Web 2.0 as a tool for university teaching in times of pandemic covid-19

La web 2.0 como herramienta para la docencia universitaria en tiempos de pandemia covid-19

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Abstract

The purpose of this article is to determine the use of Web 2.0 as a technological tool for university teaching in the teaching-learning process, as a consequence of virtual education,

which had to be implemented by the educational systems of all countries in the world due to the covid-19 pandemic. Therefore, teachers have been forced to incorporate in their teaching-learning activities, the use of digital resources for the development of the contents of the course. The analysis of the information was carried out with a quantitative, non-experimental descriptive approach. The technique used is the survey, through the design of a questionnaire that was applied to 120 university teachers from Quito, Guayaquil and Cuenca, which allowed analyzing the level of training and knowledge on the use of Web 2.0 as a technological tool in teaching in higher education. Among the results, it is highlighted that the influence of teacher training on the use of web 2.0 as a tool related to the teaching-learning process is medium. Most of the teachers surveyed use Web 2.0 as a tool for university teaching that allows them to innovate their educational practice mediated by virtual learning environments that show the development of their own digital competence. Finally, it is important to highlight that on the Web there are a large number of Web 2.0 digital tools and resources that can be used to improve the teaching-learning process inside and outside the classroom.

Key words

Covid-19, teacher training, , university education, virtual education, Web 2.0

Resumen

El presente artículo tiene como objetivo determinar el uso de la web 2.0 como herramienta tecnológica para la docencia universitaria en el proceso de enseñanza–aprendizaje, como consecuencia de la educación virtual, tuvieron que implementar los sistemas educativos de todos los países del mundo motivado por la pandemia COVID-19. Por tanto, los docentes se han visto forzados a incorporar en sus actividades de enseñanza– aprendizaje, el uso de recursos digitales para el desarrollo de los contenidos de la cátedra. El análisis de la información se realizó con un enfoque cuantitativo, no experimental descriptivo. La técnica utilizada es la encuesta, mediante el diseño de un cuestionario que se aplicó a 120 docentes universitarios de Quito, Guayaquil y Cuenca que permitió analizar el nivel de formación y conocimientos sobre el uso de la web 2.0 como herramienta tecnológica en la enseñanza en la educación superior. Entre los resultados se destaca que la influencia de la formación docente en el uso de la web 2.0 como herramienta relacionada con el proceso de enseñanza– aprendizaje, es medio. La mayoría del profesorado encuestado usa la web 2.0 como herramienta para la docencia universitaria que le permite innovar su práctica educativa mediada por entornos virtuales de aprendizaje que evidencien el desarrollo de su propia competencia digital. Finalmente, es importante resaltar que en la Web existen una gran cantidad de herramientas y recursos digitales de la web 2.0 que pueden ser utilizados para mejorar el proceso de enseñanza–aprendizaje dentro y fuera de las aulas de clase.

Palabras claves

Covid-19, educación virtual, enseñanza universitaria, formación docente, Web 2.0

1. Introduction

The purpose of this article is to determine the use of web 2.0 as a tool for university teaching in the teaching-learning process, due to the change that, as a consequence of the virtuality in teaching and learning that had to be implemented by educational institutions of all levels

in the world, motivated by the COVID-19 pandemic. Consequently, educational systems in all countries of the world found it necessary to access virtual education in a synchronous and asynchronous manner in their teaching-learning processes, using virtual environments as alternatives to continue offering educational services at all levels.

Thanks to the advance of information and communication technologies (ICT), the world has been forced to adopt technological changes in different fields, such as business, health, economics and education. In this regard, Bugawa and Mirzal (2018) express that "web 2.0 technologies provide platforms for users to create, navigate, communicate, share, and collaborate, providing them with new learning experiences and opportunities" (p. 2). Today, educational institutions, in the context of the pandemic, evidenced certain shortcomings, especially in relation to technological infrastructure and teacher training in terms of knowledge and application of technological resources in virtual (non-face-to-face) education modalities (Alcántara Santuario, 2020).

In this sense, higher education centers, despite the lack of human, material and technological resources, had to adapt their teaching-learning processes to the use of ICTs in a synchronous and asynchronous manner. Therefore, it is essential for universities today to train their teachers in digital competencies that allow them to acquire skills to use Web 2.0 as a virtual tool for the teaching-learning process in order to transmit, apply and create new knowledge in a critical way (Sales et al., 2020).

Web 2.0 is a set of more specialized dynamic applications that are constantly evolving on the Internet, thus allowing users to share, create, interact and collaborate with other users (Castells, 2008), so it has become a necessary didactic resource to be considered within the teaching-learning process as an educational innovation to such an extent that it has shaped what is called the information and knowledge society in a complex and ever-changing universe.

Bennett, Bishop, Dalgarno, Waycott and Kennedy (2012), state that "the value of using web 2.0 technologies for teaching-learning has important implications in the design of appropriate tasks for learning" (p. 524). Therefore, this makes it possible for students and teachers to interact, communicate and collaborate with each other, in short, to encourage individual, collaborative and cooperative work of the participants.

Digital technologies are present in most of the activities of human beings and education should not be the exception in this process. Nowadays, the use of academic management platforms such as Moodle, Zoom, Microsoft Teams, Canvas, Google Meet, Google Classroom, among others, is widespread. In this regard, Revelo-Rosero (2017) states that "Web 2.0 is of great importance in education, since it is more dynamic, participatory, collaborative for the different agents of the educational process, since they interact by sharing knowledge, content, opinions, relating, participating and creating knowledge through the network (p. 34).

In this sense, the use of digital platforms becomes a facilitating agent of an educational paradigm shift that allows fostering creation, autonomous work, interaction and collaboration among students, supervised by teachers, who are the facilitators of the teaching-learning process, supported by web 2.0 tools.

For Revelo-Rosero and Carrillo-Puga (2018), "this process involves, the continuous and permanent training of teachers in digital competencies, key factors such as web 2.0 integration for teaching and learning in university teaching. Therefore, the new role of the

teacher plays a leading role in teaching to achieve meaningful learning in their students" (p. 72).

This research work is structured in such a way that, first, a review of the literature related to concepts and definitions that have to do with Web 2.0 is made. Next, the methodology used for the research design is presented, which was of a descriptive non-experimental type with a quantitative approach and applied the reception of information through the survey technique, followed by the results; and, finally, the conclusions obtained are presented. The objective of this research is to determine the use of web 2.0 as a tool in the development of university teaching and its impact on the teaching-learning process, due to the change generated as a result of virtuality motivated by the COVID-19 pandemic, in addition to being at the forefront of technology.

2. Literature review

The use of web 2.0 is increasing in the teaching-learning process, starting in the year 2020, due to the impact change caused by the COVID-19 pandemic, to which universities had to adapt their teaching-learning process to the use of ICT in a synchronous and asynchronous way. By its nature web 2.0 is fundamentally characterized by being more interactive, dynamic, participatory, and collaborative among users, therefore, it is considered key to success in traditional classrooms (Bugawa and Mirzal, 2018).

The evolution of Web 2.0 has not only changed the Web technologies available, but has also provided people with ways to communicate and relate to each other (Torres-Kompen et al., 2019), as well as places to create knowledge networks, interact with each other, share content, collaborate, and improve communication channels. On the other hand, according to some authors, Web 2.0 is the new generation that contains a wide range of more interactive digital applications, including: online education (e-learning), podcast, videoblogs, interactive maps, sharing of photos, files, videos, etc., on-line games; which are mainly anchored in technological tools, such as learning management platforms (LMS), Moodle, Zoom, Microsoft Teams, Canvas, Google Meet, Google Classroom, among others; to create virtual learning environments, whose means of interaction is the Internet. On the other hand, Pérez-López et al. (2021) affirms that "teachers have adopted an asynchronous model accompanied by teacher-discussant interaction based on communication through e-mail, forums or chat" (p. 339).

In this regard, this interaction of web 2.0 tools encompass the use and exchange of information between teachers and students digitally, through emails, forums, chats, repositories of digital tools and resources or platforms specially created for this purpose such as blogs, wikis, social networks (Facebook, Whatsapp, Instagram, Twitter, Edmodo, Google+...), multimedia contents (Podcast, YouTube, Prezi, Slideshare, etc.) (Revelo-Rosero et al., 2016a), storage tools (Dropbox, Google Drive, OneDrive), among others, that facilitate the processes of research, interaction, collaboration, creation and exchange of knowledge among users through the Web (Área-Moreira, 2010; Salinas, Benito, and Lizana, 2014; Del Moral and Villalustre, 2015; Marín, Sampedro, and Muñoz, 2015; Lorenzo and Buendía, 2016).

Thus, the use of web 2.0 as a tool in university teaching, allows the creation of virtual collaborative learning environments, where teachers and students can interact and regardless of distance, which generates a great impact on the teaching-learning process inside and outside the classroom (Revelo, 2017). In this sense, the ease of use offered by the web 2.0, opens new options for teachers to improve the way of teaching with ICT, create spaces of coexistence and communication that generate new challenges in university

teaching (De la Torre, 2006), such challenges constitute facilitating processes of collaborative work that make learning more meaningful for students (Del Moral and Villalustre, 2010).

The new pedagogical thinking is necessary to face the new challenges of current educational processes that, when gradually implemented in the university classroom, promote innovation in higher education. Educational innovation is defined as the realization of changes in teacher training and the way of teaching and in student learning and training that in turn produce improvements in learning outcomes. Authors such as Freire (2007) state that Web 2.0 has already entered universities in a silent way thanks to professors, researchers and students.

Currently, due to the impact caused as a consequence of the virtuality of teaching and learning motivated by the COVID-19 pandemic, at a global level, the interest in the quality of teaching in universities with the support of ICTs is growing and is somehow related to the incorporation of Web 2. 0 as a didactic resource that promotes a new vision of teaching related on the one hand with the role of the student and the protagonism that he/she acquires during the teaching-learning process, and on the other hand, with the new challenges for the teacher in his/her way of teaching inside and outside the university classrooms in the times of pandemic that has been faced (Molina and Iglesias, 2014; Revelo, 2017).

Precisely, one of these challenges is the ongoing training of university teachers in digital competencies (Revelo-Rosero, Revuelta-Domínguez and González-Pérez, 2018) that allow them to integrate web 2. 0 tools as an educational innovation in the classroom (Acosta-Bayas and Valencia-Núñez, 2022), improve their pedagogical practice, and develop a digital culture through the creation of virtual learning environments, these being understood as "spaces organized for the purpose of achieving learning and that for this to take place requires certain components already indicated: a pedagogical function (...), the appropriate technology (...) and organizational aspects (...)" (Salinas, 2004, p. 2).

Web 2.0 is nowadays considered an essential resource for improving the quality of higher education. In this sense, the role of teachers is one of the most important factors to involve students in their own learning (Figueiredo, Godejord, Rodrigues, & Gozález-Pérez, 2016). Therefore, it is essential that universities provide the facilities and access to web 2.0 tools to incorporate them into university educational practice, providing it with infrastructure and technological resources and internet connection; ongoing teacher training that allows leaving aside traditional teaching methodologies to generate innovative pedagogical dynamization in the classroom with ICT (Revelo-Rosero, 2017).

In this context of change, due to the impact caused as a consequence of the virtuality of teaching and learning motivated by the COVID-19 pandemic, the quality of university teaching constitutes a strategic priority for higher education institutions not only in Ecuador, but worldwide.

On the other hand, the challenges and demands to which higher education institutions must respond today determine the relevance of some factors, if quality education that addresses the complexity of today's society is to be achieved (González-Pérez and De Pablos, 2015). Consequently, "the increasing ubiquity of access to the Web, and the variety of devices that allow us to interact with it, have made it possible for students to choose the tools and services that best suit their needs, providing a means to personalize the learning experience" (Torres-Kompen et al., 2019, p. 194).

The relevance of this research lies in the fact that, in Ecuador there are no conclusive studies on digital training in relation to web 2.0 as a tool for the teaching-learning process in university teaching in times of COVID-19 pandemic. One of the limitations, and perhaps the greatest and most difficult to overcome, is that this research does not deal exclusively with the continuing education of teachers with respect to the use of web 2.0 as a tool for teaching in higher education. The main reason is perhaps due to the extensive and at the same time limited amount of existing information on this topic or the continuous evolution of ICT and its various educational uses..

3. Methods and materials

The research design is of a descriptive non-experimental type with a quantitative approach which, being a formal, objective and systematic process, allowed obtaining quantifiable information on a phenomenon investigated in numerical form, by using statistical tests it was possible to describe, explain and prove the questions raised in the research (Bisquerra-Alzina, 2004).

The surveyed population included 120 teachers from universities in Quito, Guayaquil and Cuenca: 77 (64.17%) belonged to universities in Quito, 30 (25.00%) in Guayaquil and 13 (10.83%) in Cuenca and answered questions about the use of Web 2.0 as a tool for the development of university teaching, due to the impact caused as a result of the virtuality of teaching and learning motivated by the COVID-19 pandemic. The teachers were selected by probability convenience sampling, therefore, no statistical formula was used to calculate the representative sample of the population. "Probability samples are essential in cross-sectional research designs, both descriptive and correlational-causal" (Hernández-Sampieri et al., 2010, p. 177). Given the characteristics of the research, all elements of the population have an equal probability of being chosen.

Table 1, which summarizes the total sample classified by city, frequency and percentage of male and female participants, is shown below.

		Frequency	Percentage	Valid percentage	Acumulated percentage
Valid	Quito	77	64.17	64.17	64.17
	Guayaquil	30	25.00	25.00	89.17
	Cuenca	13	10.83	10.83	100
	Total	120	100	100	

Table 1. Sample

In relation to the proposed objective, the following research questions were posed: Does the level of teacher training received on Web 2.0 as a tool for university teaching influence the teaching-learning process, due to the impact caused by the COVID-19 pandemic? and Does the level of teacher training and knowledge on the use of Web 2.0 as a tool for university teaching improve the teaching-learning process?

3.1 Instrument for data collection

For the collection of information, the survey technique was applied, with the application of a questionnaire of questions, duly validated and statistically verified, through the Cronbach's Alpha reliability coefficient of 0.862 (Alpha Std. = 0.864) by using the SPSS 22.0

statistical program, which is considered very high, according to the scale proposed by Ruiz-Bolívar (1998), (2002) to interpret the reliability coefficient. According to this scale, indices higher than 0.81 are considered as a very high level of reliability. Therefore, it can be affirmed that the questionnaire designed for the present research was valid and reliable to be applied to the population under study; it was addressed to 120 teachers from universities in Quito, Guayaquil and Cuenca.

For the data reception and analysis procedure, the questionnaire was elaborated in Google forms and the teachers were contacted through e-mails. Each teacher contacted responded online anonymously, freely and voluntarily, which guaranteed the results and conclusions generated from the information collected in this research.

For the statistical analysis and interpretation of the data collected through the questionnaire prepared for this purpose, the quantitative descriptive method of frequencies and percentages of each of the variables of this study was used. The analysis was complemented by means of the cross-table procedure, the use of the chi-square statistical test and the contingency coefficient with a confidence level of 95% to determine the statistical relationship that exists between the variables crossed. The SPSS statistical program for Windows, version 22.0, was used.

4. Results

The answer to the research question: Does the level of teacher training received on the use of web 20 as a tool for university teaching influence the teaching-learning process, due to the impact caused by the COVID-19 pandemic? presents a range of results among the participants.

The study sample is 120 university teachers from Quito, Guayaquil and Cuenca, of which two thirds (64.17%) belong to universities in Quito, followed by Guayaquil (25.00%) and Cuenca (10.83%).

The general profile of the respondents shows a male population with 58.34% (n = 70) versus 41.66% (n = 50). Regarding the level of academic training, it can be observed that 9.17% (n = 11) have a doctorate (PhD), 88.33% (n = 106) have a Master's degree and 2.5% (n = 3) have a diploma, which shows that the largest number of university teachers surveyed have a Master's degree and there are a small number of PhDs. In sum, it can be observed that university professors are interested in keeping themselves up to date, in accordance with Art. 6, paragraph h) of the LOES in force in Ecuador.

Regarding age, it can be highlighted that the surveyed population does not belong to the "Net Generation" (Tapscott, 2010) or digital natives (Prensky, 2001), terms used to label the generation born after 1980, those people whose "learning preferences tend towards teamwork, experiential activities, and the use of technology" (Cabra Torres and Marciales Vivas, 2009). In Table 2, it can be seen that 58.34% (n = 70) of the sample analyzed in this research is older than 40 years, compared to 41.66% (n = 50) who are younger than 40 years, which shows that most teachers are not digital natives and there is a significant number that could be considered as digital natives and, therefore, in some way the incursion into the web 2.0 for many of them is a great challenge" (Cabra-Torres and Marciales-Vivas, 2009). Researchers such as Wodzicki et al. (2012), Bennett et al. (2008) and De la Hoz, Acevedo and Torres (2015), infer that digital natives have developed skills and abilities that go hand in hand with the digital evolution of web 2.0 and the Internet. This makes that there are differences between other previous generations in the sense of facing other difficulties

when implementing changes in their ways of teaching and learning with the use of technology (Revelo-Rosero and Carrillo-Puga, 2018, p. 81).

Age	N	%
21 – 30	12	10.00
31 – 40	38	31.67
41 – 50	35	29.17
51 – 60	29	24.17
Mas de 60	6	5.00
Total	120	100

Table 2. Age range of the studied sample

Table 3 summarizes the items (9 questions) related to the level of training received on the use of web 2.0 as a tool for university teaching in the teaching-learning process, due to the impact caused by the COVID-19 pandemic, 3.3% (n = 4) consider it to be very high, 35.00% (n = 42) high, 55.00% (66) medium and 6.67% (n = 8) low. From the results obtained, 94.17% (n = 113) of the teachers surveyed consider that it is necessary to receive ongoing training on the use and application of web 2.0 tools as educational innovations and good teaching practices; 93.33% (n = 112) affirm that the use of web 2. 0 as a tool for university teaching generates changes and innovations in the teaching-learning process, compared to 64.17% (n = 77) who affirm that the level of teacher training on the use of web 2.0 as tools incorporated in their universities' platforms for university teaching does not generate major changes.

Consequently, the overall mean value of the level of teacher training received for the use of web 2.0 as a tool for university teaching is 2.34, which shows that, in general terms, the university teachers surveyed state that it is necessary to receive ongoing training on the use of web 2.0. This result is contrasted with the calculated Chi-square value of 62.379 with a confidence level of 95% and 3 degrees of freedom; and the value of p = 0.000 shows that the degree of influence of the teacher training received at their university on the use of Web 2.0 as a tool related to the teaching-learning process is medium.

Level	n	%	Media (IC 95%)	Desv. Stand.	Chi-square test (Significance)		
					Chi ^{2}	Gl	P
Low	8	6.67%					
Medium	66	55,00%					
High	42	35.00%	2.34	0.662	62.379	3	*0.000
Very High	4	3.33%					

* = Highly significant (p < 0,05)

Level of teacher training in the use of Web 2.0 as a tool for university teaching (n = 120).)

To establish whether there is a relationship between the variables age and teacher training in the use of Web 2.0 as a tool to innovate the teaching-learning process in university

teaching, as well as the results of the Chi-square tests and the contingency coefficient, Table 4 highlights that 50. 0% (n = 13) of the sample aged between 31 - 40 years consider that their training to innovate the teaching-learning process in university teaching with Web 2.0 tools is very high, followed by 47.06% (n = 16) of respondents aged between 51 - 60 years who state that their training to innovate in university teaching with Web 2.0 as tools to improve the teaching-learning process is low.

These results coincide with studies conducted by Morales, Trujillo, and Raso (2015); Suárez, Almerich, Gallardo, and Aliaga (2013); Vera, Torres, and Martínez (2014), who affirm that younger teachers perceive greater mastery of ICT to innovate in the teaching-learning process. On the contrary, they emphasize that the older the teachers' age, the lesser their use.

In addition, the results show "the need to pay special attention to the training of the group of teachers older than 50 years, to develop training programs designed exclusively for this teaching profile and thus make them feel motivated in their teaching-learning tasks considering that they are holders of valuable experience for the training of students within the institution" (Vera, Torres, & Martínez, 2014, p. 151).

On the other hand, it is observed that the calculated Chi-square value of 10.360 is lower than the tabulated Pearson's Chi-square value of 16.919 with a confidence level of 95% and 9 degrees of freedom; and, the value of p = 0.322, being p > 0.05. Therefore, it can be affirmed that the age of teachers is not an indication that teachers use Web 2.0 tools to innovate their teaching. When analyzing the value of the contingency coefficient, C = 0.335, it can be concluded that the relationship between the variables is good.

AGE	Low 28,0% (n=34)		Medium 23,2% (n=28)		High 26,0% (n=32)		Very high 22,0% (n=26)		Chi-square test (Significance)			
	n	%	N	%	n	%	N	%	Chi²	gl	p	Contingency Coefficient
21 – 40	1	2.9%	4	14,3%	6	18,8%	1	3,8%				
31 – 40	8	23.5%	9	32,1%	8	25,0%	13	50,0%				
41 – 50	7	20.6%	8	28,6%	11	34,4%	9	34,6%	10,36	9	0,322	*NS 0,335
51 – 60	16	47.1%	5	17,9%	6	18,8%	2	7,7%				
61 – 70	2	5.9%	2	7,1%	1	3,1%	1	3,8%				

* NS = Not significant (p > 0,05)

Table 4. Relationship between age and level of teacher training in the use of web 2.0 as a tool for university teaching (n = 120)

In relation to the item that states Have you received teacher training on the use of web 2.0 for university teaching in order to improve the teaching-learning process? the results agree with those of Área (2010), González-Pérez (2017), Revelo-Rosero (2017), among others, who state that teacher training for the integration and use of web 2.0 as a tool in higher education for educational purposes is still low, and educational practices at the university teaching level do not represent an advance, innovation or improvement with respect to traditional practices. Many teachers used web 2.0 as a tool to support existing methodologies without representing a substantive alteration of teaching principles and methods.

This should lead us to reflect on what mechanisms can help to dynamize pedagogical applications supported by Web 2.0 to make the teaching-learning process more successful. These statements coincide with the results of Sanabria (2006), and Rangel and Peñalosa (2013), (González-Pérez, 2017), Revelo-Rosero (2017), among others; who sustain the importance of integrating web 2.0 as a process of change and innovation in university teaching.

Table 5 shows that 65.00% (n = 78) of the sample claims to have received teacher training on the use of web 2.0 for university teaching to improve the teaching-learning process, compared to 35.00% (n = 42) who claim NO. Therefore, there is a high percentage that has teaching training on the use of web 2.0 as a tool related to teaching and learning in higher education, so that, it is a very significant majority for $p < 0.05$ (Chi = 12.294 at 95% confidence level; 2 gl, $p < 0.006$). From the value of the contingency coefficient, C = 0.352, it can be concluded that the relationship between the variables is very good.

Teacher Training	N	%	Chi-square test (Significance)			
			Chi 2	gl	P	Contingency Coefficient
YES	78	65.00%	12,294	2	0.006 * P < 0.05	0.352
NO	42	35.00%				

* = Highly significant (p < 0.05)

Table 5. Teacher training on the use of Web 2.0 (n = 120).)

Of the 65.00% (n = 78) of professors who claim to have received teacher training on the use of Web 2.0 for university teaching to improve the teaching-learning process, 56.41% (n = 44) have been trained in the use of Web 2.0 tools through training received at the university where they work. 0 tools through training received at the university where they work, followed by 50.0% (n = 39) who have been trained autonomously (self-taught) and 14.10% (n = 11) who have done so through courses offered by private institutions dedicated to this type of training. Table 6 shows that half of the teachers have received training on the use of Web 2.0 as tools for educational innovation to improve teaching at their university; the rest have been trained on their own, either autonomously (self-taught) or through private training courses. It is important to note that some teachers have been trained in more than one way.

Ítems	n	%
By university training	44	56.41
Autonomously (self-taught)	39	50.00
By private training courses	11	14.10
Other	0	0.0

Table 6. Teacher training received on the use of web 2.0 to improve the teaching-learning process (n = 78)

Finally, to answer the second research question: Does the level of teacher training and knowledge on the use of web 2.0 as a tool for university teaching improve the teaching-

learning process, the survey asked which of the following web 2.0 tools do you use most frequently in the teaching-learning process?

The results obtained show that the influence of the teacher training received on the use of web 2.0 as a tool for university teaching related to the teaching-learning process is not always a decisive factor in the teaching staff of the sample studied, since 65. 00% (78) who use it to some extent do so to create virtual learning environments enriched by ICT for the teaching-learning process inside and outside the classroom, compared to 35.00% (n=42) of teachers who say that they do know some of the Web 2.0 tools but are unaware of the pedagogical advantages of their use.

The results are consistent with studies by Arnao and Gamonal (2016), Basurto, (2015); Boza and Conde, (2016); Drulă, (2015); González, Lleixà and Espuny, (2016); Karasavvidis, (2010); Molina, Valencia and Suárez, (2016); Revelo-Rosero (2017); Zheng, Niiya and Warschauer, (2015), which show that the integration of web 2. 0 tools to the university educational process are positive for teaching and learning. Since, they are communicative factors that promote open and flexible formative processes, facilitate collaborative work, construction and development of knowledge within a learning community.

In this sense, the uses that can be made of web 2.0 tools are diverse, which facilitates a high degree of interdisciplinarity for education since they allow breaking traditional teaching-learning schemes inside and outside the university classroom (Revelo-Rosero, 2017). Web 2. 0 are tools of the new Web generation that contains a wide range of more interactive digital applications, which is mainly entrenched in learning management platforms (LMS), Moodle, Zoom, Microsoft Teams, Canvas, Google Meet, Google Classroom, among others; which offer great potential in the participation of teachers and students in virtual learning communities, social networks, social and collaborative tools to promote reflection, creation, empowerment and self-development, but also limitations, therefore, it is necessary to be aware of them to make an appropriate use in teaching and offer students meaningful learning processes.

Table 7 shows data on the use of platforms to create virtual learning environments (virtual classrooms with synchronous and asynchronous resources), 79.2% (n = 95) of the sample uses the Moodle platform, 60.8% (n = 73) the LMS learning management platforms, compared to 30.0% (n = 36) who use Canvas and 26.7% (n = 32) Google Classroom. Regarding platforms with synchronous resources most used by university teachers, 70.8% (n = 85) use Zoom, 63.3% (n = 76) Microsoft Teams, compared to 23.3% (n = 28) who use Google Meet, among others; to create virtual learning environments, since these, by their nature, are characterized mainly by being more interactive, dynamic, participatory, allow the development of autonomous and collaborative work between teachers and students.

Use	Platforms (synchronous and asynchronous resources)				Platforms (synchronous resources)		
	LMS	Moodle	Canvas	Google Classroom	Zoom	Microsoft Teams	Google Meet
Yes	73	95	36	32	85	76	28
%	60.8%	79.2%	30.0%	26.7%	70.8%	63.3%	23.3%
No	47	25	84	88	35	44	92
%	39.2%	20.8%	70.0%	73.3%	29.2%	36.7%	76.7%

Table 7. Use of platforms to create virtual learning environments (n = 120)

Table 8 shows the web 2.0 tools most used by the teachers who participated in the survey, 90% (n = 108) use social networks such as Whatsapp and Facebook with 72.55% (n = 87), followed by blogs with 45.8% (n = 55); and, to a lesser extent Twitter (36.7%) followed by wikis (29.2%). This shows that there is a large majority of teachers who know or use blogs and social networks as educational innovation and good educational practices (Revelo, Revuelta and González-Pérez, 2016) in university teaching to improve the teaching-learning process.

Use	Blogs	Wikis	Social Networks			
			WhatsApp	Facebook	Instagram	Twitter
Si	55	35	108	87	81	44
%	45.8%	29.2%	90.0%	72.5%	67.5%	36.7%
No	65	85	12	33	39	76
%	54.2%	70.8%	10.0%	27.5%	32.5%	63.3%

Table 8. Use of Web 2.0 tools: blogs, wikis and social networks (n = 120)

Table 9 shows that, of the multimedia content tools, 81.7% (n = 98) of the sample use YouTube, followed by 63.3% (n = 76) Podcast and 40.8% (n = 30) PowToon and to a lesser extent Slideshare and Prezi. Almost all the teachers surveyed were unaware of the usefulness of social bookmarking in university teaching. As for collaborative web 2.0 tools, the most used are Google Drive (65.8%), Dropbox (56.7%) and to a lesser extent Microsoft's OneDrive (30.8%).

Multimedia Contents					Collaboration		
Podcast	YouTube	Slideshare	Prezi	PowToon	Google Drive	Dropbox	OneDrive
76	98	38	30	49	79	68	37
63.3%	81.7%	31.7%	25.0%	40.8%	65.8%	56.7%	30.8%
44	22	82	90	71	41	52	83
36.7%	18.3%	68.3%	75.0%	59.2%	34.2%	43.3%	69.2%

Table 9. Use of Web 2.0 tools: multimedia content and collaboration (n = 120)

5. Discussion and conclusions

The study shows that the teaching staff showed, in general, positive attitudes towards the use of Web 2.0 as a tool for university teaching in the teaching-learning process.

The level of teacher training received on the use of web 2.0 as a tool to innovate the teaching-learning process in university teaching is average, with the youngest teachers having positive attitudes towards change in order to innovate. On the other hand, it is essential to develop teacher training programs on the use of ICT and digital skills for older teachers who put resistance to active teaching methodologies supported by the use of technologies.

Therefore, the ongoing training of university teachers in the integration and use of ICT for educational purposes remains one of the limitations, and perhaps the greatest or most difficult to overcome for the moment. Therefore, it is important to emphasize the idea of promoting an institutional policy that promotes teacher training in the use and application

of ICT in university classrooms, with the aim of improving the quality of higher education through a robust technological training plan to adapt university teaching to the needs of a networked society.

It is true that this study has not identified strategies for the use of Web 2.0 for university teaching in the teaching-learning process. The professors who use web 2.0 tools for academic purposes have a low frequency of use, reasons that lead to suggest the need to implement institutional policies that allow the implementation of these tools to enhance the quality of teaching in their professorships. To date, there are few serious reflections on how to relate the use of Web 2.0 as an innovation tool for university teaching in the teaching-learning process. Nor is there a clear position on how to use these tools to improve the quality of higher education, in the sense of increasing relational capital, knowledge flows, and institutional identity.

In the study conducted, it is highlighted that the web 2.0 tools most used by university teachers are the learning management platforms (LMS), Moodle, Canvas, Google Classroom (virtual classrooms with synchronous and asynchronous resources); platforms such as Zoom, Microsoft Teams, Google Meet (with synchronic resources), among others; the same that have allowed them to create virtual learning environments due to the impact caused by the COVID-19 pandemic, to develop autonomous and collaborative work with their students.

Regarding the external web 2.0 tools most used by the teachers in the study sample, there are WhatsApp, YouTube, Facebook, Podcast, Dropbox, Google Drive and Blogs. However, the LMS platforms of some universities have implemented some web 2.0 tools such as videoconferencing system, virtual classrooms, forums, chats, e-mail, messaging, evaluation, among others, to develop their teaching work. However, some universities do not have a permanent plan for teacher training in the use of technological tools in the teaching-learning environment.

This leads us to propose some lines of action to improve the quality of education with the support of ICT as a didactic tool in the teaching-learning processes in accordance with those of other authors (Krumsvik, 2008 and (2014); (Pozos Perez, 2009); (Ala-Mutka, 2011); (Carrera Farrán and Coiduras Rodríguez, 2012); (Ferrari, 2013); (Pérez Escoda and Rodríguez Conde, 2014); (2016); (Cabero-Almenara and Osuna, 2015); (Pérez Díaz, 2016), which can be the object of study at present, in the specific field of HEIs in Ecuador.

- ✓ To take advantage of specific virtual didactic-pedagogical strategies for the use of web 2.0 as an educational innovation to create meaningful learning in students.
- ✓ Develop teacher training strategies for the practical use of web 2.0 as an innovation in university teaching.
- ✓ Generate positive attitudes, change mentality and meaningful learning.
- ✓ To study the educational applications of the Internet (creation and experimentation of virtual learning environments, virtual educational communities, etc.) in the teaching-learning process in university teaching and, specifically, in teacher training for the development of pedagogical and digital competencies that allow for innovation in higher education in HEIs in Ecuador.
- ✓ To analyze the level or degree of development, integration and satisfaction that teachers and students show to the new contexts of training, use and innovation of digital competences in university teaching.

To conclude, Fainholc, Nervi, Romero, and Halal (2015); Rosario and Vásquez (2012); Sancho, Ornellas, Sánchez, and Bosco (2008); Vera, Torres, and Martínez (2014), Revelo (2017), among other authors, highlight in their studies that the challenges of the knowledge society make it necessary to incorporate the use of ICT in teacher training for the exercise of new digital competencies such as technological, communicative, informational, and learning competencies whose application in the educational environment facilitate three central actions such as communication, construction, and research. According to these authors, these competencies imply ongoing teacher training on the use of web 2.0 as a tool to innovate the teaching-learning process in university teaching, "based on a critical understanding that allows teachers to integrate them into a didactic sequence aimed at achieving pedagogical objectives" (Vera, Torres, & Martínez, 2014, p. 151).

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