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Artículos científicos

Herramientas digitales en tiempos de covid-19: percepción de docentes de educación superior en México

Digital Tools in COVID-19 Times: Perception of Higher Education Teachers in Mexico

Ferramentas digitais em tempos de covid-19: percepção de professores do ensino superior no México

Norma Esther López Maldonado
Universidad Autónoma de Chiapas, México
norma.lopez@unach.mx
https://orcid.org/0000-0003-3726-4926

Sergio Ramón Rossetti López
Universidad de Sonora, México
sergio.rossetti@unison.mx
https://orcid.org/0000-0002-5524-8674

Isaac Shamir Rojas Rodríguez
Universidad de Sonora, México
shamir.rojas@unison.mx
https://orcid.org/0000-0002-0798-1476

Manuel Arturo Coronado García
Universidad Autónoma de Baja California Sur, México
mcoronado@uabcs.mx
https://orcid.org/0000-0002-5098-9932

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Resumen

Este estudio tuvo como objetivo medir la percepción del uso de herramientas digitales para gestionar cursos y videoconferencias utilizadas por docentes de tres instituciones de educación superior en México a raíz de la pandemia de la enfermedad por coronavirus de 2019 (covid-19). Mediante un estudio de corte cuantitativo, descriptivo y transversal, se determinó la utilidad y facilidad de uso percibida de las tecnologías de la información y la comunicación (TIC) utilizadas por las universidades mexicanas para transitar de la modalidad presencial a la modalidad *online*. Para ello, se aplicó un instrumento basado en el modelo de aceptación tecnológica a una muestra total de 192 docentes de tres universidades: Universidad Autónoma de Chiapas, Universidad Autónoma de Baja California Sur y Universidad de Sonora. Como resultados principales, se observó que el sistema de gestión de aprendizaje con valoración de aceptación alta en las tres instituciones analizadas fue Moodle; mientras que la herramienta para videoconferencias Zoom fue la que obtuvo mayor frecuencia con valoración alta.

Palabras clave: herramientas digitales, covid-19, tecnología educativa, sistemas de gestión del aprendizaje.

Abstract

This study aimed to measure the perception of the use of digital tools to manage courses and videoconferences used by teachers from three higher education institutions in Mexico due to the 2019 coronavirus disease pandemic (COVID-19). Through a quantitative, descriptive and cross-sectional study, the utility and perceived ease of use of the information and communication technologies (ICT) used by Mexican universities to transition from the face-to-face mode to the online mode was determined. For this, an instrument based on the technological acceptance model was applied to a total sample of 192 teachers from three universities: Universidad Autónoma de Chiapas, Universidad Autónoma de Baja California Sur and Universidad de Sonora. As main results, it was observed that the learning management system with a high acceptance evaluation in the three institutions analyzed was Moodle; while Zoom was the one that obtained the highest frequency with high valuation among the tools for videoconferencing.

Keywords: digital tools, COVID-19, educational technology, learning management systems.

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Resumo

Este estudo teve como objetivo medir a percepção do uso de ferramentas digitais para gerenciar cursos e videoconferências usadas por professores de três instituições de ensino superior no México como resultado da pandemia de coronavírus 2019 (covid-19). Por meio de um estudo quantitativo, descritivo e transversal, foi determinada a utilidade e a percepção da facilidade de uso das tecnologias de informação e comunicação (TIC) utilizadas pelas universidades mexicanas para a transição do modo presencial para o online. Para isso, um instrumento baseado no modelo de aceitação tecnológica foi aplicado a uma amostra total de 192 professores de três universidades: a Universidade Autônoma de Chiapas, a Universidade Autônoma da Baja California Sur e a Universidade de Sonora. Como principais resultados, observou-se que o sistema de gestão da aprendizagem com avaliação de alta aceitação nas três instituições analisadas foi o Moodle; enquanto a ferramenta de videoconferência Zoom foi a que obteve maior frequência com classificação elevada.

Palavras-chave: ferramentas digitais, covid-19, tecnologia educacional, sistemas de gestão de aprendizagem.

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Introduction

Although the ways of teaching and learning have undergone various changes over time, what was caused by the pandemic caused by the coronavirus disease of 2019 (covid-19) has no comparison. This disease generated a series of challenges never seen before in education. And institutions of all educational levels in the world have especially had to face them. In this sense, the different actors of the teaching-learning process have looked for alternatives that help them to comply with what is indicated in the study plans and programs. Within these measures, the deployment of alternative educational options to the classroom has been chosen, including hybrid or mixed.

Although technology-mediated education (distance, online, mixed, hybrid, etc.) has been considered a phenomenon generated over the last decades, it is a fact that what happened today has marked a before and a then regarding the use and the perceived ease of information and communication technologies (ICT) applied to education. Given these circumstances, Mexican higher education institutions (HEIs) have chosen to implement different strategies

based on the digital tools that they consider most appropriate for the achievement of the learning purposes indicated in the study plans and programs.

According to Cabero (2016), ICT in training contexts are curricular elements and teaching aids that, due to the use of symbolic systems and the strategies used, promote "the development of cognitive skills in people" (p. 2). Similarly, Cabero (2016) mentions that the incorporation of ICT into the teaching-learning process must be seen as a whole that is linked to the learning objectives or purposes, to the didactic strategies and the contents, and not as isolated or independent elements . This means that ICT in the educational field should not be seen as simple repositories of information, but as levers that promote true student learning.

Along these lines, the teacher must be very careful about which tool to use, as well as when and how to include it, since the introduction of technology by itself does not mean learning, but rather the meaning given to its use. . The same Cabero (2016) mentions that the use of ICT in the educational field requires a whole pedagogical project that gives meaning and coverage to what is declared in the study plans and programs, and that is also combined with the instructional, physical and educational contexts. curricular. It goes without saying that the different technological resources used within the teaching-learning process must be adapted to the characteristics and needs of the users.

Faced with the challenge, on the one hand, of coping with the pandemic and, on the other, of using the tools that are considered adequate for the training processes, in the last year teachers have experimented with a series of digital tools ranging from the use of learning management systems (LMS) and videoconferencing platforms in real time to social networks and instant messaging services. In some cases, the HEIs themselves have indicated the tools that should be used; in others, it has remained at the disposal of teachers, even though, for many of them, it was their first approach to the use of technology for educational purposes.

Selim (2007) recognizes four critical success factors in distance education systems in HEIs: the instructor, students, information technology, and university support. From his perspective, the most important is the instructor. Indeed, the teacher (instructor) has the main role regarding the effectiveness and success in the implementation of the courses because he is the one who directs the process and must encourage student participation through various teaching strategies.

For their part, Ong and Lai (2006) mention that, to increase the effectiveness of distance learning, it is of utmost importance that users perceive the system as useful and that it helps them improve their productivity. Likewise, Van Raaij and Schepers (2008)

emphasize that both the ease and the utility perceived by the user are factors that determine the acceptance of new technologies.

Taking into account the above, it is essential to know what digital tools have been used by teachers at three IES in Mexico, namely: the University of Sonora (Unison), the Autonomous University of Chiapas (Unach) and the Autonomous University of Baja Southern California (UABCS). The foregoing in order to determine acceptance, considering the use and perceived ease. For this, the technological acceptance model (TAM) initially proposed by Davis (1989) is taken as a starting point, who mentions that, when facing a new technology, there are different factors that influence acceptance, such as, for For example, perceived usefulness and ease of use.

Initially, the TAM was based on the theory of reasoned action, also known as the planned behavior model (Ajzen and Fishbein, 1980), which has been used to predict people's behavior according to their attitudes and intentions. It should be clarified that in this context the perceived usefulness and ease of use are considered as the convictions that people have regarding whether or not to accept technology as part of a model.

Martín and Sánchez (2014) point out that the two variables mentioned above (perceived utility and perceived ease of use) have a positive effect on the adoption of new technologies, and that they have been empirically tested on several occasions, which caused the Initial TAM has some variations that help the extension and evaluation, for which the incorporation of other variables has been necessary; This is how we get to TAM 2, TAM 3, or even extended TAM to consider social influence and extended TAM to consider cultural influence.

Covid-19: impact on higher education in Mexico

To curb the spread of covid-19 in 2020, governments around the world implemented regulations to seek social distancing: school closings, non-essential businesses, and travel restrictions were measures taken to keep people at home. In the case of Mexico, during the month of March 2020, the federal government published the covid-19 action guidelines for IES. There, the National Council of Educational Authorities (Conaedu), in coordination with the Ministry of Health, determined the suspension of school activities in person: school activities should continue remotely, remotely.

However, this transition to online education was carried out unevenly, depending on the resources and capacities, both technological and human, available to the institutions. According to EY Mexico (July 21, 2020), prior to the closure of educational centers in Mexico, despite having access and exposure to virtual educational platforms, students used these tools mainly to deliver homework, and only 15% of students had taken a course virtually. In this sense, a fundamental pillar for school continuity in HEIs in times of covid-19 was the prior knowledge by teachers about the management of online course managers and videoconferencing tools, coupled with the experience and support that each HEI gave to its community.

Digital tools for online education

Today there is a wide range of digital tools to carry out distance training processes, such as the so-called SGA, which are designed to assist the teaching-learning process in a virtual environment through a set of tools that range from activities synchronous such as chats and videoconferences to asynchronous activities such as forums, wikis and blogs (Vidal, Rodríguez and Hernández, 2015).

In many cases, the WMS do not have an integrated communication tool robust enough to carry out videoconferences in real time, and in other cases they do not even have this resource. That is why, at times, HEIs use a combination of a WMS and a tool to manage videoconferences such as Skype, Zoom and Google Meet in order to carry out training processes with synchronous virtual meetings. Table 1 shows some of the most popular course management tools today.

Tabla 1. Herramientas para gestionar cursos en línea

Nombre	Descripción	Actividades					
		Foro	Tareas	Videoconferencias	Asistencia	Chat	Exámenes
Moodle	Sistema de gestión del aprendizaje de distribución libre.	x	x		x	x	x
Blackboard	Sistema de gestión de aprendizaje con licenciamiento.	x	x	x	x	x	x
Edmodo	Plataforma virtual de comunicación y colaboración gratuita.	x	x	x	x	x	x
Schoology	Sistema de administración del aprendizaje gratuito.	x	x		x	x	x
Classroom	Servicio web educativo gratuito de la compañía Google.		x		x		x
Microsoft Teams	Plataforma de comunicación y colaboración.		x	x	x	x	x

Fuente: Elaboración propia

It is worth mentioning that, of the aforementioned tools, Microsoft Teams is not considered as an SGA. Currently, some HEIs use it as a tool to manage courses because it has functionalities that provide the possibility of creating teams, enrolling students, assigning tasks, applying online questionnaires linked to Microsoft Forms and creating communication channels, among others. In the same way, Classroom is not considered an SGA, however, it enables the management of virtual classrooms, which allows the sending of assignments and

file sharing through Google Drive. Therefore, for the purposes of this research, these two tools are considered within the digital tools to manage online courses.

As mentioned, some of the tools for managing courses do not have the integrated videoconferencing resource, so teachers find it necessary to use an external tool for managing videoconferences as a complement. Table 2 shows some of these currently best known tools.

Tabla 2. Herramientas para gestionar videoconferencias

Nombre	Características
Zoom	Aplicación para gestionar videoconferencias con versión gratuita y planes con costo. Versión de escritorio y dispositivos móviles.
Google Meet	Servicio web de videoconferencias de la compañía Google. Cuenta con planes gratuitos y de paga. Acceso vía web en equipos de escritorio y en *app* en dispositivos móviles.
Microsoft Teams	Aplicación de escritorio y web integrada con el licenciamiento de Office 365 que permite gestionar videoconferencias. Compatible con dispositivos de escritorio y móviles.

Fuente: Elaboración propia

Online education experience

Although it is true that for several years the use of technology as a support or complement to the teaching-learning process was considered an aspirational trend for most HEIs, with the arrival of the pandemic it became a quality implementation challenge of urgency: there was no time to establish the strategy that many institutions wanted. Each HEI tried to respond with the resources available. And in these circumstances, the experience and previous use of EMS served as a frame of reference for the implementation of concrete actions, in some cases, and in others, of new opportunities.

Unison, prior to the start of the pandemic, was already using the Avaus SGA and various customized Moodle platforms in the different departments and study areas as a complement to face-to-face classes. Likewise, in 2019 a training had been started to use the Microsoft Teams communication tool. Thus, in March 2020, Unison launched the COVID-19 Contingency Academic-Teaching Continuity Plan, where, among other things, a call was made to teachers to use the aforementioned institutional tools and platforms to travel towards

an online teaching modality (Unison, 2020). In addition, a guide to good practices for academic continuity and a series of tutorials and manuals for the use of digital tools were published.

The UABCS, for its part, implemented an emerging academic plan for covid-19 where it promoted and trained on the use of its UABCS Online platform, which was designed to provide teachers and students with a comprehensive, robust and safe system to create environments learning courses (UABCS, 2020). Online is based on the Moodle learning management system. Also, pedagogical and technological tools were published so that teachers of any subject could carry out the design of their own resources and thus be able to move towards teaching virtually.

Finally, Unach also already had previous experience in the use of SGA, since since 2003 work began to launch a system of this type that would serve as a complement to face-to-face classes and that would use the free software Moodle as a base. ; This project, for practical purposes, was called educa-t. However, at that time there was resistance from the teaching community, and its use was very limited, according to information provided by the Academic Secretary of said university. Later, with the creation of the General Coordination of Virtual University, in 2007, some degree courses were offered in the distance modality, using the same SGA Moodle, but with a different interface. With this background and in the presence of the covid-19 pandemic, in April 2020 the need arose for the face-to-face classes to move to a virtual or digital environment, where there was no physical contact between the different participants, for which Unach, aware of the lack of training in a high percentage of the university population, created an academic continuity plan for the January-June semester. The instruction at that time was that each teacher could decide the strategy that best adapted to the needs of her and that of the students in order to conclude said school year. At the same time, training was started on the use and management of educa-t, together with video tutorials that explained the use of the tools of this platform and how to create different learning resources.

However, at the end of said semester, the outlook was not very encouraging, since there were complaints from the student body that pointed out that some teachers had not complied with their activities. Consequently, in July 2020, the “Agreement authorizing the use of tools, electronic media and institutional platforms in the functions of the Unach” is issued (Unach, 2020), and it is thus that as of the August semester -December 2020 the

institutional instruction is given to use educa-t (Moodle), with the support of videoconferences via Google Meet or Zoom, as an institutional strategy.

Another important aspect to consider regarding the transition from face-to-face to virtuality was previous experience in each educational institution in technology-mediated study modalities. In this sense, at the beginning of the COVID-19 pandemic, Unison had 54 undergraduate level programs under the face-to-face modality, one undergraduate level program under the online modality and 43 specialty, master's and doctorate programs under the face-to-face modality . For its part, the UABCS had 41 undergraduate level programs under the face-to-face modality, 14 master and doctorate programs under the face-to-face modality and four university-level technical programs under the face-to-face modality. While Unach had 69 degree programs in the face-to-face mode and 10 in the distance mode; 59 specialty, master and doctoral programs in face-to-face modality and a master's degree in online modality.

Materials and methods

The objective was to measure the perception towards the use of digital tools used by teachers from Unison, Unach and UABCS derived from the covid-19 pandemic.

Type of study

Through a quantitative, descriptive and cross-sectional study, the utility and perceived ease of use of the digital tools used by Mexican universities to move from the face-to-face mode to the online mode was determined during the health contingency period caused by the covid-19.

Participants

The present investigation was carried out in three public universities of recognized prestige in Mexico. The population was delimited to the Division of Economic and Administrative Sciences of the Central Regional Unit of Unison (213 teachers), the Faculty of Accounting and Administration Campus I of the Unach (162 teachers) and the Faculty of Administrative Sciences of the UABCS (185 teachers).

Sample

The type of sampling used was probabilistic and the sample calculation method was used. It is necessary to know that the sample size is closely related to the representativeness to be obtained from the study population. In this sense, there is no ideal sample size and it simply must be large enough to be representative (Badii, Castillo & Guillen, 2017), but it is known that the more homogeneous the elements of a population are, it is easier to obtain representative samples. with fewer elements. For this particular study, homogeneous populations were considered. With this, the calculation for the sample size of each university was carried out as follows.

$$\text{Tamaño de la muestra} = \frac{\frac{z^2 p(1-p)}{e^2}}{1 + (\frac{z^2\ p\ (1-p)}{e^2 N})}$$

As: N = population size; e = margin of error, in this case 0.10; z = z score for the confidence level, in this case for 90% it is 1.65, and p = probability of occurrence, 0.50.

Derived from the population of each of the faculties participating in this research, the sample is defined as presented in Table 3.

Tabla 3. Tamaño de la muestra

Universidad	Población	Muestra deseada	Muestra alcanzada
Unison	213	52	53
Unach	162	49	88
UABCS	185	50	51

Fuente: Elaboración propia

Instrument

For the design of the instrument, the TAM proposed by Davis (1989) was taken as a basis and some specific adaptations were made that would allow, at first, to identify which are the technological tools used by teachers in times of covid-19, and in a second, to identify the acceptance towards the use and the ease of use perceived considering the social and cultural influence of the teachers.

To carry out the data collection process, a survey was used. Here, the TAM was also taken as a basis, also adapted to the needs required in the research. The TAM is based on the

theory of reasoned action proposed by Ajzen (1991) and Ajzen and Fisbhein (1980), commonly identified as a model of planned behavior. This model seeks to explain and predict people's acceptance of the use of certain technology based on their attitudes and intentions. Sánchez and Hueros (2010) and Bermúdez (2014) affirm that this model has predictive validity in the case of the implementation of a new technology.

As an information gathering technique, the survey was used through a web form. The survey consisted of 30 items, of which 22 were designed to measure perceived usefulness, perceived ease of use, social influence, and cultural influence. Teachers' perception is measured through the responses using a five-point Likert-type scale, where 1 = Totally disagree and 5 = Totally agree. The number of items per variable was established as shown in Table 4.

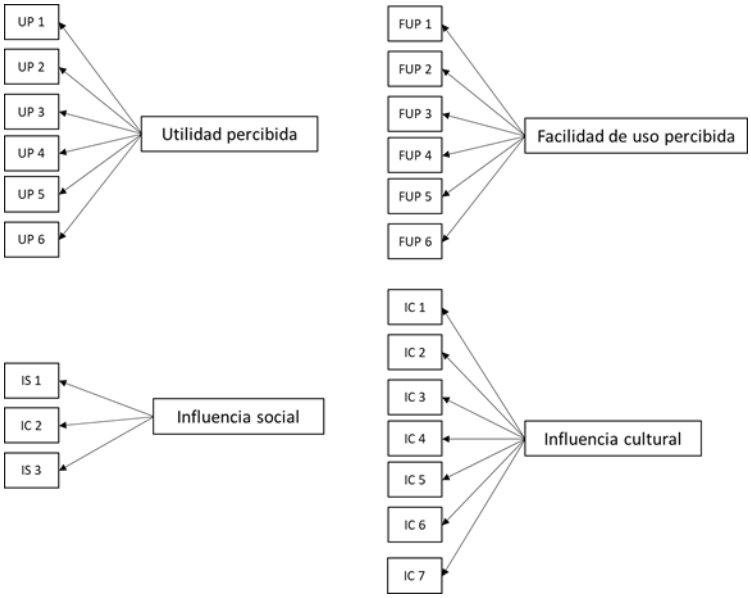
Tabla 4. Variables

Variable	Ítems
Utilidad percibida	6
Facilidad de uso percibida	6
Influencia social	3
Influencia cultural	7

Fuente: Elaboración propia

According to the number of items defined for each variable, the relationship of variables with each criterion is observed in Figure 1.

Figura 1. Relación de variables y criterios



Fuente: Elaboración propia

Description of variables

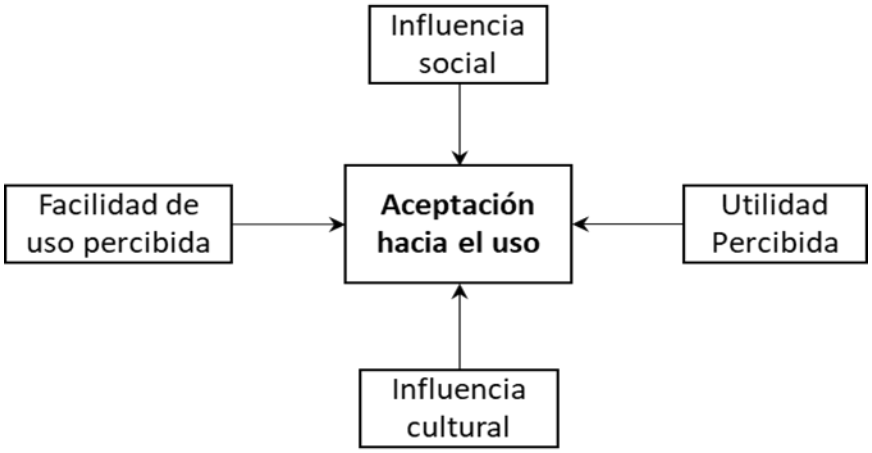
The variable "Perceived utility" represents the belief of people in considering that the use of the technological tool will improve their work / professional performance. For this, six criteria were taken into consideration: subjective norm, voluntariness, image, experience, relevance at work and demonstrability of results (Venkatesh and Bala, 2008).

On the other hand, the variable “Perceived ease of use” represents the degree to which a person considers that the use of a technological system is effortless. In this case, six criteria were considered: anxiety in the face of technology, joy in the face of technology, self-efficiency in the face of technology, perception of enjoyment, objective usability and perception of external control (Venkatesh and Bala, 2008).

The variable "Social influence" has indirect effects on the intention of use through attitude and direct effects on attitude. Here the criteria worked were those indicated by Malhotra and Galletta (1999): compliance, identification and internalization. Finally, the variable "Cultural influence" explains and predicts the mechanism through which cultural differences influence the use of a technology. The following criteria were used: individualism / collectivism, degree of distance, masculinity / femininity, perceived quality of work life, avoiding uncertainty, monochrome / polychrome of time and communication context

(McCoy and Polak, 2003; Zakour, 2004). The four variables mentioned above help determine the acceptance of a given technology, as shown in Figure 2.

Figura 2. Relación de variables de acuerdo al TAM



Fuente: Elaboración propia

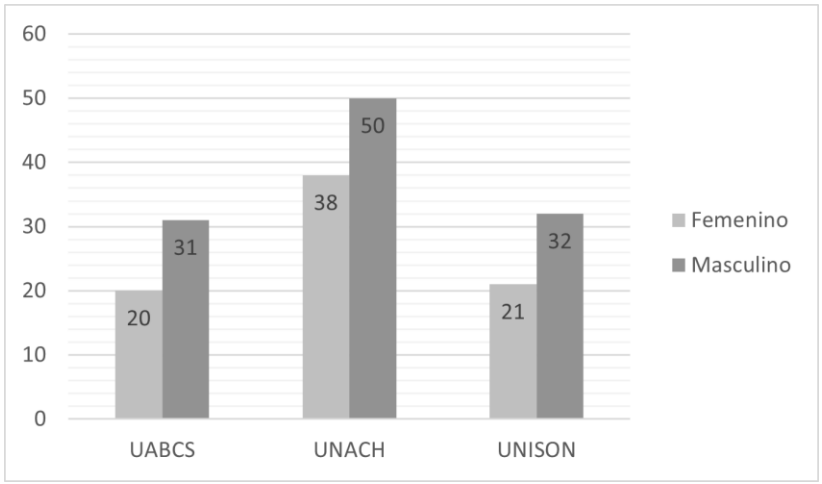
Instrument validation

A total of 192 valid surveys were applied and the reliability of the instrument was obtained using the Cronbach's alpha coefficient statistic, in which an overall value of 0.922 was obtained. This assessment, according to different authors such as George and Mallery (2009), allows us to consider it as high in terms of the internal consistency of the scale used in the instrument.

Results

Descriptive statistics and frequencies are initially shown on the sample of teachers surveyed. Subsequently, an analysis of averages per dimension evaluated is carried out. As can be seen in figure 3, the male gender answered the survey mostly in the three educational centers. A total of 113 male and 79 female participants distributed as follows: 20 women and 31 men from UABCS, 38 women and 50 men from Unach and 21 women and 32 men from Unison.

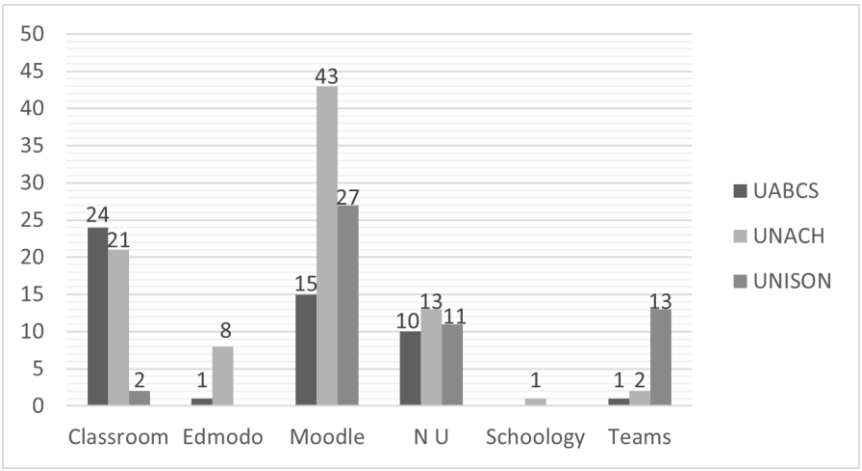
Figura 3. Distribución de la muestra por género



Fuente: Elaboración propia

Figure 4 shows the online course management tools used by the teachers of the participating universities during the 2020-1 semester, at the beginning of the face-to-face closing of the universities. As can be seen, at UABCS 24 teachers used Classroom, 15 Moodle, 10 did not report using, one Edmodo and one Teams. At Unach, 43 teachers reported using Moodle, 21 Classroom, 13 did not report using, eight Edmodo, two Teams, and one Schoology. For their part, Unison teachers mainly used Moodle with a count of 27, 13 Teams, 11 did not report using and two Classroom. In general terms, Moodle was the tool most used by teachers to manage their courses, with a frequency of 85, followed by Classroom, with 47, and Microsoft Teams, with 16. Many did not report using any of these (34).

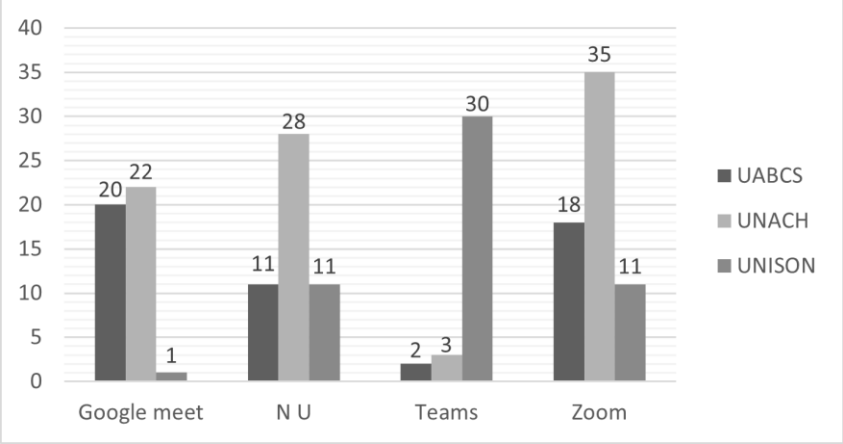
Figura 4. Herramienta para gestión de cursos en línea



Fuente: elaboración propia

Regarding the tools used to carry out videoconferences with students, in figure 5 it is observed that the most used tool was Zoom with a frequency of 64. Regarding the use by institution, it is observed that the UABCS mainly highlights the use of Google Meet (20), followed by Zoom (18) and Teams (two); 11 did not report using. In Unach, the use of Zoom stands out (35), followed by Google Meet (22) and Teams (three); 28 teachers did not report using videoconferencing. At Unison, 30 teachers reported using Teams, 11 opted for Zoom, one for Google Meet, and 11 did not report any tools. Something that can also be observed in figure 5 is the fact that, in general, 50 teachers stated that they did not use any tools for videoconferencing.

Figura 5. Herramienta para gestión de videoconferencias



Fuente: Elaboración propia

Regarding the communication tools that teachers used to maintain remote contact with their students in the pandemic, Table 5 highlights the use of email with the highest frequency in general (118), followed by WhatsApp (108) and Facebook (twenty).

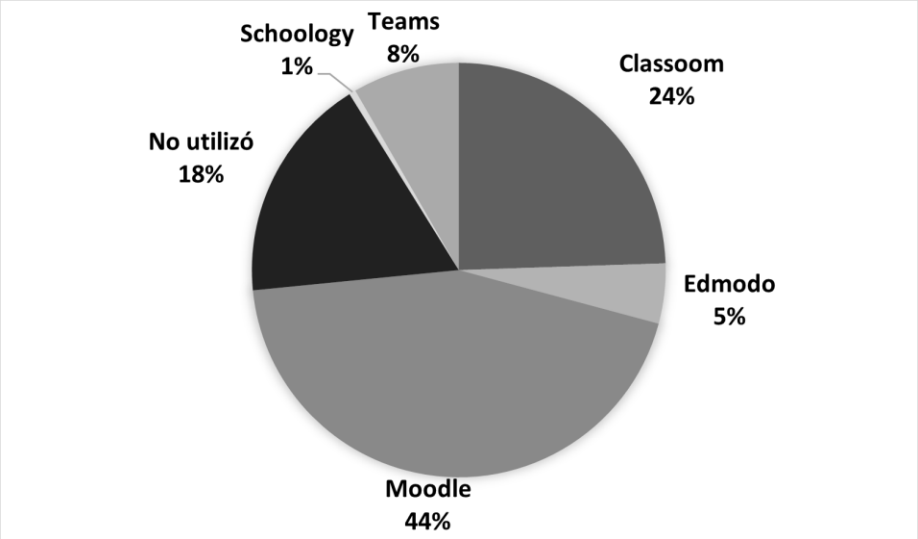
Tabla 5. Herramientas de comunicación

Universidad	Correo electrónico	WhatsApp	Facebook
UABCS	26	29	7
Unach	69	65	12
Unison	23	14	1
Total	118	108	20

Fuente: Elaboración propia

Figure 6 shows that 44% of teachers used Moodle as a course management tool, 24% opted for Classroom, 8% used Teams, 5% Edmodo and only 1% Schoology. It should be noted that 18% stated that they did not use any platform.

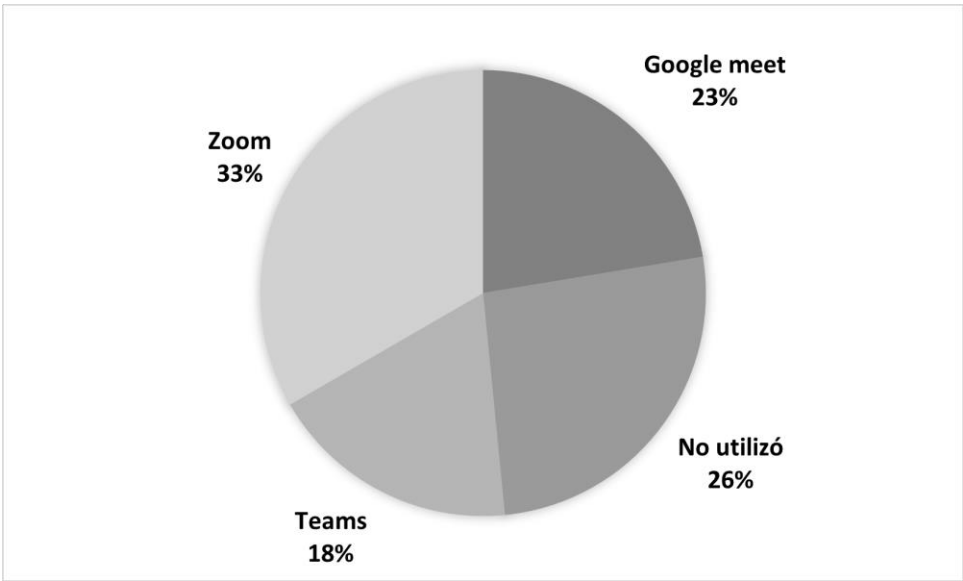
Figura 6. Porcentaje de docentes por herramienta de gestión de cursos



Fuente: Elaboración propia

Regarding the type of video conference management tool, 33% of the teachers stated that they had used Zoom, 26% did not use any video conference tool, 23% used Google Meet and 18% Microsoft Teams, as observed in the figure 7.

Figura 7. Porcentaje de docentes por herramienta de gestión de videoconferencias



Fuente: Elaboración propia

Below are the global evaluations of each course management tool based on the study variables. Valuations are based on the average obtained per variable. With the intention of establishing a better interpretation of the results, it was determined to use average values considering 1.0 to 2.3 as low acceptance, average values of 2.4 to 3.6 indicate medium acceptance and average values of 3.7 to 5.0 indicate high acceptance.

Table 6 shows that Moodle is the tool that presents the highest perceived utility with a frequency of 70, followed by Classroom with 41; While the highest frequency in average evaluation also corresponds to Moodle, with 14. Regarding perceived ease of use, the highest evaluation with the highest frequency corresponds, in the same way, to Moodle with 60, followed by Classroom with 28. Regarding the variable "Social influence", again it is observed that the highest frequency in high valuation corresponds to Moodle with 49, followed by Classroom with 26; While in the variable "Cultural influence" it is observed that Moodle again obtains the highest frequency in high valuation with 62, followed by Classroom 30.

Tabla 6. Evaluación de herramientas para gestionar cursos en línea

Variable	Valoración	Classroom	Edmodo	Moodle	Schoology	Teams
Utilidad percibida	Alta	41	8	70	1	10
	Media	5	1	14	0	3
	Baja	1	0	1	0	3
	Total	47	9	85	1	16
Facilidad de uso percibida	Alta	28	3	60	0	9
	Media	17	6	24	1	5
	Baja	2	0	1	0	2
	Total	47	9	85	1	16
Influencia social	Alta	26	3	49	0	4
	Media	17	6	32	1	8
	Baja	4	0	4	0	4
	Total	47	9	85	1	16
Influencia cultural	Alta	30	4	62	1	9
	Media	17	5	22	0	6
	Baja	0	0	1	0	1
	Total	47	9	85	1	16

Fuente: Elaboración propia

Table 7 presents an exercise similar to the previous one, but in relation to the videoconferencing tool used. In this sense, in the variable "Perceived utility" it is observed that the highest frequency with the high category corresponds to Zoom with 53, followed by Google Meet with 35 and Teams with 28. Regarding "Perceived ease of use", again the highest frequency in the high category corresponds to Zoom with 36, followed by Teams with 27 and Google Meet with 24. While in the variable "Social influence" it is observed that the highest frequency in the high category corresponds to Zoom with 32, followed by middle category with frequency 25 for the same tool; Google Meet has a frequency of 22 in the medium category. Regarding "Cultural influence", it is observed that the highest frequency is located in the high category with 25 corresponding to Zoom, followed by Google Meet with 30 in the same high category and Teams with 26.

Tabla 7. Evaluación de herramientas para videoconferencias

Variable	Valoración	Google Meet	Teams	Zoom
Utilidad percibida	Alta	35	28	53
	Media	8	4	10
	Baja	0	3	1
	Total	43	35	64
Facilidad de uso percibida	Alta	24	27	36
	Media	18	6	27
	Baja	1	2	1
	Total	43	35	64
Influencia social	Alta	19	18	32
	Media	22	13	25
	Baja	2	4	7
	Total	43	35	64
Influencia cultural	Alta	30	26	39
	Media	13	8	25
	Baja	0	1	0
	Total	43	35	64

Fuente: Elaboración propia

In general, regarding the evaluation of online course management tools, it is observed that the largest evaluations with the highest frequencies are for Moodle both for utility and perceived ease; This tool also presents the highest ratings in the high ratings regarding social influence and cultural influence, which means that its acceptance towards use is highly related to social and cultural influence. This may be due to the fact that Moodle has a high position as an online course management tool and has been implemented by various universities due to its free-use license and its easy-to-use modular design.

On the other hand, regarding the evaluation of the videoconferencing tool, Zoom is the one with the highest frequencies in the variable "Perceived utility" and "Perceived ease of use"; Similarly, the highest frequencies with respect to the variables "Social influence and" Cultural influence "are found in the same tool, which means that their acceptance of use is highly influenced both culturally and socially.

Table 8 shows the frequencies of high acceptance in online course management tools by university, taking into account the four variables "Perceived utility", "Perceived ease of use", "Social influence" and "Cultural influence".

At Unison, Moodle stands out as the tool with the highest frequency of high valuation in the four variables. Regarding the UABCS, Classroom stands out in the variables related to perceived utility and cultural influence; At the same university, for the variable "Perceived ease of use", Moodle stands out and in "Social influence", Moodle and Classroom stand out. On the other hand, Unach presents the same trend as Unison, Moodle stands out as the tool to manage online courses with the highest frequency of high acceptance.

Tabla 8. Frecuencias de aceptación alta en herramientas de gestión de cursos en línea

Valoración	Universidad	Classroom	Edmodo	Moodle	Teams
Utilidad percibida	Unison	2	0	23	7
	UABCS	16	0	9	0
	Unach	18	3	31	1
Facilidad de uso percibida	Unison	1	0	15	7
	UABCS	8	0	11	0
	Unach	12	0	19	1
Influencia social	Unison	1	0	15	3
	UABCS	4	0	4	0
	Unach	10	1	15	1
Influencia cultural	Unison	2	0	10	2
	UABCS	4	0	2	0
	Unach	6	0	10	1
Totales		84	4	164	23

Fuente: Elaboración propia

Table 9 shows the high acceptance frequencies in videoconferencing tools. In Unison Teams stands out as the tool with the highest frequency of high acceptance in the four variables. In the UABCS a clear concentration towards a single tool is not observed. In the variable “Perceived utility”, Google Meet and Zoom stand out; in "Ease of use" Google Meet stands out again; in "Social influence" Zoom stands out, and in "Cultural influence" Google Meet and Teams stand out. With regard to Unach, Zoom stands out in the variable “Perceived

profit". In the variables "Perceived ease of use" and "Social influence" Google Meet stands out and finally, in this same university, Google Meet and Zoom stand out in the variable "Cultural influence".

In this sense, the results show that the tool to manage online courses most accepted for use by Mexican teachers who participated in the study was Moodle, with a concentration of high frequencies of 164, followed by Classroom with 84, Teams with 23 and Edmodo with four.

Tabla 9. Frecuencias de aceptación alta en herramientas para videoconferencias

Valoración	Universidad	Google Meet	Zoom	Teams
Utilidad percibida	Unison	1	8	22
	UABCS	11	11	1
	Unach	16	26	2
Facilidad de uso percibida	Unison	1	8	17
	UABCS	8	6	1
	Unach	12	10	2
Influencia social	Unison	1	8	12
	UABCS	2	4	0
	Unach	9	8	1
Influencia cultural	Unison	1	6	8
	UABCS	3	2	3
	Unach	4	4	1
Totales		69	101	70

Fuente: Elaboración propia

The results also show that the most widely accepted tool for managing videoconferences for use by the Mexican teachers who participated in the study was Zoom, with a concentration of high frequencies of 101, followed by Teams with 70 and Google Meet with 69.

Discussion

According to the results obtained, of the tools used by the teachers participating in this research, Moodle is the one with the highest frequency of high acceptance towards its use, and a high social and cultural influence. It is considered here that this result is due to the fact that Moodle provides all the necessary tools to present content and evaluate through a virtual classroom, since it has resources such as forums, chats, questionnaires, wikis, URLs, a referenced model of objects of shareable content (Scorm, for its acronym in English), surveys and others that enrich and promote collaborative and friendly virtual spaces. In this sense, Cabero, Marín and Sampedro (2018) point out that the TAM used for the elaboration of the instrument used is a good predictor to explain the attitude towards the use of Moodle and its application to education, for which the results are considered positive.

On the other hand, in a general way, it is perceived that Zoom is the tool to manage videoconferences with the highest frequency of acceptance towards the use, with the exception of the perception expressed by teachers of the Unach, specifically regarding the perceived ease of use and the social influence, where Google Meet stands out.

Regardless of the results obtained with respect to the tool with the greatest acceptance for use both for content management and for videoconferences, it is a fact that, from now on, new concepts regarding educational modalities will be discussed. In this regard, García, Aguaded and Bartolomé (2018) speak of integrated learning, a concept that underlines the importance of working in flexibility, in models that consider integrating and combining both means and resources, methodologies, activities, techniques and strategies, regardless of the modality of studies; The important thing in this sense is to achieve a balance in the curricular variables and in the materials and resources available in order to satisfy the learning needs of the students.

The foregoing invites us to think that no matter what technological tool is used to manage courses and videoconferences, we must not ignore the strategies used, either for the design of content or for the preparation of video classes, putting as a focal point student learning.

Conclusions

The objective of this work was to measure the perception towards the use of digital tools derived from the covid-19 pandemic.

Although this time the two tools with the greatest acceptance for use were Moodle and Zoom, it does not mean that they are the perfect tools, since both are used separately. Contrary to this, Microsoft Teams is a tool that allows both the management of courses and the opportunity to use video conference rooms, massive live events such as webinars and video recordings. Thus, it is possible to create spaces for the exchange of ideas, reflection and feedback directly with the students; however, according to the results obtained, the teachers do not accept its use. This is probably due either to the fact that its use requires paid licensing, and that of the three participating universities, only one has the license for its use, or because it is a relatively new tool, since its creation dates from the year 2017 , while Moodle was launched in 2002, more than a decade apart in terms of its socialization, knowledge and use.

Another fact worth rescuing is that despite the fact that Unison gives its teachers access to Microsoft Teams, only 13 of them said they used it as a tool for content management, against 27 from the same university who said they used Moodle. The foregoing may be due to what has been commented in the previous paragraph, to the lack of knowledge in its use. On the other hand, in Unach, derived from the policies established by the institution itself, the official platform is Moodle, however, only 43 teachers said they use it, and the rest opted for another content management tool. This may be due to various factors, among which could be considered the lack of knowledge about the tool and the possible complexity of use for loading information, since it requires processes that could be complex for those who are not very familiar with it. the use of this type of technology.

Finally, it is worth noting that a limitation found in the present research was the size of the samples, because, although they were teachers in the same area of knowledge, each university has different populations and with access to different digital tools. Therefore, the data analysis had to be performed by frequencies, since, when trying to do it by percentages, there were biases in the results.

Future lines of research

It remains open as a future line of research to determine the way in which the use of these tools truly contributes to the achievement of the development of students' competencies, since, due to the health contingency, the focus of attention was that the actors in the process of teaching-learning will use digital tools to provide continuity to educational processes.

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Rol de Contribución	Autor (es)
Conceptualización	Norma Esther López Maldonado - principal Sergio Ramón Rossetti López - que apoya
Metodología	Norma Esther López Maldonado - principal Sergio Ramón Rossetti López - que apoya
Software	No aplica
Validación	Norma Esther López Maldonado - igual Sergio Ramón Rossetti López - igual Isaac Shamir Rojas Rodriguez - igual
Análisis Formal	Norma Esther López Maldonado - igual Sergio Ramón Rossetti López - igual Manuel Arturo Coronado García - igual
Investigación	Norma Esther López Maldonado - igual Sergio Ramón Rossetti López – igual Isaac Shamir Rojas Rodriguez - igual Manuel Arturo Coronado García - igual
Recursos	Norma Esther López Maldonado - igual Sergio Ramón Rossetti López – igual Manuel Arturo Coronado García - igual
Curación de datos	Sergio Ramón Rossetti López – igual Isaac Shamir Rojas Rodriguez - igual
Escritura - Preparación del borrador original	Norma Esther López Maldonado - igual Sergio Ramón Rossetti López - igual
Escritura - Revisión y edición	Norma Esther López Maldonado - principal Sergio Ramón Rossetti López - que apoya Manuel Arturo Coronado García – que apoya
Visualización	Manuel Arturo Coronado García – igual Isaac Shamir Rojas Rodriguez – igual
Supervisión	Norma Esther López Maldonado
Administración de Proyectos	Sergio Ramón Rossetti López
Adquisición de fondos	No aplica