



# Relationship between social media use and critical thinking in university students

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Received: 21 May 2024 / Accepted: 6 August 2024 / Published online: 11 October 2024  
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## Abstract

Although part of their use is intended for leisure, social networks could be a useful tool for developing students' critical thinking. Nevertheless, this relationship could also be influenced by our competence in learning to learn, that is to say, our knowledge, skills, and attitudes associated with self-regulation, metacognition, use of learning strategies, and problem-solving. To test this hypothesis, 301 university students participated ( $M=19.83$ ;  $SD=3.17$ ). The results showed which functions of social media related to information, content creation, and problem-solving were associated with a higher level of Learning to Learn competence and of Critical Thinking. However, the different functions of social media use were poor predictors of Critical Thinking, with the best predictor of critical thinking being the competence of learning to learn. Finally, in students with a low competence in learning to learn, a greater interaction with their immediate environment (e.g. friends, family...) or with their teachers or peers through social media was associated with a higher development of critical thinking. Moreover, in students with a high competence in learning to learn, a greater use of social media to solve academic problems was associated with a higher development of critical thinking. These results shed some light on the potential benefits that the use of social media could bring in both formal and informal settings, as well as the need to work among university students on some of the main aspects of the learning to learn competence, like metacognition, self-regulation or problem-solving, to develop critical thinking.

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This is an article presenting the results of original research in Higher Education, where the use of social networks by students and its purpose, as well as their critical thinking ability and competence in learning to learn, were measured. The aim has been to identify possible relationships and causes among the mentioned variables. Furthermore, the methodology and results analysis have been conducted with the rigor that a publication of this caliber demands. We believe that the topic and research, related to the use of technology in the educational context, and its relationship with such relevant variables in higher education as critical thinking and learning to learn, make this article a potentially valuable contribution to this journal.

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**Keywords** Social media · Social networks · Critical thinking · Learning to learn · Competence · Higher education

## 1 Introduction

### 1.1 Digital competence and the use of social media

Nowadays, digital competence has become an indispensable skill in various aspects of life, particularly in academic and professional spheres. Digital competence can be understood as a collection of skills necessary for using technology proficiently in various aspects of life: professional, educational and leisure (Zhao et al., 2021). This proficiency entails employing technology with confidence, critical thinking, and accountability within the framework of an information-driven society. Cognitive, attitudinal, and technical proficiencies constitute the core components of digital competence, enabling individuals to address and navigate through the complexities and obstacles prevalent in contemporary knowledge-based societies (Gallego-Arrufat et al., 2019; Guillén-Gámez & Mayorga-Fernández, 2020; He & Li, 2019). This concept has been formalized and structured through the DigComp model, developed by the European Commission, which provides a framework for assessing and understanding digital skills in five fundamental areas: information and data, communication and collaboration, digital content creation, security, and problem-solving (Carretero et al., 2017).

Examining how the DigComp model relates to the use of social networks by university students, there is a significant convergence between the areas defined by DigComp and the functions of social networks. On this matter, university students use a variety of social media platforms, such as Facebook, Twitter, Instagram, WhatsApp, YouTube, or Snapchat, among others (Arif, 2019; Hamade, 2013; Kircaburun et al., 2020; Kolhar et al., 2021; Marín-Díaz et al., 2019; Meşe & Sancak, 2019; Yousif, 2013) spending approximately 2 to 4 h per day engaged in these resources (Gómez et al., 2012; Kircaburun et al., 2020; Yousif, 2013). The excessive time spent can partially be explained by the fact that social media platforms are not just useful for communication and entertainment anymore; they also serve as tools for developing digital skills at different levels (Perifanou et al., 2021; Correa, 2015).

- First and foremost, information and data management are crucial in a digitally saturated environment like social media. University students utilize social networks to access gossip, entertaining information or follow opinions of the people they are interested in (Gómez et al., 2012; González et al., 2017; Kircaburun et al., 2020; Meşe & Sancak, 2019), read commentaries and news about different topics (Gómez et al., 2012; González et al., 2017; Hamade, 2013), read and share information related to students' classes (González et al., 2017), find out educational information, and/or apply information to their studies and academic projects (Kircaburun et al., 2020; Meşe & Sancak, 2019).
- Secondly, communication and collaboration are central aspects of both social media and digital competence. Social platforms provide university students with

the opportunity to interact and communicate with friends by sharing or commenting on photos, videos or other's comments (Gómez et al., 2012; González et al., 2017; Kircaburun et al., 2020; Kolhar et al., 2021; Meşe & Sancak, 2019; Yousif, 2013), to collaborate by creating groups to do tasks, projects or homework (Gómez et al., 2012; Hamat et al., 2012; Meşe & Sancak, 2019), to share information, files, music, photos or documents related to their classes (González et al., 2017), to make friends or meet new people (Gómez et al., 2012; Kircaburun et al., 2020), to tell the world about what they are doing and share my feelings (Gómez et al., 2012; Kircaburun et al., 2020), to look for a partner/date (Gómez et al., 2012), and to make new professional contacts (Gómez et al., 2012).

- Digital content creation is another area that intertwines with university students' use of social media. They not only consume content on these platforms, but also have the opportunity to produce and share their own posts, photos, videos, and other media (Manca & Ranieri, 2016). This activity fosters the development of skills in digital content production, from image editing to storytelling through videos, thereby contributing to strengthening students' digital competence (Carretero et al., 2017). In this regard, it has been observed in previous studies that the perceived importance of sharing content with peers is one of the most relevant predictors for engaging in various activities on social media, such as consuming, sharing, and creating content (Lu et al., 2016).
- Finally, digital security and problem-solving are skills that students can also develop through interacting in social networks. For instance, Giumetti and Kowalski (2022) observed how indiscreet posting, time spent on social media, and personality traits were predictors of receiving cyberbullying on social networks. Therefore, failing to apply certain security measures and problem-solving approaches can lead to more devastating consequences, such as psychological outcomes like stress, anxiety, or suicidal ideation (Giumetti & Kowalski, 2022), as well as health-related consequences like alcohol and drug consumption (Ilakkuvan et al., 2019).

## 1.2 Social networks and critical thinking

The predominant uses of social media in higher education, as indicated in the literature, are associated with leisure and social exchange, information seeking, research on specific topics, or the discussion of ideas. Indeed, students perceive the integration of social media into their learning positively as it provides them with access to information, content, opinions, or more specific issues, such as fact-checking certain news; likewise, they perceive that with social media, they can express their reflections in different ways, which can promote the development of themes in the academic sphere (Garcés-Fuenmayor et al., 2023).

Following Reid and Mang (2023), some of the benefits or potentials of using social media in higher education are related to:

- Participation and communication: Social media platforms provide an opportunity for students to engage in learning and to promote formal and informal commu-

nication. Furthermore, participation can improve at different levels, both among peers and with teachers.

- Classroom motivation: Social media platforms have the potential to enhance motivation in the classroom. Likewise, their use must be planned to ensure positive outcomes (e.g., selection of social network, prior experience...).
- Digital literacy and critical thinking: The use of social media in higher education can help develop critical thinking skills among students. Through activities involving analyzing and evaluating problems, forming opinions, engaging with digital content, students can improve these skills.

Critical thinking is a set of processes, strategies and representations used to solve problems, make decisions and learn new concepts. It is an important characteristic of a competent professional, and teachers coincide it is basic to be developed in the students (Bezanilla et al., 2018). These authors conceive the development of critical thinking as a process with several dimensions (analysis, argumentation, questioning, evaluation, decision making and taking a position). Briefly, Facione (2007) defines it as the process of intentional, self-regulated judgement. In a world where change and complexity are part of people's daily lives, critical thinking becomes necessary to face new challenges (Franco & Almeida, 2015; Flores, 2016) and to defend and argue one's ideas as well as to understand and evaluate others' views (Tenías, 2013).

The use of social media can be related to the development of critical thinking in higher education in different ways. Firstly, the use of social media can be an ally for learning and helping to develop critical thinking (Garcés-Fuenmayor et al., 2023; González-Cacho & Abbas, 2022; Dastjerdi & Ahmed, 2019). Likewise, some activities through which critical thinking can be promoted through the use of social media are related to promoting tasks of analysis, evaluation, and creation of content on social media platforms (e.g., tasks related to categorization or validation of information platforms); organization of content and mind maps, creating different content strategies by analyzing the needs of different audiences; criticizing practices or trends that appear on social media; exploring and comparing the utilities and limitations of different social media platforms; or promoting broad learning outcomes by providing students with greater creativity possibilities, with greater flexibility and adaptability (Reid & Mang, 2023).

Furthermore, regarding the relationship between the use of social media and critical thinking ability, many authors have found a negative correlation between social media dependency and the development of critical thinking skills, and their results suggest that an excessive attachment to social media can hinder the development of critical thinking skills in university students (Cheng et al., 2022; Thomas, 2020).

However, other research findings suggest that if social media is used to foster interactivity and collaborative learning, its application can be positive for the development of critical thinking (González-Cacho & Abbas, 2022). In fact, social media can play a crucial role in education by enabling the comparison of ideas and opinions, fostering questioning and reflection on teaching and learning methods, promoting the debate of viewpoints, helping to form personal opinions, and actively participating in problem-solving (Garcés-Fuenmayor et al., 2023). A recent study by Orhan (2023)

revealed that critical thinking dispositions and new media literacies significantly predicted university students' abilities to detect fake news on social media.

### 1.3 The influence of learning to learn competence on critical thinking

Learning to learn is the ability of a person to take charge of his or her own learning throughout life; it involves not only cognitive and emotional processes that develop from childhood and act as a basis for sustaining lifelong learning, but also implies the conscious management of social skills and aptitudes that make him or her competent to perform successfully in different contexts with criteria of autonomy and effectiveness (Salmerón Pérez & Gutiérrez-Braojos, 2012). According to Sala et al. (2020), this competence involves several components within the personal and social domains. At personal level, it involves a cognitive dimension (e.g. problem-solving skills), a metacognitive dimension (e.g. self-awareness and self-assessment of one's knowledge and thinking), and an affective and motivational dimension (e.g. the motivation to learn, the regulation of the emotions as well as learning dispositions such as critical curiosity, creativity, and resilience among others). Related to the social domain, learning to learn involves the context in which learning occurs, the perception of support from others, the capacity to learn with peers and in groups, and the resources and social values within the community.

Self-regulation of learning is considered a key process in developing the competence of learning to learn, in that it involves an advance in personal self-direction that enables students to transform their mental skills into academic competences (Zimmerman, 2008). It refers to the ways in which students can take control of their own learning processes, and thus, develop autonomy and responsibility for them (Fernández & García, 2019). Deep and self-regulated learning is enhanced by the development of other instrumental competences such as reflective, critical, analytical, and systemic thinking, as they allow to recognise one's own way of thinking and help to question the assumptions underlying the habitual ways of thinking and acting (Villa & Poblete, 2008). For Sala et al. (2020) critical thinking is an important element of learning to learn competence. It is a higher-order thinking skill that is crucial to cope with uncertainty, complexity, and change and it is interrelated with the managing of the learning process. "Critical thinking entails a self-directed, skilful analysis of information, beliefs or knowledge, with an ongoing reconstruction of one's thinking knowledge about methods to assess and produce new knowledge and strategies to solve problems" (Sala et al., 2020, p. 64).

New developments in the concept of learning to learn include not only the perspective of a self-regulatory competence as a broad concept that encompasses metacognition, but also integrates cognitive and sociocultural perspectives of learning (Martín & Muñoz, 2023). Learning to learn is understood by some authors as a deeper level of learning rather than a set of skills (Rawson, 2000).

Henry and Dillon (1992) point out that in order to teach the learning to learn competence, rather than introducing new content in the curriculum, active, learner-centered methods must be used. Specifically, they advocate the use of inquiry-based methods reinforced by the development of information literacy and critical thinking processes. According to these authors, effective strategies for teaching critical

thinking include to make students aware of their ability to think, to help them extend their power of thinking and, above all, to maintain their interest to acquire more effective ways of learning and thinking. In this regard, keeping students' interest in independent learning may influence positively on their critical thinking. Moreover, inquiry-based learning has been proved to be an effective methodology for the development of learning to learn competence (Letina, 2020). Since inquiry-based learning is a student-centered approach focusing on questioning, critical thinking and problem solving (Letina, 2020), it is expected that critical thinking might be enhanced by the development of learning to learn competence via inquiry-based learning and vice-versa. Recent studies have shown that teaching critical thinking to university students using problem based learning methodologies has had a positive effect on metacognitive strategies and critical thinking, by using reflective questions, decision diagrams, dialogues and reflective debates (Rivas et al., 2022).

#### 1.4 Purpose of the study

Based on the previous sections, some limitations were found. Social networks seem to have found a place in higher education to enhance communication and collaboration, reading and sharing information for learning and the development of educational projects and develop digital competence and critical thinking. However, little research has been found on the different uses of social networks (information, collaboration, content creation, safety, problem solving) and the development of critical thinking. It is expected that some of these functions may have a more positive effect than others on the development of critical thinking, and this is an important issue, since accordingly specific educational plans might be developed to reinforce the development of specific uses of social media in the university context to develop deep and critical learning. In the same line, learning to learn is an important competence and one of the key ones identified by the European Commission for successfully addressing the challenges of the 21st century. Learning to learn is included as a transversal competence in many university educational plans and programs and it is significant to know if it can act as a moderator between the use of social networks and critical thinking, that is, if the development of learning to learn competence can help the development of critical thinking while using social networks for academic purposes.

That is why the current study will attempt to reply to two objectives:

- $O_1$ : To analyze the relationship between the social networks' use and critical thinking.
- $O_2$ : To analyze whether the possible relationship between the social networks' use and critical thinking is moderated by the learning to learn competence.

## 2 Method

### 2.1 Sample

The sample consisted of a total of 301 college students ( $M=19.83$ ;  $SD=3.17$ ). Out of the total, 203 were females and 98 were males. Regarding their academic year, 107 were in their 1st year, 141 in their 2nd year, 28 in their 3rd year, and 25 in their 4th year. In terms of degree programs, 91 were enrolled in Early Childhood Education, 167 in Primary Education, 31 in Primary Education and Physical Activity Sciences, 7 in Social Education, and 5 in other similar degree programs. Concerning the type of university, 210 were studying at the University of the Basque Country, a public university, while 91 were attending the University of Deusto, a private university.

### 2.2 Instruments

For the present study, a total of 4 different instruments were employed:

#### 2.2.1 Personal information

To measure the personal variables of the students, they were asked to identify their age, gender, academic year, university degree, and type of university they were enrolled in.

#### 2.2.2 Functions and use of social media

To assess various functions of social networks, an ad-hoc instrument was designed consisting of 19 Likert-type items with 5 points, based on the European DigComp model (Vuorikari et al., 2022). The DigComp model is the main European model for measuring the digital competence of citizens. It is composed of 5 dimensions, each associated with different functions that can be performed through ICT:

- **Information and Digital Literacy:** This dimension focuses on the ability to search, locate, capture, and organize digital information, as well as the skill to evaluate its relevance, credibility, and quality. It also includes knowledge of how to handle data effectively and understand concepts related to privacy and data protection (e.g., How much time do you spend on social networks searching for information for non-learning purposes (gossip, pastime, stress relief, etc.)?);
- **Communication and Collaboration:** Refers to the ability to communicate, share, and collaborate in digital environments effectively. This involves using a variety of digital tools and platforms to interact with others clearly, constructively, and respectfully, as well as working in teams remotely and leveraging technologies for collaboration on projects (e.g., How much time do you spend on social networks interacting or socializing with your close circle (friends, family, partner...)?);
- **Digital Content Creation:** This dimension evaluates the ability to create and edit various types of digital content, such as texts, images, videos, music, etc. This

includes knowledge of using editing tools and software, as well as an understanding of the principles of design and visual communication (How much time do you spend on social networks adapting and reworking existing content (texts, photos, videos...)?);

- **Safety:** Refers to the ability to understand the risks associated with the use of digital technologies and to adopt safe practices online. This involves knowing common threats, such as malware and phishing, as well as taking measures to protect personal information (e.g., To what extent on social networks do you protect information about people in your close circle? ) and stay safe online (e.g., not sharing certain sensitive information, not forwarding suspicious information, asking for permission before posting, etc.);
- **Problem Solving:** This dimension focuses on the ability to identify, analyze, and solve problems using digital tools and resources. This involves critical and creative thinking skills, as well as the ability to adapt and learn new technological skills as needed to address specific challenges (e.g., To what extent do you use social networks to solve an academic problem (e.g., questions that arise, completing an assignment, collaborative learning, etc.)?).

### 2.2.3 Learning to learn competence

Learning to Learn competence is understood as the set of cognitive, metacognitive, emotional, and relational skills that allow individuals to understand and manage their own learning (Martín-Alonso & Muñoz, 2023). To measure this construct, the *Scale to Assess Learning to Learn Competence* (Martín-Alonso & Muñoz, 2023) was utilized. This scale consists of a total of 18 items measured on a 5-point Likert scale, aiming to assess the three main elements of Learning to Learn Competence: Self-awareness as a learner (e.g., I am aware of my strengths and weaknesses when studying or learning (I know what I'm good or bad at), Process self-assessment (e.g., When I'm studying and there's something around me that can hinder or prevent studying, I am able to change this situation (e.g., if there's noise, I move to another place, ask a classmate for help if needed, ...), and Learning management (e.g., Before starting to study, I plan the necessary time to achieve the goals I have set). According to the authors, the scale obtained optimal validity indices ( $X^2/df=2.08$ ; CFI=0.94; RMSEA=0.04; AIC=12.88) and reliability ( $\alpha=0.723$  to  $\alpha=0.770$ ) for research purposes. The reliability of the total scale was  $\alpha=0.888$ .

### 2.2.4 Critical thinking

Critical thinking can be understood as a combination of skills and attitudes that facilitate the examination to achieve reliable information and guide decision-making processes (Gulbakhor, 2017). To measure the level of Critical Thinking, the *Scale for Measuring Critical Thinking in University Students* (Galindo-Domínguez et al., 2023) was used. This scale, consisting of 42 Likert-type items with 5 points, is

divided into a total of 6 dimensions, each corresponding to a skill of Critical Thinking. The skills are as follows:

- **Analyzing/Organizing:** Understanding Critical Thinking as a method of examining something (a text, a reality) in detail, considering its components to understand its characteristics and draw conclusions. In some cases, it involves aspects related to structuring and organizing information, but does not go beyond this (e.g., I analyze the information by contrasting different sources).
- **Reasoning/Argumenting:** This category involves the comparison of ideas and experiences based on arguments, in order to draw conclusions and form a reasoned judgment. It entails expressing reasons for or against something verbally or in writing, or justifying it as a rational action to convey content and promote understanding (e.g., Faced with a certain argument, I can detect and differentiate between what is objective (data, verified facts) and subjective (opinions)).
- **Questioning/Asking oneself:** Critical thinking is viewed as questioning an issue that is controversial or commonly accepted by posing a series of questions. It means questioning issues and asking oneself questions about the reality in which one lives (e.g., When I see news on the web, I wonder if they are true or false).
- **Evaluating:** It refers to assessing, weighing, and determining the value of something, estimating the importance of a fact considering various elements or criteria. It goes beyond mere argumentation (e.g., deducing pros and cons of a reality) because it involves determining the value of something based on certain criteria (e.g., I evaluate the quality of the information that I use for my work, based on solid academic criteria (author, year, medium in which it has been published, etc.)).
- **Taking a position/Making decisions:** This dimension encompasses not only analyzing, reasoning, questioning, or evaluating but also making a decision. It involves providing a solution or a definitive judgment on an issue, adopting a position, or proposing a solution (e.g., I make my decisions after interpreting and analyzing all the data I have).
- **Acting/Committing oneself:** Critical thinking is seen as a means of transforming reality through social commitment. It involves taking action, behaving, performing voluntary and conscious acts in a determined and committed manner. It implies adopting a certain attitude or position regarding a particular issue (e.g., I get involved to respond to a situation of injustice or inequality).

The scale exhibited optimal reliability indices across all its dimensions, ranging from  $\alpha=0.701$  to  $\alpha=0.838$ . Similarly, the validity ( $X^2/df=0.1.86$ ;  $CFI=0.849$ ;  $RMSEA=0.05$ ;  $AIC=1778.56$ ) of the scale was optimal.

### 2.3 Procedure

The procedure began by conceptualizing the research design and selecting the scales to measure different constructs. These scales, previously discussed in the [instruments](#) section, were then transferred to online platforms using Google Forms. Subsequently, the authors reached out to the Deans and Coordination

Teams of each participating faculty to seek approval for the research. Upon receiving their approval, the scales were distributed to students both during and outside class hours, including those who did not attend classes. The sample was selected using non-probabilistic methods based on the proximity of the researchers. Nevertheless, previous studies have shown that the use of such methods does not adversely affect the results compared to more randomized methods (Coppock et al., 2018). At the end of November 2023 participating teachers were informed about the study and the procedure for the application process. The data collection was carried out during the winter 2023–2024. Regarding participation, students were required to accept the terms of participation, which included understanding the study's objectives briefly, being informed about data handling procedures (data anonymity, data privacy, data deletion once the project concluded), and having the option to participate or withdraw from the study at any time. Upon completion of the study, students who expressed interest in learning more about the research were provided with a scientific report containing the most relevant results.

## 2.4 Data analysis

The data analysis process was conducted entirely using SPSS Statistics 27. Initially, total scores for the constructs of critical thinking and learning to learn were calculated. The score for each of these constructs was derived by averaging all the items that comprised that particular construct. Next, descriptive statistics of the main variables were examined. Specifically, means and standard deviations of the different functions of social media usage were studied, along with their correlations with the competence in learning to learn and critical thinking. This analysis was supplemented by examining the reliability indices of the two scales used: the scale of competence in learning to learn and the scale of critical thinking. This analysis was essential as subsequent analyses were performed using total scale scores rather than individual items or dimensions. Although the ad-hoc questionnaire on social media usage functions is grouped into the main dimensions of DigComp, it cannot be asserted that each grouping forms a statistical dimension because while all items in each grouping are connected, each measures a completely different idea about the type of social media usage, contributing in various ways to the factor (e.g., searching for gossip information could be contrary to searching for information for academic purposes). Subsequently, to understand to what extent different functions of social media usage and competence in learning to learn significantly predict critical thinking, a multilevel linear regression analysis was conducted. This method is particularly relevant for addressing the objectives of the current study as it allows for the introduction of different models composed of various variables. By progressively introducing these variables into the equation, it enables understanding their impact on a dependent variable, such as critical thinking. In total, six models were presented, each gradually integrated into the prediction of critical thinking. The initial five models each referenced different functions of social media use (information-related use, communication-related use, content creation-related use, security-related use, and problem-solv-

ing-related use), while the sixth model pertained to the competence of learning to learn.

Finally, to determine if the association between social media usage functions and the development of critical thinking was conditioned by competence in learning to learn, a moderation analysis was performed using the PROCESS Macro in SPSS Statistics 27. For this analysis, a total of 10,000 bootstrap samples were used, and conditional effects were selected using the pick-a-point technique by percentiles (Percentile 16, Percentile 50, and Percentile 84). As discussed in the study's rationale, it can be expected that social media serve to a greater extent for the development of critical thinking, especially for those individuals with high competence in learning to learn. That is why this method is particularly relevant for addressing the objectives of the current study since it allows us to determine whether the impact of different functions of social media use on the development of critical thinking is conditioned by participants' competence in learning to learn.

### 3 Results

Initially, descriptive statistics of the various functions of social media usage were analyzed. As seen in Table 1, a significant portion of these functions positively correlate with competencies in learning to learn and critical thinking. Regarding the competence in learning to learn, only "Searching for academic information for learning purposes" ( $r = .096$ ;  $p = .097$ ) and "Evaluating the sources you find on social media" ( $r = .200$ ;  $p < .001$ ) correlate with the competence in learning to learn. Concerning the communication dimension, none of the studied functions are associated with the competence in learning to learn. In terms of content creation dimension, only "Taking into account licenses, copyright, and ethical criteria when publishing content you want to adapt or rework" ( $r = .145$ ;  $p = .012$ ) correlates with the competence in learning to learn. Regarding the security dimension, "Using strategies to protect your device" ( $r = .291$ ;  $p < .001$ ), "Protecting information related to people in your close circle" ( $r = .236$ ;  $p < .001$ ), "Reviewing protection systems" ( $r = .302$ ;  $p < .001$ ), and "Using strategies to minimize potential social risks" ( $r = .214$ ;  $p < .001$ ) correlate with the competence in learning to learn. Finally, concerning the problem-solving dimension, "Being attentive to updating your software with the latest versions" ( $r = .111$ ;  $p = .054$ ), "Learning functions that are unfamiliar to you" ( $r = .121$ ;  $p = .035$ ), and "Using social networks to solve an academic problem" ( $r = .162$ ;  $p = .005$ ) also correlate with the competence in learning to learn.

Regarding critical thinking and concerning the information dimension, it can be observed that "Seeking information related to personal interests for non-academic learning purposes" ( $r = .119$ ;  $p = .040$ ), "Searching for academic information for learning purposes" ( $r = .131$ ;  $p = .023$ ), "Evaluating the sources you find on social media" ( $r = .230$ ;  $p < .001$ ) correlate with critical thinking. Regarding the communication dimension, "Engaging in civic or social activities" correlates with critical thinking ( $r = .105$ ;  $p = .069$ ). In content creation, "Creating original

**Table 1** Descriptive statistics of functions of social media use and correlations with learning to learn and critical thinking

Item	Description	M	SD	Correlation	
				LtL	CT
INF01	Looking for information for non-learning purposes (gossip, pastime, stress relief...).	2.89	0.994	-0.015	-0.011
INF02	Seeking information related to personal interests for non-academic learning purposes (reading current news, learning about hobbies, health...).	2.43	0.816	-0.038	0.119*
INF03	Searching for academic information for learning purposes (preparing for an exam or assignment, learning about a curricular aspect...).	2.41	0.922	0.096+	0.131*
INF04	Evaluating the sources you find on social media.	2.4	1.024	0.20***	0.23***
COM01	Interacting or socializing with your close environment (friends, family, partner...).	3.4	0.967	-0.007	0.09
COM02	Interacting or socializing for academic purposes (classmates, teachers...).	2.52	0.881	-0.014	0.063
COM03	Sharing information and content with others.	2.64	0.968	0.007	0.053
COM04	Engaging in civic or social activities (participating in virtual social events, reposting, signing, voting for social causes...).	1.7	0.855	-0.056	0.105+
CCR01	Creating original content (text, photos, videos).	1.84	0.848	-0.086	0.112+
CCR02	Adapting and reworking existing content (texts, photos, videos...).	1.6	0.833	-0.042	0.107+
CCR03	Taking into account licenses, copyright, and ethical criteria when publishing content you want to adapt or rework.	2.09	1.098	0.145**	0.199***
Section 01	Using strategies to protect your device (e.g., deleting suspicious messages before opening them, not downloading unknown files...) from virus, malware, etc. threats.	3.24	1.172	0.291***	0.183***
Section 02	Protecting information related to people in your close circle (e.g., not sharing certain sensitive information, not forwarding suspicious information, asking for permission before posting, etc.).	3.67	1.158	0.236***	0.15**
Section 03	Reviewing protection systems (passwords, account privacy, permissions granted to applications, etc.).	2.98	1.1	0.302***	0.203***
Section 04	Using any time usage control system (e.g., setting social media to not spend more than X time on it, leaving or turning off your phone in a specific place to avoid using it for more than X time, etc.).	2.2	1.199	0.084	0.114*
Section 05	Using strategies to minimize potential social risks (e.g., unwanted requests such as sexual or pornographic content) by not sharing personal information or not posting your live location.	3.36	1.238	0.214***	0.19***
PRS01	Being attentive to updating your software with the latest versions.	2.69	1.245	0.111+	0.124*
PRS02	Learning functions that are unfamiliar to you (e.g., because they have just been released in an update or because you are not yet familiar).	2.58	1.103	0.121*	0.127*
PRS03	Using social networks to solve an academic problem (e.g., questions that arise, completing an assignment, collaborative learning, etc.).	2.94	1.125	0.162**	0.151**

Note INF, Information; COM, Communication; CCR, Content Creation; SEC, Security; PRS, Problem-Solving. +  $p < .10$ ; \*  $p < .05$ ; \*\*  $p < .01$ ; \*\*\*  $p < .001$

content” ( $r = .112$ ;  $p = .052$ ), “Adapting and reworking existing content” ( $r = .107$ ;  $p = .063$ ), and “Taking into account licenses, copyright, and ethical criteria when publishing content you want to adapt or rework” ( $r = .199$ ;  $p < .001$ ) correlate with critical thinking. Concerning security, “Using strategies to protect your device” ( $r = .183$ ;  $p < .001$ ), “Protecting information related to people in your close circle” ( $r = .236$ ;  $p < .001$ ), “Reviewing protection systems” ( $r = .203$ ;  $p < .001$ ), “Using any time usage control system” ( $r = .114$ ;  $p = .048$ ), and “Using strategies to minimize potential social risks” ( $r = .190$ ;  $p < .001$ ) correlate with critical thinking. Finally, regarding problem-solving, “Being attentive to updating your software with the latest versions” ( $r = .124$ ;  $p = .031$ ), “Learning functions that are unfamiliar to you” ( $r = .127$ ;  $p = .027$ ), and “Using social networks to solve an academic problem” ( $r = .151$ ;  $p = .009$ ) also correlate with critical thinking.

Subsequently, a multilevel linear regression analysis was conducted, initially introducing the different functions grouped by dimensions, and reaching the final level where competence in learning to learn was introduced. Critical thinking was introduced as the dependent variable. The results gathered in Table 2 show that up to model 5, only 2 variables predicted critical thinking in a statistically significant manner: “Looking for information for non-learning purposes” ( $\beta = -0.055$ ;  $p = .077$ ), and “Evaluating the sources you find on social media” ( $\beta = 0.063$ ;  $p = .033$ ). The variance explained by these variables on critical thinking was relatively small ( $R^2 = 11.9\%$ ). However, upon introducing the competence in learning to learn into the equation, the explained variance increased significantly ( $R^2 = 25.1\%$ ). In the new model where competence in learning to learn is introduced, all social media usage functions cease to be statistically significant, with competence in learning to learn being the sole predictor of critical thinking ( $\beta = 0.292$ ;  $p < .001$ ). These results demonstrate that despite the previously observed correlation between most social media usage functions and critical thinking, the causality between the two is almost nonexistent, with students’ competence in learning to learn being the primary predictor of critical thinking.

The next step involved conducting moderation analysis. In these moderation analyses, we examined how interactions between various social media usage functions and competence in learning to learn could predict students’ levels of critical thinking. The results of these analyses are presented in Table 3.

Among the statistically significant interactions, as depicted in Fig. 1, it can be observed how competence in learning to learn moderates the relationship between item COM01 and critical thinking ( $\beta = -0.088$ ;  $p = .032$ ). Specifically, it can be seen that for those students with lower competence in learning to learn the use of social media to interact or socialize with their immediate environment helps them to a greater extent in developing critical thinking ( $\beta = 0.096$ ;  $p = .006$ ) compared to students with moderate ( $\beta = 0.039$ ;  $p = .114$ ) or high ( $\beta = -0.010$ ;  $p = .774$ ) competence in learning to learn.

Another statistically significant interaction, as depicted in Fig. 2, was observed between the variable COM02 and competence in learning to learn ( $\beta = -0.079$ ;  $p = .043$ ). Here, it could be observed how students with lower competence in learning to learn benefitted much more from using social media for academic interactions in developing critical thinking ( $\beta = 0.082$ ;  $p = .020$ ) compared to stu-

**Table 2** Results from the multilevel linear regression analysis

	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6	
	$\beta$	<i>p</i>	$\beta$	<i>p</i>	$\beta$	<i>p</i>	$\beta$	<i>p</i>	$\beta$	<i>p</i>	$\beta$	<i>p</i>
INF01	-0.040	0.157	-0.052	0.082	-0.045	0.141	-0.053	0.084	-0.055	0.077	-0.042	0.140
INF02	0.049	0.167	0.040	0.281	0.037	0.315	0.043	0.239	0.045	0.232	0.055	0.112
INF03	0.037	0.209	0.031	0.326	0.026	0.413	0.021	0.511	0.017	0.613	0.006	0.833
INF04	0.092	<0.001	0.095	<0.001	0.079	0.006	0.065	0.027	0.063	0.033	0.041	0.136
COM01			0.048	0.155	0.046	0.170	0.040	0.245	0.037	0.276	0.041	0.198
COM02			-0.007	0.846	-0.008	0.818	-0.001	0.983	0.000	0.990	-0.001	0.973
COM03			0.000	0.991	-0.009	0.802	-0.003	0.936	-0.003	0.924	-0.022	0.513
COM04			0.010	0.773	-0.001	0.973	-0.007	0.855	-0.006	0.872	0.016	0.662
CCR01					0.022	0.602	0.016	0.705	0.014	0.746	0.043	0.285
CCR02					0.000	0.998	0.010	0.820	0.010	0.828	0.007	0.875
CCR03					0.048	0.059	0.027	0.304	0.024	0.372	0.027	0.278
Section 01							0.007	0.820	0.008	0.795	-0.012	0.673
Section 02							0.004	0.893	0.001	0.980	-0.005	0.840
Section 03							0.040	0.155	0.040	0.169	0.005	0.850
Section 04							-0.002	0.927	-0.005	0.850	-0.007	0.769
Section 05							0.038	0.133	0.038	0.138	0.030	0.196
PRS01									0.000	0.993	0.014	0.570
PRS02									-0.001	0.983	-0.009	0.741
PRS03									0.053	0.407	0.003	0.896
LtL											0.292	<0.001
R <sup>2</sup>	0.069		0.077		0.091		0.117		0.119		0.251	
$\Delta R^2$	0.069		0.009		0.013		0.026		0.002		0.197	

Note INF, Information; COM, Communication; CCR, Content Creation; SEC, Security; PRS, Problem-Solving

dents with moderate ( $\beta=0.030$ ;  $p=.262$ ) or high ( $\beta=-0.014$ ;  $p=.708$ ) competence in learning to learn.

The next significant interaction occurred between the variables PRS01 and competence in learning to learn ( $\beta=0.059$ ;  $p=.030$ ), as shown in Fig. 3. In this figure, it can be observed that students with higher competence in learning to learn ( $\beta=0.060$ ;  $p=.013$ ), when more focused on the latest updates of applications, were aided to a greater extent in developing critical thinking compared to students with moderate ( $\beta=0.027$ ;  $p=.154$ ) or low competence ( $\beta=-0.011$ ;  $p=.668$ ) in learning to learn.

Finally, the last statistically significant interaction was between PRS03 and competence in learning to learn ( $\beta=0.058$ ;  $p=.065$ ), as observed in Fig. 4. In this figure, it can be seen that students with higher competence in learning to learn ( $\beta=0.064$ ;  $p=.018$ ), who use social media to solve academic problems, develop their critical thinking to a greater extent compared to students with moderate ( $\beta=0.031$ ;  $p=.141$ ) or low ( $\beta=-0.006$ ;  $p=.834$ ) competence in learning to learn.

## 4 Discussion

The aim of this study has been twofold. First, it has sought to understand how different functions of social media usage could aid in developing critical thinking. Likewise, it has aimed to explore how this relationship between social media usage functions and critical thinking could be conditioned by students' predisposition towards learning, as measured through their competence in learning to learn.

Firstly, the results of the correlations between the different functions of social media usage and both critical thinking and learning to learn competence suggest that there are functions more significantly related. Related to the dimension of information, the evaluation of the sources in social media appears to be an important factor related to critical thinking and learning to learn competence. As Menichelli and Braccini (2020) declare, millennials are thought to have weak critical thinking skills because they tend to passively consume information through social media. Related to this, many studies have also found a significant, positive and bilateral relationship between information literacy, which includes information evaluation, and critical thinking, with different types of samples (McMullin, 2018; Moradi et al., 2014; Saglam et al., 2017; Celik, 2020).

According to the dimension of communication and collaboration, non-significant correlations were found. Interacting or socializing, even with academic purposes, did not appear to be related to critical thinking or to the learning to learn competence. These results do not entirely align with the majority of the literature on this topic, which define that social media can be used as a platform to discuss and collaborate for learning (Abd Halim et al., 2024). However, several studies investigating this dimension relate the importance of using social media communication as a motivational tool or a pathway for students' engagement for the development of critical thinking (Shieh & Nasongkhla, 2024; Williams & Lahman, 2011). Nevertheless, motivation or students' engagement were not

**Table 3** Interactions of the moderation analyses between the functions of social media use and learning to learn competence

		$R^2$	$\beta$	$p$	LLCI	ULCI	Conditional effects
Information	<b>INF01</b>	0.186	-0.032	0.333	-0.098	0.033	-
	<b>INF02</b>	0.203	-0.033	0.392	-0.109	0.048	-
	<b>INF03</b>	0.193	-0.029	0.446	-0.102	0.045	-
	<b>INF04</b>	0.205	0.002	0.959	-0.063	0.067	-
Communication	<b>COM01</b>	0.204	-0.088	0.032	-0.169	-0.007	Low [ $\beta=0.096$ ; $p=.006$ ] Medium [ $\beta=0.039$ ; $p=.114$ ] High [ $\beta=-0.010$ ; $p=.774$ ]
	<b>COM02</b>	0.199	-0.079	0.043	-0.156	-0.002	Low [ $\beta=0.082$ ; $p=.020$ ] Medium [ $\beta=0.030$ ; $p=.262$ ] High [ $\beta=-0.014$ ; $p=.708$ ]
	<b>COM03</b>	0.187	-0.031	0.421	-0.106	0.044	-
	<b>COM04</b>	0.204	-0.045	0.204	-0.115	0.025	-
Content creation	<b>CCR01</b>	0.208	-0.035	0.336	-0.105	0.036	-
	<b>CCR02</b>	0.199	-0.015	0.650	-0.082	0.051	-
	<b>CCR03</b>	0.203	-0.008	0.807	-0.069	0.054	-
Security	<b>Section 01</b>	0.189	0.024	0.430	-0.036	0.085	-
	<b>Section 02</b>	0.191	0.043	0.171	-0.018	0.104	-
	<b>Section 03</b>	0.195	0.043	0.149	-0.016	0.103	-
	<b>Section 04</b>	0.189	-0.004	0.894	-0.062	0.054	-
	<b>Section 05</b>	0.194	0.012	0.686	-0.045	0.068	-
Problem solving	<b>PRS01</b>	0.202	0.059	0.030	0.006	0.113	Low [ $\beta=-0.011$ ; $p=.668$ ] Medium [ $\beta=0.027$ ; $p=.154$ ] High [ $\beta=0.060$ ; $p=.013$ ]
	<b>PRS02</b>	0.193	0.037	0.215	-0.022	0.096	-
	<b>PRS03</b>	0.199	0.058	0.065	-0.004	0.120	Low [ $\beta=-0.006$ ; $p=.834$ ] Medium [ $\beta=0.031$ ; $p=.141$ ] High [ $\beta=0.064$ ; $p=.018$ ]

Note INF, Information; COM, Communication; CCR, Content Creation; SEC, Security; PRS, Problem-Solving

measured as a variable in this study. Likewise, online communication is demonstrated to be effective to develop critical thinking, but always in structured and controlled conditions (Richardson et al., 2013), which could be more aligned with the results of this study.

Related to content creation, “taking into account licenses, copyright, and ethical criteria when publishing content” appeared to be an item related to critical thinking and learning to learn. This result can be linked to the dimension of security, where most of the items, associated with device protection, protection systems, protection of the information and not sharing personal information, correlated with critical thinking and learning to learn competence. Savchenko and Shekhavtsova (2020) suggest introducing specific courses about information security into the curriculum at university to improve the development of critical thinking and enable students to manage the vast amount of information

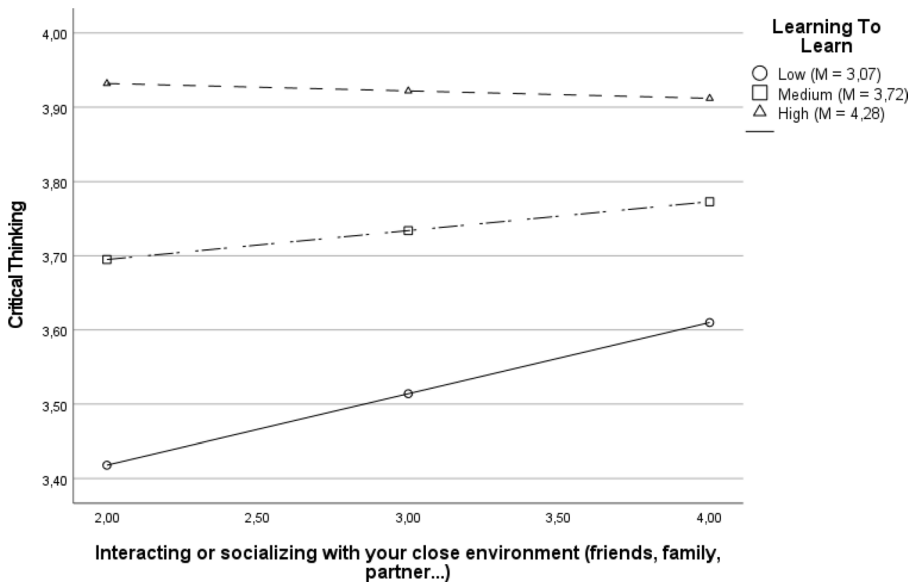


Fig. 1 Interactions of the moderation analyses between COM01 and learning to learn competence

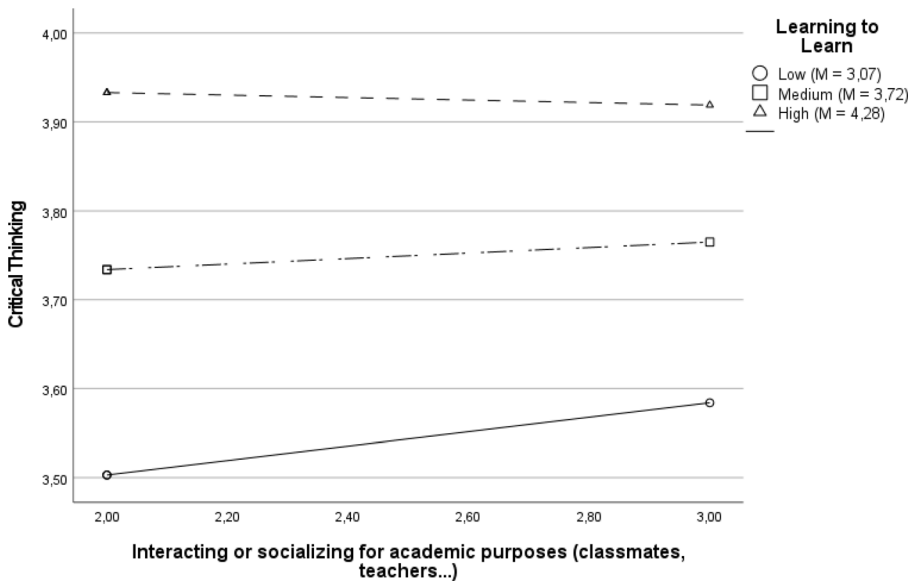


Fig. 2 Interactions of the moderation analyses between COM02 and learning to learn competence

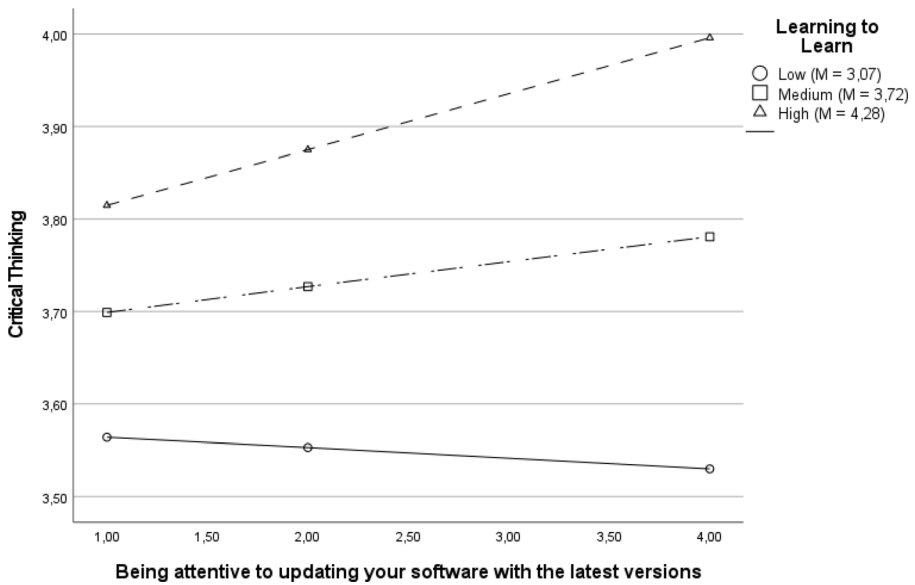


Fig. 3 Interactions of the moderation analyses between PRS01 and learning to learn competence

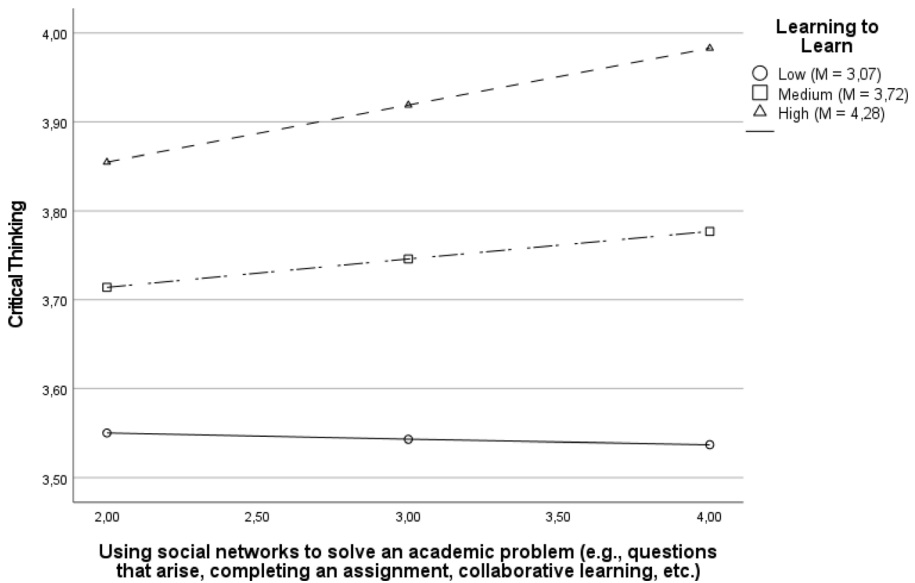


Fig. 4 Interactions of the moderation analyses between PRS04 and learning to learn competence

they encounter. The protection of devices, systems and personal information is commonly related in literature to the information literacy, specifically to the application of the information. Although, few studies have been founded where, specifically, information security is related to the development of critical thinking, therefore, this is a matter that should be addressed in further research on the subject.

Concerning the dimension of problem solving, results suggest that there is a correlation with critical thinking and learning to learn competence. There can be founded literature where both variables seem to be related in training, in different fields (Chaung, 2011; Rohani et al., 2021). Some studies point out the importance of students' motivation and involvement to develop them (McCormick et al., 2015). Likewise, Yang (2010) suggested that critical thinking influences problem solving.

The results from the multilevel regression analysis revealed that the predictive capacity of social media usage functions on the development of critical thinking is very limited, as it only explains approximately 12% of the variance in critical thinking. Specifically, the functions of “Looking for information for non-learning purposes” (inversely) and “Evaluating the sources you find on social media” (positively) emerged as the main predictors of critical thinking. Despite its limited predictive capacity, the results suggest that this is a relationship that can be fostered. In accordance with the literature, social networks have multiple potentials to aid the development of critical thinking (Cheng et al., 2022). In fact, these results are consistent with previous studies that demonstrate how, when used appropriately to promote interactivity and collaborative learning (Garcés-Fuenmayor et al., 2023; González-Cacho & Abbas, 2022), and avoiding excessive attachment to them (Cheng et al., 2022; Thomas, 2020), social networks can be helpful for the development of critical thinking skills, such as analysis, evaluation, or inference of information (Thaiposri & Wannapiroon, 2015).

However, when elements associated with competence in learning to learn is introduced into the model, the predictive capacity significantly increases, explaining over 25% of the variance in critical thinking.

Similarly, the results also demonstrated how for students with poorer competence in learning to learn, interacting or socializing with their close environment (friends, family, etc.), as well as with their academic environment (classmates, teachers, etc.), could help them develop critical thinking to a greater extent compared to students with better competence in learning to learn. However, for students with better competence in learning to learn, utilizing social media more extensively to solve academic problems could assist them to a greater degree in developing their critical thinking skills compared to students with poorer competence in learning to learn.

Furthermore, previous research has demonstrated how elements associated with competence in learning to learn, such as self-regulation (Ghanizadeh & Mirzaee, 2012; Ghanizadeh, 2017), are strongly associated with critical thinking. In fact, some broad definitions of learning to learn competence include critical thinking as an essential element of the competence together with management of

learning and growth mindset (Sala et al., 2020). Effective learning entails critical thinking (Henry & Dillon, 1992).

These results have several theoretical and practical implications that should be considered. Firstly, they are useful for researchers as they contribute to the consolidation of the existing scientific literature on how the use of social networks can contribute to the development of critical thinking (Reid & Mang, 2023). Secondly, they are valuable for in-service teachers as they enable reflection on how the use of social networks, especially when accompanied by other skills associated with competence in learning to learn, can lead to an improvement in the critical thinking skills of university students. In this regard, there are already various interventions based on social networks documented in the literature to develop students' critical thinking (e.g., Lutzke et al., 2019; Mingoia et al., 2019; Pattanapichet & Wichadee, 2015). Likewise, among the main methodologies that can be employed for the development of critical thinking there are written and oral reflections, reading and analysis of resources, and case studies (Bezanilla et al., 2019). Based on these methodologies, it could be interesting to use social media for certain tasks in line with these methodologies, such as conducting written reflections, analyzing and evaluating certain texts, images, and videos; actively participating in debates to argue and justify a stance; and analyzing a well-known case study on social media. Similarly, and based on Self-Determination Theory (Deci & Ryan, 2000), addressing elements like interactivity with the online community, peers, and friends, as well as fostering autonomy in completing the aforementioned tasks, could be an incentive for students to show greater motivation in carrying out these types of tasks. This predisposition to learning is a key factor in the development of critical thinking (Fahim & Hajimaghsoodi, 2014; Valenzuela et al., 2011). In general, enquiry based methodologies, based on questioning, problem solving and research are needed to develop critical thinking and the learning to learning competence (Henry & Dillon, 1992; Letina, 2020).

Finally, the present study has several limitations that need to be mentioned in order to better understand the work carried out. Firstly, the study has been entirely conducted with samples from the university setting, specifically from degrees associated with education and similar fields. Therefore, the patterns obtained in the present study may not be identical in other fields of knowledge. For this reason, future research could attempt to replicate the present study by introducing samples from other branches of knowledge, such as health sciences (medicine, nursing, etc.) or pure sciences (physics, mathematics, etc.). Secondly, the nature of the data used is purely cross-sectional, making it difficult to draw longitudinal conclusions. This fact is compounded by the theoretical difficulty of understanding what has greater weight: whether the use of social media fosters critical thinking (e.g., Ku et al., 2019), or if critical thinking skills could contribute to using social media in a certain way (e.g., Niza et al., 2022). To address this question, future studies could replicate the present study by collecting data at different time points to observe a greater impact of the independent variables on the dependent variable over time. Despite these limitations, it is hoped that the present study will serve as a starting point for a series of future studies aim-

ing to explore the influence of social media on key competencies such as critical thinking.

**Acknowledgements** Acknowledgment to the institutions where the research was applied, as well as to the participating students.

**Author contributions** The authors Galindo-Domínguez, Bezanilla and Campo confirm that the content of this manuscript has not been published, and has not been submitted for publication anywhere, according to the Duplicate publication policy.

**Funding** Not applicable.

Open Access funding provided thanks to the CRUE-CSIC agreement with Springer Nature.

**Data availability** The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

## Declarations

**Ethics approval and consent to participate** All participants consented to their participation in the study through the *GoogleForms* application, prior to the requirement of any data about them.

The information for the participants was the following (translated from Spanish): Below, you will find a series of questions aimed at better understanding your thought process and your use of social media. The team values your time in participating in this task and we appreciate your honesty in the responses, which will neither be right nor wrong. All responses are anonymous and confidential, and will not affect any rights you may already have access to. All data will be analyzed in its entirety and never as individual particulars. The estimated time to complete the task is about 10–15 min. Upon completion of the survey, you will have the option to provide an email address to receive the report of this work with the results obtained, if interested. In advance, we thank you for your participation in this small task. I accept the terms and conditions described above, also specified in the provided link: <https://bit.ly/3SNZInt>.

**Consent for publication** Not applicable.

**Competing interests** There is no potential competing interest.

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**Publisher's Note** Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

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