

## PROFESSORS' PERCEPTION OF THE USE OF DIGITAL SKILLS AND GAMIFICATION IN A PERUVIAN UNIVERSITY

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### Abstract

The COVID-19 pandemic has produced profound changes in higher education, with the replacement of face-to-face instruction with distance or remote education, which involves the management of digital skills by teachers and students. The purpose of this research is to analyze the perception of professors with regard to digital skills and the use of gamified strategies in the teaching-learning process in a virtual context. A questionnaire was sent to 81 professors in different areas of knowledge at a Peruvian public university during the first academic semester of 2020. A strong correlation ( $r \geq .700$ ,  $p = .01$ ) was found between the use of ICT and gamification as a resource for teaching-learning, and a moderate correlation between the knowledge of digital competences and the possibilities of application as part of the instructional strategies. From the results obtained, it is clear that the participants have a positive perception of digital skills and gamified strategies, regardless of academic degree or area of knowledge. This could provide support for the update of those proposals targeting professors in order to improve their digital skills.

**Keywords** – Professor perception, Gamified strategies, Online teaching, Innovation, Higher education.

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### 1. Introduction

The worldwide COVID-19 pandemic has caused profound changes around the globe. In the area of education, the pandemic has resulted in face-to-face instruction being replaced by distance or remote education, which has required educational institutions to make greater use of different computer platforms and innovative methodological strategies that successfully engage students in order to achieve educational competences. As Cabero (2020) describes it, we have gone from a model based on transmitting information and on-site presence to an educational model revolving around the use of technologies and distance education.

The pandemic has affected every country, but in different ways and to varying degrees, exposing large technological gaps. This is particularly true in Latin American countries, where the pandemic has exposed a series of centuries-old structural inequalities. Along these lines, Gajardo-Asbún, Paz-Maldonado, Salas and Alaluf (2020) observe the difficult conditions encountered by Chilean and Honduran university instructors when dealing with this situation in the midst of the health emergency. The situation is similar in the rest of Latin America, as in the case of Peru. It was not only instructors who experienced problems with this new educational model that requires the use of technology tools, so did the students, who in many cases did not have access to the minimal technological means, thus increasing university dropout rates. Suffice it to say that according to the National Institute of Statistics and Computing (Instituto Nacional de Estadística e Informática - INEI, 2018), only 28% of Peruvian homes had Internet access; one year after the pandemic, 47.1% of homes had Internet access (Instituto Nacional de Estadística e Informática - INEI, 2021).

### 1.1. Digital Competences and Higher Education

Society is evolving at a breathtaking speed at all levels of social, technological, and educational development, among others. Recent decades have shown an accelerated and increasing incorporation of Information and Communication Technology (ICT). As they progress, these technologies take on a leading role in different areas of our individual and collective lives. Their pervasiveness represents, on the one hand, a renewed or new vision of knowledge, concerning how and what to learn; and on the other hand, it seeks to provide answers about the new uses of knowledge, about what this knowledge can be used for and what purposes it serves. Educationally speaking, the questions revolve around how to teach and learn this knowledge (Duarte de Krummel, Bautista-Vallejo, Hernández-Carrera & Espigares-Pinazo, 2020). In this scenario, different proposals have of course emerged. One position that is gaining increasingly more ground is that focusing on competences.

The competences proposed by the ‘Tuning América Latina: Innovación Social y Educativa’ (s.f.) [‘Tuning in Latin America: Social and Educational Innovation’] project for higher learning are generic and include a total of 27 competences. Among them is a series of abilities and skills that higher education students must develop, such as the ability to communicate both orally and in writing, and the ability to communicate in other languages. Other competences are associated with research and the use of technology resources. The Tuning AL project also includes a set of cognitive skills, such as continuous learning, information processing, the development of critical thinking, etc. Likewise, it also addresses social skills, such as team work and a series of soft skills.

Of the aforementioned competences, there is one that has been given greater relevance in recent times, especially in the context of the pandemic: skills in the use of ICT, which affect both students and instructors alike. It is precisely these times that are characterized by the dizzying pace and volatility of the conceptions and devices for education. Whenever a proposal or vision of knowledge or learning emerges, questions should be asked not only about its impact and prevalence, but also about its academic and societal appropriateness (Guevara-Benítez & Rugerio-Tapia, 2019; Fraga-Varela, Vila-Couñago & Martínez-Piñero, 2021). In other words, we must investigate the scope and use of conceptual and technological tools that make the instructional process feasible. From this perspective, ICT constitutes active methodologies to educationally promote learning and competences in accord with the world today.

In university education, information and communication technology (ICT) have a great impact, having completely transformed the relationship between instructors and students, and the different ways of producing knowledge (Habib, Jamal, Khalil & Khan, 2020). On this level, the achievement of competences primarily has to do with a set of abilities, skills and knowledge that the university students must attain. In the current context, many of these competences are closely related to ICT, and have come to be included in what is referred to as digital competences. Wild and Schulze (2020), basing their findings on the European DigComp, indicated that digital competence has to do with the confident, critical and creative use of ICT in order to achieve goals in different areas, including labor, educational, leisure and social realms, among others.

On the other hand, Fernández, Ordóñez, Morales and López (2019), based on the ‘Alfa Tuning América’ Project, conclude that digital competences are related to a set of abilities aimed at using information and communication technologies (ICT); likewise, they have to do with skills needed to search for, process and analyze information, which come from different sources, preferably from scientific databases; the ability to learn how to learn; the ability to make abstractions; the ability to analyze and synthesize information; and the ability for continuous, permanent learning and the updating of that learning. In turn, Kurnikova, Dodorina and Litovchenko (2021) state that digital competences have to do with the comprehension of the cultural context of the Internet setting; the ability to communicate in online communities; the ability to create and distribute contents; and the skills needed to use digital technology for personnel development. Along similar lines, Colás-Bravo, Conde-Jiménez and Reyes-de-Cózar (2019) propose a sociocultural model for the purpose of promoting the digital competence of educators based on four constructs: mastery, preference, reintegration and appropriation of the digital culture.

Before the pandemic, the digital competence of educators was gradually developing through the *blended learning* method, which combines traditional teaching methods with online learning. In many countries, this method had been rigorously implemented, while in others it was still in the incipient stages. It should be stressed that Spain is also a leader in research on digital competences in the field of university education, as demonstrated by Rodríguez-García, Raso and Ruiz-Palmero (2019); although the study by Peirats-Chacón, Marín and Vidal (2019) positions Spain in second place, after Italy. These studies in Spain have in turn promoted research in other Spanish-speaking regions, such as in the case of Turpo-Gebera and García-Peñalvo (2019), who based on a brief study on blended learning in Peru, warn that the research on the integration of ICT in training processes through blended learning is still weak; however, the Coronavirus pandemic has accelerated this process of transition to totally digital education in most of the world.

## 1.2. Gamification and Higher Education

One of the strategies that has been heavily promoted in educational efforts in the midst of this health emergency has been gamification, which implies taking a fun approach to achieving certain objectives in various fields of human activity, among them, education. The term gamification itself originated in the digital media industry; it was used for the first time in a document in 2008, although it was coined in 2002, according to Marczewski, as cited by Bai, Hew and Huang (2020), but it was not widely adopted until mid-2010. One of the early works dealing with the definition and characterization of gamification is that by Deterding, Dixon, Khaled and Nacke (2011), who define it as the use of the design elements of games in non-leisure contexts. Teixes (2015) maintains that gamification can be defined as the use of elements that are typically found in games, such as the design, dynamics, mechanics, etc., in contexts that are not leisurely in nature, for the purpose of changing the behavior of people, especially with regard to motivation, and thus achieving the proposed objectives (Teixes, 2015: page 18). Gamification does not necessarily require technological support; however, this facilitates the learning experience and makes it more attractive. Högberg, Hamari and Wästlund (2019) identify seven dimensions in the gamified experience: accomplishment, challenge, competition, guided, immersion, playfulness and social experience.

According to Prieto (2020), in the field of education, gamification would be a learning methodology that promotes motivation, effort, loyalty and cooperation, since the gamified educational materials emphasize the interactive experience of the subject. Hung (2017) indicates that gamification implies the use of mechanisms such as missions, levels, insignias, points, boards, avatars, narratives and a progress bar, used either individually or in combination with one another.

Research on gamification at the university level is still lacking (Gómez-Trigueros, 2019). Likewise, Prieto (2020), in a systematic review, finds that most articles on gamification are primarily empirical-quantitative (32%), as opposed to combined (21%) and qualitative (9%) approaches. Similarly, most works correspond to the area of engineering. Another important fact is that Spain leads with 42% of the studies on gamification in higher education, followed by the United States with 21%, Germany with 11%, Turkey with 11%, and the rest of the countries with 15%. The study by Peñalva, Aguaded and

Torres-Toukourmidis (2019) reveals that in Spain, there is a predominance of research on gamification in the areas of engineering and architecture as compared to studies in the areas of communication and education. In Latin America, and more specifically, Peru, works are still in the early stages, and thus there is a need to research this field in these contexts.

Unlike studies on the use of mobile telephone games by young people (Yucra-Quispe, Espinoza-Montoya, Núñez-Pacheco & Aguaded, 2022), research on gamification in higher education is still scarce, as indicated by Gómez-Trigueros (2019). However, worthy of mention is the work by Ardila-Muñoz (2019), who reviews the theoretical assessments of how gamification has been implemented in higher education. His research consists of a discursive analysis based on obtaining semantic macrostructures from articles obtained from different scientific databases that include the terms video games and gamification. The aim of the works analyzed is to improve **students' commitment** to their own learning, turning them into student players. Meanwhile, the instructor is in charge of designing and evaluating the different gamified activities and becomes the “gamifier” in the teaching-learning process.

In particular, it should be pointed out that students in different areas of Engineering have shown a positive attitude towards gamification and those who received gamification training felt more motivated and believe that they are emotionally more involved in the learning process of the instructional material (Zerkina & Chusavitina, 2020); the same occurs with engineering instructors, who have conducted more studies on gamification than instructors in social fields (Peñalva et al., 2019).

On the other hand, one of the most commonly used gamified tools is Kahoot! Martínez-Jiménez, Pedrosa-Ortega, Licerán-Gutiérrez, Ruiz-Jiménez, García-Martí (2021) used it for the purpose of analyzing the relationship between the use of Kahoot! and student learning. The findings indicate that there is an improvement in the test results and the final grade for students in Kahoot!; in other words, they demonstrated that when Kahoot! is used as an evaluation tool, it improves the efficiency of students, and thus there is a smaller number of failing grades. Along the same lines, Wang and Tahir (2020) present the results of a literature review on the effect of the use of Kahoot! on learning. The study includes 93 studies and the main conclusion is that Kahoot! makes greater learning possible, and also promotes a better attitude toward the educational process on behalf of both students and instructors.

Another study that considers the use of gamification at the university level is that by Rodríguez-Fernández (2017), who also investigates the use of the gamified resource Kahoot! in two academic programs at a Spanish university during the 2015-2016 academic year. The results of this work indicate the high valuation and consideration that Kahoot! has among university students, even though the learning outcomes were not necessarily what was expected.

Likewise, Chen, Li and Chen (2019) created a web-based collaborative reading annotation system (WCRAS) with gamification mechanisms to motivate the note-taking behavior of students and promote the reading comprehension performance among said students. The results showed that the experimental group made significantly more notes in almost all types of reading annotations and response annotations and had a significantly higher degree of immersive experience and social interaction than the control group. However, no difference in reading comprehension performance was found between the two groups.

Also of note is the work by Pérez-Manzano and Almela-Baeza (2018), who consider gamification and digital-based learning in games in order to disseminate science and foster technological scientific vocations among adolescents. They show the results of using a gamified web environment with transmedia resources. They conclude that the participants significantly increased their interest in science and research.

Another study corresponding to El Tantawi, Sadaf and AlHumaid (2016) evaluated the use of gamification and its results on improving the academic writing of first-year dentistry students; they also evaluated the satisfaction of these students with aspects of the game. They concluded that the use of gamification was associated with improved academic writing skills, although the satisfaction of students

with aspects of the game was moderate and their willingness to use gamification in future courses was minimal.

In a similar manner, Gallego and Ágredo (2016) used gamification to motivate reading and writing in young university students in the 'Oral and written communication' course. They implemented an online platform called 'El Palabrero' [Babbler] in order to develop a gaming dynamic centered on the argumentative typology. These authors also proposed a methodology to create gamification projects that consider the following stages: analysis, gamification, formalization, mediation and packaging.

Ortega-Arranz, Er, Martínez Monés, Bote Lorenzo, Asensio Pérez and Muñoz Cristóbal (2019) presented a study on the behavior of students with regard to obtaining insignias on a MOOC platform, where a gamification system was incorporated in order to increase the motivation and participation of students in educational contexts on a small scale. The results show that the behaviors towards the insignias by active students were generally positive and were significantly correlated with other variables that measure their commitment, even though this positive behavior seems to decrease throughout the course.

Likewise, Rojas-López, Rincon-Flores, Mena, Garcia-Penalvo and Ramirez-Montoya (2019) investigated the use of gamification based on challenges in a university-level programming course. These were based on the methodology proposed by Werbach and Hunter. They used surveys to determine the acceptance of the strategy and an instrument of metaevaluation was applied to strengthen and improve the instructional strategy. They concluded that gamification in the classroom contributed to improving student commitment to successfully solving the challenges.

Contreras and Eguia (2017) resorted to gamification to improve student motivation in a game design course and to evaluate the impact of this strategy on the learning experience. They included experience points, levels, insignias and challenges. This allowed students to improve their attention to reference materials and to be more proactive, which had an effect on earning better scores.

In particular, the study on the perception of university instructors regarding the use of gamified strategies is also an incipient field. It must be said that there are works that take into account the perception of gamification by university students, such as that by Buckley, Doyle and Doyle (2017), which found that the perception of the effects of gamification is contextual; it is necessary to delve deeper at the level of university instructors.

In the context of Peruvian university education, there are few works related to the topic of the use of ICT and gamification (Laura de la Cruz, Turpo-Gebera & Noa Copaja, 2022). For this reason, in the current situation in which classroom-based education has been transformed into online education, the concern arises, prompting researchers to investigate the perception that university instructors have with regard to the use of ICT resources and gamification. In this sense, the main purposes of this research consist of analyzing the perception with regard to the digital competences of university instructors and the use of gamified strategies in the teaching-learning process.

## **2. Methodology**

This non-experimental research has a descriptive interdisciplinary quantitative design (Hernández-Sampieri & Mendoza-Torres, 2018). The data were collected during the first academic semester, from June 23 to July 1, 2020. Questionnaires are used to gather information about digital use, knowledge, perceptions and opinions of the users themselves (Ala-Mutka, 2011), for which purposes an online questionnaire was used to obtain information about the perceptions of instructors with regard to their digital competences in an academic setting.

### **2.1. Sample**

The participants in this research were undergraduate professors at a public university in the city of Arequipa, Peru. The sample was made up of 34 women (42%) and 47 hombres (58%), who ranged in age

from 31 to 72 years, with a mean of 56 (DS=9.53) years. Table 1 shows the academic degree of the professors and the areas of knowledge to which they belong. It can be seen that almost all of the instructors surveyed had a master's degree or a doctorate; similarly, most of the instructors who responded to the questionnaire taught in the areas of engineering and the social sciences at this institution of higher learning; and in a far smaller percentage, they were instructors in the fields of the natural sciences and humanities.

The Arequipa public university in which this study was carried out is the fifth oldest university, located in the southern region of Peru, and the public university with the second largest number of students registered (Superintendencia Nacional de Educación Superior Universitaria [SUNEDU], 2019, 2020). The questionnaire was distributed through the Google Forms application to approximately 600 professors by means of the institutional email, although only 81 responded; the participants gave informed consent and the questionnaire was anonymous, voluntary, confidential and the participants' email addresses were not collected.

The data obtained were analyzed using the SPSS computer software v.23.

	n	%
<b>Academic degree</b>		
Bachelor's degree	1	1.2
Master's degree	40	49.4
Doctorate	40	49.4
<b>Area of knowledge</b>		
Natural and exact sciences	9	11.1
Engineering and technology	27	33.3
Medical and health sciences	13	16.1
Social sciences	23	28.4
Arts and humanities	9	11.1
Total	81	100

Table 1. Descriptive analysis of the sample

## 2.2. Instrument

In order to collect data, a 14-item questionnaire was used that was proposed by Gómez- Trigueros (2019); it was adapted to the sample and the research purposes: a) the first two items were omitted (gender and age), as they were already considered in the sociodemographic data; b) in items 10 to 14, the term "Social Sciences" was omitted, since in our sample, the participants come from different areas of knowledge; and c) for the purposes of this study, the questionnaire will be entitled "Instructor perception of digital competences and gamification in the teaching process."

The adapted instrument consists of 12 items organized into two blocks: the first is related to the sample's knowledge of digital competence and the new learning strategies (items 1 - 8); the second referred to the participants' perception of instructional options offered by gamified proposals and the teaching-learning of ICT (9 - 12). The instrument uses a 5-point Likert scale (1 "not at all" and 5 "a lot"). The reliability in the study by Gómez-Trigueros was  $\alpha=.962$ ; Cronbach's alpha in our study was .913, confirming that the instrument has a high degree of internal consistency.

In order to determine the validity of the internal structure of the instrument, a factorial analysis was carried out and it was concluded that the analysis is feasible ( $p < .001$ ) and that the correlation among all the variables is high; the value obtained by the Kaiser-Meyer-Olkin test was .874, Chi square was 600.934 and there were 66 degrees of freedom according to the Bartlett sphericity test.

### 2.3. Data Analysis

For the processing and analysis of the data, a descriptive analysis was carried out, shown in tables with the measurements of central tendency and standard deviation. A Pearson correlation was used to determine the correlation among the variables analyzed. Student's *t* was applied to compare the means by gender and a one-factor ANOVA was used to compare the means by age, but no statistically significant differences were found. Prior to the statistical analyses, normalcy tests were conducted for the study variables by means of the Lilliefors and Kolmogorov-Smirnov tests.

The data obtained were analyzed using the SPSS computer software v.23.

### 3. Results

The descriptive analysis, the mean and standard deviation of each of the items is shown in Table 2. The perception of the participants with regard to ICT as a resource for teaching and learning is positive, as can be observed in the values obtained for item 9 ( $M=4$ ) and item 12 ( $M= 3.84$ ), which expands the inclusion of ICT as an instructional resource to attain contents, procedures, attitudes and key competences in students. Both items had scores close to 5, which is the maximum expected score.

The lowest means correspond to items 2 ( $M=2.77$ ), 6 ( $M=2.98$ ) and 8 ( $M=2.69$ ), which have in common questions about gamification: the concept, whether their digital competence allows them to incorporate new teaching strategies in their classes, such as gamification, and whether gamification is used as a teaching-learning strategy in the course they teach. The results obtained assume lesser knowledge of the techniques, methods and strategies of gamification as compared to those referring to the knowledge and application of ICT in classrooms where averages above 3 points are obtained.

On items referring to digital competence and ICT, item 1 ( $M=3.36$ ), item 3 ( $M=3.05$ ), item 4 ( $M=3.38$ ) and item 5 ( $M=3.86$ ), the participants perceived that they know about the concepts referring to digital competence, ICT-based resources, such as massive open online courses, and the use of social networks such as Facebook, which might be included in instruction. They believe that their digital competence is adequate and that they use ICT resources in the classroom. At the time when the instrument was applied, all the professors made use of the virtual platform to provide online instruction, due to the restrictions imposed by the pandemic, having received basic training courses from the institution.

With regard to ICTs and gamified proposals as resources for their own training (item 7) and for their application in teaching-learning (items 10 and 11), they have a favorable opinion, as the means obtained were 3.25, 3.62 and 3.33, respectively.

The Pearson correlation was applied to analyze the relationship between the knowledge of digital competences and the perception that the participants have of the instructional possibilities offered by ICTs and gamification.

The results (Table 3) show a high correlation ( $r \geq .700$ ,  $p=.01$ ) between considering ICTs and gamification as important resources for teaching and learning (items 9 and 10) and the positive perception of including new technologies in achieving basic competences in the disciplines (items 11 and 12). The perception that digital competences, ICTs and gamification boost teaching performance (items 6 and 7) is moderately correlated ( $r \geq .60$ ,  $p=.01$ ) with the possibilities of applying gamified strategies in the courses that they teach (item 8). The knowledge of learning resources based on ICTs (item 3) shows a moderate correlation ( $r=.652$ ) with the use of these strategies in their courses.

The items referring to knowledge that the participants have regarding digital competence, ICT and gamification (items 1, 2 and 3) had a low correlation ( $r=.416$ ,  $r=.464$  and  $r=.332$ ) with the inclusion of ICTs in the teaching-learning process, as support for achieving the competences planned for in each discipline (item 12).

In general, the greater the perception is that adequate digital competence allows you to include new teaching strategies, such as gamification and the social media, the greater the probability is of positively assessing their use as important resources for the acquisition of knowledge and achieving competences in a university setting.

	<b>M</b>	<b>SD</b>
1. I know about the concept of digital competence.	3.36	0.870
2. I know about the concept of gamification.	2.77	1.306
3. I know about the different learning resources based on ICT, such as massive open online courses (MOOC), gamification and Facebook.	3.05	0.850
4. I believe that my digital competence is adequate for my instructional work.	3.38	0.845
5. I use ICT resources in teaching and learning in the courses I teach.	3.86	0.737
6. My digital competence allows me to incorporate in my classes new teaching strategies, like gamification.	2.98	0.851
7. I think gamification and ICT help me in my teaching performance.	3.25	0.956
8. Gamification is used as a strategy for teaching and learning in the courses I teach.	2.69	1.091
9. I believe that ICTs help professors as resources for teaching and learning processes.	4.00	0.822
10. ICTs and gamification can be important resources for the good performance of university professors.	3.62	0.916
11. I believe that the gamified instructional proposals allow for the proper acquisition of knowledge in a university setting.	3.33	0.987
12. The inclusion of ICTs in teaching-learning processes in a university setting allows for the instructional proposals to be carried out that help students attain contents, procedures, attitudes and key competences.	3.84	0.782

Table 2. Descriptive statistics (M=mean and SD=standard deviation) of the perception of the digital competences and gamification in instruction

Items	1	2	3	4	5	6	7	8	9	10	11	12
1	1											
2	.580**	1										
3	.533**	.675**	1									
4	.389**	.433**	.652**	1								
5	.564**	.460**	.529**	.466**	1							
6	.501**	.523**	.416**	.448**	.492**	1						
7	.418**	.437**	.308**	.392**	.367**	.668**	1					
8	.526**	.527**	.354**	.292**	.304**	.638**	.673**	1				
9	.402**	.466**	.376**	.306**	.598**	.375**	.382**	.376**	1			
10	.378**	.509**	.362**	.288**	.440**	.565**	.538**	.581**	.615**	1		
11	.412**	.507**	.248*	.130	.389**	.590**	.601**	.665**	.632**	.765**	1	
12	.416**	.464**	.332**	.264*	.504**	.501**	.522**	.410**	.700**	.611**	.604**	1

\* The correlation is significant at the 0.05 level (bilateral).

\*\* The correlation is significant at the 0.01 level (bilateral).

Table 3. Bivariate Pearson correlations of the items on the questionnaire regarding the perception of digital competences and gamification in instruction



Altogether, the findings of this study indicate a strong correlation between the use of ICTs and gamification and the perception of digital competences, as well as a weak correlation between the knowledge of digital competences and the possibilities for their application as part of the instructional strategies.

#### 4. Discussion

The study was focused on the analysis of the perception of the digital competences of university instructors and the use of ICTs and gamified strategies in the teaching-learning process. The results obtained show that the perception professors have of the use of ICTs is positive, regardless of the academic degree and area of knowledge. These results differ from the findings by Mercader and Gairín (2020), who found that Arts and Humanities professors perceived greater obstacles to integrating digital technologies for instructional uses than professors in the areas of the Social Sciences and Health Sciences. The study by Mercader and Gairín was conducted prior to the pandemic. They reached the conclusion that personal traits are not as relevant to the integration of digital technology as professional attributes are; the latter include time management, entertainment, educational focuses, experience and instructional focuses using digital technologies. In addition, it must be considered that the Humanities are very different in nature from other knowledge areas, which also means a very unique relationship with new technologies.

On a similar note, it must be taken into account that the moderate correlation between the knowledge of digital competences and the possibilities for application as part of the instructional strategies found in the present study is congruent with the study by Dias-Trindade and Moreira (2020), who found moderate levels of digital competence among instructors. However, the results of this research differ from the findings of Guillén-Gámez, Mayorga-Fernández and Álvarez-García (2018). In their study, future instructors have a low level of predisposition towards the use of ICTs in the classroom; however, the results also reveal that the level of digital competence and motivation to use ICTs are two variables that are positively correlated, while the other variables show no such correlation, such as in the case of age.

The present study was conducted during the first semester of the academic year when for the first time, as a result of the COVID-19 pandemic, the university was forced to turn to a completely remote form of instruction. This is probably one of the reasons why there were no differences in perception according to academic area, since all the professors were committed to using the virtual classroom platform. It is necessary to point out that the virtual classroom already existed before the pandemic, but it was not used with all the available resources it offered. The professor's attitude toward incorporating information technologies in instruction plays a vital role (Fernández et al., 2019), as does time management, due to the greater number of hours/work involved in preparing the study material as compared to the preparation required for classroom instruction.

With regard to technological resources, in agreement with the findings of Mercader and Gairín (2020), the results show that the participants perceive that they do not have adequate training in technological resources in order to implement them in the teaching-learning of their courses. They obtained lower scores ( $M \leq 4$ ) than those found by Gómez-Trigueros (2019) ( $M \geq 4$ ), with some of the lowest being those referring to gamification ( $M \leq 3.33$ ).

The low level of digital competence by some of the professors when it came to incorporating technologies in education has also been indicated by Cabero (2020) as a problem when changing over to a virtual system with quality educational results, and more so for using innovative methodologies, such as gamification (Núñez-Pacheco, Barreda-Parra, Guillén-Chávez & Agudado, 2021). During the health emergency, professors were suddenly required to deliver their courses in diverse learning contexts, which was exhausting and implied uncertainty regarding the effort of preparing the contents, maintaining an emotional connection with their students and engaging in research, social responsibility and other activities associated with their academic position (Gajardo-Asbún et al., 2020).

This study corroborates the findings by Ruiz-Cabezas, Medina-Domínguez, Pérez-Navío and Medina-Rivilla (2020), who analyzed the digital competences of Ecuadorian university instructors, using a combined methodology through the use of a questionnaire and discussion groups. The results reveal the importance that university instructors give to developing digital competence in order to improve their instructional performance. It should be noted that the instrument used by these researchers consisted of 25 items, all referring to digital competence, and none of them explored gamification. In a similar manner, Martín-Párraga, Palacios-Rodríguez and Gallego-Pérez (2022) engaged in a virtual learning experience with professors from a Latin American university with positive results. The faculty perceive the incorporation of gamification methodology as an appropriate strategy; especially significant dimensions referred to the simplicity of its classroom use, the consent to its incorporation in the classes, learning motivation and a positive attitude toward its use. The tools used in gamification were Edmodo, Class Dojo, Quizizz, Mentimeter, Socrative, Kahoot! and Studio. The results were satisfactory, although the limitation exists that the model used refers to the prediction of their use, but not to the increase in user performance.

Another instrument used for diagnosing technological competences of university faculty members was created by Cabero, Llorente and Marín (2010). Once again, this 70-item questionnaire does not allude to gamification strategies. More recently, Cabero, Barroso-Osuna, Gutiérrez-Castillo and Palacios-Rodríguez (2020) developed a new 20-item instrument to evaluate the digital competence of future teachers in training. It does not explicitly include the topic of gamification; however, it introduces a dimension that has to do with creativity and innovation, which opens the door to including gamified resources. In relation to gamification, knowledge of the term and its classroom implementation are most likely not fully understood. Other studies have also found diversity in the terminology and in the method of classifying the typology of gamification, which was a limitation to the systematic review carried out by Prieto (2020); in spite of this, evidence exists that the classroom gamification experiences have positive results on the motivation of university students, as indicated in the same study by Prieto.

Other results on gamification show a significant mean effect size (Hedges'  $g=0.504$ ) for learning in students of different levels; however, secondary students enjoy gamification more (Hedges'  $g=0.822$ ) than undergraduate university students (Hedges'  $g=0.363$ ); the reasons for this are that gamification fosters enthusiasm, provides information on performance, meets the students' needs for recognition and promotes goal setting. Two reasons why gamification is not attractive to them is that it does not provide any additional utility and it can cause anxiety or jealousy (Bai et al., 2020).

Sanchez, Langer and Kaur (2020) used a quasi-experimental research design to replicate the effect of the questionnaires, both traditional and gamified, on exam preparation for university students. The results were positive over the short term and showed that the interpersonal differences could have an influence on the positive effects of gamification, in other words, students with better performance and greater cognitive abilities would benefit from certain focuses of gamification. The short-term effectiveness of the results of gamification has also been indicated by Bai et al. (2020). In their study, they found a large effect size when applied at 1 to 3 months (Hedges'  $g=0.906$ ), as compared to its application  $\geq 1$  semester (Hedges'  $g=0.392$ ).

Finally, Mercader and Gairín (2020), in a sample of 527 university professors in the areas of science and technology and in the areas of the humanities, social and biomedical sciences, identified the most important barriers to integrating digital technologies in their disciplines, mentioning among them time limitations, followed by the lack of entertainment, shortcomings in terms of infrastructure, a lack of knowledge regarding educational focuses of digital technology, an excessive work load, the generation gap and the quality of the infrastructure. These obstacles are more prevalent in the disciplines associated with the arts and humanities, where there is the perception of greater labor obstacles. No barriers were identified in relation to gender.

## 5. Conclusions

Based on the findings obtained in this study, it can be stated that the university instructors who participated in this study have a positive perception of information technologies and gamified strategies, regardless of their academic degree or area of knowledge. These positive results favor the proposals for updating professors in order to improve their digital competences, since as Gromova (2021) alleges, information technologies contribute significantly to the efficiency of the educational process and the university is a place preparing professionals for the 21<sup>st</sup> century. This does not mean that strategies which are backed by technology, such as gamification, ensure full innovation in higher education (Pařová & Vejačka, 2022). Organizations will demand people who actively use mobile devices and the Internet and are willing to engage in ongoing training in ICTs.

This research has presented certain limitations, such as the number of participants, since for reasons of accessibility, only instructors from one public university were included. While the invitation was extended to most of the university instructors, only part of them responded to the online questionnaire, probably due to being overworked during the semester as a result of the pandemic.

In spite of the aforementioned limitations, this study is one of the first to examine the perception of university instructors regarding digital competences and gamification in the context of the COVID-19 pandemic in southern Peru, and the results show a positive attitude that can be considered for the future training of these professors.

In subsequent studies, it would be a good idea to examine the attitude of professors towards information technologies, especially the uses of gamified strategies. This approach would make it possible to evaluate whether the resources used in the classroom led to achieving the required competences in the courses. Likewise, in future works it would be recommended to expand the sample to other Ibero-American settings in order to compare the current underlying educational situations in each country in the context of the pandemic.

Finally, it would be interesting to know greater details about the attitudes of university instructors toward gamification, as well as that of students, since previous studies have been done in other situations with mixed results in terms of assessing the benefits offered by gamified strategies. It would even be advisable to assess whether these experiences proved significant for both instructors and university students alike.

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The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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