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PAPER

Critical Thinking and Digital Competence in College Students: A Cross-Sectional Study

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ABSTRACT

This research explores the intricate relationship between critical thinking and the cultivation of essential skills, competencies, and knowledge crucial for effective learning and digital fluency among university students. The backdrop of health emergencies has thrust students into unfamiliar terrain, necessitating the discernment of valuable information from the superfluous within the digital landscape. This study, specifically focusing on students enrolled at a university in northern Peru, adopts a non-experimental, correlational, and cross-sectional research design. The sample, selected through a non-probabilistic method, comprises 218 students. The survey instrument used encompasses 30 questions related to critical thinking and 25 questions concerning digital competence, each offering response options on a 4- to 5-point scale. A comprehensive analysis encompassed both the substantive and dialogic dimensions of critical thinking, and within digital competence, the dimensions included learning, informational, communicative, digital, and technological cultures. The findings underscore a remarkably high level of positive correlation between these variables (0.96). In summary, digital competence emerges as a complementary pillar that reinforces and fosters critical thinking within the realm of lifelong learning.

KEYWORDS

critical thinking, competition, digital learning

1 INTRODUCTION

The United Nations Educational, Scientific, and Cultural Organization (UNESCO) underscores that digital technologies have revolutionized information access, and the cultivation of digital competence empowers individuals to acquire, disseminate, comprehend, and create knowledge and data [1]. Moreover, addressing educational needs entails instilling and nurturing intellectual curiosity, fostering critical thinking, and concurrently fostering judgment autonomy [2]. In this contemporary landscape, today's students are inherently digital natives, immersed in a perpetually evolving

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digital milieu that necessitates diverse modes and styles of reflective learning compared to traditional paradigms.

Research findings highlight the variability of digital competence across regions: for instance, in Chile, it stands at a modest 48%, while in Costa Rica, it reaches a medium to high level [3]. Conversely, a study encompassing 269 students in Peru indicates that although students possess proficiency in digital skills, these capabilities have not been seamlessly integrated into pedagogical processes, with limited utilization of ICT resources for reading and writing [4]. Notably, the study reveals an upswing in the digital competence of educators [5].

Digital competence, as an integral component of societal development, necessitates ongoing practice to foster learning with proficiencies that equip students for the multifaceted demands of the 21st century. This encompasses their professional, personal, and occupational domains, entailing adaptations in strategic approaches, methodologies, and environmental contexts [6]. Students must be adept at applying their acquired knowledge and skills within their individual contexts, which are profoundly infused with technology. In a knowledge-driven society, technology utilization reverberates across personal, social, cultural, economic, political, and institutional dimensions, leaving an indelible impact.

Concurrently, the cultivation of critical thinking is a pressing and indispensable concern due to the limited emphasis on this fundamental cognitive ability in current educational practices. Research conducted in Chimbote, Peru, reveals that fifth-grade primary education students exhibit a low level of proficiency in both substantive and dialogic dimensions of critical thinking [7]. Similarly, another study conducted in Lima, focusing on fifth-year secondary school students, reports that 60.2% achieve an average (medium) level of critical thinking, while 28.3% perform at a lower level [8]. In Ancash, within the context of the student census evaluation (ECE) measuring learning quality, results indicate that in reading, 27.8% of fourth-grade primary school students fall within the "pre-start" and "start" performance levels [9]. Significantly, these studies underscore the dearth of research at the university level, where the cultivation of reasoning, analysis, reflection, and divergence in learning should constitute a continuous facet of professional development. Consequently, at the university level, the capacity for effective and competent argumentation, debate, analysis, and reflection is notably deficient [10].

The present research endeavors to provide an authentic and objective assessment of how students develop digital competence, insofar as their proficiency in utilizing ICT enhances their critical acumen when scrutinizing, reflecting upon, and debating information. This undertaking holds relevance as it can serve as a foundational element for forthcoming research and evaluations, as well as for directing learning processes toward active, argumentative strategies, discussions, debates, reflection, and analytical approaches in knowledge construction. Furthermore, it holds utility for the state in decision-making pertaining to teacher training and improvement. Additionally, this research contributes to enhancing teacher preparedness and proficiency in active methodologies, ultimately fostering elevated critical thinking and enhanced classroom performance. Ultimately, it is incumbent upon the state to shoulder the responsibility of making decisions that break free from the cycles of misunderstanding and routine.

2 METHODOLOGY

2.1 Study design and setting

The study uses a cross-sectional design [11] to explore how different concepts or variables relate to each other within a specific context.

This study was conducted in the city of Chimbote, situated in northern Peru. The research population encompassed 246 university students pursuing degrees in education during the year 2020. Given the prevailing pandemic conditions, data collection occurred in two phases: Group A was surveyed between April and May, while Group B was surveyed from June to July 2020. The sampling approach employed was non-probabilistic, resulting in a sample size of 118 students. This sample was composed of both genders, with approximately 48% representation from each, and encompassed individuals aged between 19 and 25 years. Furthermore, the students spanned academic cycles ranging from I to X within the field of education.

2.2 Data collection

To initiate the research process, we sought permission from the Directorate of the Professional School of Education to conduct the study within the School of Education. This involved obtaining essential data such as the number of enrolled students, their email addresses, and telephone numbers. To create a digital instrument, we developed the survey using Google Drive for online accessibility. Furthermore, to secure informed consent from each student, we obtained their authorization for data collection by having them sign a consent form. The questionnaire was distributed digitally, with personalized links sent via email, WhatsApp, and Facebook, ensuring comprehensive coverage of the sample. It's important to note that student participation was entirely voluntary, as they had the choice to access and complete the survey online via Google. For data processing, we established an Excel database and subsequently coded each questionnaire item for analysis.

2.3 Instrument

Two online instruments were employed in this study. First, the digital competence questionnaire [12], which has been validated and exhibits a strong internal reliability score of 0.96. This questionnaire consists of 44 items rated on a scale of 1 to 4 (with 1 indicating "never" and 4 indicating "always"). It encompasses various dimensions, including learning, informational, communicative, digital, and technological culture.

Additionally, the critical thinking questionnaire, originally developed by Santiuste and his colleagues in 2001 [13], was utilized. This questionnaire has demonstrated a reliability index of 0.90. It comprises 30 questions, each offering respondents five response options on a Likert scale, ranging from 1 (indicating "total disagreement") to 5 (indicating "total agreement"). This questionnaire assesses both substantive and dialogic dimensions of critical thinking.

It's noteworthy that these questionnaires underwent rigorous validation procedures, including expert assessments for clarity and coherence, resulting in high reliability scores. Furthermore, a pilot test was conducted to refine the instruments before their full application.

2.4 Statistical analysis

For data analysis, the variable was reorganized into two main dimensions: the substantive dimension, which included categories such as substantive reading, substantive writing, and listening to substantive oral expression; and the dialogic

dimension, encompassing dialogic reading, dialogic writing, and dialogic listening—oral expression.

Similarly, when dealing with the digital competence variable, consideration was given to its various dimensions, namely learning, informational proficiency, communicative aptitude, digital literacy, and technological culture.

Due to the inherent nature of these variables, descriptive statistics were employed to present the results in alignment with the research objectives. Excel 2010 was used for this quantification process, which involved the coding of each item for subsequent analysis in the SPSS statistical program.

3 RESULTS

Referring to Table 1 and Figure 1, the data reveals that the majority of students exhibit a high level of critical thinking (59.32%), while 40.68% demonstrate a moderate level. Notably, no students fall into the low or very low categories. In contrast, digital competence is distributed as follows: 48.34% at a high level, 48.34% at a moderate level, and 3.39% at a low level. A strong positive correlation between these study variables is evident, with a linear correlation coefficient of 0.9656772.

Table 1. Relationship between critical thinking and digital competence

Level	Critical Thinking		Digital Competence	
	No	%	No	%
High	70	59.32	57	48.31
Moderate	48	40.68	57	48.31
Low	0	0.0	0	3.39
Very low	0	0.0	0	0
Overall	118	100%	118	100%

Notes: *Level: High = 3, Moderate = 2, Low = 1, Very low = 0.

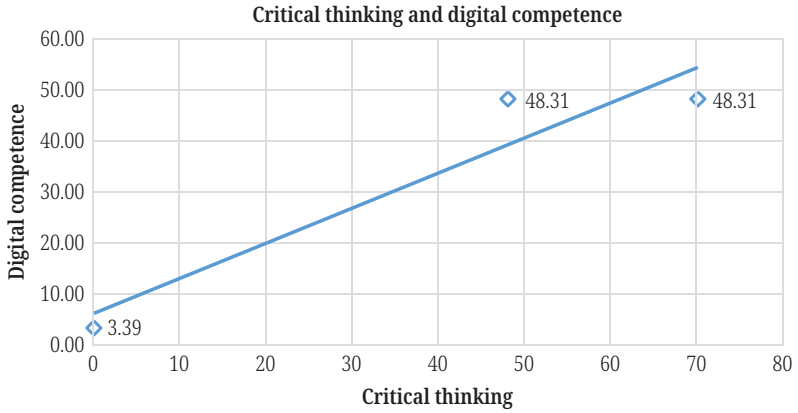

Fig. 1. Line of correlation between critical thinking and digital competence

As shown in Table 2, students predominantly exhibit a high level of critical thinking at 59.32%, with a moderate level observed at 40.68%. Remarkably, none of the students fall into the low or very low categories. Moving to the learning dimension,

a moderate level is the most prevalent at 55.93%, followed by a high level at 32.20% and a low level at 11.86%. The informational dimension mirrors this trend, with the moderate level dominating at 44.52%, followed by a high level at 43.22%, and a low level at 11.86%. Shifting to the communicative dimension, the majority of students fall within the moderate level, accounting for 65.25%, while the high level represents 12.71%, and the low level stands at 22.03%. Within the digital culture dimension, a moderate level prevails at 89.62%, accompanied by a high level at 15.38%, and no students register in the low or very low categories. Lastly, in the technological dimension, a moderate level holds the highest percentage, comprising 52.54%, followed by a low level at 37.29% and a high level at 10.17%.

Table 2. Description of critical thinking and the dimensions of general competence

Level	Critical Thinking	Learning	Information	Communicative	Digital Culture	Technological
High	70 (59.32)	38 (32.2)	51 (43.22)	15 (12.71)	33 (84.62)	12 (10.17)
Moderate	48 (40.68)	66 (55.93)	53 (44.92)	77 (65.25)	6 (15.38)	62 (52.54)
Low	0 (0.0)	14 (11.86)	14 (11.86)	26 (22.03)	0 (0.0)	44 (37.29)
Very low	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)

Notes: *Level: High = 3, Moderate = 2, Low = 1, Very low = 0 **Number (percentage).

4 DISCUSSION

The current study investigated the relationship between critical thinking and digital competence among students enrolled in the School of Education at Universidad CatólicaLos AngelesdeChimbote. Upon analyzing the findings, it becomes evident that most students exhibit moderate levels of both critical thinking and digital competence. Furthermore, a very strong positive correlation exists between these two variables. This implies that as critical thinking abilities increase, so does digital competence, establishing a cohesive relationship between the two.

Interestingly, these results contrast with the observations of [15], who reported that educators often perceive a lack of critical thinking practice among students at various educational levels. Similarly, another study [16] highlighted teachers' struggles in fostering critical thinking within the classroom. While these findings suggest that promoting critical thinking in an educational setting can be challenging, our study's participants seem to have an advantage in leveraging technology, which aids in the development of digital competence.

While it's possible that different circumstances could yield different results, this study reveals that students have achieved a high level of critical thinking and a moderate level in the learning dimension of digital competence, demonstrating a significant positive correlation. This underscores the profound and constructive relationship between students' critical thinking abilities and their learning capacity within the context of digital competence. It suggests that despite the challenges posed by the health emergency, students have continued to study diligently, striving for better outcomes. Moreover, this study delves into the interplay between critical thinking and the informational dimension of digital competence. It elucidates that critical thinking excels in both learning and information contexts, exhibiting robust performance. This phenomenon aligns with the notion that strengthening critical thinking involves questioning beliefs and thought processes, fostering the ability to provide well-founded, reflective arguments, as suggested by [17].

Conversely, when scrutinizing the relationship between critical thinking and the communicative dimension, a weak positive correlation emerges. In essence, as critical thinking abilities advance, communication skills follow suit, albeit without a significant impact. Similar weak and very weak positive relationships exist between critical thinking and the dimensions of digital culture. This suggests that changes in these variables might not be significant or consistent, perhaps because of unknown factors.

In 2020, researchers at a private university in Lima highlighted the significance of digital competence in cultivating knowledge and skills for students' academic and professional development. Creativity and innovation are highlighted as critical components of this development. Drawing insights from research on critical thinking in education [19] [20], it is apparent that educators must actively nurture this skill. Thus, employing strategies that foster criticality in students may be more conducive to its development. As such, teachers are instrumental in promoting reading, writing, oral expression, and debate among students, thereby empowering them to take charge of their learning and their development in critical thinking [21] [22].

Despite its contributions, this study had certain limitations, primarily concerning the application of the digital instrument, which necessitated more time. However, strengths lie in the use of a validated instrument adapted to the context, accompanied by a pilot test, and the utilization of a statistical program to assess reliability, all of which enhanced the study's validity and relevance.

5 CONCLUSION

This study reveals a substantial correlation between critical thinking and digital competence within the university student population. Put simply, most students demonstrate moderate levels of proficiency in both critical thinking and digital competence, underscoring a robust and noteworthy positive correlation between these two competencies. Consequently, as an implication of this study, there is a demand for well-designed opportunities to educate students in the optimal application of transferable research skills. Additionally, the study's outcomes highlight the need for enhancing moderate levels of critical thinking, which could be accomplished by integrating these skills into course content as recommended.

6 FINANCING

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