih et al. (2022) demonstrated a positive and significant effect of social networks as online learning tools on students' academic performance.

It should be noted, however, that the general improvement in digital competence observed not only in the experimental group may be due to factors such as the following: knowing that students would be assessed (McCarney et al., 2007); the content of the course, which is linked to improving technological skills for teaching with technology (Martínez-Sala & Alemany-Martínez, 2022); the control group may have experienced a learning effect due to the repetition of the tests and familiarity with the test and experience (Fehringer, 2023); and the motivation of the students, their engagement with the work on social media, their attitudes towards technology, and the intensity of social media use are elements with the greatest capacity to predict digital competence in the use of social media (Gil-Fernández & Calderón, 2021; Mayor-Buzón et al., 2019).

At the same time, the lack of a significant effect may be due to factors such as the exposure time to working with social media, which might need to be longer to improve students' levels. Research by Means et al. (2013) indicates that in educational technology studies, the most significant effects are typically observed in prolonged interventions. Similarly, Tondeur et al. (2017) mention that the development of digital competences requires extended interventions, as participants need time to become familiar with digital tools.

Regarding the results by specific areas of digital competence, it was observed that the experimental group obtained better scores, although not significantly, in areas related to communication and collaboration, content creation, and security, while the control group excelled in information and data management and problem-solving. This could indicate that Instagram has a more direct impact on the areas that showed greater improvement, being the main skills needed to work with social media (Jashari et al., 2022; Robles-Moral & Fernández-Díaz, 2021; Rodríguez-Moreno et al., 2021).

5. Conclusions

This study highlights an intermediate level of digital competence among the students, with significant improvements observed following the intervention, particularly in the experimental group. Although both groups increased their scores, no significant intergroup differences were found. In terms of specific areas, communication and collaboration, content creation, and security were more strengthened in the experimental group, while the control group excelled in the areas of information and data management, as well as problem-solving. Additionally, sociodemographic factors such as intensive social media use (4–6 h daily) and prior ICT training showed a positive relationship with higher digital competence scores.

It is worth noting that the research was conducted with a specific sample of young university students, which limits the generalisation of the results to other educational contexts or populations. Furthermore, the improvements observed in both groups could be influenced by uncontrolled external factors, such as the learning effect resulting from the repetition of tests or the intrinsic motivation of participants towards the ICT topic. Moreover, the non-significant effect could be due to the need for more time using social media to identify improvements in digital competence.

Future lines of research could explore how the use of Instagram as a collaborative tool contributes to the conceptual, technical, and procedural elements necessary to foster digital competence. This would allow for the evaluation of whether it improves the connection between university education and teaching practice. In the long term, it would be useful to investigate whether this intervention impacts teaching performance and the integration of technologies in the classroom. Moreover, it should be studied how sociodemographic factors, such as sex or prior ICT experience, influence the benefits of the tool in different educational contexts.

Finally, this study confirms that social networks as a learning tool can improve digital competence. However, it is crucial to continue researching to optimise educational strategies and consider the influence of sociodemographic factors in the design of training programmes in order to maximise the effectiveness of teaching with social networks.

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