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Personal Factors Associated with Digital Competencies in University Students in the Context of Pandemic

Abstract

The present research aimed to establish the association between personal factors (age, sex, hours connected and school of origin) and the digital competencies of university students, which have been originated and developed with a greater degree of intensity during the pandemic, generating as a consequence the need for distance education. The study was basic, explanatory, and quantitative, with a non-experimental and cross-sectional design. The sample consisted of 1242 students of the Faculty of Medicine from the tenth to the fourth cycle: 658 males (53.0%) and 584 females (47.0%). A probabilistic sampling by strata was performed and the questionnaire of Gutiérrez et al. (2017), an instrument for the evaluation of the digital competence of the university student with a reliability of 0.997, was used. It was concluded that personal factors are associated with digital competencies in students of a private university because the personal factors of sex, age, school of origin and hours connected to social networks presented $p < 0.05$. Regarding descriptive results, 52.3% of male students presented ineffective level. Of students aged 22 years or younger, 58.2% presented an ineffective level. It was observed that 57.7% of the students who come from private schools presented an ineffective level, and 57.1% of the students who connect for 3 hours or less presented an ineffective level.

Keywords: Digital Competencies, Age, Gender, Hours Connected, Pandemic.

Introduction

According to the World Health Organization (2020), the so-called COVID-19 is an infectious disease produced by a type of coronavirus, which is distinguished by scientists as SARS-CoV-2. The WHO learned about the presence of COVID-19 on December 31, 2019 after receiving information from the city of Wuhan, located in the People's Republic of China, about some cases such as "viral pneumonia". Similarly, Diaz and Toro (2020) referred to COVID-19 as a condition with a high degree of transmissibility and a case fatality rate that varies from low to moderate, which depends

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more on comorbidities and the geographical situation of the place where it occurs.

With the presence of this new disease, the Government has implemented health measures such as the mandatory suspension of on-site academic activities in order to protect the health of students, teachers and the general population. In view of this, and in order to guarantee the continuity of education, new teaching modalities were proposed, which consist of providing educational content at a distance through the implementation of new educational prototypes such as that offered virtually (Vivanco, 2020). However, for a better understanding of what this recently added modality entails, it is necessary, in the first instance, to have knowledge of what the concept of education involves and its various implications.

The digital competences during the formation of the individual will allow the empowerment of this in relation to intrinsic social aspects such as politics, economy, employability; also aspects of the new cultural and entertainment trends in the present century. They constitute an extremely important instrument that allows the development of attitudes, knowledge and processes, enabling teachers to acquire skills that facilitate the transfer of knowledge and generate innovation (Marzal and Cruz, 2018).

For such reason, we must emphasize, in parallel that outside an academic institution students can learn in diverse contexts. Faced with these new scenarios, informal or self-managed learning has been enhanced in recent years. Due to the ease in the extraction of pedagogical resources, these tools will allow to focus on an own and reconstructive learning construct, complementary a priori to the educational class. Likewise, we must highlight the simplicity in the global interaction in the communities -groupings where they share the same particular purpose-, allowing an edifying interaction without losing their own and collective identity (López and Sevillano, 2020).

We live in a reality in which social networks are the most influential means of communication, especially in the daily life of the new generations. This, consequently, entails new lifestyles, new methods of information processing, exchange and expression of communication, among others (Sinéctica, 2013). Today's youth remains fixedly connected to social networks, where there is a great saturation of information thanks to platforms such as Facebook, Twitter, WhatsApp, among others. Rarely is attention focused on a single task; for example, a young person does their university homework, but next to it they have Facebook active from their cell phone or even watch television at the same time they are doing academic tasks. This is due to the fact that there is a great demand for social networks. In the absolute, these actions are not beneficial for the student because they could alter their patience and anxiety control, added to the lack of learning strategies (Sinéctica, 2013).

Being in "multitasking" mode (multiple attention) does not help to build the same knowledge as focused attention, since dividing our attention can become a functional behavior and, although doing two or more things at once may seem useful to some extent, continuously, and in the long term, it becomes a stress-led lifestyle, compromising the quality of thinking and decision making (Synectica, 2013). Therefore, it is important to highlight that, when people go through situations of uncertainty and tension on a daily basis, the best tools and resources are totally linked to the ability to focus attention to all aspects and indicators, central and peripheral, that condition it. Being in multiple attention or multitasking mode serves to have short-term knowledge (momentarily), while focused attention (sequential, reflective and deductive) is, on the contrary, the most appropriate tool in the short, medium and long term, making the person capable of reflecting on that knowledge (Sinéctica, 2013).

Personal Factors

Personal factors are personal qualities that serve to predict certain behavior in specific situations. These are classified into biological, psychological and sociocultural personal factors. Biological factors include age, body mass, strength, agility, balance, among others. Psychological factors include self-esteem, self-motivation and self-perception. Finally, sociocultural personal factors include race, ethnicity, education and socioeconomic status. Within the wide variety of existing personal factors, for the purposes of this research, gender, socioeconomic and age of the students were analyzed.

The gender gap is one of the most important issues addressed in Peruvian and international society in recent decades. The privileged position historically inherited by men in different aspects also influences the possibilities of women's performance in society. Laws in favor of gender parity for important positions, both in the public and private sectors, reinforce the struggle for equality. However, the United Nations (2020) has indicated that, worldwide, and as a consequence of the impact of COVID-19 on the economy, it is estimated that women have a 9.1% higher incidence of poverty, in contrast to the 2.7% decrease that was expected before the outcome of the global crisis for the period 2019-2021. It is in this sense that, as a consequence of the lack of prominence that women have had over the last decades in jobs, mastery of digital tools is required

(Vásquez-Cano et al., 2017); the persistence of a gender gap is associated with less access to technological tools and lack of digital competence.

A third personal factor is age. In this regard, there is currently a stereotype: young people are naturally more skilled in knowledge and use of new technologies. In this regard, Hauk et al. (2018) concluded that this stereotype is true for certain uses given to certain technologies. On the other hand, Barrantes et al. (2016) concluded that, in Metropolitan Lima, the ability to use technologies, except in the case of adult women and older adults, is not superior for a specific age group; rather, it changes and adapts throughout the stages of life according to the needs of the social position. For the present study, five-year age ranges are used, a criterion taken into account in previous studies.

Conceptualization of Digital Competence

Digital competence is a transversal issue to almost all disciplines in order to cover a wider coverage of these and make them more accessible, functional and adaptive. With this premise, Centeno and Cubo (2013), in a study conducted with students of Psychopedagogy in the virtual and face-to-face modalities, discovered a "deficit" in relation to virtual competencies, noting, however, that ICTs were better understood and functioned among the students themselves, since most of these were used in the university environment. Also, in the study by Castellanos et al. (2017), a level not expected in those considered "digital natives" is evident. The respondents were primary level magisterial university students, where the majority stated using traditional programs without getting to the point of knowing Web 2.0 or new programs that have been updated with the growth of the Internet, even though 90 % had all the tools at their fingertips on their computer or cell phone.

Digital Era

The theoretical approach to connectivism is connectivism, this being a theoretical proposal complementary to the current theories in the educational field (Gašević et al., 2015). Siemens (2019) stated that the learning theories recognized in academia, behaviorism, cognitivism and constructivism, have a common orientation among them, in the sense that they are widely used in the educational field; however, from the current perspective, the technological component is a gravitating factor in the different sectors of society and, especially, in the learning process.

Connectivism is the learning theory of the digital era that analyzes the way in which we learn in a networked digital society. As its name suggests, it is based on connectivity; that is, on the creation of connections. According to Siemens (2004), connectivism is the integration of principles explored by the theories of chaos, networks, complexity and self-organization. Hence, it is presented as a model that reflects a society in which learning is no longer an individual activity, but a continuous process of network construction. Learning becomes equivalent to opening a door to a new way of perceiving and knowing, where our mind must adapt to the environment.

The digital era has impacted both students and teachers. Digital platforms have undoubtedly become a great tool and source of information. Some people even believe that, in the not too distant future, virtual networks will replace educational teachings. On the other hand, it is a fact that, with the arrival of computers and technological devices, schools have changed the concept of the classroom as a pedagogical space, the curriculum and the meaning of student-teacher interaction processes.

This requires the latter to educate themselves and integrate digital technology into their teaching methodology (Sinéctica, 2013). The modernization of schools has been another global impact, since it not only meant the implementation of devices and infrastructures that allow network communication; but, in turn, the adaptation to these meant an advantage, since the new tools will be used to develop the old tasks in a faster, cheaper and more efficient way (Sinéctica, 2013).

Importance of Digital Competence in University Students

Gómez and Huertas (2019) conducted a research on the importance of digital competence for overcoming the language gap in the 21st century. Among the conclusions of the study, it is highlighted that socioeconomic difficulties are a fundamental factor that increases the language gap for an autonomous second language learning context and that it is necessary to ensure free access to online resources, since digital competence is the umbrella that allows users to take full advantage of these resources. In the same vein, He and Zhu (2017) examined the effects of digital competence and personal factors on digital informal learning in university students in China. This study, with a cross-sectional design and quantitative approach, applied the iDCA (Instant Digital Competence Assessment) instrument to 235 students to confirm the association between digital competence and informal digital learning. The study concludes that digital competence is

associated with a greater interest in informal digital learning. In addition, there is a gender difference at the subcomponent level, which does not necessarily indicate that one gender is more digitally competent than the other.

Dimensions of Digital Competence

According to Gutiérrez et al. (2017), digital competence has six dimensions that every university student must develop for the achievement of ubiquitous learning, being obliged to acquire them even more in the current pandemic context. Such dimensions are:

(a) Creativity and innovation. Students demonstrate creative thinking, construct knowledge and develop innovative products and processes using ICTs.

b) Communication and collaboration. Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others.

c) Research and information management. Students apply digital tools to obtain, evaluate, and use information.

d) Critical thinking, problem solving and decision making. Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions, using appropriate digital tools and resources.

e) Digital citizenship. Students understand the human, cultural, and social issues related to ICT and practice legal and ethical behaviors. Set of understanding, skills and behaviors essential for girls, boys, young people and adults develop in a democratic group through the technological realization of information and communications, in a sensible, accurate, moral, honest, autonomous and collaborative way, performing and identifying their digital rights and understanding the impact of these in their personal sphere and in their surroundings.

f) Functioning and concepts of ICT. Students demonstrate an adequate understanding of ICT concepts, systems and functioning.

Materials and Methods

The present research is of a basic and explanatory level. According to Sánchez and Reyes (2015), a basic research attempts to respond to theoretical or substantive problems, thus being focused on orienting, predicting or describing reality with the purpose of elaborating a scientific theory, and does not have specific practical purposes. Regarding the explanatory level, Hernández-Sampieri and Mendoza (2018) indicate that studies at this level are aimed at explaining the causes of a phenomenon or the relationship between two or more variables.

Research Design

The present research is of a non-experimental cross-sectional design. Hernández-Sampieri and Mendoza (2018) argue that a research with this quantitative design does not intentionally manipulate the independent variable to alter its effect on other variables. In that sense, it is also cross-sectional, as the data were measured at a single point in time.

The participants were students from the Faculty of Medicine of a private university from the tenth to the fourth cycle. The sample comprised 1242 university students and the sampling was probabilistic by strata. The total number of students selected was 658 males (53.0%) and 584 females (47.0%). The technique was the survey and the instrument, the questionnaire conducted by Gutiérrez et al. (2017), which measures the digital competence of university students. This consists of six dimensions with 44 items, with a reliability of 0.997, according to Cronbach's Alpha. The statistical test chosen for the study was Pearson's Chi-square with a significance level of 0.05.

Results

Table 1.

Distribution of levels of the dimensions of the digital competence variable

Levels	Creativity and innovation	Comunication and colaboration	Investigation and information management	Critical thinking, problem solving and decision making	Digital citizenship	TICS concepts and operation
		%	F	%	F	%
Ineffective	72.3	71.1	78.7	79.9	81.9	80.7
Moderate	27.5	28.4	20.8	19.5	17.5	18.8
Effective	0.2	0.5	0.5	0.6	0.6	0.6
Total	100,0	100,0	100,0	100,0	100,0	100,0

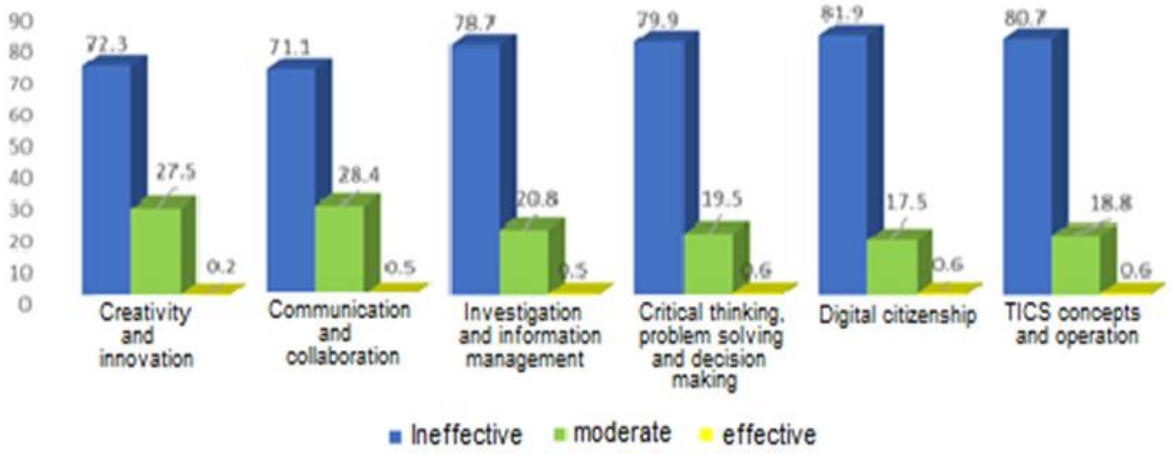

Figure 1.

Distribution of levels of the dimensions of the digital competency variable

In Table 1 and Figure 1, with respect to the creativity and innovation dimension, it was found that 72.3% of students presented an ineffective level; 27.5%, a moderate level; and 0.2%, an effective level. Regarding the communication and collaboration dimension, it was found that 71.1% of students presented an ineffective level; 28.4%, a moderate level and 0.5%, an effective level. Regarding the research and information management dimension, it was found that 78.7% of students presented an ineffective level; 20.8%, a moderate level; and 0.5%, an effective level. Regarding the dimension critical thinking, problem solving and decision making, it was found that 79.9% of students presented an ineffective level; 19.5%, a moderate level and 0.6%, an effective level. Regarding the digital citizenship dimension, it was found that 81.9% of students presented an ineffective level; 17.5%, a moderate level and 0.6%, an effective level. Finally, regarding the ICT functioning and concept dimension, it was found that 80.7% of students presented an ineffective level; 18.8%, a moderate level and 0.6%, an effective level.

Table 2.

Distribution of digital competence levels according to gender

			Sex		**Total**
			Male	**Female**	
Digital Competence	Ineffictive	Count	649	312	961
		% of total			
		% of total	52,3%	25,1%	77,4%
	Moderate	Count	7	265	272
		% of total			
		% of total	0,6%	21,3%	21,9%
	Effective	Count	2	7	9
		% of total			
		% of total	0,2%	0,6%	0,7%
Total		Count	658	584	1242
		% of total			
		% of total	53,0%	47,0%	100,0%

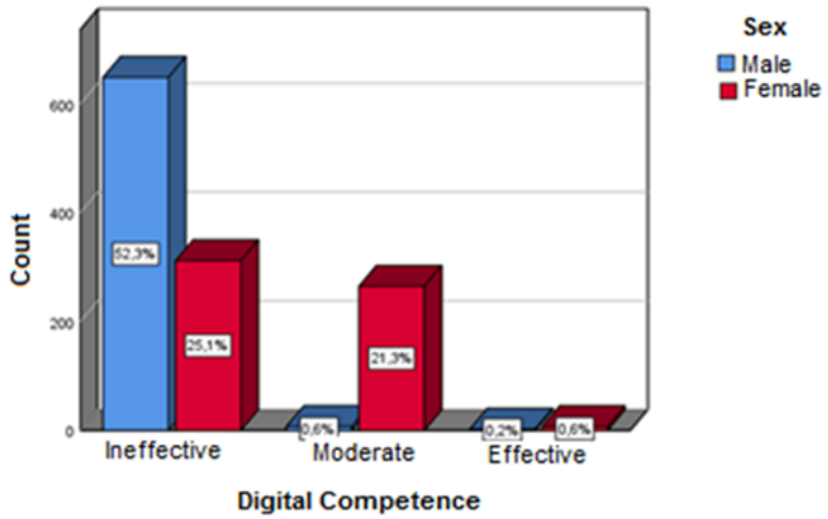

Figure 2.

Distribution of digital competence levels according to sex

Table 2 and Figure 2 show that 52.3% of male students presented an ineffective level, 0.6% a moderate level and 0.2% an effective level, while 25.1% of female students presented an ineffective level, 21.3% a moderate level and 0.6% an effective level of digital competencies.

Table 3.

Distribution of digital competence levels according to age

			Age			
			<22	23-25	>26	Total
Digital Competence	Ineffective	Count	723	222	16	961
		% of total	58,2%	17,9%	1,3%	77,4%
	Moderate	Count	20	221	31	272
		% of total	1,6%	17,8%	2,5%	21,9%
	Effective	Count	0	2	7	9
		% of total	0,0%	0,2%	0,6%	0,7%
Total		Count	743	445	54	1242
		% of total	59,8%	35,8%	4,3%	100,0%

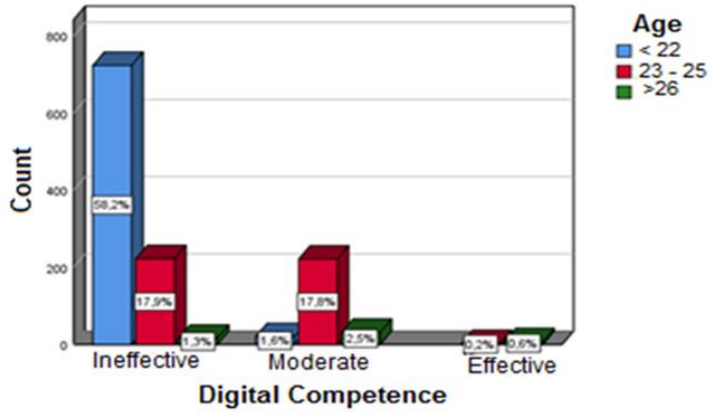

Figure 3.

Distribution of digital competence levels according to age

In Table 3 and Figure 3, it is observed that, of the students aged 22 years or younger, 58.2% presented ineffective level; 1.6%, moderate level; of the students aged 23 to 25 years, 17.9% presented ineffective level and 0.2%, effective level; and of the students older than 26 years, 1.3% presented ineffective level; 2.5%, moderate level and 0.6%, effective level of digital competence.

Table 4.

Distribution of levels of digital competence according to school of origin

			School of origin		Total
			Private	Public	
Digital Competence	Ineffective	Count	717	244	961
		% of total	57,7%	19,6%	77,4%
	Moderate	Count	16	256	272
		% of total	1,3%	20,6%	21,9%
	Effective	Count	2	7	9
		% of total	0,2%	0,6%	0,7%
Total		Count	735	507	1242
		% of total	59,2%	40,8%	100,0%

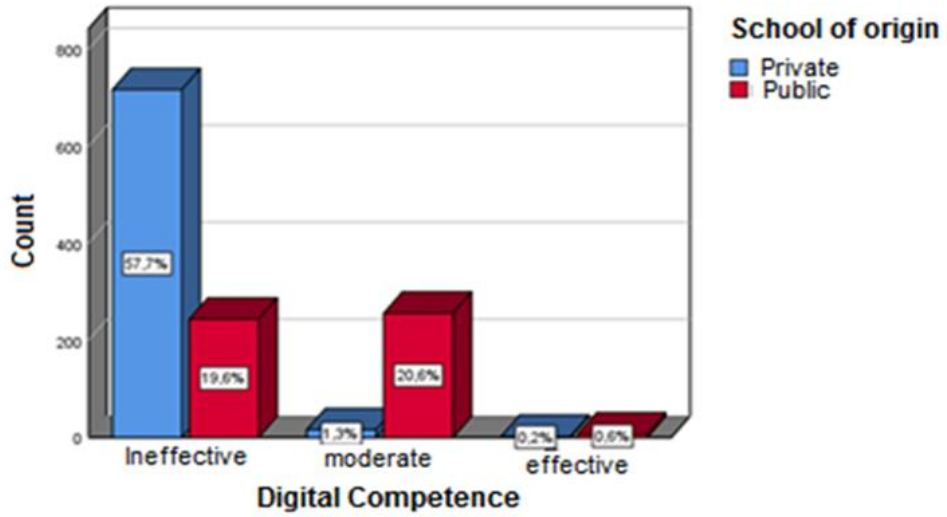

Figure 4.

Distribution of levels of digital competence according to school of origin

In Table 4 and Figure 4, it was observed that of the students coming from private schools, 57.7% presented ineffective level; 1.3%, moderate level and 0.2%, effective level and, of the students from public schools, 19.6% presented ineffective level; 20.6%, moderate level and 0.6%, effective level of digital competencies.

Table 5.

Distribution of levels of digital competence according to hours online

			Hours online			Total
			>3	4-6	<7	
Digital Competence	Ineffective	Count	709	220	32	961
		% del total	57,1%	17,7%	2,6%	77,4%
	Promedium	Count	20	180	72	272
		% of total	1,6%	14,5%	5,8%	21,9%
	Effective	Count	0	1	8	9
		% of total	0,0%	0,1%	0,6%	0,7%
Total		Count	729	401	112	1242
		% of total	58,7%	32,3%	9,0%	100,0%

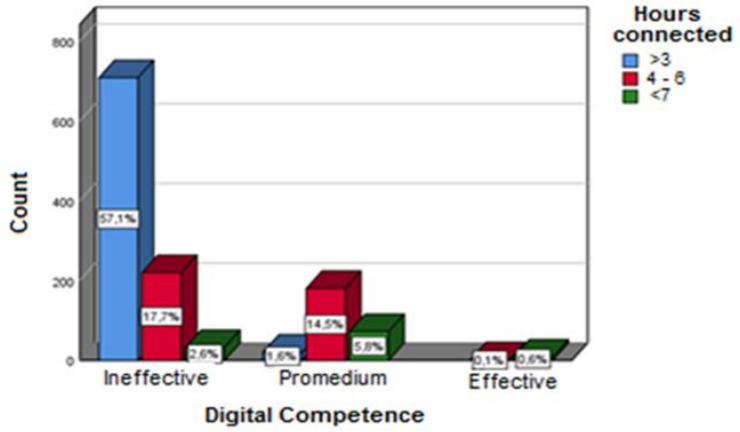

Figure 5.

Distribution of digital competency levels according to hours online

In Table 5 and Figure 5, it was observed that, of the students who connect equal to or less than 3 hours, 57.1% presented ineffective level; 1.6%, average level; of the students who connect from 4 to 6 hours, 17.7% presented ineffective level; 14. 5%, average level and 0.1% presented effective level; and finally, of the students who connect from 7 hours to more, 2.6% presented ineffective level; 5.8%, average level and 0.6%, effective level of digital competencies.

Table 6.

Distribution of creativity and innovation levels according to gender

			Sex		Total
			Male	Female	
Creativity and innovation	Ineffective	Count	649	249	898
		% oftotal	52,3%	20,0%	72,3%
	Moderate	Count	9	332	341
		% ofl total	0,7%	26,7%	27,5%
	Effective	Count	0	3	3
		% of total	0,0%	0,2%	0,2%
Total		Count	658	584	1242
		% del total	53,0%	47,0%	100,0%

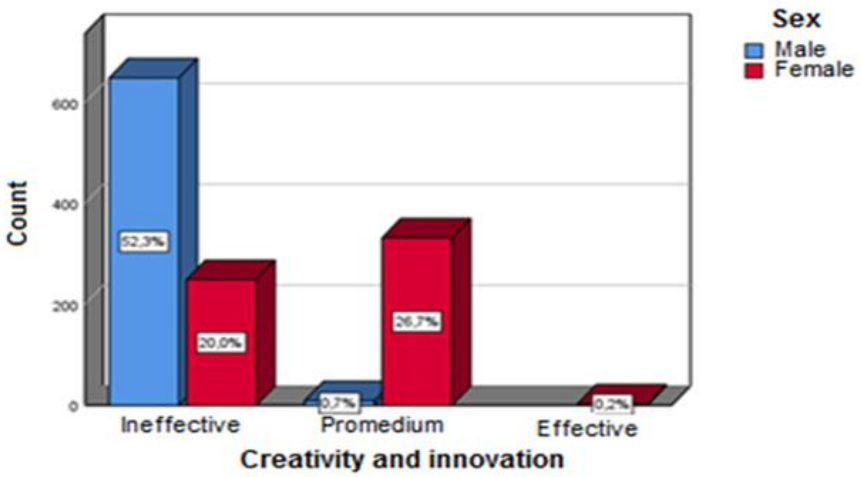

Figure 6.

Distribution of creativity and innovation levels according to gender

In Table 6 and Figure 6, it is observed that, of the male students, 52.3% presented ineffective level; 0.7%, moderate level and, as for the female students, 20% presented ineffective level; 26.7%, moderate level and 0.2%, effective level of creativity and innovation of digital competences.

Table 7.

Association of personal factors and digital competencies

Variables	Chi-square of Pearson	Significance asymtotic (bilateral)
Sex	362,554[a]	,000
Age	527,860[a]	,000
School of origin	419,638[a]	,000
Hours connected to the social nextworks	478,976[a]	,000

In Table 7, digital competencies are associated with (or depend on) sex, age, school of origin and hours connected to the social networks since the test of independence (Chi-square x2 = 362.554th; 527.860th; 419.638th and 478.976th respectively; likewise $p< 0.05$, before these comparisons the alternate hypothesis was accepted and the null hypothesis was rejected; therefore, it is established that personal conditions are associated with digital competencies in students of a private university.

Table 8.

Association of personal factors to creativity and innovation of digital competencies

Variables	Chi-square of Pearson	Significance asymtotic (bilateral)
Sex	484,435[a]	,000
Age	553,732[a]	,000
school of origin	490,048[a]	,000
Hours connected to the social nextworks	532,716[a]	,000

In Table 8, creativity and innovation of digital competencies are associated (or depend) on sex, age, school of origin and hours connected to the social networks since the test of independence (Chi-square x2 = 484.435[a], 553.732[a], 490.048[a] and 532.716[a] respectively; likewise $p<0.05$). 05, in view of these comparisons the alternate hypothesis was accepted and the null hypothesis was rejected; therefore, it is established that personal conditions are associated with creativity and innovation of digital competencies in students of a private university.

Table 9.

Association of personal conditions to communication and collaboration of digital competences

Variables	Chi-square of Pearson	Significance asymtotic (bilateral)
Sex	553,723[a]	,000
Age	577,542[a]	,000
School of origin	640,928[a]	,000
Hours connected to the networks	546,100[a]	,000

In Table 9, the digital competencies are associated with (or depend on) sex, age, school of origin and hours connected to the networks since the test of independence (Chi-square x2 = 553.723[a], 577.542[a], 640.928[a] and 546.100[a] respectively; likewise $p< 0. 05$, in view of these comparisons the alternate hypothesis was accepted and the null hypothesis was rejected; therefore it is established that personal conditions are associated with communication and collaboration of digital competences of the participating students.

Table 10.

Association of personal factors to research and information management of digital competencies

Variables	Chi-square of Pearson	Significance asymtotic (bilateral)
Sex	327,812[a]	,000
Age	489,158[a]	,000
School of origin	339,125[a]	,000
Hours connected to the social networks	399,231[a]	,000

In Table 10, the digital competencies are associated (or depend) on sex, age, school of origin and hours connected to the social networks since the test of independence (Chi-square x2 = 327.812th, 489.158th, 339.125th and 399.231th respectively; likewise p< 0. 05, in view of these comparisons the alternative hypothesis was accepted and the null hypothesis was rejected; therefore it is established that personal conditions are associated to the research and information management of digital competences in students of a private university.

Table 11.

Association of personal factors and critical thinking, problem solving and decision making

Variables	**Chi-square of Pearson**	**Significance asymtotic (bilateral)**
Sex	312,926[a]	,000
Age	481,104	,000
School of origin	298,912[a]	,000
Hours connected to the social networks	460.948[a]	,000

In Table 11, the digital competencies are associated with (or depend on) sex, age, school of origin and hours connected to the social networks since the test of independence (Chi-square x2 = 312.926th, 481.104th, 298.912th, and 460.948th respectively; likewise p<0.05). 05, in view of these comparisons the alternate hypothesis was accepted and the null hypothesis was rejected; therefore, it is established that personal conditions are associated with Critical thinking, problem solving and decision making of digital competencies in students of a private university.

Table 12.

Association of personal factors and digital citizenship of digital competencies

Variables	**Chi-square of Pearson**	**Significance asymtotic (bilateral)**
Sexo	301,231[a]	,000
Age	372,888[a]	,000
School of origin	325,630[a]	,000
Hours connected to the social networks	363,005[a]	,000

In Table 12, the digital competencies are associated with (or depend on) sex, age, school of origin and hours connected to the social networks since the test of independence (Chi-square x2 = 301.231[a], 372.888[a], 325.630[a], and 363.005[a] respectively; likewise p< 0. 05, in view of these comparisons the alternate hypothesis was accepted and the null hypothesis was rejected; therefore, it is established that personal conditions are associated with digital citizenship of digital competences in students of a private university.

Table 13.

Association of the personal conditions and the functioning and concepts of ICT digital competencies

Variables	Chi-square of Pearson	Significance asymtotic (bilateral)
Sex	291,193[a]	,000
Age	391,555[a]	,000
School of origin	245,487[a]	,000
Hours connected to the social networks	340,535[a]	,000

In Table 13, the digital competences are associated (or depend) on sex, age, school of origin and hours connected to the social networks since the test of independence (Chi-square x2 = 291.193rd, 391.555th, 245.487th, and 340.535th respectively; likewise p< 0. 05, before these comparisons the alternate hypothesis was accepted and the null hypothesis was rejected; therefore it is established that personal conditions are associated to the functioning and concepts of ICT of digital competences in students of a private university, 2020.

Discussion

Having obtained the results in a descriptive and inferential way, the reasons that could explain the association or non-association of the variables were analyzed. In addition, the results found were contrasted with previous research on digital competence, its dimensions and the association with the personal factors studied. Finally, the implications of what was found regarding the relevance of the current pandemic context and the challenges that university students face, and will face, are analyzed.

The results show that, of the medical students, 77.4% presented an ineffective level; 21.9%, a moderate level and 0.7%, an effective level of digital competencies. Similarly, Gutiérrez and Serrano (2016), in their study, reveal that university students present an acceptable level in each of the basic aspects of digital competence. However, this level is far from the level desired by the students, compared to the level necessary to perform competently at a professional level. On the other hand, Sánchez et al. (2019) state that digital competence is, therefore, the sum of all these skills, knowledge and attitudes in technological, informational, multidirectional and communicative management, giving a complex functional literacy and productively performing the strict operational uses in information search and execution

It was found that 52.3% of male students presented ineffective level; 0.6%, moderate level and 0.2%, effective level in digital competencies; as for the female gender, 25.1% presented ineffective level; 21.3%, moderate level and 0.6%, effective level in digital competencies. Vásquez-Cano et al. (2017) studied the possible gender differences with respect to basic digital competencies for students of social science degrees at a Spanish university. The study concludes that, for the component online information search processes and online presentation, men show greater competence; however, this does not occur for the rest of the components, where equity is found for both genders; that is, such a difference does not exist for the components of interpersonal competencies in the use of information and communication technologies and with respect to social and virtual communication tools. On the other hand, Silva et al. (2019) conducted a research with students from universities in Chile and Uruguay to determine their level of digital competencies. The results confirmed, for the four dimensions of virtual competence, a fundamental improvement, highlighting a medium competence of 28.5%, basic of 38.7% and 38% of differentiated level of men acquiring higher digital skills for the dimension of elaboration of plans, agency and management of areas and technological resources. Additionally, Romero et al. (2016) concluded that digital competence is varied at the gender level according to the types of information technologies. Thus, in this case, they did not find a predominance of women or men in general; but rather, at the level of technologies such as mobile applications or digital services, it was observed that women were more knowledgeable in some, and there were others in which men stood out.

It was observed that 58.7% of medical students connect from 3 to less hours through social networks; 32.3%, from 4 to 6 hours and 9%, more than 7 hours through social networks. Faced with this conclusion, Hernandez et al. (2019) evidenced the lack of competence homogeneity within a group of digital natives, observing that 42.15% of these digital natives present a habitual tendency to put into practice activities related to information access; 63.6% present it in communication; 15.6% evidenced it in content creation; 63.7%, in security and, finally, 32.7% show it in problem solving. The study concluded that there is a tendency of university students towards lower order thinking skills that focus on activities related to storage, retrieval, presence, participation, maintenance and protection, while higher order skills are applied less frequently (evaluation and management of information, filtering, creation, critical use and autonomy in problem solving). In this regard, García (2019), who conducted a research on engineering students on the management of their digital skills and information and communication technologies, concluded that of the total number of students questioned, most had a medium-low level in terms of ICT and digital skills, where only 17.9% reached a higher level in the use of these despite the fact that all students reported investing at least 5 hours a week in front of their computer to perform both academic activities and socially demanding activities.

Regarding the creativity and innovation dimension, it was found that 72.3% of students presented an ineffective level; 27.5%, a moderate level and 0.2%, an effective level. Cuban (2003), in a study on the new learning

environments in education, concludes that the new learning environments do not depend much on the use of Information and Communication Technologies (ICT), but rather on the student's ability to know how to organize himself in a learning situation, and this change is related to the attitude and training of the student. On the other hand, Pinto-Santos et al. (2020) found that the modifications that have been generated within the numerous situations of the virtual era by the irruption of ICT in people's lives, have also led to modifications within the methods of teaching and knowledge, and within the roles that the instructor must expand.

Regarding the communication and collaboration dimension, it was found that 71.1% of students presented an ineffective level; 28.4%, a moderate level and 0.5%, an effective level. An important contribution was the study conducted by Gómez-Parra and Huertas-abril (2019), concluding that interactive and participatory technologies can offer a socially positive experience; but, over time, they can become knowledge experiences with others who are learning in other virtual spaces.

Regarding the research and information management dimension, it was found that 78.7% of students presented an ineffective level; 20.8%, a moderate level and 0.5%, an effective level. According to Rivadeneira (2017), for a literate person to be able to decode, evaluate, analyze and understand the information raised in information sources, he/she must be trained through a complete analytical and communicative development, carried out in a technological context (Sánchez et al., 2019). These didactic competences will allow orienting to a new knowledge independently, corroborating and completing it with the support of the pedagogical activity of the teacher. In this sense, technological competence will encompass a greater capacity in personal understanding, as well as greater meaningful learning as long as the student is trained to carry them out. For their part, Hernández and San Nicolás (2019) conducted a research whose rationale was to know the use of ICTs, their frequency and self-perception about them. The study was quantitative with a descriptive design, in which a questionnaire was applied to a sample of 99 students, of which, for processing, only 89 responses were considered due to a duplicity of these. The results showed that, among different activities, 39.8% of students carry out information search activities, 37.5% surf the Internet; 27.3% use more frequently programs to make presentations; while 22.7% use word processors. The study concluded that students' self-perception of digital competence is high, except for activities such as programming, games, statistics, image editing and video editing.

Regarding the dimension critical thinking, problem solving and decision making, it was found that 79.9% of students presented an ineffective level; 19.5%, a moderate level and 0.6%, an effective level. Rumiche et al. (2019) conducted a study with the central objective of analyzing the psychometric characteristics as a first adaptation of the Digital Competencies Questionnaire for Peruvian university students, so that the instrument can be corrected or improved. Likewise, this research also aimed to give some results of the informational dimension, so it measured the mastery and acquisition of concepts and use of information in digital fields. Regarding the results, it was obtained that the majority of students do not yet master optimally the informational dimension; but they are in the process of achieving it, while only one eighth of students (12.5%) master such dimension. Similar results were obtained in the study by Rojas et al. (2020), in which a basic general level was observed in teachers, while students reached an intermediate level in terms of information mastery and problem solving. A basic level was also observed in the area of content creation, in which it was the teachers who achieved an intermediate level.

Regarding the digital citizenship dimension, it was found that 81.9% of students presented an ineffective level; 17.5%, a moderate level and 0.6%, an effective level. According to UNESCO (2018), digital competence allows creating and exchanging digital content, communicating and collaborating, as well as providing solutions to problems with a view to achieving effective and creative development in life, work and social activities in general. Along the same lines, Gallego et al. (2019) conducted a descriptive and cross-sectional study with the participation of 317 students to whom an ad hoc questionnaire was applied, whose raison d'être lies in determining the level and profile of the predominant competence in their initial training. The results showed, with respect to the levels of competence in digital security, that 34% of the cases show habitual safe practices; while 47% show habitual practices that entail risks such as sharing information and digital content inappropriately. Finally, 18% are at risk, presenting a low level. The university students have an average competence in the area of digital security with good attitudes towards the area; but with deficiencies in the responsible and safe use of the Internet.

Regarding the ICT functioning and concept dimension, it was found that 80.7% of students presented an ineffective level; 18.8%, a moderate level and 0.6%, an effective level. Castiglioni (2018) states that, in the face of this new modality, the information generated by society itself, is mostly of digital index. These supports allow storing, reading and distributing

data, being, at present, a development-dependent skill, conditioned in daily activities. Therefore, this digital competence will be instrumental and analytical, the information sources will be implemented to implications in the literary consensus, embracing and distributing in a selective personal management for a specific didactic purpose, and highlighting the continuous knowledge of terminological management of these new digital literacies.

Conclusions

Personal factors are associated with the communication and collaboration of digital competencies in students of a private university, since the personal factors of sex, age, school of origin and hours connected to social networks presented $p< 0.05$. In the time frame of an accelerated digitalization, and after constant actions to reduce the gender gap at different levels of our society, the differences regarding gender and the development of a digital competence reveal that there is still much to do about such reality. Regarding age, the proposition that the younger a person is, the more skilled and better trained he/she is in the use of digital tools is discarded, because digital competence implies a development in virtual spaces and management of digital tools in an academic and work context, when not only for leisure or recreation purposes.

Digital competence is a fundamental element in the training of future professionals in all fields, present in all educational levels. This era of technological evolution has had an impact on all areas of society; however, it requires new adaptive methods and demands the development of competencies and skills. University students must understand that digital technologies greatly favor not only communication, but also creativity and innovation, as well as identify the limitations and risks of these technologies. Students should be critical of the validity, reliability and impact of information, as well as be aware of the use of these technologies.

It is recommended to plan an information search and retrieval process based on an information need, which allows them to retrieve, locate, identify, evaluate, use and manage the necessary information within the research process. It is necessary that university students demonstrate ethical conduct in the handling of information, respecting legal aspects related to intellectual property and, above all, national and international copyrights.

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