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Research Article

Academic self-efficacy and digital competence in a sample of university students

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ABSTRACT

The objective of this study is to determine the relationship between academic self-efficacy and digital competence in a sample of undergraduate university students in Peru. The design was nonexperimental, cross-sectional, and correlational. The non-probabilistic sample consisted of 98 students from a private university in Peru. Academic self-efficacy single-item scale and digital competence questionnaire were used. Spearman correlation coefficient, Kolmogorov-Smirnov test, and Mann-Whitney U test were used for statistical analysis. The statistical program used was SPSS v. 25. The average academic self-efficacy obtained was 3.73 (standard deviation [SD]=0.73). Regarding digital competence, the mean recorded was 72.34 (SD=11.57). Additionally, it was found that there were no significant differences in academic self-efficacy and digital competence according to gender ($p>0.05$). Similarly, it was found that there is a significant correlation between academic self-efficacy and digital competence in students (rho=0.438; $p<0.001$). Similarly, it was found that there is a correlation between academic self-efficacy and the five dimensions of digital competence (information, communication, content creation, technological security and problem-solving) in university students ($p<0.05$). This research could contribute to the development of programs, courses, or psychoeducational strategies for the development of academic self-efficacy and digital competence in university students.

Keywords: academic self-efficacy, digital competence, DigComp 2.0, DigCompEdu, university students

INTRODUCTION

Self-efficacy influences people's success in different areas and situations in life (Bandura, 1997; Uzun & Karatas, 2020). Therefore, this psychoeducational construct was studied in different fields of human endeavor: emotional, obstetric, occupational, nutritional, social, among others (Ahmad et al., 2014; Caprara et al., 2022; Peng et al., 2021; Shakarami et al., 2021; Yang et al., 2021). For this reason, the interrelationship between self-efficacy and digital competence should be explored in the academic context.

The research was conducted to obtain a master's degree by the main author of the study.

Self-efficacy is found within the theoretical framework of social cognitive theory proposed by Bandura (1997). This variable is defined as an individual's personal assessment of his or her own ability to perform in a given field (Bandura, 1997). Self-efficacy is different from self-esteem. Although self-efficacy is related to the judgment of one's own ability, self-esteem refers to the judgment of a person's own worth (Bandura, 2006). In addition, Bandura (1997) argues that self-efficacy develops as a function of four sources of beliefs: mastery experience, vicarious experience, verbal persuasion, and physiological reactions. On the other hand, self-efficacy is not a general construct, but is manifested according to the area or situations, where an individual develops. That is, there is a specific type of self-efficacy for each field or area of human endeavor, including academic self-efficacy (Dominguez, 2014).

Academic self-efficacy refers to an individual's belief in his or her ability to successfully accomplish a subject or activity in the educational setting. It is the confidence in one's own ability to meet academic challenges and achieve satisfactory results (Bandura, 1997; Uzun & Karatas, 2020). Based on the self-efficacy theory of (Bandura, 1997), students with high expectations of self-efficacy are more academically motivated, achieve better results, effectively self-regulate their learning, and show greater intrinsic motivation to learn. Additionally, several studies have shown that academic self-efficacy is also associated with behavior-related variables such as skills, competencies, and academic performance. For example, Sari et al. (2020) showed that academic self-efficacy predicts self-regulation skills (cognitive, affective, and psychomotor/behavior). Consequently, academic self-efficacy is positioned as a crucial metacognitive factor that influences students' competencies, skills, and behaviors. By believing in their own ability to achieve academic success, students can develop a positive approach to learning, apply effective study strategies, and face academic challenges with confidence.

In the scientific literature, various terminologies have been used to refer to the use of information and communication technologies (ICT) in the academic environment. Among them, "ICT competencies", "digital literacy", "skills with ICT", "digital skills", "digital competence", among others (He & Zhu, 2017; Sánchez-Caballé et al., 2020; Spante et al., 2018). In this study, it will be studied as digital competence. It should be noted that the different names attributed to the use of ICTs in the university environment are interrelated and are not mutually exclusive categories, but complementary concepts. Although the concept of digital literacy seems to be the most widely used at the international level, the term digital competence is often used as a synonym, especially in the European context (Esteve-Mon et al., 2020). Digital competence is defined as "the safe, critical, and responsible use of and engagement with digital technologies for learning, working, and participating in society" (European Commission, 2019).

Digital competence can be conceptualized within the theoretical framework of self-determination theory (SDT) (Deci & Ryan, 1985, 2008). SDT postulates that human beings have three fundamental psychological needs: the need for autonomy, the need for competence, and the need for relatedness. These intrinsic needs guide people's motivation and well-being and are considered fundamental to growth and self-actualization (Wang et al., 2021). The digital competence variable used in this study is based on the model "DigComp 2.0: The digital competences framework for citizens", developed by the European Commission in 2016. This framework defines the digital competencies necessary for citizens to effectively participate in today's digital society. This competency model is distributed in five dimensions:

(1) information and data literacy,

(2) communication and collaboration,

(3) creation of digital content creation,

(4) security, and

(5) problem-solving (Fernández-Miravete & Prendes-Espinosa, 2022; Voorikari et al., 2016).

Furthermore, it is important to note that the DigComp 2.0 model is not prescriptive, but descriptive (Zhao et al., 2021).

In the current university context, marked by an increasing reliance on technology and a rapid change in digital tools, students face the need to develop robust digital competencies (Katsarou, 2021). These competencies refer not only to the competent use of technological tools, but also to the ability to apply these skills critically and creatively in their academic learning (Wang et al., 2021).

At the same time, academic self-efficacy, i.e., students' confidence in their ability to perform academic tasks successfully, becomes a crucial factor and directly impacts their motivation, persistence, and approach to academic challenges (Hayat et al., 2020). In an environment, where academic tasks are increasingly mediated by technology, digital competence becomes intrinsically linked to academic self-efficacy. Students with low self-efficacy may feel overwhelmed or incompetent when faced with tasks that require advanced digital skills, which in turn can negatively affect their academic performance and emotional wellbeing (Beatson et al., 2021; Salami et al., 2021).

This picture is further complicated by the rapid transition to online or hybrid learning modalities, driven in large part by the COVID-19 pandemic (Golden et al., 2023; Wang et al., 2021). Students who once relied on face-to-face learning now need to adapt to virtual environments, where digital competence is not only desirable, but essential for academic success (Kumpikaitė-Valiūnienė et al., 2021). The digital competence gap can exacerbate existing inequalities among students, especially those who lack access to technological resources or come from backgrounds with less technological exposure (Golden et al., 2023).

Therefore, the central issue based on the current study lies in how university students can simultaneously foster their digital competence and academic self-efficacy in an educational environment that is continuously evolving and increasingly influenced by technology. This scenario raises relevant questions about how educational institutions can support their students not only in developing technical skills, but also in building their confidence and resilience so that they can successfully navigate the digital academic environment.

LITERATURE REVIEW

The interaction between academic self-efficacy and digital competence in university students is a field of study that has gained relevance in the digital era. In fact, several studies have shown a positive correlation between academic self-efficacy and digital competence. For example, Hatlevik et al. (2015) in their research revealed that self-efficacy, cultural capital, home language integration, strategic use of information, and students' average grades predict 20.0% of the variance in students' digital competence and 49.0% of the variance among schools' digital averages. Similarly, Galindo-Domínguez and Bezanilla (2021) found that digital competence is correlated with academic self-efficacy in a group of students in the field of education; in fact, they found that students with higher digital competencies tended to have better time management and higher self-efficacy, which in turn reduced their perceived stress. These findings suggest that digital competence not only facilitates access to learning resources, but also strengthens student confidence in their academic ability.

On the other hand, Katsarou (2021) highlighted that low levels of computer anxiety and high levels of computer self-efficacy are important for academic success in the digital age. This study highlights how familiarity and confidence in the use of ICT can improve students' perception of their academic skills. Likewise, another study revealed that digital competence helped students manage cognitive load and academic burnout during the COVID-19 pandemic, thus preserving their psychological well-being. This demonstrates how digital competence can be a buffer against academic stress in challenging circumstances (Wang et al., 2021). Additionally, Tella et al. (2008) found that efficacy in the use of electronic information is a significant predictor of academic performance. This finding suggests that digital competence is not only a technical skill, but also a critical component of academic self-efficacy. Digital competence not only improves access to learning resources, but also strengthens students' academic self-efficacy. This synergy between self-efficacy and digital skills is fundamental to academic success and well-being in today's educational context (Golden et al., 2023; Kumpikaitė-Valiūnienė et al., 2021). Therefore, it is important to foster both academic self-efficacy and digital competence in university educational programs.

Previous research in academic self-efficacy and digital competence is notable for its focus on how these skills influence college students' performance and well-being. However, a less explored aspect and therefore a weakness in the existing literature is the deepening of how these competencies are developed and strengthened in different educational contexts, especially in Latin American settings such as Peru. Furthermore, although the importance of digital competence as a predictor of academic performance has been recognized (Tella et al., 2008), here is still a gap in the understanding the dynamic interaction between academic self-efficacy and digital skills in specific educational contexts. Studying this relationship in a sample

of university students in Peru can provide relevant and specific information on how these variables are related in the Peruvian educational context, which may have important implications for the design of educational programs and policies aimed at improving students' self-efficacy and digital competence.

To address this gap, the present study focuses on examining the relationship between academic self-efficacy and digital competence in the Peruvian educational context, seeking to understand how the interaction between these competencies can be modeled and improved through specific interventions. This research hopes to fill the existing gap by providing empirical data on the development of these competencies in an understudied context, thus offering a solid basis for future educational strategies in Peru and possibly in similar contexts in Latin America.

MATERIALS & METHODS

Study Design & Participants

A descriptive correlational study was carried out. The sample consisted of 98 university students from a private university in Metropolitan Lima (Peru), selected by non-probabilistic purposive sampling. Students were selected for the study who were enrolled during the second academic period of the year 2020, with the condition of being over 18 years of age and having signed the informed consent. In addition, an essential requirement for inclusion was to have regular access to the Internet and digital devices. On the other hand, five records of students who were not nationals were discarded. **Table 1** presents the sociodemographic characteristics of the participants. The results indicate that approximately 75.0% of the participants are single, female, between 18 and 23 years of age, and profess the Adventist religion. Finally, more than 50.0% of the students belong to the coastal region and are dedicated exclusively to study.

Table 1. Socio-demographic analysis of sample (n=98)

Variable	Frequency (n)	Percentage (%)
Gender		
Male	16	16.3
Female	82	83.7
Region of origin		
Coast	52	53.1
Sierra	26	26.5
Jungle	13	13.3
Foreign	7	7.1
Age (years)		
18-23	80	81.6
24-29	18	18.4
Couple		
With partner	25	25.5
No partner	73	74.5
Religion		
Seventh-day Adventist	82	83.7
Catholic	8	8.2
Others	8	8.2
Employment and academic status		
Only study	53	54.1
Work and study	45	45.9

Instruments Used for Data Collection

Academic self-efficacy single item scale was developed in the Peruvian context by (Dominguez-Lara et al., 2019), in a sample of university students. The item is worded, as follows: "How confident are you that you will be able to efficiently perform the tasks [papers, exhibits, exams, among others] that your academic life demands of you?" The graded response for this item was Likert-type (never, rarely, very rarely, sometimes, frequently, and always), with scores ranging from one to five points.

Digital competence questionnaire was developed as part of the Ikanos Project, an initiative promoted by the Basque Government (Voorikari et al., 2016). This tool is based on digital competence of educators (DigCompEdu) framework proposed by the European Commission (Ferrari, 2013). This questionnaire is made

up of 21 items and five dimensions: information (items: 1, 2, and 3), communication (items: 4, 5, 6, 7, 8, and 9), content creation (items: 10, 11, 12, and 13), security (items: 14, 15, 16, and 17) and problem-solving (items: 18, 19, 20, and 21). Item responses are Likert-type (not at all, a little, some, quite a lot, and a lot), with scores ranging from one to five. As an example, the first item of the scale is: "You identify and select digital information in search engines, databases, repositories or compilers". The reliability scores reported were information α=.75, communication α=.78, content creation α=.72, safety α=.78, and problem-solving α=.73 (according to Cronbach's alpha). In this study, CD reliability was α=.88, according to Cronbach's alpha. Furthermore, the reliability according to the dimensions of CD was the following: information α=.744; communication α=.726; content creation α=.719; safety α=.656, and problem-solving α=.718.

Procedure

Data collection was carried out during the second academic semester of 2020, using a virtual form created through the Google Forms platform. The first section of the form included an informed consent form requesting the participant's acceptance. The second section contained questions related to sociodemographic information, while the third section consisted of questionnaires used to measure study variables. Participants completed the form in Spanish, at the beginning or at the end of their virtual class. Participants were assured that their participation was optional and confidential. Ultimately, the research was conducted following the principles set forth in the Declaration of Helsinki.

Statistical Analysis

Descriptive analysis was performed using mean, median, and standard deviation. Tables of frequencies and percentages were used to describe sociodemographic variables. The normality analysis of the data was performed using the Kolmogorov-Smirnov statistical test. The difference between groups was determined using the nonparametric Mann-Whitney U test, and the correlation analysis was performed using Spearman's correlation, because the data did not have a normal distribution. A significance level of 5.0% was used for all analyzes. The analyzes were performed using SPSS version 25 statistical software (SPSS Inc., based in Chicago, IL, USA).

RESULTS

This section presents the descriptive and comparative analysis of the study variables. According to the results presented in **Table 2**, no statistically significant differences were found in academic self-efficacy, digital competence, and its dimensions (information, communication, content creation, security, and problem-solving) as a function of gender (p>0.05). Furthermore, it is observed that the overall mean of academic self-efficacy is 3.73 (standard deviation [SD]=0.73), with minimal differences in both the male and female groups. On the other hand, the overall mean of digital competence is 72.34 (SD=11.57), with similar values in the male and female groups. Furthermore, the dimension with the highest mean is communication (mean [M]=21.11; SD=4.05).

Table 2. Descriptive & comparative analysis of academic self-efficacy & digital competence

	Total (n=98)		Male (n=16)		Female (n=82)		p-value
	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation	
Academic self-efficacy	3.73	0.73	3.81	0.75	3.72	0.72	0.531
Digital competence	72.34	11.57	70.75	10.74	72.65	11.76	0.436
Information	11.56	2.27	10.81	1.80	11.71	2.33	0.075
Communication	21.11	4.05	20.56	3.93	21.22	4.08	0.540
Content creation	12.66	3.09	12.19	2.40	12.76	3.21	0.306
Security	14.26	2.89	14.25	2.38	14.26	3.00	0.823
Problem-solving	12.74	2.73	12.94	2.38	12.71	2.81	0.805

Note. Mann-Whitney U test was used

Table 3 shows a statistically significant correlation between academic self-efficacy and digital competence in university students (rho=0.438; p<0.001). Furthermore, a significant correlation was observed between academic self-efficacy and information dimensions (rho=0.479; p<0.001), communication (rho=0.414; p<0.001), content creation (rho=0.258; p<0.05), safety (rho=0.276; p<0.01), and problem-solving (rho=0.204; p<0.05).

Table 3. Correlation between academic self-efficacy & digital competence

	Digital competence	D1	D2	D3	D4	D5
Academic self-efficacy	0.438***	0.479***	0.414***	0.258*	0.276**	0.204*

Note. Spearman test was used (p<0.001***; p<0.01**; & p<0.05*); D1: Information; D2: Communication; D3: Content creation; D4: Security; & D5: Problem-solving

DISCUSSION

The integration of digital technology in education has generated a significant transformation in learning environments (Barboutidis & Stiakakis, 2023). University students are faced with the need to acquire digital skills to adapt to the academic and work demands (Cabero-Almenara & Palacios-Rodríguez, 2019; Méndez et al., 2022). Digital competence, understood as the ability to effectively use ICT to obtain, evaluate, and communicate information in an appropriate manner, has become crucial in the educational context (Blau & Shamir-Inbal, 2017). However, digital competence is not only limited to the technical mastery of digital tools, but also involves cognitive and metacognitive skills to effectively apply these skills in academic situations (Méndez et al., 2022; Touron et al., 2018). In this sense, academic self-efficacy, which refers to an individual's belief in his or her ability to accomplish academic tasks and achieve proposed goals, plays a fundamental role in the successful use and application of digital skills in the university context.

Despite the growing importance of digital competence and academic self-efficacy in education, there is a gap in research exploring the relationship between these two variables in Peruvian university students. Therefore, the present study aimed to determine the relationship between academic self-efficacy and digital competence in a sample of university students in Peru.

On average, students were found to perceive a moderate to high level of confidence in their academic abilities. This information provides a reference to the degree of academic self-efficacy in the group studied and may be useful for further comparisons and analysis. Several studies have found similar results in relation to academic self-efficacy. For example, a study conducted by Zimmerman and Bandura (1994) in which first-year university students were evaluated reported high values of perceived academic self-efficacy. Similarly, other research, such as the studies by Pajares and Miller (1994) and Schunk and Pajares (2002), have also reported consistent results, indicating that students tend to have relatively high levels of academic self-efficacy. In addition, a study of Gutiérrez and Landeros (2020) revealed that, of a set of university students, 59.6% reported having satisfactory academic self-efficacy, while 20.2% indicated high levels of self-efficacy. These results not only highlight the proportion of students who feel empowered to face academic challenges, but also open the door to future research on strategies and factors that contribute to the construction and strengthening of academic self-efficacy in higher education. Academic self-efficacy is considered an important factor in motivation and academic performance, since it influences the choice of goals, the effort invested and persistence in achieving educational objectives (Cabero-Almenara et al., 2023). These findings support the fact that most students have a positive perception of their ability to cope and succeed in academic tasks. Understanding these aspects is important for developing educational interventions and programs that effectively support students in their academic and personal development.

Digital competence has traditionally been defined as a person's ability to use digital technologies critically, collaboratively, and creatively. Additionally, it implies that you have knowledge, skills, and an attitude that allows you to be considered digitally competent (Tzafilkou et al., 2022). In the current study, the overall mean level of digital competence was found to be 72.34, suggesting that on average students show a high level of digital competence. Similar studies have reported similar findings. In fact, in a study conducted by Carretero et al. (2017), it was found that the average digital competence in primary and secondary school students in Europe was 68 points on a scale from zero to 100. Furthermore, the results of research that examined digital competence in 1,073 students from one Italian university and two Spanish universities revealed that these students possessed a relatively high level of competencies related to information and digital literacy, as well as communication and collaboration skills (López-Meneses et al., 2020). These results are consistent with those obtained in another study carried out with Spanish university students in which most of them perceived themselves as having a medium-high level of digital competence, particularly in multimedia and communicative dimensions (Esteve-Mon et al., 2020). A student's perceived digital competence is manifested in his or her knowledge and skills to use ICT in performing various ICT-related tasks (Meng et al., 2019).

The findings of the current study, which is part of a broader analysis of the level of digital readiness at the university level, provide valuable insight into how students in higher education are equipped with essential skills for today's academic and professional environment, marked by the increasing importance of technology and digital interconnectedness. These findings underscore the need for educational institutions to continue to foster and develop these crucial skills to ensure that their students are well prepared for the challenges of the digital world.

On the other hand, the study findings have shown that there is a significant correlation between academic self-efficacy and digital competence in students. Furthermore, there was evidence that there is a correlation between academic self-efficacy and the five dimensions of digital competence (information, communication, content creation, technological security and problem-solving) in university students ($p<0.05$). These findings are supported by other studies that have reported similar results. For example, a study conducted on university students in the United States found that students with higher academic self-efficacy also reported having a higher level of digital competence (Chen et al., 2010). Likewise, in their study, Hatlevik et al. (2015) found that several factors, such as self-efficacy, cultural capital, language integration at home, strategic use of information and average grades of students, can predict 20.0% of the variance in student digital competencies. Similarly, Galindo-Domínguez and Bezanilla (2021) reported that digital competence correlates positively with academic self-efficacy in a group of students in the area of education. Through the results obtained, the notion that confidence in academic skills plays an important role in the development and application of digital competencies in the educational environment is supported. It is possible that students who feel confident and competent in their academic performance are more likely to develop and use the digital competencies needed to meet current educational demands. This highlights the importance of fostering academic confidence and providing adequate support to promote the holistic development of students' digital competencies in the educational setting.

Main Contributions

This study contributes by providing new theoretical insights by examining the relationship between academic self-efficacy and digital competence in university students. First, the findings provide empirical evidence to support the positive relationship between the two variables in question, which is consistent with the existing literature. Second, the study expands knowledge by exploring this relationship specifically in the academic context, which may help in better understanding how academic self-efficacy influences students' digital competence. Finally, these theoretical contributions contribute to the development of conceptual frameworks and explanatory models in the fields of education, psychology, and technology.

Practical Implications

According to the results of this study, it is important to foster academic self-efficacy and digital competence in university students. This has implications for the education and training of teachers, who can develop pedagogical strategies that promote confidence in academic skills and the effective use of digital technologies. Furthermore, the design of programs and activities that strengthen student digital competence should be a priority for university students. In fact, university administrators, along with professors, should include these programs in courses and workshops, using educational resources that allow them to acquire and develop technological skills relevant to their future academic and professional performance. Finally, considering the findings of the current study and given that digital competencies are fundamental in current reality, it is important to provide personalized guidance and support to students in the development of their academic self-efficacy and digital competence. In this case, academic tutoring along with academic counseling should constitute resources and support strategies that help students overcome challenges and strengthen their digital competencies.

Limitations

Although the results of this study are derived from a robust quantitative analysis, there are some limitations. First, it is important to note that the results and conclusions of this study cannot be generalized or extrapolated to students from other contexts or educational levels due to the sample selection made through nonprobability sampling. Second, it is important to note that the distribution of the sample by year

was not homogeneous. This lack of balance in the distribution may introduce biases and limit the representativeness of the results. Another important limitation to consider is the use of a quantitative self-perception instrument to measure academic self-efficacy and digital competence. Although these instruments are widely used and offer a convenient way to collect data, it is important to recognize that self-perception may be biased and may not always accurately reflect students' actual skills and competencies. Finally, it is important to mention that this study is based on a cross-sectional design, which limits its ability to establish causal relationships, making it difficult to determine the temporal sequence of events and to identify cause-and-effect relationships.

Future Studies

Future studies could include in the bidirectional relationship variables. This would allow us to examine not only how academic self-efficacy may influence the development of digital competencies, but also how digital competence may feedback and affect academic self-efficacy. In addition, it is suggested to conduct a predictive or explanatory type of research (considering structural equation modeling) with the aim of analyzing the impact and interaction of psychoeducational, social and/or personal variables on digital competence in university students. Finally, it is suggested to expand the knowledge about the relationship between academic self-efficacy and digital competence in secondary, elementary, or higher technical students.

CONCLUSIONS

This study investigated the relationship between academic self-efficacy and digital competence in a sample of Peruvian university students. The findings confirm that there is a significant relationship between academic self-efficacy and digital competence of university students, highlighting that a higher level of academic self-efficacy is associated with higher digital competence. This suggests that students' perceptions of their ability to achieve academic success have a direct impact on their ability to effectively use digital tools. These findings are fundamental for the implementation of educational interventions that include programs, courses or psychoeducational strategies aimed at strengthening academic self-efficacy, which could improve digital competence among university students and better equip them to face academic and professional challenges in an increasingly digitized world. Concluding, this study sheds light on the interdependence between academic self-efficacy and digital competence, providing a solid foundation for future research and educational practices.

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Declaration of interest: The authors declare no competing interest.

Data availability: Data generated or analyzed during this study are available from the authors on request.

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