Capítulo 5

DIGITAL COMPETENCIES AND COOPERATIVE LEARNING IN NON-PRESENTIAL EDUCATION

DIGITAL COMPETENCIES AND COOPERATIVE LEARNING IN NON--PRESENTIAL EDUCATION

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Abstract: The purpose of the study was to determine the relationship between digital competencies and cooperative learning in non-presential education, basic type, quantitative approach, non-experimental, cross-sectional design. The sample consisted of 86 undergraduate students of systems engineering, simple random sampling was considered, and the instrument was a valid and reliable questionnaire. The results showed that digital competences are at a medium level (40.7%). In addition, cooperative learning is at a regular level (44.2%). It was concluded that there is a high positive direct relationship between digital competencies and cooperative learning, with a Spearman correlation coefficient of 0.775.

Keywords: Digital skills, e-learning, digitalization.

Introduction

Currently the world population is going through a change in their lifestyle, caused by the pandemic called Covid-19. This event is occurring in a very fast way, creating gaps in digital competencies and cooperative learning in the various nations. According to Unesco (2018) 95% of the

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world's population, is in a region with 2G mobile network coverage, which makes internet browsing difficult. In Peru, digital competencies, as well as cooperative learning have suffered an impact as a result of the measures dictated by Sunedu (2020), which, in order to take care of the continuity of university studies, dictated criteria to supervise the exceptional dictation of subjects through virtual education mechanisms. With regard to the above, it has been observed that at the Santo Domingo de Guzmán University, students in the first cycle of the Systems Engineering course had deficiencies in digital competencies and cooperative learning. And this situation affected the work methodology that was already established before the beginning of the pandemic. In addition, it could be observed that, in relation to digital competence, there is a deficit in the use of ICT. Similarly, it is necessary to promote criteria for critical thinking of information and to develop ethical values in the use of information and technology (Levano-Francia et al., 2019). Likewise, it was noted that, since students are at home, the development of cooperative learning, which is manifested in teamwork, has increased (Johnson et al., 1999). Given this, the following question has been formulated as a general research problem: What is the relationship between digital competencies and cooperative learning in non-presential education?

The present research allowed us to fill a gap in knowledge, which consists of determining the existence of a relationship between digital competencies and cooperative learning in non-presential education, the results obtained will serve as support for future research, which will allow the development of necessary strategies in order to contribute to the development of university students. Likewise, the research was carried out developing the quantitative approach, which allowed us to elaborate a new instrument to measure the variables. Similarly, the dimensions and indicators were defined, which allowed us to precisely define the variables.

The general objective was: to determine the relationship between digital competencies and cooperative learning in non-presential education. It was also proposed as a general hypothesis: there is a direct relationship between digital competencies and cooperative learning in non-presential education.

Theoretical framework

In reference to previous works reviewed on the digital competencies variable, Iordache et al. (2017) concluded that the analysis of the current context emphasizes the need to expand digital competencies, given the need to activate the basic psychological processes of perception, attention, memory, reflection and integration of information processing mediated by networks and the ability to share knowledge at all levels. Likewise, Lopez et al. (2020) concluded that there is a gap between current needs and the actual level of digital competencies. Although the use of ICTs has increased, the labor market and future careers demanding higher levels of digitization, dialectically, the development of artificial intelligence is looming, which will displace some jobs.

Likewise, Organista-Sandoval et al. (2017) concluded that for the case of digital competencies, it was possible to have a structure with educational purpose, focused on aspects of information management, communication, organization and of the use of technology. Likewise, Manco-Chavez et al. (2020) concluded that a significant relationship was found between the integration of ICTs to learning, allowing students to master technological tools that make them compatible with virtual education. Similarly, Handley (2018) concluded that there is a rapid development of digitization in higher education. The pace of this change reflects an understanding of the realities in which individuals are constantly learning and using digital technology.

Similarly, Zúñiga (2020) concluded that educational authorities should provide leaders in digital competencies to educational institutions, to improve teaching practice, to close the gap between teachers and students. Likewise Machuca and Véliz (2019) argued that the training of teachers in digital competencies should be promoted with the purpose of using them in the study, to strengthen student performance in their learning processes. Finally Novoa-Castillo and Sánchez-Aguirre (2020) concluded that the development of digital competencies should be implemented urgently, taking into

account the high percentage of unemployment and the low rate in employability suitable for university students, considering the work of the teacher as a teacher 4.0.

In reference to previous works reviewed on the cooperative learning variable, Fernandez (2020) concluded that cooperative learning is a fundamental factor for the academic training of university students. He indicates that different forms of teaching and learning should be adapted to the current educational context through technology, including the use of social networks. Similarly, Zakaria et al. (2010) concluded that cooperative learning improves student performance. Therefore, school teachers need to be aware of the benefits and importance of this methodology.

He (2019) concluded that college students need to strengthen their sense of cooperation and improve their comprehensive cultural quality to meet their learning needs. Also, Guevara (2014) concluded that the use of cooperative learning strategies should be deepened in students. For this, it is necessary to develop lectures, workshops or similar, with the purpose that students obtain the necessary tools for their learning and professional training. Likewise, Carbajal (2017) specified the importance of the development of workshops for the transmission of the cooperative learning strategy, with the objective that students obtain the skills for the management of digital competencies. Similarly, Acuña (2017) concluded that teachers should present activities that encourage cooperative learning, so that the student internalizes a practice, not only of knowledge learned, but of those skills necessary to interrelate with their peers. Finally Alejandro (2019) concluded that teachers should take into account the implementation of cooperative learning in the classroom as part of their strategy, therefore, it is required to forge the growth of autonomy of university students, because many researches also support that this methodology is necessary for their development in life.

Cooperative Learning

Cooperative learning, is a method of learning by forming groups, this method can produce

more understanding than individual learning methods Lestari et al. (2019). According to Johnson et al. (1999), cooperative learning is a methodology that relies on group work and whose purpose is the creation of knowledge. Likewise, according to Azorín (2018) cooperative learning drives positive habits towards diversity that increases sensitivity and empathy, cooperation, solidarity and search for the usual good, and decreases egocentrism. On the other hand, the dimensions of cooperative learning are positive interdependence, individual and group accountability, promotive interaction, interpersonal skills and group processing.

Digital competencies

According to Rangel (2015), digital competencies are the individual's skills that allow a safe and efficient use of information and communication technologies, likewise according to Kolodziejczyk et al. (2020) digital competencies have evolved in new directions to obtain new functions and more complex uses of technology. The dimensions of digital competences according to Lazo et al. (2016) are: instrumental, cognitive, attitudinal and axiological dimensions.

Materials and Methods

The research work is of a basic type and has a quantitative approach, since it is characterized by the fact that it originates in a theoretical framework and remains in it (Hernández-Sampieri et al., 2014). This type of research uses data collection and quantifies the variables to test the hypothesis, based on statistical analysis and numerical measurement. In turn, the data generated, after passing through validity and reliability standards, will derive useful conclusions for the purpose of the research.

According to Quispe, (2015), the design is non-experimental, because the study is developed

without interacting directly on the variables and the phenomena are examined just as they are presented in a specific scenario. Likewise, it is cross-sectional because the observation was carried out in a specific time interval.

Similarly, the research is correlational. Bilbao and Escobar (2020) maintain that the purpose of this type of research is to measure the degree of relationship between the variables studied, this correlation is established in the same context and will be supported by hypotheses that will be subjected to statistical tests.

Population, sample and sampling

The population consisted of 110 students enrolled in the introductory course, who are in the first cycle of the Systems Engineering course at the Faculty of Engineering of the Universidad Santo Domingo de Guzmán, whose ages range from 20 to 25 years, being male and female. The sample consisted of 86 undergraduate students, in the 2020-II academic period, who are in the first cycle of the course in question.

Figure 1

Sample size calculation

$$n = \frac{Z^2.P.Q.N}{\varepsilon^2(N-1) + Z^2P.Q}$$

Where: Z is 1.96 (for 95% confidence level), ε is 0.05 (estimation error), P is 0.50, Q is 0.50 and N is 110 (population). Replacing it is obtained as a sample, that "n" is equal to 86 students.

A simple random probability sampling was used, since this type of sampling "assigns the same probability of being chosen to each and every possible sample" (Gutiérrez and Vladimirovna,

2016: 10 ff.).

Instruments

The technique used to collect data on both variables was the survey, defined by Wolf, et al. (2016), as a methodology organized to compile information from a sample of entities with the purpose of elaborating quantitative descriptors of the qualities of the population to which they belong. The instrument used was the questionnaire for both variables in a virtual manner, through a form that was sent to the e-mails of the students who were subjects of the study. These forms consisted of 31 questions distributed in 6 dimensions: positive interdependence (1-5), individual accountability (6-11), group accountability (12-15), promotive Interaction (16-21), interpersonal skills (22-27) and group processing (28-31), for the cooperative learning variable and 20 questions distributed in 4 dimensions: instrumental (1-5), cognitive (6-11), attitudinal (12-16), and axiological (17-20), for the digital competences variable. In both cases the Likert scale was used, with the following options: (1) Never, (2) Almost never, (3) Sometimes, (4) Almost always, (5) Always, for the questions.

Validity and reliability

Validity was done through expert judgment to determine the suitability of the instruments, determining the content validity, through the analysis of the belongingness and clarity of each of the items of the questionnaires. According to Galicia et al. (2018), expert judgment is the opinion of prominent people, with extensive experience in the topic in question. Therefore, analysis of 3 experts from the specialties of methodology, statistics and subject matter, who determined to be applicable, was considered.

According to Warrens (2015) Cronbach's alpha coefficient is an estimate of the reliability between the correlation of variables that are part of a scale. That is why, this coefficient was used to

measure reliability, conducting a pilot test with a sample of 20 individuals, being the Cronbach's alpha coefficient for the instrument that measures digital competencies 0.898 and for the instrument that measures cooperative learning 0.942. In both cases it has very high values.

Data collection procedure

The database was prepared using Excel and SPSS Statistics V25.0 software. For the analysis of the information, descriptive and inferential statistics were used. The descriptive analysis was developed with frequency tables and graphs, while the inferential analysis was performed by means of a hypothesis test, measuring the level of correlation between the variables and determining the level of significance by means of Spearman's correlation coefficient. First, the inferential analysis of the general hypothesis was performed, examining the relationship between the first and second variables. Then, the analysis of the specific hypotheses was performed, examining the relationship between the dimensions of the first and second variables.

Results and discussions

A descriptive analysis was carried out to determine the results of the questionnaires on cooperative learning and digital competencies, using cross-tabulations.

Table 1

Descriptive analysis of cooperative learning and digital competencies

			Digital competencies			
			Low	Medium	High	Total
Cooperative learning	Deficient	Count	15	7	0	22
		% of Total	17.4%	8.1%	0.0%	25.6%
	Regular	Count	3	25	10	38

		% of Total	3.5%	29.1%	11.6%	44.2%
	Efficient	Count	0	3	23	26
		% of Total	0.0%	3.5%	26.7%	30.2%
Total		Count	18	35	33	86
		% of Total	20.9%	40.7%	38.4%	100.0%

Note. This table shows the results of the questionnaire between cooperative learning and digital competencies.

From the results obtained in Table 1, it can be seen that 25.6% of the respondents stated that the level of cooperative learning was deficient. Of these, 17.4% obtained a low level of digital competencies, 8.1% a medium level and none a high level. Likewise, it can be seen that 44.2% of the respondents stated that the level of cooperative learning was regular. Presenting 3.5% of the respondents, a low level of low digital competences, 29.1% a medium level and 11.6% a high level. In addition, it was observed that 30.2% of the respondents stated that the level of cooperative learning was efficient. Of which, none presented a low level of digital competencies, 3.5% obtained a medium level and 26.7% a high level.

Table 2

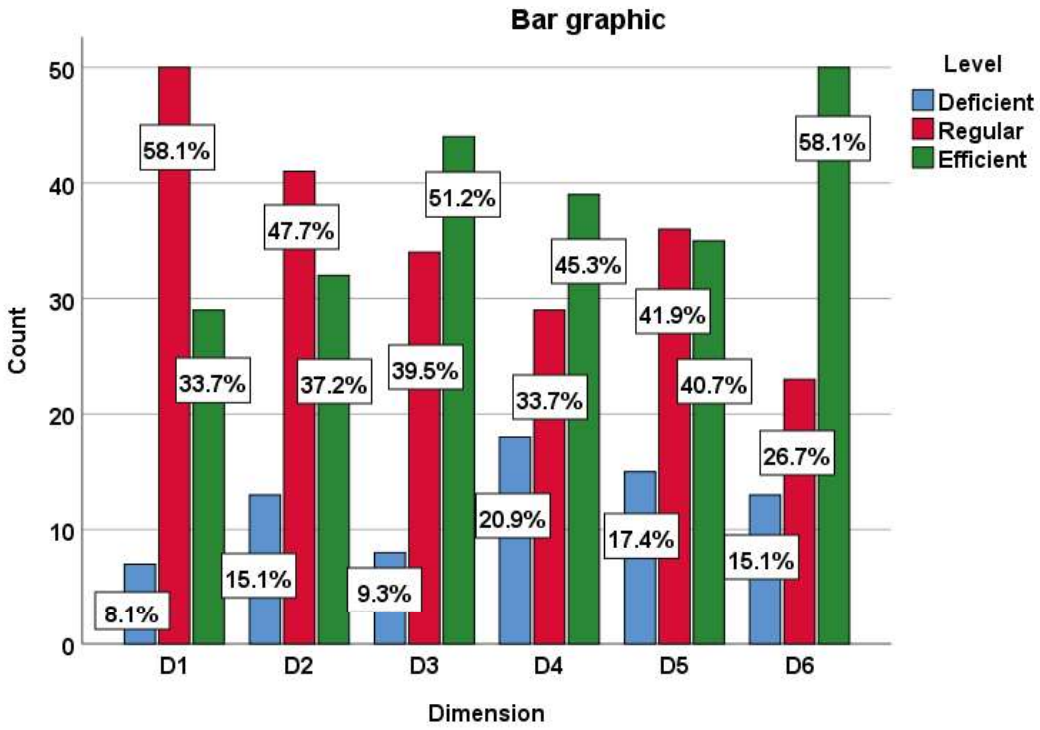
Distribution of levels of the dimensions of the cooperative learning variable

Level	D1		D2		D3		D4		D5		D6	
	C	%	C	%	C	%	C	%	C	%	C	%
Deficient	7	8.1	13	15.1	8	9.3	18	20.9	15	17.4	13	15.1
Regular	50	58.1	41	47.7	34	39.5	29	33.7	36	41.9	23	26.7
Efficient	29	33.7	32	37.2	44	51.2	39	45.3	35	40.7	50	58.1
Total	86	100	86	100	86	100	86	100	86	100	86	100

Note. This table shows the results of the levels of the dimensions of the cooperative learning variable.

Figure 2

Results of the distribution of levels of the dimensions of the cooperative learning variable



Note. This image shows the distribution of levels of the dimensions of the cooperative learning variable.

Regarding the dimensions of the cooperative learning variable, according to Table 2 and Figure 2, it can be seen that 8.1% of the university students surveyed obtained a deficient level of positive interdependence (D1), 58.1% a regular level and 33.7% an efficient level. For individual accountability (D2), 15.1% of the respondents obtained a deficient level, 47.7% a regular level and 37.2% an efficient level. For group accountability (D3), 9.3% of the respondents achieved a deficient level, 39.5% a regular level and 51.2% an efficient level. Likewise, for promotive interaction (D4), 20.9% of the respondents had a deficient level, 33.7% a regular level and 45.3% an efficient level. In addition, for interpersonal skills (D5), 17.4% of the respondents reached a deficient level, 41.9% a regular level

and 40.7% an efficient level. Finally, for group processing (D6), 15.1% had a deficient level, 26.7% a regular level and 58.1% an efficient level.

After the descriptive analysis, we proceeded to perform the inferential analysis, with the purpose of contrasting the hypotheses proposed. For this reason, Spearman's correlational analysis was performed, with the following rule: H0 (null hypothesis) and H1 (alternative hypothesis). And as significance level (p): If $p<0.05$ then H0 is rejected and H1 is accepted, if $p>0.05$ then H0 is accepted and H1 is rejected.

H0: There is no direct relationship between digital competencies and cooperative learning in non face-to-face education.

H1: There is a direct relationship between digital competencies and cooperative learning in non face--to-face education.

Table 3

Correlation between digital competencies and cooperative learning

		Digital competencies
Cooperative learning	Correlation Coefficient	0.775**
	Sig. (2-tailed)	0.000
	N	86

** Correlation is significant at the 0.01 level (2-tailed).

Table 3 shows that the Spearman's rho correlation coefficient obtained at a significance level of 0.01 was 0.775, which shows that there is a high positive correlation. It is also observed that the degree of significance obtained is less than 0.05 (0.00 < 0.05), therefore the null hypothesis is rejected

and the alternative hypothesis is accepted. That is, there is a direct relationship between digital competencies and cooperative learning in non-presential education.

Table 4

Correlation between digital competences and cooperative learning dimensions

			Digital competences
Spearman's rho	Positive interdependence	Correlation Coefficient	0.459**
		Sig. (2-tailed)	0.000
	Individual accountability	Correlation Coefficient	0.528**
		Sig. (2-tailed)	0.000
	Group accountability	Correlation Coefficient	0.564**
		Sig. (2-tailed)	0.000
	Promotive Interaction	Correlation Coefficient	0.569**
		Sig. (2-tailed)	0.000
	Interpersonal skills	Correlation Coefficient	0.710**
		Sig. (2-tailed)	0.000
	Group processing	Correlation Coefficient	0.647**
		Sig. (2-tailed)	0.000
		N	86

**. Correlation is significant at the 0.01 level (2-tailed).

For the analysis of the positive interdependence dimension, the Spearman's rho coefficient was 0.459. This shows that there is a moderate positive correlation. It is also observed that the degree of significance obtained is less than 0.05 (0.000 < 0.05), therefore the null hypothesis is rejected and the alternative hypothesis is accepted. That is, there is a direct relationship between digital competencies and positive interdependence in non-face-to-face education. For the analysis of the individual

accountability dimension, the Spearman's rho coefficient was 0.528. This shows that there is a moderate positive correlation. Similarly, it is observed that the degree of significance obtained is less than 0.05 (0.000 < 0.05), therefore the null hypothesis is rejected and the alternative hypothesis is accepted. That is, there is a direct relationship between digital competencies and individual accountability in non-classroom education. For the analysis of the group accountability dimension, Spearman's rho coefficient was 0.564. This shows that there is a moderate positive correlation. Similarly, it was observed that the degree of significance obtained is less than 0.05 (0.000 < 0.05), therefore the null hypothesis is rejected and the alternative hypothesis is accepted. That is, there is a direct relationship between digital competencies and group accountability in non-presential education.

Likewise, for the analysis of the promotive interaction dimension, Spearman's rho coefficient was 0.569. This shows that there is a moderate positive correlation. Likewise, the degree of significance obtained was less than 0.05 (0.000 < 0.05), therefore the null hypothesis is rejected and the alternative hypothesis is accepted. That is, there is a direct relationship between digital competencies and promotive interaction in non-presential education. For the analysis of the interpersonal skills dimension, Spearman's rho coefficient was 0.710. This shows that there is a high positive correlation. Likewise, the degree of significance obtained was less than 0.05 (0.000 < 0.05), therefore the null hypothesis is rejected and the alternative hypothesis is accepted. That is, there is a direct relationship between digital competencies and interpersonal skills in non-presential education. Similarly, for the analysis of the group processing dimension, Spearman's rho coefficient was 0.647. This shows that there is a moderate positive correlation. Likewise, the degree of significance obtained was less than 0.05 (0.000 < 0.05), therefore the null hypothesis is rejected and the alternative hypothesis is accepted. That is, there is a direct relationship between digital competencies and group processing in non-presential education.

According to the descriptive results of the digital competencies variable, it was observed that these results are similar to the research proposed by Zúñiga (2020). Her results were low in digital

competencies in 55.0%, 35.0% were medium and 10.0% were high. In this research, emphasis was placed on the deficient ICT skills of teachers and students. Despite the years since digital competencies were introduced, ICT have not been accepted as one of the valid processes of academic training at all levels of education. As indicated by Rangel (2014), digital competencies allow a safe and efficient use of ICT. And considering that the research was developed within a context of social isolation and digitization of education, it was obtained that 38.4% of respondents stated that digital competencies were high.

Similarly, with respect to the descriptive results of the cooperative learning variable, it was observed that these contrasted with the research proposed by Carbajal (2017), in relation to cooperative learning and generic competencies. Their results were of deficient level in cooperative learning in 43.3%, 54.0% mentioned that it was regular and for 2.7% it was efficient. It could be seen that Carbajal's research environment was face-to-face, unlike the present research, which has more tools to enhance this study methodology, such as forums to interact with students, toolboxes to increase self-knowledge through Power Point presentations. According to Johnson et al. (1999), cooperative learning is a methodology that is based on teamwork and has as its objective the construction of knowledge and the acquisition of competencies and social skills. And taking into account the new coexistence as a result of the pandemic, it was obtained that 30.2% of the respondents stated that cooperative learning was efficient.

In relation to the inferential results of the general hypothesis, it was corroborated that these results agree with the study of Carbajal (2017), where a correlation level of 0.727 was obtained, also obtaining a high positive correlation. Similarly, the study by Acuña (2017) yielded results of correlation degree 0.501, obtaining a moderate positive correlation. In the aforementioned cases, the significance level was less than 0.05.

According to the descriptive results of the positive interdependence dimension, it was observed that these results are similar to the research proposed by Guevara (2014). Her results were of de-

ficient level in positive interdependence in 1.2%, 37.6% mentioned that it was regular and 61.2% was efficient. These results are similar because of the virtualization of education that allows in a synchronous and asynchronous way to be able to perform academic work. In relation to the inferential results, it was corroborated that these results contrast with those of Guevara (2014), where the significance level obtained was 0.193 being a very low positive correlation. Considering the research scenarios, a higher correlation coefficient can be appreciated in the research developed, since the respondents had a better perception of positive interdependence and were not limited by the factors of time and availability.

Similarly regarding the descriptive results of the individual accountability dimension, these results contrasted with the research raised by Guevara (2014). His results were of deficient level in individual accountability in 1.2%, 45.9% was regular and 52.9% was efficient. It could be seen that, the environment of the present research facilitates the delivery of work and attendance to the teaching sessions since the virtual classrooms are available 24 hours a day in order to be able to deliver the students' work. In relation to the inferential results, these results contrast with those of Guevara (2014), where the significance level obtained was 0.141 being a very low positive correlation.

Likewise, regarding the descriptive results of the group accountability dimension, it was observed that these results contrasted with the research proposed by Carbajal (2017). His results were of deficient level in group accountability in 36.0%, 62.0% were regular and 2.0% were efficient. It could be appreciated that, the research environment that Carbajal conducted was presential, unlike the present research and the respondents mostly indicated their conformity with the facility allowed by the digitization of education. In relation to the inferential results, it was corroborated that these results are similar to the research by Carbajal (2017), where there is also a direct correlation, but at a correlation level of 0.304, reaching a low positive correlation. Considering the research scenarios, a higher correlation coefficient could be appreciated in the present research, since the respondents perceived a higher level of acceptance to the creation of groups and the use of virtual teaching tools.

Similarly, regarding the descriptive results of the promotive interaction dimension, it was observed that these results contrasted with the research proposed by Guevara (2014).Their results were of deficient level in promotive interaction in 2.4%, 31.8% were regular and 65.9% were efficient. It could be seen that, the research environment that Guevara conducted was face-to-face and in a context different from the current one, unlike the present research where the use of technological resources, such as virtual library repositories, was facilitated. In relation to the inferential results, these results are contrasted to the research of Guevara (2014), where the significance level obtained was 0.165 being a very low positive correlation. Considering the research scenarios, a higher correlation coefficient can be appreciated in the research developed, since the respondents perceived greater recognition and motivation of the group.

Similarly, regarding the descriptive results of the interpersonal skills dimension, these results were contrasted with the research proposed by Carbajal (2017). His results were of deficient level in interpersonal skills in 50.7%, 46.7% were regular and 2.7% were efficient. It could be appreciated that, the research environment that Carbajal conducted was face-to-face and in a context different from the current one, unlike the present research that facilitated the communication of the members of the work teams since it was not limited by time and space. In relation to the inferential results, it was corroborated that these results are similar to the research of Carbajal (2017), where there is also a direct correlation between interpersonal skills and generic competencies, but at a correlation level of 0.607, reaching to obtain a moderate positive correlation. Considering the research scenarios, a higher correlation coefficient can be appreciated in the present research, since the respondents perceived a better organization for teamwork.

Finally, regarding the descriptive results of the group processing dimension, it was observed that these results are contrasted with the research raised by Guevara (2014). His results were of deficient level in group processing in 1.2%, 28.2% were regular and 70.6% were efficient. It could be seen that Guevara sought to strengthen the group processing, thus achieving a higher perception

on the part of the students. In relation to the inferential results, it was corroborated that these results contrast with the research of Guevara (2014) where the correlation level was 0.038, reaching a very low positive correlation. Considering the research scenarios, a higher correlation coefficient can be appreciated in the present research, since the respondents perceived a more efficient way with the use of technological resources in order to be able to develop online evaluations.

Conclusions

First

It was determined that there is a direct relationship of 0.775, being very high positive, with a significance level of 0.00 ($p< 0.05$), between digital competencies and cooperative learning non--presential education. Similarly, digital competencies are at a medium level (40.7%), and cooperative learning is at a regular level (44.2%).

Second

It was determined that there is a direct relationship of 0.459, being moderate positive, with a significance level of 0.00 ($p< 0.05$), between digital competencies and positive interdependence in non-presential education. Similarly the positive interdependence is at a regular level (58.1%).

Third

It was determined that there is a direct relationship of 0.528, being moderate positive, with a significance level of 0.00 ($p< 0.05$), between digital competencies and individual accountability in non-presential education. Similarly, individual accountability is at a regular level (47.7%).

Fourth

It was determined that there is a direct relationship of 0.564, being moderate positive, with a significance level of 0.00 (p< 0.05), between digital competencies and group accountability in non--presential education. Similarly, group accountability is at an efficient level (51.2%).

Fifth

It was determined that there is a direct relationship of 0.569, being this moderate positive, with a significance level of 0.00 (p< 0.05), between digital competencies and promotive interaction in non-presential education. Similarly, the promotive interaction is at an efficient level (45.3%).

Sixth

It was determined that there is a direct relationship of 0.710, being this high positive, with a significance level of 0.00 (p< 0.05), between digital competencies and interpersonal skills in non-presential education. Similarly, interpersonal skills are at a regular level (41.9%).

Seventh

It was determined that there is a direct relationship of 0.647, moderate positive, with a significance level of 0.00 (p< 0.05), between digital competencies and group processing in non-presential education. Likewise, group processing is at an efficient level (58.1%).

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