

Virtual Learning Environments: University faculty experiences during and after the COVID 19 pandemic

Entornos Virtuales de Aprendizaje: Experiencias del docente universitario durante y después de la pandemia COVID 19

AMAVIZCA-VALDEZ, Laura Olivia †*, GÁMEZ- WENDLANDT, Julio César, VAZQUEZ-MORENO, Erika Ercilia and TOLANO-GUTIERREZ, Helga Karina

Universidad Tecnológica del Sur de Sonora

ID 1st Author: *Laura Olivia, Amavizca-Valdez* / ORC ID: 0000-0003-1614-110X, Researcher ID Thomson: W-2140-2018, CVU CONACYT ID: 877335

ID 1st Coautor: *Julio César, Gámez-Wendlandt* / ORC ID: 0000-0001-9909-688X, Researcher ID Thomson: W-6196-2018, CVU CONACYT ID: 898833

ID 2nd Coautor: *Erika Ercilia, Vazquez-Moreno* / ORC ID: 0000-0003-0511-9804, Researcher ID Thomson: W-6466-2018, CVU CONACYT ID: 456433

ID 3rd Coautor: *Helga Karina, Tolano-Gutiérrez* / ORC ID: 0000-0002-3848-8115, Researcher ID Thomson: W-2091-2018, CVU CONACYT ID: 436643

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Abstract

To improve and innovate the teaching and learning process, it is necessary to develop or use technological means that allow effective communication between teachers and students. Likewise, the use of virtual learning environments, with the appearance of COVID 19, have become a priority in teaching practice, revolutionizing many fields of engineering and the educational system in general. A mixed approach research with descriptive and correlational design was carried out in a sample of 59 teachers, whose objective is to share the experiences of professors of a higher education institution, during and after the pandemic, on the use of virtual environments, such as Moodle and Google Classroom. Also, the benefits and difficulties encountered in virtual classes and currently, in face-to-face classes. Some of the results are 67.2% of the professors already knew about the use of learning environments, but even so, 98.2% concluded that they did develop new skills and aptitudes, most frequently 71.4%, in the creation of courses in virtual platforms and 66.1% in basic competencies in the use of virtual learning platforms, as others to promote quality and educational innovation in the institution.

Teaching experiences, COVID-19, Virtual environments

Resumen

Para mejorar e innovar el proceso de enseñanza y aprendizaje, es necesario desarrollar o utilizar medios tecnológicos que permitan una comunicación eficaz entre profesores y alumnos. Asimismo, el uso de entornos virtuales de aprendizaje, con la aparición de COVID 19, han resultado prioritarios en la práctica docente, revolucionando muchos campos de la ingeniería y del sistema educativo en general. Se realizó una investigación de enfoque mixto con diseño descriptivo y correlacional, en una muestra de 59 docentes, cuyo objetivo es compartir las experiencias de los profesores de una institución de enseñanza superior, durante y después de la pandemia, sobre el uso de entornos virtuales, como Moodle y Google Classroom. También, los beneficios y dificultades encontradas en las clases virtuales y actualmente, en las clases presenciales. Algunos de los resultados son 67.2% de los profesores ya sabían sobre el uso de ambientes de aprendizaje, pero aun así, 98.2% concluyeron que sí desarrollaron nuevas habilidades y aptitudes, con mayor frecuencia 71.4%, en la creación de cursos en plataformas virtuales y 66.1% en competencias básicas en el uso de plataformas virtuales de aprendizaje, como otras para promover la calidad y la innovación educativa en la institución.

Experiencias docentes, COVID 19, Entornos virtuales

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* Correspondence to Author (e-mail: lamavizca@uts.edu.mx)

† Researcher contributing as first author.

1. Introduction

Mid-March 2020 began with an atypical situation in all contexts, which had its origin in the wake of the emergence of the pandemic caused by COVID-19 which caused a scenario of mandatory confinement, a measure that was adopted by governments and health systems in different countries with the purpose of caring for the health of citizens, this in turn led to many educational institutions, at all levels and countries, had to close their doors and therefore, to the suspension of classes. However, the United Nations Children's Fund (UNICEF) stated that education is a priority and despite the health emergency, classes must continue, even more so when the pandemic caused by covid-19 has affected millions of students in Mexico. (UNICEF, 2020).

Certainly, it was a year of many changes for education, with Information and Communication Technologies (ICT) being the protagonists of this transition, since, characteristics such as interactivity and interconnection (García-Jiménez & Ruiz-de-Adana-Garrido, 2013), make them a desirable mechanism to guarantee the continuity of the educational process between teachers and students. However, despite technological advances and relevant government measures, the e-learning model leaves many gaps in the development of students at all levels. Therefore, the use of technological tools that initiate the restructuring of pedagogy in the educational field are of utmost importance, and their advantages focus on breaking the limitations of time and space and creating dynamic and intuitive scenarios that enhance the student's academic training process.

On 6 April 2020, UNESCO, through the International Institute for Higher Education in Latin America and the Caribbean (IESALC), presented the document: "Covid-19 and higher education: from immediate effects to the day after. Analysis of impacts, response and recommendations". This document shows the impact of the pandemic on higher education actors, including students, teachers, non-teaching staff, public policy, as well as the institutional response to the context of the pandemic.

It also allows to review the impact of temporary closures of face-to-face operations of HEIs, the disruption of daily life, the fear of facing crises and the generation of anxiety due to the demands of students are related to their impact on the quality of online education which is not the same as face-to-face classes; (UNESCO IESALC, 2020, p. 13).

However, several universities in Mexico, public or private, have expressed their opinion on this issue and, in general, it seems that this change of approach has not been received positively. Part of the dissatisfaction stems from the fact that the content offered was never designed as part of a distance higher education course but in an effort to reduce the absence of online courses followed by virtual courses without additional or prior preparation (UNESCO IESALC, 2020, p. 16). This meant that the training process will move from face-to-face to virtual, but without losing the forms of face-to-face classes: synchronisation of space-time, activities and feedback, rigid timetables and the same number of contents.

On the other hand, there is a disparity between technological advancement and learning and teaching skills, i.e. skills for the knowledge society, as students and teachers say they need support and see new barriers to participation in virtual classes emerging. This means that age or generation is not a determining factor in technological literacy; a reality that suggests that experts in Technology for Learning and Knowledge (TAC) stress that education today is in crisis because there is a gap between technological advances, curricula, methods and students' needs. This unexpected fact has highlighted the difficulties and failures of the education system at all levels to adapt to virtuality, as well as the various technologies that can be used to face this challenge.

However, in order to be able to continue with the teaching-learning process, institutions have sought through the training of their teachers to attack these difficulties as much as possible and offer students tools and means with which they can work, so much so that they have even managed support strategies for those who lack easy access to education due to economic issues or distance.

Considering that online classes need a series of situations to achieve successful learning and that there are certain factors on the part of the student such as motivation, responsibility and autonomy to develop their learning. In reference to the teacher, he/she must pay special attention to ensure that the design of the materials is of high quality, that the methodologies used are adapted to the required learning and that the tutoring and counselling process is carried out in an agile and efficient manner.

At the Technological University of Southern Sonora, considering the changes brought about by the confinement, virtual training was offered to teachers where they could learn to design, with the necessary basic elements, the courses of the subjects they would be teaching at that time, and seeking to ensure that virtual education was centred on the main educational actors such as the teacher and the student. It also focused on interactive learning, didactic material and the evaluation process for the achievement of the objectives set and not on ICT as the main instrument.

It can be said that, like other institutions, UTS designed strategies in order to successfully complete the current term and start the next one. The strategies established were directly related to the use of ICT, Virtual Environments and a little bit about educational paradigms, all with the aim of achieving the necessary interactions and effective communication between teacher and student. According to preliminary results obtained through the Survey on Teaching and Learning in Quarantine Times published by the Inter-University Observatory on Society, Technology and Education (2020), it seems that everyone resorted to what they had at hand (sometimes more, sometimes less) to continue the dialogue with their students: WhatsApp, Email, YouTube, Moodle, Google Classroom, Zoom, Jitsi, Meet, among others.

Learning in most educational institutions during the pandemic is associated with the introduction of virtual learning environments that were not used before and had some shortcomings or were used by few, but have been able to get off to the best possible start due to the contingency.

During this time, virtual education has become an opportunity to acquire important skills such as: cooperative learning, discipline and autonomy, internationalisation, time organisation, acquisition of technological and digital skills, aiding academic development.

Therefore, we should not lose sight of the fact that "virtual" is only a development scenario and "learning" is relevant to quality.

Virtual does not represent the juxtaposition of face-to-face education, but can be transformed into a more effective application of education by combining technology and the development of students' professional skills in educational institutions supported by virtual platforms.

In Mexico and Latin America, according to Peña (2009), the following should be recognised as an object of study: a) the contribution of the virtual to educational innovation and b) assessing its impact on educational processes, with the aim of generating knowledge about the use and contribution of digital resources, which will allow the development of digital skills to be systematised.

Behind a device and a platform there is a set of factors that give meaning to its use: study plans and programmes, the mission and vision of educational institutions, teacher planning, especially if we consider that "in Mexico, priority continues to be given to the distribution of equipment and software, but no profound changes are documented in the forms of teaching" (Guerrero and Kalman, 2010, p. 214).

Before concluding this section, it is important to mention that the Universidad Tecnológica del Sur de Sonora has had the Moodle institutional platform in operation for more than 15 years. This platform was initially implemented in the Information Technology (ICT) educational programme and is currently used by all the degree courses offered at the institution. Undoubtedly, it has been a great support for teaching practice in face-to-face classes since it began its operation.

However, currently, due to the number of applications and courses designed in it, it has been showing some deficiencies in its performance and it has not been possible to invest sufficient economic resources to optimise the processes that can be worked on in it. Likewise, for some time now, various training courses have been offered on the use of Moodle and its different resources. Even so, there is resistance from a few teachers of different ages who prefer not to use a platform to support and innovate with the implementation of technological tools in the teaching and learning process.

At the beginning of the pandemic, in March 2020, a group of teachers from the ICT career, designed a course for the acquisition and strengthening of technological skills and design of courses in Moodle platform, synchronous and asynchronous at the same time, because it is the institutional environment, which was not completed by all teachers, presenting again a little resistance to the use of technologies and preferring individual methods to establish communication and delivery of their virtual classes. Following this, the university received the opportunity, in August 2020, to offer teachers training with Arizona State University on the use of Google Classroom, but some teachers did not complete the training and it was offered again in order to achieve a greater number of trained teachers.

From discussions among teachers, Classroom is mostly heard of for its ease of use and flexibility in delivery for students, although it has fewer resources than Moodle. This is considered inadequate, as the university and those who are part of it must move forward and seek to be on a par with other universities and thus, in due course, attract more enrolments by expanding the coverage that could be offered by implementing more flexible modalities than only the face-to-face one. In this sense, and through this research, the aim is to find out through the opinion of the teachers their experiences of using virtual environments during and after the pandemic and thereby generate a series of proposals to improve the quality and educational innovation in the institution, seeking the application of best practices in the teaching and learning process to achieve the professional competences that are set out in the syllabuses and a teaching staff that is able to face the diversity of emerging changes that may arise.

2. Methodology

The development of this research was carried out considering the following aspects:

A. Type of research:

The methodological approach of this study is of a mixed type with a descriptive design because it aims to collect statistical data on the subject under study, also the experiences of teachers on the use, benefits and difficulties encountered during and after the confinement in the teaching and learning process mediated by virtual environments in order to thereby generate proposals that seek to improve educational quality and continue to innovate in teaching practice.

B. Resources

As material resources, to collect data, a survey was designed with the Google Forms tool and distributed through the WhatsApp social network by means of managed institutional groups. The application is carried out in this way as it was requested during the holiday period. It was decided to use Google Forms because it allows statistics to be obtained in real time and at the time of implementation. In this way, it is possible to keep track of the subjects who have answered and those who have not, in order to comply with the significant sample or more requested for the research.

This survey has 37 items divided into 4 categories of study, the type of responses is designed as closed-ended, with multiple response options, single response, as well as Likert and dichotomous scale responses.

Likewise, a statistical calculator published online at Netquest.com was used to calculate the sample, where the universe was 68 teachers, resulting in a sample of 58 for it to be significant. See figure 1

<p>68</p> <hr/> <p>UNIVERSE SIZE Number of people that make up the population to be studied.</p>	<p>50</p> <hr/> <p>HETEROGENEITY % It is the diversity of the universe. The usual thing is to use 50%, the worst case.</p>
<p>5</p> <hr/> <p>ERROR RANGE % Smaller margin of error requires larger sample.</p>	<p>95</p> <hr/> <p>CONFIDENCE LEVEL % A higher level of confidence requires a larger sample. The usual is between 95% and 99%.</p>
<p>58</p> <hr/> <p>SAMPLE People to survey.</p>	<p>Calculate</p>

Figure 1 Statistical calculator
Source: Netquest.com

C. Procedure

For the execution of each of the tasks in this study, first and foremost, as mentioned in the previous paragraphs, the type of research and the elements that comprise it are defined, as well as the material and human resources necessary for the orderly execution of this study.

Following this, the survey is applied to a total of 59 teachers in a population of 68, from the different educational programmes offered at the university, with no age limit, who have participated in hybrid mode when returning from the pandemic or who have taught virtual classes during the confinement, as well as those who teach at least one subject at the institution. The research is conditioned to the fact that they can only be answered by teachers, given that they are the element of study in this research and meet the necessary characteristics to be studied and analysed. However, there was one finding where a female teacher who complies with the above did not answer some questions and a male teacher who is starting out as a teacher and is teaching hybrid classes. Subsequently, after 3 days of application and follow-up in filling out the survey until the requested sample was completed, the survey was closed and the results analysed, which will be presented in the corresponding section.

3. Results

Currently, UTS is implementing the hybrid mode, classes with face-to-face hours from Monday to Thursday and virtual classes only on Fridays, but it is planned to return, in January 2023, to only the face-to-face mode.

The following questions arise from the above: Will it be appropriate for the university, once it has moved to the virtual mode during the pandemic, and once it has returned to the hybrid mode after the pandemic, to go back to the face-to-face mode? What factors will be decisive in making the decision on this return? Do teachers have or do not have the basic technological skills necessary to continue operating the hybrid mode? How can this backtracking impact on the teaching-learning process? Do teachers and students have sufficient tools and resources to operate in both modes? Will the student be affected in any way by continuing in the hybrid mode or changing to the face-to-face mode? Some of the questions will be addressed in this research and the rest in the next one.

The results obtained in this research on the experiences of teachers during and after the pandemic about the use of virtual environments, the benefits and difficulties they presented are: As can be seen in table 1, out of 59 teachers only 19 did not know about Virtual Learning Environments (VLE), of which 7 were female and 12 were male; they belong to the following careers: 2 in Automotive After-Sales Service, 8 in Marketing, 2 in Information Technology, 4 in Mechatronics and 3 in Industrial Maintenance.

The age ranges with the highest frequency of knowledge about VAS are 23 to 35 and 36 to 45; in the range of 46 to 65 was where there is the highest frequency of teachers whose age is located in it, but it is where there was the highest frequency of lack of knowledge about VAS and also dominated the largest number of educational programmes (EP), 4 out of 6 to be exact, with teachers in this situation. Another important aspect obtained is that male teachers were the ones who most frequently answered that they had no knowledge, 12 out of 19. In terms of degree programmes, the Business Development programme predominates in the two areas it offers: Automotive After-Sales Service, with two teachers, and Marketing, with eight. However, this educational programme represents 39% of the surveyed sample and 16.9% of its active teachers showed a lack of knowledge.

Age range	¿ I knew about the EVAs?		Sex		To which race do they belong?					
	Yes	No	F	M	SPA	MKT	MA	TIC	MI	
23 -35	5	2	0	2	1	1	0	0	0	
36 -45	17	4	0	4	0	1	2	1	0	
46 -65	18	10	6	4	1	5	0	1	3	
66 o +	0	3	1	2	0	1	2	0	0	
	40	19	7	12	2	8	4	2	3	

Table 1 Total number of teachers by age, gender and career who did not know about Virtual Learning Environments

Source: Own Elaboration

In table 2, it can be seen that the most used means by those who did not know about virtual learning environments was institutional training. It is worth mentioning that in previous paragraphs we talked about the two trainings that were given in pandemic, highlighting the importance that the institution should continue to offer them as it is a means of support for teaching practice. Following this, it was found that the most frequent means of attention to attend the virtual classes were WhatsApp and watching videos, with 4 teachers using them frequently for each one. Likewise, the age range and the resources used to attend the virtual classes, the teachers who expressed not having the knowledge, even so, 4 teachers had used Moodle, 3 Google Classroom and 1 none.

Age range	¿ I knew about the EVAs?	¿ How did you attend your virtual classes in times of pandemic?					
		No	I used other means and resources	For WhatsApp	Watching videos	By institutional training	By email
23-35		2			1		1
36-45		4	1	1			2
46-65		10	1	3	3		3
66 o +		3					2
		19	2	4	4		8

Table 2 Type of resource used by teachers who had no knowledge of Virtual Learning Environments (VLE)

Source: Own Elaboration

Table 3 shows how the adaptation process was for those who had no knowledge of EVA, showing that 8 of the 19 had a very easy process but 7 found it difficult to adapt and their age ranged from 46 onwards.

Age range	¿ I knew about the EVAs?	Being in a pandemic, what was the adaptation process like?			
		No	very easy to adapt	Little easy to adapt	hard to adjust
23 - 35		2	2		
36 - 45		4	3	1	
46 - 65		10	3	2	5
66 o Más		3		1	2
		19	8	4	7

Table 3 Adaptation process of teachers who had no knowledge of Virtual Learning Environments (VLE)

Source: Own Elaboration

Table 4 shows that of the 40 teachers who did have knowledge of the use of VLE, 29 were able to adapt easily and 1 was unable to adapt, and their age range was between 25 and 35 years old. It is also important to mention that this statistic does not show those aged 66 and over, as they had no knowledge of learning environments.

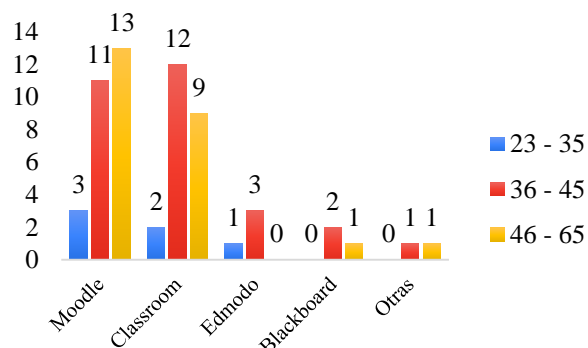
Age range	¿ I knew about the EVAs?	Being in a pandemic, what was the adaptation process like?				
		Yes	very easy to adapt	Little easy to adapt	hard to adjust	I couldn't adapt
23-35		5	1	1	2	1
36-45		17	15	1	1	0
46-65		18	13	4	1	0
		40	29	6	4	1

Table 4 Adaptation process of teachers who did have knowledge of Virtual Learning Environments (VLE)

Source: Own Elaboration

With regard to the virtual learning environments that the 40 teachers who mentioned having knowledge of them had already used, it was possible to obtain a frequency of 27 teachers who had used Moodle and 23 who had used Google Classroom. As mentioned in previous paragraphs, the Moodle platform has been in use for approximately 15 years, around 2007 it began to operate in the Information Technology programme, and after that, the other educational programmes began to incorporate it. In the case of classroom, in the year 2020 training was carried out on this platform and in that short time it has been taking a lot of use by teachers due to its ease of use and flexibility. However, Moodle has more resources to work with and implement in teaching practice, but it does present greater control of delivery times, where the teacher can establish the total closure of the activities versus in classroom the student can continue to deliver even if a delivery date and time is set. See graph 1.

Frequency of use of Virtual Environments, by age range, by teachers who have knowledge of them.



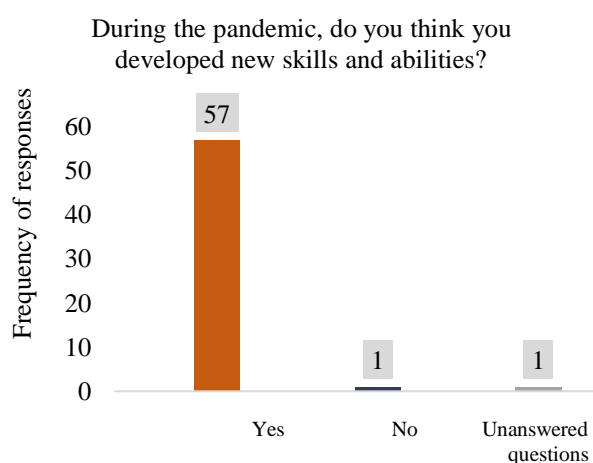
Graph 1 Frequency of use of virtual learning environments by teachers who do have knowledge

Source: Own Elaboration

Concluding the first phase of the results of this research, it can be argued that it is so important to be trained in the different technological platforms and tools, given that by using them it would be increasingly easier and with better quality that they could be integrated into the teaching and learning process and innovate, why not. It is also observed that it is not a question of age but rather of attitude and willingness to change, since 37 (62.7%) teachers say that it was very easy to adapt to the process during the pandemic with and without knowledge in the use of EVA.

The results of the teachers' experiences during the confinement are shown below, focusing on the following aspects:

Development of skills and aptitudes: in this aspect it can be seen in graph 2 that 57 (96.61%) of the 59 teachers surveyed mentioned that they did develop new skills and aptitudes and only 1 teacher said that they did not; they also did not require any training to teach their virtual classes but stated that they had to request training in the creation of courses on virtual platforms. With regard to the 59 teachers who say that they have developed skills and aptitudes, table 5 shows the following.



Graph 2 Frequency of teachers who feel they developed skills and abilities during the pandemic
Source: Own Elaboration

Age range	During the pandemic, Do you feel you developed new skills and abilities during the pandemic??		Required training??		Sex	
	Yes	No	Yes	No	F	M
23 - 35	7	0	3	4	1	6
36 - 45	20	1	9	12	8	13
46 - 65	27		21	6	13	14
66 o más	3		3	0	1	2
	57	1	36	22	23	35

Table 5 Teachers who say they did develop new skills and abilities during the pandemic
Source: Own Elaboration

Table 6 shows the results obtained on the training that teachers say they have requested or requested during the pandemic. The most frequent courses are the creation of courses on virtual platforms with 28, in second place with 25 Introduction to EVA (Moodle, Classroom, others), in third place with 23 Design of planning for virtual courses, in fourth place with 21 Management of Google tools and finally with 18, Management of stress and anxiety. Interestingly, these courses, except for the last one, were offered in the two trainings mentioned in previous paragraphs, one was institutional which contemplated the first four most frequently and the other, which was given by the University of Arizona, was totally focused on Google Classroom and its tools. But, the ones that were not given during the pandemic were the last one with the highest frequency and the rest with lower frequencies. What this means is that the focus during the pandemic was on the use of virtual environments to carry out teaching practice and the aim was to adapt to change in accordance with the possibilities of each teacher at home.

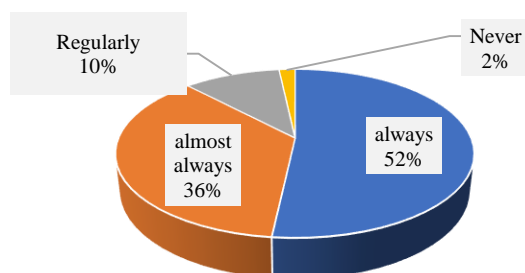
Training that should have been requested or requested by the teacher during the pandemic	Frequency	%
Emotion management	13	22.03%
Creation of courses on virtual platforms	28	47.46%
Designing course plans for virtual courses	23	38.98%
Introduction to EVA (Moodle, Classroom, others)	25	42.37%
Management of Google tools	21	35.59%
Stress and anxiety management	18	30.51%
Time management	10	16.95%
Use of social networks (Facebook, WhatsApp)	4	6.78%
None	5	8.47%

Table 6 Training requested or to be requested during the pandemic
Source: Own Elaboration

Similarly, the teachers were asked whether, during the pandemic, the institution provided them with the necessary facilities, flexibility and resources to be able to conduct their classes virtually. The following responses were obtained, from highest to lowest frequency: out of 59 teachers surveyed, 25 (42.37%) said regularly, 21 (35.59%) said always, 9 (15.25%) said almost always and 3 (5.08%) said never, while one teacher did not answer again.

Consequently, the elements studied on the teachers' experiences during the pandemic were obtained with respect to the question "In your home, did you have sufficient technological tools to be able to teach your classes virtually? In graph 3 we can see that 30 (52%) of the teachers affirm that they had sufficient technological tools for their virtual classes, as well as 21 (36%) say that almost always and 6 (10%) and 1 (2%) affirm that they regularly and never had the tools. The most frequently used tools at home were: 1) Laptops 91.53%, 2) Mobile phones 69.49%, 3) Webcam 59.32% and, 4) Microphone 54.24% of the teachers surveyed. The two most used communication tools were: WhatsApp (94.8%) and email (79.3%) by the teaching staff during the pandemic.

At home, did you have enough technological tools to be able to teach your classes virtually?



Graph 3 Percentage of teachers who had, at home, the technological tools to work in virtual classes

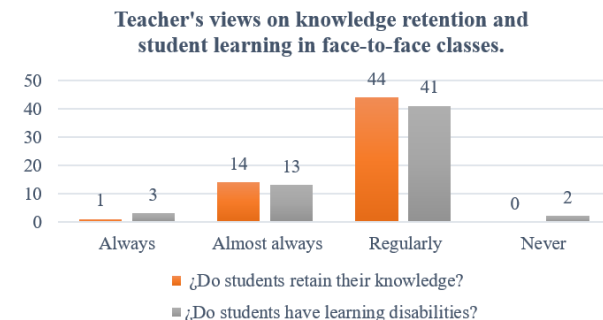
Source: Own Elaboration

Likewise, the teachers stated in the survey, "What were the most frequent difficulties you encountered? The five most frequently reported by teachers were: 1) Low student participation in virtual sessions and the increase in telephone and internet charges with a percentage of 43.1% each, 2) Internet access with 37.9%, 3) Interruptions in classes with 32.8%, 4) Low performance devices with 31% and 5) Stressful moments with 27.6%. In the case of students, they also presented different difficulties, according to the opinion of the teachers surveyed, the most frequent were: 1) Access to internet with 91.53%, 2) Lack of equipment and technological tools with 88.14%, 3) Low performance devices with 64.41%, 4) Difficulty to concentrate in the sessions with 59.32%, 5) Integrating and organising school with work was presented in 52.54% and finally the organisation of their work with 50.85%.

Another aspect, and more important than having a good, is the health aspect, where the teachers surveyed showed that due to the lack of mobility or the sedentary lifestyle that arose as a result of the pandemic, they had some health problems: 1) Weight gain in 29 (49.15%) of the 59 teachers surveyed, stress in 25 (42.375%) teachers, decreased vision in 23 (38.98%) teachers and anxiety in 21 (35.59%) teachers.

There were also changes in the cognitive process such as: Slow processing in 25 teachers, poor retention of information in 22 and forgetfulness of information in 20 teachers out of 59 respondents. Students regularly attended class according to 32 of the teachers and that, regularly, 48%, 28 teachers mentioned that the student's role was active during the teaching and learning process in pandemics.

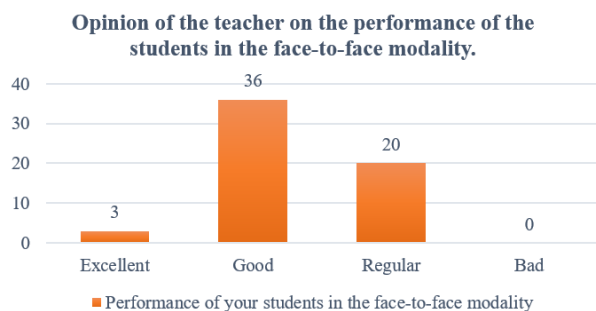
Regarding the experiences of the teachers after the confinement, the cognitive process, according to the opinion of the teachers, students regularly have problems in retaining knowledge and learning due to the difficulty of concentration since the pandemic.



Graph 4 Students' knowledge retention and learning problems, according to the teacher's opinion in the face-to-face mode

Source: Own Elaboration

The teachers (36 out of 59) perceive that the student's performance, although they had some difficulties in pandemic and currently in classroom mode, has a good performance (see graph 5).



Graph 5 Student performance in face-to-face mode, according to the teacher's opinion

Source: Own Elaboration

Another element of the study was whether teachers consider it indispensable to use learning platforms as a means of support in teaching practice; the results are presented in this regard, in which it is stated that 40.7% of the teachers surveyed almost always use virtual environments as support and 28.8% always use them, stating that they are indispensable, 45.8% being in complete agreement and 40.7% agreeing with the use of Moodle and Classroom in their classes in the teaching-learning process at UTS. See table 7.

When returning to face-to-face teaching, do you use virtual environments to support your teaching practice?		He considers the use of platforms such as Moodle and Classroom indispensable to support his classes?	
Always	17(28.8%)	I fully agree	27(45.8%)
Almost always	24(40.7%)	Agree	24(40.7%)
Regularly	16(27.1%)	Neither agree nor disagree	6(10.2%)
Never	2(3.4%)	Strongly Disagree	2(3.4%)

Table 7 The need to use VAS in teaching practice during face-to-face classes

Source: Own Elaboration

Before concluding this section, it is important to mention that the virtual environment most used by the teaching staff surveyed is Google Classroom, with 55.9% in favour, due to its ease of use and adaptability in each of the subjects taught by the teacher. They also mention that it was easy to adapt again to the teaching practice in face-to-face mode, with 54.2% in favour, and the two most frequent communication tools used in the face-to-face mode are WhatsApp (88.1%) and e-mail (81.4%), the same as in the virtual mode, only with minimal percentages of difference in each.

To close this section, the main challenges faced by teachers are:

- Adaptation of face-to-face content for the virtual mode.
- Designing creative and innovative teaching strategies.
- Development of the level of expertise in computer and communication tools.
- Availability of infrastructure and equipment required given that they were at home in a pandemic.
- Adaptation to the digital work platform.

4. Acknowledgements

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5. Conclusions

The findings of this research allow us to take up some of the quotes mentioned in previous paragraphs and to answer some of the questions that triggered this study.

In Mexico and Latin America, according to Peña (2009), the following should be recognised as an object of study: a) the contribution of the virtual to educational innovation and b) assessing its impact on educational processes, with the aim of generating knowledge about the use and contribution of digital resources, which will enable the development of digital skills to be systematised.

It is also important to point out that behind a device and a platform there is a set of factors that give meaning to their use: study plans and programmes, the mission and vision of educational institutions, teacher planning, especially if we consider that "in Mexico, priority continues to be given to the distribution of equipment and software, but there are no documented profound changes in the forms of teaching" (Guerrero and Kalman, 2010, p. 214).

Based on what these authors mention, while it is true that the education system in general, was in dire need of reinventing itself with extreme urgency, to remain constant despite the absence in the classroom, the teaching and administrative community of UTS also did so, strategies were designed in order to successfully complete the current school term. These strategies were directly related to the use of ICT and in order to continue the interactions between teacher and student.

With this research it was possible to affirm that teachers are trained to operate and face challenges in new study modalities, they consider it essential that virtual learning environments, specifically Moodle and Classroom, are also used in the face-to-face modality as a support to their teaching practice, age was not a determining factor to stop innovating in the teaching and learning process, it is shown that teachers continue to use means of communication such as WhatsApp and email to interact with students.

Likewise, it was found that student performance is good even with the presence of learning and knowledge retention problems, a situation that the Student Care and Services Centre continues to attend to all those who present one or both situations so that they can be channelled and attended to as has been the case up to now.

The main challenges they faced were;

- a) The adaptation of face-to-face content for the virtual and they have already made progress in this for two years.
- b) The design of creative and innovative teaching strategies, they have already received training on planning virtual sessions, design of virtual courses, use of resources in Moodle and Classroom platform, learning styles, teaching modalities.

- c) The development of the level of expertise in computer and communication tools, according to the results of the research they say that their level of knowledge to be able to attend their virtual classes through platforms was intermediate, So this challenge is in favour of improving the quality and educational innovation in their teaching practice, and other challenges were the availability of infrastructure and equipment required, they had in their homes with the basic elements to carry out their classes, but they mention that regularly the institution provided them with the facilities, flexibility and resources necessary to carry out their classes virtually and the last challenge was the adaptation to the digital work platform, training was given in Moodle and Classroom, each teacher decided in which to design their courses if they did not already have it in Moodle which until today, is the institutional platform.

As for the difficulties presented by the students, what the university offers is the management of external and internal support so that they can solve economic situations and facilitate their access to education, as well as the availability of timetables in computer laboratories for the development of their face-to-face and virtual activities.

The position of 49 (83%) of the 59 teachers surveyed regarding the hybrid mode that had been operating until December 2022 is that it should continue, as the university has taken a great step forward in its processes and it would not be beneficial to return only to face-to-face education, which is favoured by 28.9% of the teachers surveyed.

By continuing with the hybrid modality, the university would have savings in services offered to students in general and could continue to innovate in the teaching-learning process. In general, with the results obtained, we proceed to generate new studies and a proposal for educational innovation to address each of the weaknesses found in this research and actions aimed at expanding coverage in order to increase enrolment.

Finally, it is recommended:

- Establish mechanisms so that the opinion of teachers and students on improvements in the educational process is taken into account in decision-making, given that they are one of the main actors in the process.
- Promote innovative education that allows the institution to become one of the best in the state for its educational praxis.
- Establish alternative programmes to avoid the effects that students who work there could have by constantly changing their modality, as this generates instability for teachers and students.
- Improve teacher training programmes to continue with the updating in the use of ICT and creative and innovative pedagogical strategies.
- Grant financial resources to improve the optimisation of the institutional platform or, failing that, study the feasibility of others to facilitate the means of support in the educational process and even in the offering of continuing education courses or degree seminars.
- Expand coverage with the implementation of new study modalities, giving those who work the opportunity to professionalise in the career of their choice.
- To take full advantage of new educational trends in all areas.

In order to achieve success in teaching in virtual learning environments, academics need to acquire skills, abilities, knowledge and competences linked to pedagogical, communicational, technological and evaluative aspects that enable the implementation of good educational practices and, above all, the institutional support to achieve this.

6. References

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