

# **Digital Competencies in Collaborative Learning of Students in a Public University in Lima**

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*Recently, traditional education is experiencing a digital transformation shift, caused by the Covid-19 pandemic. This process generates in students the need to strengthen digital competences through the practice of collaborative learning. The objective of the research was to determine the impact of digital competences on the collaborative learning of students at a public university in Lima. The study was a basic, causal correlational, non-experimental, cross-sectional design. The population was 1,150 undergraduate students from the School of Education of a public university in Lima and the sample consisted of 289 students. The descriptive results showed that digital competences are at a middle level (44.3%) while cooperative learning is at a regular level (36.3%). Finally, it is concluded that digital competences have a significant influence on collaborative learning, with Nagelkerke's  $R^2$  value (0.704) demonstrating that the proposed model explains this influence.*

*Keywords: digital competences, collaborative learning, online learning, higher education*

## **INTRODUCTION**

The world's population is currently undergoing a lifestyle change brought about by the Covid-19 pandemic. Although this event is accelerating the digital transformation (Bogdandy et al., 2020), it is not occurring homogeneously around the world and is creating digital and educational gaps, especially in developing countries, affecting digital competences and student learning (Mhlanga et al., 2022). In Peru, in order to ensure the continuity of university studies, universities have established criteria to monitor the

teaching of subjects through virtual education platforms (Estrada et al., 2022). Regarding this change, it has been observed that undergraduate students of the School of Education of a Public University of Lima presented deficiencies in the management of digital competences, due to the sudden change of the study modality. This situation affected the work methodology that had already been established prior to the outbreak of the pandemic. Likewise, it was noted that, as students are at home, the need to develop collaborative learning, which is manifested through efficient teamwork, has increased (Johnson and Johnson, 2014). In view of this, the following research question has been formulated: How do digital competences influence collaborative learning among students at a public university in Lima?

This research filled a gap in knowledge related to digital competences and collaborative learning of higher education students during the pandemic. The results obtained will provide support for future research, which will allow the development of strategies necessary to contribute to the improvement of learning and mastery of digital skills of university students during the post-pandemic period. For this purpose, the general objective was to determine the influence of digital competences on the collaborative learning of students at a public university in Lima. Likewise, it was also proposed as a general hypothesis: digital competences influence collaborative learning among students at a public university in Lima.

## **LITERATURE REVIEW**

In reference to previous works reviewed, we have Lordache et al. (2017) who stated that in the current context it is essential to expand digital competences, given that it is necessary to activate psychological processes for the processing of information coming from digital networks. Similarly, Novoa-Castillo and Sánchez-Aguirre (2020) suggested that the development of digital competences should be implemented, taking into consideration the high percentage of unemployment and the low rate of employability for university students, considering the work of the teacher 4.0 as fundamental. In addition, Fernandez (2020) concluded that different forms of teaching should be adopted, according to the current educational context. Therefore, technology should be considered as a means to achieve cooperative learning.

In order to understand the importance of the digital competences variable, it is necessary to mention connectivism, which according to Siemens (2005), achieves knowledge through the flow of information to the individual from outside the individual, by means of digital connections. Similarly, according to Rangel (2014), digital competences are skills that an individual possesses for a safe and efficient management of Information and Communication Technology (ICT). In addition, Lazo et al. (2016), categorize digital competences as instrumental, cognitive, attitudinal and axiological. Regarding collaborative learning, Johnson et al. (1999) define this type of learning as a methodology that relies on group work and whose purpose is the creation of knowledge and the acquisition of social skills. The dimensions of cooperative learning are positive interdependence, individual and group responsibility, stimulating interaction, interpersonal and team skills, and group processing.

## **METHODOLOGY**

The research was basic and quantitative in approach. According to Hernández-Sampieri and Mendoza, (2018), this type of research remains in the theoretical domain, using data collection and measurement, for its analysis. In addition, the design was non-experimental cross-sectional and causal correlational. According to Arroyo (2020), the purpose in this case is to determine the degree of influence of one variable on another.

### **Population, Sample and Sampling**

The population consisted of 1150 undergraduate students of the School of Education of a public university in Lima, enrolled in the 2022-I cycle. These students were receiving virtual classes during this period, which were both synchronous, through videoconferencing, and asynchronous, through activities hosted in the virtual classroom. The sample consisted of 289 students, using simple random probability sampling.

## Tools

The technique employed was the survey and the instrument for both variables was the questionnaire, consisting of 20 questions distributed in 4 dimensions: instrumental (1-5), cognitive (6-11), attitudinal (12-16) and axiological (17-20), for the digital competences variable, and 31 questions distributed in 6 dimensions: positive interdependence (1-5), individual and group responsibility (6-15), stimulating interaction (16-21), interpersonal and team skills (22-27) and group processing (28-31), for the collaborative learning variable. In both cases the Likert scale was used, with the options: (1) Never, (2) Almost never, (3) Sometimes, (4) Most of the time, (5) Always, for the questions.

## Validity and Reliability

The instrument was validated by means of expert judgment. For this purpose, we considered the analysis of three specialists in methodology, statistics and subject matter, who determined that the instrument was applicable. Similarly, for reliability, a pilot test was conducted with a sample of 20 individuals, with a Cronbach's Alpha coefficient of 0.870 for the instrument that measures digital competences and 0.780 for collaborative learning. In both cases high values were obtained, demonstrating that the instruments were reliable.

## Data Collection Procedure

Data collection was carried out through the application of a questionnaire, elaborated in a Google form, which was sent to the participants' e-mail addresses. Once the students filled out the forms, a database was created with the responses obtained in an Excel spreadsheet. The results were analyzed using the SPSS V.25 statistical program. In the statistical analysis, descriptive statistics were used to show the results of the research and inferential statistics for hypothesis testing, using ordinal logistic regression testing, given that the variables were qualitative, ordinal and non-parametric in distribution. Therefore, the Nagelkerke coefficient was used to measure how the independent variable influences the dependent variable.

## RESULTS

After the application of the instruments, data processing was carried out in order to determine the levels of digital competences and cooperative learning of the students of the School of Education, as well as to test the influence of one variable on the other.

### Descriptive Analysis

**TABLE 1**  
**DIGITAL COMPETENCES LEVELS**

Levels	Frequency	Percentage
Low	109	37.7%
Middle	128	44.3%
High	52	18.0%
Total	289	100%

As shown in Table 1, 37.7% of the university students surveyed indicated that their digital competences are at a low level, 44.3% indicated that they are at a middle level and 18.0% perceive that they are at a high level. Therefore, it could be concluded that the middle level is the dominant level.

**TABLE 2**  
**LEVELS OF THE DIMENSIONS OF THE DIGITAL COMPETENCES VARIABLE**

Levels	Instrumental		Cognitive		Attitudinal		Axiological	
	f	%	f	%	f	%	f	%
Low	100	34.6%	91	31.5%	108	37.4%	108	37.4%
Middle	118	40.8	150	51.9%	136	47.1%	133	46.0%
High	71	24.6%	48	16.6%	45	15.6%	48	16.6%
Total	289	100	289	100	289	100	289	100

*Note. f= frequency*

Table 2 shows that, regarding the instrumental dimension, 34.6% of the university students stated that they were at a low level, 40.8% at a middle level and 24.6% at a high level. In the case of the cognitive dimension, 31.5% indicated that it was at a low level, 51.9% at a middle level and 16.6% at a high level. Likewise, for the attitudinal dimension, 37.4% stated that they were at a low level, 47.1% at a middle level and 15.6% at a high level. Regarding the axiological dimension, 37.4% showed a low level, 46.0% a middle level and 16.6% a high level. It could be inferred, therefore, that the medium level is the dominant level for all the dimensions of the digital competences variable.

These results are lower than those obtained by Dávila (2022) who found that 70.4% of the students showed an advanced level in the management of digital competences. In this sense, Tsarapkina et al. (2021), specified that the efficiency of digital competences is linked to the student's attitude when using electronic educational tools, applications and online services for self-training and to achieve their professional development goals. Likewise, Tóth et al. (2022) found that students have a favorable attitude towards digital technologies, as well as towards their use in education. On the other hand, Mancha et al. (2022) assert that the pandemic caused by Covid-19 has impacted education at the technological level and it is essential that teachers also have an efficient management of digital competences so that they can create a link with the student and to be able to guide them. In addition, Ascencio et al. (2019) state that educational institutions need a standard of digital competences that go hand in hand with the concepts of internet, globalization, collaboration, digital culture among others, so that students can be trained with the competences they require to effectively address a specific situation or solve a problem based on their knowledge and skills in ICT.

**TABLE 3**  
**COLLABORATIVE LEARNING LEVELS**

Levels	Frequency	Percentage
Deficient	93	32.2%
Regular	105	36.3%
Efficient	91	31.5%
Total	289	100%

The results obtained in Table 3 indicate that 32.2% of the university students surveyed stated that collaborative learning is deficient, 36.3% indicated that it is at a regular level, and for 31.5% their perception is that it is at an efficient level. Therefore, it could be concluded that the regular level is the dominant level.

**TABLE 4**  
**DISTRIBUTION OF LEVELS OF THE DIMENSIONS OF THE COOPERATIVE**  
**LEARNING VARIABLE**

Levels	Positive interdependence		Individual and group responsibility		Stimulating interaction		Interpersonal and team skills		Group processing	
	f	%	f	%	f	%	f	%	f	%
Deficient	98	33.9%	81	28.0%	94	32.5%	79	27.3%	63	21.8%
Regular	80	27.7%	117	40.5%	86	29.8%	115	39.8%	120	41.5%
Efficient	111	38.4%	91	31.5%	109	37.7%	95	32.9%	106	36.7%
Total	289	100	289	100	289	100	289	100	289	100

Note. f= frequency

Table 4 shows that, in terms of positive interdependence, 33.9% of university students stated that they were at a deficient level, 27.7% at a regular level and 38.4% at an efficient level. In the case of individual and group responsibility, 28.0% indicated that it is at a deficient level, 40.5% at a regular level and 31.5% at an efficient level. Likewise, for the stimulating interaction, 32.5% stated that they were at a deficient level, 29.8% at a regular level and 37.7% at an efficient level. Regarding interpersonal and team skills, 27.3% showed a deficient level, 39.8% a regular level and 32.9% an efficient level. Finally, for group processing, 21.8% of the students surveyed indicated that they were at a deficient level, 41.5% at a regular level and 36.7% at an efficient level. It could be deduced, therefore, that the regular level is the dominant level for individual and group responsibility, interpersonal and team skills and group processing, while in the case of positive interdependence and stimulating interaction, the efficient level is the most predominant.

In view of these results, Zurita (2020) indicates that collaborative learning enables students to show what they learn with greater fluency. In addition, this is obtained through interaction among team members, since as students resort to socialization, they acquire, construct and transfer knowledge and what they have learned. Fernandez (2020) states that it is also important to promote student interaction by delegating responsibilities within the work team, making a group reflection and seeking heterogeneity within the groups that are formed. To this end, different forms of teaching and learning must be adapted according to the current educational context, through the use of technology and the management of digital competences. Since, as Sugino (2021) states, the pandemic caused a sudden change in the relationships between students, restricting their possibilities to connect with others. And under such circumstances, it is critical to have interactive components that generate a favorable environment for cooperative learning in the classroom. In this way, students will be able to overcome isolation, moving positively towards a new normal of online learning in higher education.

### **Inferential Analysis**

The inferential analysis test was performed to test the research hypotheses. In addition, it was established that the significance value should be less than 0.05 for the hypothesis to be accepted as valid. First, the general hypothesis was analyzed, establishing both the null and the alternative hypothesis.

***H<sub>0</sub>: Digital competences do not influence collaborative learning among students at a public university in Lima.***

***H<sub>a</sub>: Digital competences influence collaborative learning among students at a public university in Lima.***

**TABLE 5**  
**VARIABILITY TEST OF THE RESEARCH HYPOTHESIS**

Hypothesis	Variables	Log likelihood logarithm	Chi-square	Bilateral sig.	Nagelkerke R <sup>2</sup>	influence %
General hypothesis	Digital competences Collaborative learning	19.164	284,050	0.000	0.704	70.4%

As shown in Table 5, it is evident that the ordinal logistic regression test calculates a Chi-square value (284.050), with a significance value (bilateral sig. = 0.000) below 0.05. This rejects the null hypothesis and tests the research hypothesis. Furthermore, the value of Nagelkerke's R<sup>2</sup> coefficient (0.704) confirms that the regression model has a high adjustment level (70.4%) for the independent variable digital competences and its impact on the dependent variable collaborative learning.

Inferential analysis was also performed for the specific hypotheses.

*H<sub>0</sub>: Digital competences do not influence the dimensions of collaborative learning of students at a public university in Lima.*

*H<sub>a</sub>: Digital competences influence collaborative learning dimensions of students at a public university in Lima.*

**TABLE 6**  
**VARIABILITY TEST OF SPECIFIC HYPOTHESES**

Hypothesis	Variables	Log likelihood logarithm	Chi-square	Bilateral sig.	Nagelkerke R <sup>2</sup>	influence %
Specific hypothesis 1	Digital competences Positive interdependence	20.294	254.324	0.000	0.660	66.0%
Specific hypothesis 2	Digital competences Individual and group responsibility	18.079	295.020	0.000	0.722	72.2%
Specific hypothesis 3	Digital competences Stimulating interaction	20.709	248.987	0.000	0.650	65.0%
Specific hypothesis 4	Digital competences Interpersonal and team skills	18.311	270.613	0.000	0.686	68.6%
Specific hypothesis 5	Digital competences Group processing	23.452	188.717	0.000	0.544	54.4%

Table 6 shows that the significance value (Bilateral)=0.000 is less than 0.05 for all cases. This rejects the null hypothesis and tests the specific hypotheses of the research. In the case of specific hypothesis 1, Chi-square value (254.324) and Nagelkerke's  $R^2$  coefficient (0.660) indicate that the regression model presents a moderate adjustment level (66.0%). Regarding specific hypothesis 2, the Chi-square value (295.020) and Nagelkerke's  $R^2$  coefficient (0.722) show that the regression model has a high adjustment level (72.2%). Furthermore, for specific hypothesis 3, the Chi-square value (248.987) and Nagelkerke's  $R^2$  coefficient (0.650) show that the regression model has a moderate adjustment level (65.0%). For specific hypothesis 4, the Chi-square value (270.613) and Nagelkerke's  $R^2$  coefficient (0.686) show that the regression model has a moderate adjustment level (68.6%). Finally, in specific hypothesis 5, the Chi-square value (188.717) and Nagelkerke's  $R^2$  coefficient (0.544) show that the regression model has a moderate adjustment level (54.4%).

These results confirm the findings of Kwiatkowska and Wiśniewska-Nogaj (2022), who highlight the importance of digital competences in collaborative distance learning and their effectiveness in individualizing the teaching and learning process. Meanwhile, Erro-Garcés and Hernández, (2021) state that the development of digital competences allows students to work in a consensual and collaborative manner, carrying out activities that involve responsibility and decision making to achieve a common goal. Thus, Belonovskaya et al. (2022) justify collaborative student learning based on digital competences as a fundamental aspect in the educational process. In addition, Engel et al. (2023) point out that the interactive learning activities provided by digital tools enable the social exchange needed in collaborative learning. For that reason, it is important that universities develop digital competences programs for their students and continue to invest in such projects in the aftermath of the pandemic.

## **CONCLUSIONS**

We first conclude that digital competences significantly influence collaborative learning among students at a public university in Lima. Furthermore, digital competences significantly influence positive interdependence, individual and group responsibility, stimulating interaction, interpersonal and team skills, and group processing.

On the other hand, both digital competences and their instrumental, cognitive, attitudinal and axiological dimensions are at a middle level in all cases. This means that although efforts have been made to promote the use of technological tools among students, the development of their digital competences has not yet fully facilitated teamwork in the virtual classroom environment.

As for collaborative learning, it is at a regular level, as are its dimensions related to individual and group responsibility, interpersonal and team skills, and group processing. In the case of the positive interdependence and stimulating interaction dimensions, they have an efficient level. This demonstrates that students have initiative at the time of working as a group in the activities they are assigned. However, the effort made by each student when participating in the groups is not entirely equitable and more activities are delegated to some members than to others.

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