

Digital Tools as the Main Alternative in Ecuadorian Higher Education in Times of Pandemic

Las herramientas digitales como la principal alternativa en la Educación Superior Ecuatoriana en tiempos de pandemia

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ABSTRACT: For several years, the use of the Internet has increasingly been used for different purposes. However, some difficulties still persist such as the escalating gap in the digital division. In an increasingly globalized world where connectivity is at the service of a minority, it is imperative that technological advances in education are socialized so that they reach everyone. Digital tools in the educational system offer a viable alternative for dissimilar people, in particular, to students of all levels. The following research project aims at describing those digital technological tools that can be used in the teaching and learning process of Ecuadorian Higher Education, both by students at this level and teachers, in times of pandemic. The correct use of these digital tools based on a common benefit, offers guarantees of quality education.

KEYWORDS: digital tools, higher education, ICT, pandemic, teaching-learning.

RESUMEN: Desde hace varios años ha venido aumentando el uso de internet para disímiles aspectos, sin embargo, aún persisten dificultades como la brecha digital que cada vez es más grande. En un mundo cada vez más globalizado donde la conectividad está al servicio de una minoría, se impone que los adelantos tecnológicos en materia de educación sean socializados de manera que llegue al alcance de todos. Las herramientas digitales en el sistema educativo ofrecen una alternativa viable para disímiles personas y en particular a los estudiantes de todos los niveles. El siguiente trabajo investigativo pretende describir aquellas herramientas tecnológicas digitales que pueden ser utilizadas en el proceso de enseñanza-aprendizaje de la educación superior ecuatoriana, tanto por parte de los estudiantes de este nivel como los docentes en tiempos de pandemia. El correcto uso de estas herramientas digitales en función de un beneficio común, ofrece garantías de una educación de calidad.

PALABRAS CLAVE: herramientas digitales, educación superior, TIC, pandemia, enseñanza-aprendizaje.

Today, many countries have been affected by a silent enemy which has struck enormously and without precedent in the history of humanity. It has paralyzed practically all the countries around the world and their major structures such as the economic and financial sector, the health sector, the industrial sector, the transport sector and the education sector. From all the sectors that above mentioned, our main focus for this work is the education sector and within this higher education, especially in the Republic of Ecuador, which has been considerably affected. In early May, the Secretary of Higher Education, Science, Technology and Innovation (Senescyt) announced that this year 2020 the resources allocated to public universities would be 98 million USD less due to the global situation generated by the pandemic and the ravages of COVID-19. All this is due to an analysis carried out within the Ministry of Economy and Finance, which resulted in cutting out budgets for public entities in the second quarter of this year 2020.

This measure affects thirty-two universities, polytechnics, and public institutes in the country. A reduction in part of the budget of these Higher Education Institutions (IES) directly affects the teaching staff who work there. Not only does it considerably affect the teaching staff, but also other items that are used, such as the investments that are made, the budget for teaching staff who are currently doing postgraduate studies abroad, and the acquisition of inputs for the development of research that is being carried out. That is why the Constitutional Court of Ecuador, in the exercise of its constitutional and legal powers, issued Resolution No. 34-20-IS on May 12, in which it resolved in its numeral 1 that:

To order the authorities of the Ministry of Economy and Finance, as well as the other authorities of the corresponding executive function, to suspend and refrain from making budgetary modifications that could have a negative impact on the budget of higher education institutions. (Constitutional Court of Ecuador, 2020, p. 5)

In the Ecuadorian higher education arena, under the current conditions in which teaching should be developed, according to the circumstances in which people live, the use of digital platforms is becoming more important. Logically, if the universities have the conditions and have dedicated themselves to preparing their teaching staff consecutively, they should not present difficulties for the beginning of an academic period. In the case of the Technical University of Manabí, to cite only one example, it has been preparing its staff in the management of virtual classrooms at both the basic and advanced levels by offering preparation courses twice a month. On the other hand, if a university, whether private or public, has not developed its digital infrastructure, has not periodically carried out a training program for its teachers in the use of this platform, it will have serious problems in carrying out a satisfactory educational process and achieving great results. It should also be mentioned that students play a fundamental role since they must be considered in this important equation. In this case, it is necessary to consider some variables that may attempt against the teaching and learning process such as: connectivity, internet access, contracting plans and the acquisition of technological devices such as computers or desktops and laptops.

ICTs have been used in relation to education in different cases, for example the case of online education which helps to reduce the distance between the educational institution, in this case the University, and the student body. The latter

does not always live close enough to be able to travel to it or does not have sufficient resources to be able to pay for everything in the case that this education is private.

The incorporation of ICTs in universities is not only a technological issue, since in order to take advantage of all the benefits and possibilities of these tools, a change in the teaching and learning models is necessary, allowing these processes to focus more on the way students acquire and process information, on the flexibility of time and space for teaching and learning, on collaborative work and, in general, on the development of the skills that today's society demands from its graduates. One of the strategies that universities have worked to try to incorporate ICTs in a dynamic and effective way is the incorporation of online courses (Flores, López & Rodríguez, 2016).

That is why the main objective of this research work is to describe those digital technological tools that can be used in the teaching and learning process in Ecuadorian higher education, both by students at this level and by teachers in times of pandemic.

Digital Web 2.0 tools

Information and Communication Technologies (ICT), a common practice in the field of educational innovation (Silva Ordaz et al, 2016), have become an essential tool for Higher Education Institutions (HEI), which are facing changes that today's society demands and in which innovation is a challenge. The Organic Law on Higher Education (LOES), in its Article 8, paragraph a, describes that the purpose of education is to contribute to the development of universal thought, the deployment of scientific production, arts, culture and the promotion of technological transfers and innovations (National Assembly of Ecuador, 2010, p. 9).

In the last few years, HEIs have been contributing to a wide extension of the Web 2.0 concept, so that today it is a much easier task from the point of view of logical and technological resources, through which the teaching profile can prevail over the handling of tools that are closer to the world of Information Technology. The Web 2.0 is part of the technological innovation that has a great potential to change the way of learning. According to the theoretical postulates of San Andrés et al., «Web 2.0 tools are defined as the use and applications of the Web, where participation, creation, publication and dissemination of content is promoted, characterized by hardware and software that facilitate the creation and exchange of content online» (San Andrés, Campuzano, Ramírez & Navarrete, 2019, p.113).

At present, Web 2.0 is part of the educational innovation that has come to revolutionize the processes of teaching and learning, has achieved that the classes taught allow communication between teachers and students both synchronously and asynchronously where both interact and access easily to different websites, to filter and download required information and convert it into knowledge. For Steve (2009), Web 2.0 «generates ideal communication spaces for the development of some of the skills and, above all, attitudes of a new type of critical, collaborative and creative technological literacy» (p. 61). According to Villalonga (2015), Rodrigo-Cano et al., (2017) and Rodrigo-Cano et al., (2019), in HEIs, teacher training should be intensified, and teachers who are considered designers of mediated learning situations should have timely advice on curricula that provide knowledge of the tools required for the 21st century, so this requires new approaches, including open and distance education (ODL) and incorporating ICTs.

Technological training at present has become one of the fundamental pillars, on which higher education focuses, because it is part of everyday life; therefore, the importance that teachers have the necessary skills and knowledge on the use of digital tools to lead their classes, where the student plays the main roles and participates in the use and application of these, in order to achieve the professional profile according to the demands of society.

Inclusive processes and ICT are considered relevant elements to effectively apply Web 2.0 digital tools. For Marín-Díaz et al. (2018) «Attention to diversity, specifically inclusive educational contexts and processes and educational technology, are particularly present with Web 2.0 tools» (p. 400). Thus, at present, HEIs must have a teaching staff with the necessary digital competences to be able to face students who require better learning opportunities.

Main applications

In the theoretical position of Marmanillo (2019) and Ibarra (2016), technology has made strides in all fields such as education, causing revolutionary changes in terms of the agility of the teaching and learning processes; thus, technology has strongly burst into the mechanisms of communication and interaction as well as in the way students are educated and how they access all available information.

For Rodrigo-Cano et al, (2017); Freire et al. (2019), Web tools are an excellent ally for cooperative and collaborative work, as they allow information to be shared, work with joint documents and facilitate problem solving; these

tools are used as didactic means to support the teaching and learning process, giving way to active learning methodologies; which are used to build knowledge, thus generating significant results in the cognitive, procedural and attitudinal spheres, contributing to the comprehensive development of the learner.

The application of these tools is helping to ensure that the information production processes that are developed around the Web are executed without almost any technical knowledge and without excessive time expenditure. Therefore, «this is a social or communication network, which promotes collaboration and agile exchange of information from users, creating interactive and visual networks» (San Andrés, Campuzano, Ramírez & Navarrete, 2019, p.112).

HEIs are increasingly using information and communication technologies for the process of teaching and learning, and have opted for the use of ICT for learning. The use of this working environment in HEIs will favor the collaborative creation of reusable, accessible, durable and interoperable resources, thus contributing to the quality of the teaching and learning process.

At present, there is a boom in a new paradigm that has led to the spread of participatory and collaborative technologies. These tools being used are conducive to cooperation and communication between the members of an educational community, especially those that encourage collaborative work. In Table 1 we can see some of these tools for the search, the organization, the storage of information, the work with virtual platforms, the collaborative work and the implementation of videoconferences.

Table 1. Digital resources for virtual education

Information search tools	
Google Scholar	It allows the search of information of scientific articles and books at international level. https://googlescholar.com
Scielo	Bibliographic database of free access. https://scielo.org
Scopus	Database of citations and abstracts of peer-reviewed research literature. https://www.scopus.com
Dialnet	Database of scientific content with books, articles, and theses. https://dialnet.unirioja.es
Tools for the organization of information	
Symbaloo	It is a desktop which allows to organize the information through a link on the web. https://symbaloo.com
Scoopit	It is a content curator, which allows to classify the information and share it with other users. https://www.scoop.it
Feedly	Allows you to add and organize content from different websites. https://feedly.com
Tools for information storage	
Google drive	Allows you to store information on google servers, in free version you have up to 15GB of cloud storage. https://gsuite.google.com
OneDrive	OneDrive is a file hosting service. In its free version it allows up to 5Gb in free version. https://onedrive.live.com
Mega	Allows Mega cloud storage up to 50 Gb in free version. https://mega.nz
Dropbox	It is a multi-platform file hosting service in the cloud, allowing up to 2Gb of storage in free version.
Tools for working on virtual platforms	
Moodle	Online training platform that allows to have online courses. https://moodle.org
Google Classroom	It is a free tool from Google to manage classes in the educational field. https://classroom.google.com
Edmodo	A free, educational, technological platform that allows communication between students and teachers in a closed environment. https://www.edmodo.com
Tools for collaborative work	
Google Suite	For teachers and students, it includes several Google tools for working online: Gmail, Google Drive, Google Calendar, Docs or Sites. https://gsuite.google.es
Office365	Includes several tools for online work Word, Excel, PowerPoint
Mindmeister	It allows the generation of online mind maps where ideas can be visually captured, developed and shared.

	https://www.mindmeister.com/es
Padlet	Create collaborative murals virtually, where links and photos can be shared in secure environments.
Tools for videoconferencing	
Zoom	It allows videoconferences of up to 100 people and 40 minutes in free version. https://zoom.us/es-es/meetings.html
Google Meet	Videoconferencing application
Microsoft Teams	Communication and collaboration platform combining persistent workplace chat, video meetings, file storage and application integration. https://teams.microsoft.com

Source: Own research by the authors.

Each of these tools generates ideal communication spaces, which allow the development of skills and competencies; therefore, it has become a new space for technological literacy, socialization and culturalization, mainly for the youngest. Blogs, wikis, social networks and each of these emerging information and communication media after the Web 2.0 generate an ideal context for the development of skills such as critical thinking, autonomy, initiative, collaborative work and/or individual responsibility; skills, within the spaces of higher education (Steve, 2009).

The Web 2.0 tools allow to facilitate learning. They are easy to use because the students are accustomed and familiarized with these technological tools, the same ones that allow to carry out classes in an asynchronous way with the students, uploading the videoconferences so that they can be seen by the student as many times as they are necessary, thus making the student work at his own pace.


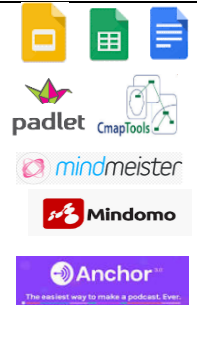


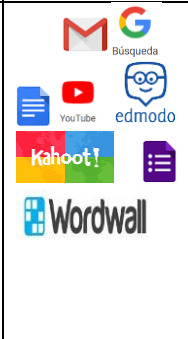
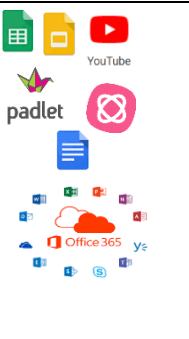
On the other hand, there are disadvantages for those who do not always have a computer and internet service. In other cases, it is the lack

of commitment that some students must assume for the adequate use of tools, or also due to the lack of knowledge, not only on the part of students but also many teachers who lack training.

Bloom's taxonomy and its relationship to digital tools

The digital tools and resources provided by the Web 2.0, make it easier for teachers to carry out the development of their classes for the teaching-learning process in a better way, making it dynamic and attractive to students. Learning tasks are made easier thanks to the work of Benjamin Bloom (1913-1999), who believed that learning was a process and that it was the teacher's task to design units of instruction and tasks that would allow students to achieve their objectives. Table 2 shows the levels of behavior ranging from the least complex level (remembering), to the most complex level (creating); it also details the actions and digital tools that can be used at each level of Bloom's Taxonomy.

Table 2. Digital resources for e-learning classified according to Bloom's taxonomy

Levels	Remember	Understand	Apply	Analyze	Evaluate	Create
Definition	To have in the memory or retain an information in the mind.	To perceive and have a clear idea of what is being said. It is to understand the deep meaning of what is said.	To put into practice the knowledge acquired by using appropriate procedures to achieve an end.	To examine something in detail, to know characteristics and qualities and from this to draw your own conclusions.	To give a value judgment to determine the extent to which the objectives set have been achieved. (Ex ante-intermedia-post)	According to the previous knowledge and starting from one's own capacities to realize something.
Actions	Remembering, reasoning, relating, describing.	I interpret, I conceive, I think, I judge, I deduce, I reason.	I practice, I use, I dedicate, I take advantage resolutely.	I identify, analyze, prioritize, extract, conclude.	I decide, I justify, I value, I determine.	I create, perform, build, plan.
Suggested digital tools						

Source: Own research by the authors.

Each of the verbs (active or action verbs), shown in Table 2, play a key role in writing learning outcomes. They describe how the teacher should construct them and develop the more complex levels of understanding, given that these are compatible with constructivist pedagogical postulates if the six levels of the cognitive dimension established by Bloom are

developed in teaching practice. According to Leon's and Jaime (2015) criteria, all this favors the maturation of higher intellectual skills that will later allow the development of complex problems and processes such as: analysis and synthesis.

In other words, it allows for the formation of competencies that are characteristic of scientific activity, which requires logical rigor, creativity and

the development of strategic reasoning. According to San Andrés and Rodríguez (2017), written learning outcomes for different disciplines may differ in their components due to knowledge structures, this context will indicate the level at which that learning outcome or achievement should be acquired in the subject. Therefore, learning outcomes are related to what the learner is able to do, upon completion of a learning activity.

The educational field is not alien to technological advances, which is why - considering that current generations are increasingly familiar with the use of new electronic tools - teachers face a new challenge, that of taking that potential to their advantage (Rodríguez, López & Mortera, 2017).

The digital divide, therefore, whether between nations (global divide), between people (social divide) or even between those who use the potential of the Internet, or not, as a means of empowerment and political participation (democratic divide), would condition potential development by limiting access to the benefits that could arise from the use of technology (Rodríguez & Sandoval, 2017).

Many students, because of the influence of social networks, use the internet for online gaming primarily, to communicate and post photos of themselves and their friends rather than being used for personal educational benefit. Logically, when you have a large mass of university students using the internet in an inadequate manner or not taking advantage of its potential, this problem can be one of the causes of low performance among others such as lack of study. It can be stated that there are two types of students when addressing the digital divide, a type of student body that uses the Internet and ICTs in terms of their benefit and professional growth as well as economic growth.

When the digital gap becomes a problem of access and quality in the relationship established with each other, in terms of production and consumption of digital goods and services, the school is configured in an appropriate place and space that can democratize access for those who will need this tool in the future, and the means to install digital competencies for value-added use (Rodríguez & Sandoval, 2017, p. 3).

Digital tools not only offer technological benefits to the population but also bring with them other limitations that can be a determining factor in the educational process of students. Previously, reference was made to a series of aspects that attempted against the acquisition of knowledge. Recent studies carried out in the Republic of Ecuador state that approximately 70 % of students throughout the country do not possess all the resources and tools to carry out an online study under the current circumstances the nation lives. Access to the Internet is a limitation, and even more so in rural areas, where only 16 % of households have access to this service, while in urban areas the figure is approximately 47 %.

Sometimes the hiring of internet plans are affected due to the fact that the family does not have enough money, in addition to the geographical location as another discordant element because there is no connectivity in all areas and often it can only be reached via satellite, and the plans are extremely expensive and people end up not buying this service that is not considered vital for the average family. These digital tools are not always free or in most cases the free version is limited in time of use and different options.

Despite the problems abovementioned, Internet access has been improving slightly in Ecuadorian households as shown in (Table 3) according the results published by the latest

report of the National Institute of Statistics and Censuses issued in 2018 (NISC, 2018).

Table 3. Households with Internet access at the national level.

Area	National	Urban	Rural
2012	22,5%	31,4%	4,8%
2013	28,3%	37,0%	9,1%
2014	32,4%	40,4%	14,6%
2015	32,8%	41,0%	13,7%
2016	36,0%	44,6%	16,4%
2017	37,2%	46,1%	16,6%
2018	37,2%	46,6%	16,1%
Year			

Source: National Institute of Statistics and Censuses.

After analyzing the data expressed above, it can be clearly stated that until the end of 2018, less than 40 % of Ecuadorian families at the national level did not have access to the Internet. Without a doubt, this has a significant impact on access to information and contributes to the increase in digital illiteracy among the population. In this time of pandemic in compliance with the guidelines by the Committee of Special Operations (COE) from the implementation of the traffic light which regulates a series of measures and of free circulation; the continuity of the most important works has been established according to the modality of telework

When in a family composed of four members, one of the parents and two children who regularly attend two different educational institutions because they are at different educational levels are working; the use of the internet is limited to these only but there are not always three electronic devices such as computers or laptops available to carry out work or tasks assigned by teachers. This undoubtedly becomes an odyssey because in times of pandemic, teleworking is carried out and school orientations are done through a platform, although the transmission of

information through WhatsApp groups is being used as an alternative, since most people have a smartphone with a plan for unlimited use of this application.

Conclusions

Given the current situation in the vast majority of the world's countries due to the pandemic that is raging unchecked, many governments have been forced to take somewhat drastic measures, but these can never affect the population in sectors that are of vital importance to the people, such as health and education. Rather, efforts must be redoubled to ensure ever higher quality health and education and thus contribute to improving the population's quality of life.

The use of digital tools and the benefits offered by the various resources of the Web 2.0, allow teachers and students to develop with greater quality the teaching-learning process. For this it is strictly necessary a change of mentality especially in those people who are not familiar with ICT because they came to stay and be used for the benefit of education of society. Another essential element to improve the process of knowledge transmission between teachers and

students is the use of Bloom's taxonomy which, without a doubt, ensures a better performance in the development of their skills.

In times of pandemic, the development of education is increasingly necessary, as it is an essential element for human development. Despite the adverse problems and critical economic situation, the country is currently facing, the unstable health of the population, the poor accessibility to the Internet, the lack of full access to electronic and technological means for connectivity, the unequal preparation of teachers and students; education has continued. Every effort has been made to avoid digital and cognitive gaps, so that existing and available technology can be used to extend the cultural, educational, and cognitive heritage of an entire nation.

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- Raydel Hernández García: Interpretation and analysis of the data, preparation of the abstract in English, translation into the English language, approval of the manuscript in its final version.

Conflicts of interest

The authors declare not to have any interest conflicts.

Authors Contribution

Yulexy Navarrete Pita: Initial research and idea, collection of information, interpretation and analysis of the data, writing of the manuscript and approval in its final version, adaptation to the norms of the journal and submission.