Emergency remote teaching during the covid-19 pandemic: Experiences among Mexican university students

La enseñanza remota de emergencia durante la pandemia por la covid-19: experiencias en universitarios mexicanos

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Alejandrina Bautista Jacobo*
María Olga Quintana Zavala**
Daniel González Lomelí***

ABSTRACT

The aim of this research was to explore the experiences of emergency remote teaching (ERT) during the covid-19 pandemic among students at a public university in the northwest region of Mexico. A descriptive correlational exploratory cross-sectional study was conducted with a nonprobabilistic sample of 1550 students. A survey was designed and validated by experts, and it was implemented online using the Microsoft Forms platform. Findings revealed that more than half of the students demonstrated very good or excellent proficiency in virtual platforms. Additionally, 28% of women experienced a difficult or very difficult adaptation process to the platforms, while this percentage was lower among men (20.9%). Students expressed that the academic performance of their instructors during ERT ranged from average to good, but the majority indicated that instructors were not adequately prepared to conduct classes in this modality, since teaching through virtual platforms requires planning and designing strategies. Despite both teachers and students became familiar with digital tools during the pandemic, it is recommended to encourage synchronous digital environments for teachers and explore didactic strategies for asynchronous ones.

Keywords
Covid-19; distance learning; virtual platforms; university students; confinement

RESUMEN

El objetivo de esta investigación fue conocer las experiencias de la enseñanza remota de emergencia (ERE) durante la pandemia por la covid-19 en estudiantes de la Universidad de Sonora, México. Se aplicó un estudio exploratorio descriptivo correlacional de corte transversal a una muestra no probabilística de 1 550 estudiantes. Se diseñó una encuesta que fue validada por expertos y se implementó en línea utilizando la plataforma de Microsoft Forms. Se encontró que más de la mitad de los estudiantes presenta un manejo muy bueno o excelente de las plataformas virtuales, y que 28% de las mujeres experimentó un proceso de adaptación difícil o muy difícil, mientras que en los hombres este porcentaje fue menor (20.9%). Los estudiantes aseguraron que el desempeño académico del profesor durante la ERE fue de regular a bueno, pero la mayoría señala que el profesor no estaba preparado para impartir las clases en esta modalidad, pues la enseñanza mediante las plataformas virtuales requiere planificar y diseñar estrategias. Aunque los docentes y los estudiantes se familiarizaron con herramientas digitales durante la pandemia, se recomienda fomentar en los profesores entornos digitales sincrónicos y buscar estrategias didácticas para los asincrónicos.

Palabras clave
Covid-19; enseñanza a distancia; plataformas virtuales; universitarios; confinamiento

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* Doctora en Educación por el Instituto Pedagógico de Posgrado de Sonora, A.C. Profesora investigadora de la Universidad de Sonora, México. ORCID: http://orcid.org/0000-0001-8018-7546, correo electrónico: alejandrina.bautista@unison.mx | ** Doctora en Enfermería por la Universidad de Concepción en Chile. Profesora investigadora de la Universidad de Sonora, México. ORCID: http://orcid.org/0000-0003-3725-4226, correo electrónico: olga. quintana@unison.mx | *** Doctor en Psicología por la Universidad Nacional Autónoma de México. Profesor investigador de la Universidad de Sonora, México. ORCID: http://orcid.org/0000-0001-6683-1008, correo electrónico: daniel.lomeli@unison.mx

INTRODUCTION

At the end of 2019, a disease emerged in the city of Wuhan in China that shocked the world. This disease was called covid-19, as a consequence of SARSCoV-2 virus. Shortly after its onset, the virus rapidly spread globally, causing a high percentage of deaths. Because of this, on 11 March 2020 the World Health Organization (WHO) declared this disease a pandemic (WHO, 2020).

As a measure of containment, and to preserve the health of the population, the governments of various countries took the decision to close workplaces, cancel social events and close spaces with a massive accumulation of people. In accordance with the above-mentioned strategies, the Mexican Ministry of Public Health declared that school work at all levels would be suspended from 17 March 2020 (ILO, 2020). Thus, thousands of university students were forced to remain confined in their homes, with the challenge of adapting to new forms of coexistence and education, moving to the non-face mode and using computers, cell phones and the internet, among other tools. This form of education was called emergency remote education (ERE) (Hodges *et al.*, 2020).

There is a difference between e-learning and e-learning. Emerging distance learning is a temporary change in education delivery that emerged in response to the health crisis caused by covid-19 (Hodges *et al.*, 2020). On the other hand, online education is an infrastructure that serves the objectives of online teaching and learning (Fuchs, 2022).

Distance education is a form of teaching in which students and teachers are not physically present in the same place or at the same time (Wedemeyer, 1981). This concept is not new, because in 1941 there was already the modality in which correspondence courses were taught with the aim of making people living in remote regions literate (Navarrete-Cazales and Manzanilla-Granados, 2017).

During confinement, in the educational field it was common to hear as synonyms the terms online education, virtual education, distance or emergency distance education, and although some of these have aspects in common, It is also true that there are characteristics that distinguish them. Online education refers to the mode of teaching and learning where teachers and students interact in a digital environment through technological resources, making use of the internet and networks in a synchronous manner, that is, the teacher and the student coincide in time. By contrast, virtual education is a broader term encompassing both distance education and online education, and requires technological resources such as a laptop, internet connection and the use of a multimedia platform. It differs from online education because it is not necessary for

teachers and students to coincide in schedules, so it works asynchronously (Ibáñez, 2020).

Online education requires detailed planning of lessons, technical skills, instructional materials, prior preparation and experience in online teaching (Xhelili *et al.*, 2021), a situation that did not occur during the pandemic, as the ERE was a temporary solution forced by the closure of educational institutions (Hodges *et al.*, 2020) and although these measures minimized the spread of the disease, they also caused other problems in both the student community and teachers (Aslam, 2020).

The ERE presented important challenges in adapting to this new form of teaching-learning. Teachers and students faced a shortage of technological resources; in addition, teachers had to deal with the lack of preparation for online classes, forcing them to improvise by incorporating the physical and digital resources they had at their disposal.

Since 2020, several studies have emerged that have revealed the experiences of students and the strategies implemented by teachers during the contingency. Zambrano (2021) explores the possibilities of combined learning (blended learning) in the subject of ethics, society and profession in students of the Faculty of Engineering of the Autonomous University of Nuevo León, Mexico. The study highlights the benefits of this approach, such as social interaction and the collaborative construction of knowledge, as well as the importance of expanding its use and mastery in teaching.

Another technological tool used by students from a public university in northwestern Mexico as a resource in remote teaching was Padlet, a digital platform where virtual collaborative walls or whiteboards can be created, which allows students and teachers to work simultaneously on these. Most of the students rated this tool positively, noting that it was useful to understand the topics of the class and that it encouraged teamwork (Hernández, 2021).

The growth of technology can provide different tools to contribute to online teaching; however, students interact with different teachers and not all have the resources or technological skills for education. The reports report that the most used resources by teachers as a means of communication, before the sudden closure of educational centers, were WhatsApp and email (Expósito and Marsollier, 2020), while the most used platforms for teaching were Zoom, Meet, Classroom and Teams, (Fernández *et al.*, 2021; Herrera *et al.*, 2020). Among the main problems presented in some students is the lack of a device (such as laptop or smartphone) to attend online classes (Mercado and Otero, 2022). In other cases, there was a lack of internet connection, platform failures or sudden interruption of light (Hebebci *et al.*, 2020; Kado *et al.*, 2020). In Mexico, the main problem faced by students during online classes was lack of internet connection.

Various reports are currently analyzing the difficulties and experiences experienced by students during the period of remote education due to the covid-19 pandemic. The most prominent concerns relate to emotional health. High levels of stress, anxiety, sleep disorders and physical tension derived from the use of virtual platforms have been identified (Bautista, Quintana *et al.*, 2023; González, 2020), as well as risk eating behaviors (Bautista, González *et al.*, 2023). The effectiveness of academic training is compromised by the exhaustion and lack of motivation of students, as they spend long hours in front of the computer, which reduces their ability to concentrate and interest in virtual classes.

The perception of learning in the non-face mode has been varied. According to a study conducted at the Faculty of Malaga, 34% of students reported that their learning level was significantly lower compared to face-to-face classes (Alba-Linero *et al.*, 2020). For their part, Mexican students expressed that the lack of clarity in the teachers' instructions and the insufficient availability to resolve doubts hindered the learning process during distance classes (Zapata-Garibay *et al.*, 2021).

In regions like India, online classes are not popular as they are perceived as less effective. Students consider that interaction with peers is reduced and knowledge transfer diminishes. In addition, technical problems interrupt the flow of the class, making it difficult to participate in the debate (Nambiar, 2020). For students in Spain, however, remote classes have proven to be motivating and have effectively adapted to their needs (Area-Moreira *et al.*, 2020). Rajab (2018) argues that online education provides a safe learning environment for students and can provide quality education; however, during the pandemic, technical and technological issues have been identified as some of the most crucial factors to be taken into account in order for e-learning systems to be effective (Almaiah *et al.*, 2020).

It is important to share the experiences of students during the classes. Despite the considerable effort made by teachers and students to adapt to this modality in a short time, certain aspects have been identified that were not completely satisfactory and that need to be improved, such as methodological and evaluation processes. This becomes relevant because virtual teaching in a formal way is not too distant. As a result, the results of this study can provide empirical evidence on student acceptance of the shift to a distance learning model.

The general objective of this work was to know the experiences of the students of the University of Sonora (UNISON), Mexico, during the ERE imposed from the pandemic. In addition, it was of interest to investigate possible gender differences and the educational program. To achieve this, a questionnaire was designed that included questions related to four areas of interest: the availability of technological resources (equipment, internet), experience in the management and process of adaptation to

virtual platforms, the perception of academic performance and workload, and the perception of the academic performance of the teacher during this teaching process. Finally, a question was added to know the willingness to continue with classes at a distance.

METHODOLOGY

A descriptive cross-sectional study was conducted in a sample of UNISON students during the June 2020 summer school. Due to the difficulty to access the list of all students in the population to perform a random sampling, it was decided to apply a non-probabilistic sampling for convenience. The inclusion criteria were to be UNISON students and to have signed the informed consent. A total of 1 620 responses were received, of which 70 were eliminated due to the scarcity of data; the final sample consisted of 1 550 students. This research was approved by the Research Ethics Committee of the Nursing Department of the University of Sonora (CEI Nursing), with EPD-005-2021, and followed the standards established by the Declaration of Helsinki.

Instrument

To obtain the information, an ad hoc survey was designed that originally consisted of 25 open and closed questions. The questionnaire was reviewed by a panel of experts to validate its content and criteria. Subsequently, a pilot study was carried out with 160 students from the same population, in order to evaluate the clarity of the questions and determine the answer options for some open questions. The final version of the survey was composed of 19 questions, four collect general information about the student (gender, age, semester and educational program), and the remaining fifteen rescue the experiences acquired during the ERE due to the contingency, divided into four sections:

1) Technological resource and signal quality. Research was conducted on the platform used by the teacher and its level of quality, as well as whether students had adequate technological equipment and whether they had an efficient internet signal. The section consisted of seven questions, of which three were multiple-choice, two used a format of six Likert-type options with the following scale: 1 = very bad, 2 = bad, 3 = regular, 4 = good, 5 = very good and 6 = excellent. The remaining two questions were dichotomous (yes/no).

2) Management of virtual platforms and adaptation process to the ERE. This section consisted of two questions, one on the management of virtual platforms, while the other analyzed the process of adaptation to teaching in this modality. Both questions followed a Likert scale, the first with six categories arranged as follows: 1= very bad, 2 = bad, 3 =

regular, 4 = good, 5 = very good and 6 = excellent; and the second with the following scale: 1 = very difficult, 2 = difficult, 3 = indecisive, 4 = easy and 5 = very easy.

3) Academic performance and workload during ERE. In this section, three questions were asked with the aim of inquiring about the academic performance of the student during ERE, its causes and the workload perceived during the distance modality. Of the three questions, two had a Likert format, the first with six options (1 = very bad, 2 = bad, 3 = regular, 4 = good, 5 = very good and 6 = excellent); and the second with five options (1 = nothing, 2 = little, 3 = normal, 4 = moderate and 5 = excessive). The third question was multiple choice.

4) Teacher performance and ability to teach in RE mode. In this section students were consulted about their perception of teacher performance during remote teaching. This question consisted of a Likert scale with six options (1 = very bad, 2 = bad, 3 = regular, 4 = good, 5 = very good and 6 = excellent). In addition, a further question was raised as to whether teachers were considered qualified for ERE, and two answer options (yes/no) were offered.

Finally, a question was included asking the level of willingness of students to continue teaching in the distance modality. It was presented with five Likert-type response options established as follows: 1 = totally disagree, 2 = disagree, 3 = indecisive, 4 = agree and 5 = totally agree.

The questionnaire achieved a level of Cronbach's Alpha reliability of . 72 acceptable. Nunnally (1978) recommends that instruments used in basic research have a reliability value of . 70 or higher.

Procedure

The survey was captured online using the Microsoft Forms platform. Teachers who were providing summer courses in different UNISON educational programs were invited to participate by e-mail. Both the link to the final survey, the research objectives and informed consent were sent to the professors who agreed to collaborate with the research. These, in turn, shared the link and information to each of their students by email and through the Teams platform. Students were made clear that the survey was voluntary and anonymous, and that anyone who decided to participate should read, sign and send informed consent. The time to answer the survey was approximately ten minutes.

Statistical analysis

As part of the data analysis, tables and figures of frequencies and percentages for categorical variables are presented. The mean and standard deviation are reported for the age variable. The Chi-square test was used to detect an association between the management and process of

adaptation to virtual platforms and academic performance during ERE according to gender and educational program. If necessary, the Bonferroni method was also used in no dichotomous variables to determine in which group significant differences were found. The Statistical Package for the Social Sciences (SPSS) version 24 was used and a significance level of .05 was considered.

RESULTS

Demographic data of the students

The sample was composed of 1 550 students whose ages ranged from 18 to 49 years, with an average of 20.61 years and a standard deviation of 2.67. Of these, 35.5% (551) correspond to men and 64.5% (999) to women. The educational programs that participated were Social Sciences (12.6%), Engineering (21%), Biological and Health Sciences (46.9%), Natural and Exact Sciences (2.9%), Humanities and Fine Arts (6.7%), and Economic-Administrative (9.9%). Of the participants, 22.8% were from the second semester, 27% from the fourth, 28.7% from the sixth and 6.7% from the eighth semester.

Technological resource and signal quality during ERE

For this section, seven questions were asked with the aim of collecting information on the availability of technological resources by students, such as equipment and internet access. The first question was about the virtual platform used to conclude the 2020-1 semester due to the sudden closure caused by sanitary confinement. Table 1 shows that the most used platforms were Sivea (32.6%), Teams (18.7%) and Avaus (12.8%), and the least used was Classroom (5.8%).

Table 1. Most used virtual platform to conclude the 2020-1 semester

Virtual platform	Frequency	Percentage
Teams	290	18.7%
Zoom	175	11.3%
Avaus	199	12.8%
Sivea	505	32.6%

Google Meet	120	7.7%
Classroom	90	5.8%
Combinations and others	171	11.1%

Availability of technological equipment with internet access was a determining factor in maintaining communication with teachers and continuing online classes. This was especially relevant because many students are foreigners and not all have the right equipment or space to work. In addition, some reside in regions where internet access is limited or insufficient. Therefore, the next question focused on finding out if students had the technological resources to participate in classes in the non-face mode. Fortunately, most university students (92.3%) said they had the necessary technological resources to participate in classes in this modality, highlighting the laptop as the most used device (74.6%). Another question raised in this section inquired whether students needed to move elsewhere to continue classes, and 82.3% of students stated that they did not have to. However, among those who had to move (17.7%), the most common option was to go to a family member's house to continue their classes (see table 2).

Tabla 2. Availability of techonological resources to continue with non-face-to-face classes

Ask	Answers	n (%)
P6: ¿Do you have the technological resources to take clases in the non-face mode (equipment and internet)?	Yes	1 431 (92.3%)
	Not	119 (7.7%)
P7: ¿What techological equipment did you use to complete your courses in this modality?	Computer	202 (13%)
	Laptop	1 156 (74.6%)

	Cell phone	192 (12.4%)
P8: ¿Did you have the need to move to another place to continue with your classes?	Yes	275 (17.7%)
	Not	1 275(82.3%)
P9: If your answer was affirmative, where did you have to move?	Family´s house	191 (70%)
	Friend´s house	64 (23.4%)
	Cyber coffee	7 (2.6%)
	Workplace	5 (1.8%)
	From the town to the city	6 (2.2%)

Another interesting question raised in this section was the quality of the platform used. Of the university students, 27.6% considered it was excellent or very good, 66.5% rated it as good or regular and only 6% evaluated it as bad or very bad. The quality of the internet signal was a crucial factor in continuing the semester during the pandemic. This resource was compromised due to the exponential increase in the use of social networks during confinement and the sudden transition to remote teaching throughout the education system. Therefore, the last question in this section focused on the quality of the internet signal; in this respect, 18.1% indicated having had an excellent or very good quality, 63.1% considered it good or regular and 18.7% had a low or very low quality (see table 3).

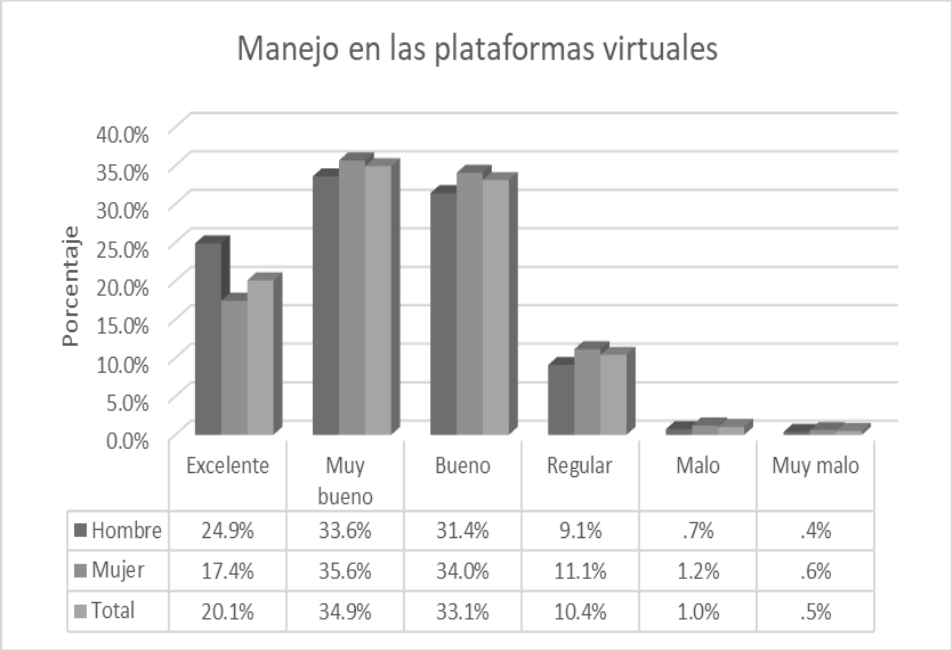
Table 3. Percentage distribution of the perception of the quality of the platform(s) used and the internet signal

Ask	Excellent	Very good	Good	Regular	Bad	Very bad
P10: ¿How do you rate the quality of the platform(s) used for distance classes?	6.4%	21.2%	38.8%	27.7%	4.3%	1.7%
P11: ¿How do you rate the quality of the internet signal?	4.0%	14.1%	27.7%	35.4%	13.7%	5.1%

MANAGING VIRTUAL PLATFORMS AND PROCESSES FOR ADAPTING TO GENDER EQUALITY AND THE EDUCATIONAL PROGRAM

The second section was designed to investigate students' self-perception of their ability to manage virtual platforms and their process of adaptation to ERE. Two questions were asked, which were analyzed by gender and educational program of students.

Figure 1 shows the percentage distribution by gender for the question on self-perception in the management and use of virtual platforms. Most (68%) consider their ability to be good or very good, and one in five students rate it as excellent. An association was detected between skill in the use of virtual platforms and gender ($\chi 2$ (5) = 13.576; p = 0.019). The Bonferroni test identified significant differences only in the "excellent" category, where men outperform women in this classification (24.9% vs 17.4%).



Graph 1. Percentage management distribution in virtual platforms by gender.

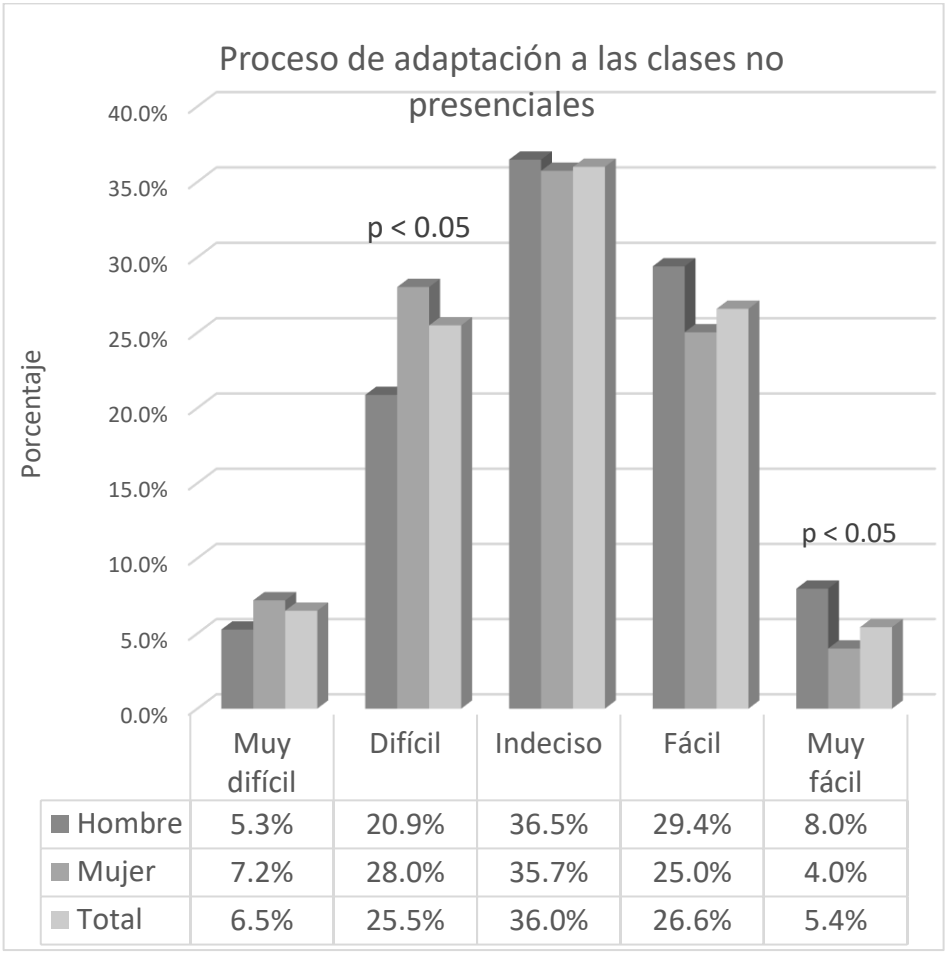
To make the comparison by educational program, students of Humanities and Fine Arts were grouped with those of Social Sciences due to the characteristics of both programs. Likewise, students of the Natural and Exact Sciences program were grouped with those of Engineering. The groups of students of Biological and Health Sciences and those of Economic-Administrative remained the same. Table 4 shows the percentage distribution. Significant differences were found ($\chi 2$ (15) = 25.943; p = 0.039) only in the "excellent" option between the Engineering and Natural and Exact Sciences (26.5%) and Economic-Administrative (22.2%) groups with those of Social Sciences (18.3%) and Biological Sciences (17.1%). Also, the Economic-Administrative program (40.5%) was distinguished from the other groups in the category of "very good".

Tabla 4. Percentage distribution of management on virtual platfoms by educational program

Management virtual platforms	Educational program				Total
	Social sciences	Engineering and Exact and Natural Sciences	Biological and Health Sciences	Economic-Administrative Sciences	
Excellent	18.3_a%	26.5_b%	17.1_a%	22.2_b%	20.1%
Very good	33.7_a%	33.8_a%	34.8_a%	40.5_b%	34.9%
Good	33_a%	31.1_a%	35.4_a%	27.5_a%	33.1%
Regular	13.7_a%	7.6_a%	10.7_a%	9.2_a%	10.40
Bad	1_a%	0.5_a%	1.4_a%	0.7_a%	1.0%
Very bad	0.3_a%	0.5_a%	0.7_a%	0_a%	0.50%

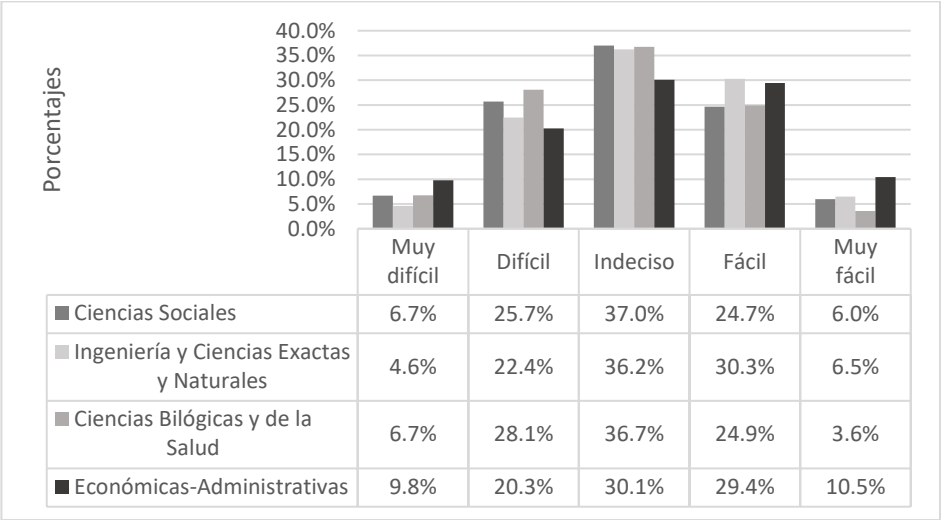
Note: Each letter of the subscript denotes the academic program, whose proportions do not differer significantly from each other at the significance level of a= .05 obtained with the Bonferroni test.

Another question in this section focused on the process of adaptation to remote teaching. In general, no definite trend is observed, the majority of students noted "indecisive" in this question (36%). The others were equally divided into two groups: 32% stated that their process was difficult or very difficult, while another 32% stated that it was easy or very easy; however, when analyzing responses by gender, significant differences were found ($\chi 2$ (4) = 22.198; $p<.001$). The data presented in figure 2 show that the adaptation process was not the same for men and women: women experienced a difficult adaptation process (28%) compared to men (20.9%). It also shows that the percentage of men who considered that their process was very easy is double (8%) compared to that of women (4%).



Graph 2. Percentage distribution of the adaptation process to classes in the distance modality by gender.

When analyzing the question by educational program, significant differences were found between the groups ($\chi 2$ (12) = 27.512; p = .007). These, according to the Bonferroni test, were identified only in the "very easy" category in the Economic-Administrative (10.5%) and Biological and Health Sciences (3.6%) programs. Descriptively, and excluding the "undecided" option, it is highlighted that the most frequent response for students of the Social Sciences program was the "difficult" option (25.7%), as well as those of Biological and Health Sciences (28.1%). On the other hand, in the students of the Engineering and Exact Sciences program and those of Economic-Administrative predominated the "easy" option with 30.3% and 29.4% respectively (see graph 3).



	Muy difícil	Difícil	Indeciso	Fácil	Muy fácil
Ciencias Sociales	6.7%	25.7%	37.0%	24.7%	6.0%
Ingeniería y Ciencias Exactas y Naturales	4.6%	22.4%	36.2%	30.3%	6.5%
Ciencias Bilógicas y de la Salud	6.7%	28.1%	36.7%	24.9%	3.6%
Económicas-Administrativas	9.8%	20.3%	30.1%	29.4%	10.5%

Graph 3. Percentage distribution of the adaptation process to distance classes by educational program.

ACADEMIC PERFORMANCE AND WORKLOAD DURING THE SEMESTER THAT ENDED IN THE DISTANCE MODE

During remote classes various factors were present that influenced the academic performance of the students. To become aware of their perception on this point, a question was asked related to academic performance in the semester that ended in the distance modality, where academic performance predominated, "good" in large part (53.5%) of the respondents (see table 5).

When reviewing responses by gender, significant differences were found ($\chi 2$ (4) = 14.432; p = .006) in academic performance only in the options of "very good" and "bad", that is, the proportion of women who had a "very good" academic performance (27.7%) was higher than that of men (22.3%). In contrast, the frequency of men who declared their performance was "bad" (14.3%) compared to that of women (10.2%). Similarly, academic performance was associated with the educational program ($\chi 2$ (12) = 21.900; p = .048), but only for "excellent" and "very good" options. Table 5 shows that the proportion of students with "excellent" academic performance was notably higher for students of Engineering and Natural and Exact Sciences (10.3%), while those of Economic-Administrative predominated the "very good" option (33.3%).

Table 5. Acedemic performance in subjects during the ERE

Variables	¿How was your acedemic performance in the semester that ended in the distance modality?				
Sex	Excelente	Muy bueno	Bueno	Malo	Muy malo
Men	9.3_a%	22.3_b%	53.2_a%	14.3_a%	$.9_a$%
Women	6.6_a%	27.7_a%	53.7_a%	10.2_b%	1.8_a%
Educational program					
Social sciences	8.7_a%	25.3_a%	50.7_a%	13.3_a%	2.0_a%
Engineering and Exact and Natural Sciences	10.3_b%	22.7_a%	51.6_a%	14.1_a%	1.4_a%
Biological and Health Sciences	5.6_a%	26.0_a%	56.3_a%	10.6_a%	1.5_a%
Administrative economic	7.8_a%	33.3_b%	50.3_a%	7.8_a%	$.7_a$%
Total	7.5_a%	25.8_a%	53.5_a%	11.7_a%	1.5_a%

Note: Each letter of the subcript denotes sex and educational program, whose proportions do not differ significantly from each other at a significance level of .05 obtained with the Bonferroni test.

The second question in this section focused on the factors that, from the students' perspective, negatively influenced their academic performance. Response options were obtained from the pilot study conducted to validate the instrument. Table 6 shows that the majority of students (41.2%) indicated that their low performance was due to the lack of connectivity by the teacher and the lack of necessary advice for their subject. In addition, one in five students indicated that their low performance was related to

technical difficulties in the platform used, which in most cases were caused by problems with internet connection.

Table 6. Factors that negatively influenced the academic performance of students during the ERE

P15: ¿What factors do you think negatively influenced your academic performance during distance classes?	n (%)
I had technical problems with the platforms used or I had problems connecting to the internet	40 (19.6%)
I could not submit assignments or take exams for family reasons	18 (8.8%)
I couldn´t submit assignments or take exams due to internet problems	23 (11.3%)
I could not establish contact with the teacher	19 (9.3%)
The teacher connected very Little and I did not have the necessary advice to understand the topics	84 (41.2%)
Others (health problems, work, lack of resources, lack of interés or concentration, excessive tasks, etc.)	20 (9.9)

One of the factors attributed to the unfavorable performance of students, although in a small proportion, was the number of assignments during remote classes. This was addressed through the third and final question in this section. The majority of students indicated that it was excessive (52.3%), 33.2% considered it moderate and 11.2% normal. Only a small percentage (3.3%) indicated that it was scarce, while no one chose the "nothing" option.

STUDENTS' PERCEPTION OF TEACHER PERFORMANCE AND ABILITY TO TEACH IN VIRTUAL MODE

In this section, the following questions were asked: how do you rate the teacher's performance during distance classes? And do you think teachers

are trained to teach in the virtual mode? When analyzing the first question, it was found that the majority considered that the teacher's performance was good (37.1%), followed by a slightly lower percentage that qualified it as regular (35.4%). In extreme options, only 3.5% described it as excellent, and 14.7% considered it to be very good. In contrast, 9.3% mentioned that the teacher's performance was bad or very bad (7.1% and 2.2%, respectively). For the second question, 69.7% stated that the teacher is not qualified to teach in the virtual mode, while 30.3% consider that it is.

The last question of the questionnaire asked the willingness of students to continue with classes in remote mode, presenting five answer options. The majority of students (32.2%) selected "undecided" about this question; this was followed by "disagree" (23.3%) and "totally disagree" (16.1%). In contrast, 28.4% selected "fully agreed" or "agreed" (6.9% and 21.5%, respectively).

DISCUSSION

The results of this research found that the percentage of students who did not have a digital device was low. In Mexico, most people have a digital device and almost half of Mexicans have a computer (INEGI, 2020). The majority of respondents who participated in this research used a laptop computer to continue their classes in the distance mode, data that does not agree with other studies, where the cell phone was the most used device to give continuity to classes (Lemus-Pool *et al.*, 2020).

Although several virtual platforms were identified, Sivea and Teams were the most used by students. These results can be explained because Sivea is an institutional virtual space that has been in use for many years at UNISON and has been the first asynchronous resource that teachers have used to interact with students, as it provides a common space for them to share and exchange knowledge through online applications and activities during subject development in the semester. On the other hand, Teams is a digital tool that, unlike Sivea, operates synchronously. It has not been adopted as an institutional platform for long, but since the university incorporated it as part of its academic and teaching continuity plan, courses have been offered to teachers to familiarize themselves with this platform and other similar ones.

Despite the fact that most of the students had a technological team, one in five had to move to another place to continue their classes. The main difficulties identified in the university community of various countries were the failures in the internet connection or its lack of access (Pérez and Rodríguez, 2021; Zamora, 2020). This can be understood in the context of the fact that in 2020 there were about 84.1 million people using the

internet, which represented an increase of almost two percentage points compared to the figures recorded in 2019 (INEGI, 2021).

Regarding the management of virtual platforms, very good management by women predominated, while men excelled with excellent management. These results may be due to the fact that a large number of young Mexicans use digital platforms for entertainment activities (INEGI, 2020). Today, young people have widely adopted digital technologies and acquired skills to interact with the media and incorporate information and communication technologies (ICTs) into their educational spaces. This has also influenced their way of studying, working and relating to the outside world through digital resources (Lemus-Pool *et al.*, 2020).

It is important to note that students of Engineering and Natural and Exact Sciences consider more often that they have excellent management of platforms. These findings can be attributed to the fact that Engineering students possess skills related to the use of modern technologies to perform surveys and surveys, as well as using commercial software packages in their daily practices. Likewise, we observe a remarkable performance in the group of students of Economic-Administrative, where almost half declare to have a very good management. This is explained by the frequent use of computational packages to optimize administrative activities in this group of students. However, no positive or negative group trend was identified in the process of adaptation to remote classes, as indecision predominated in most.

When gender responses were analyzed, it was found that the adaptation process was more difficult for women than for men. These data do not coincide with what was reported in other studies, where the results on this subject are conclusive.

A study in Costa Rica reported that more than 90% of students had faced personal difficulties in adapting to non-face classes (Regueyra-Edelman *et al.*, 2021). The adaptation process can be conditioned by many factors, such as resistance to change by both the teacher and the student.

The traditional paradigm of education has been the main obstacle to the formal incorporation of technology into education (García-Martínez and Silva-Payró, 2022). During the pandemic, various situations arose that hindered the process of adaptation to the ERE, such as failures in connectivity, electricity problems, noise or limitations in the physical conditions for the study, among others (Hebebci *et al.*, 2020). Another factor that can influence the adaptation process is the academic discipline the student is studying. There are areas of study that require a laboratory or learning environments that are not subject to technology, such as health science programs. The research was evidenced with students enrolled in the Biological and Health Sciences program, who reported having experienced a difficult or very difficult adaptation process.

On the other hand, most of the students of Engineering and Natural Sciences, as well as those enrolled in the Economic-Administrative program, said that their process of adaptation to this mode of teaching was very easy or easy. This trend has been observed in other research, where students with a technological focus in their field of study tend to perceive online learning as less challenging and consider this method more interesting. In contrast, students in health-related disciplines perceive that online learning is not as effective and has limitations on the practical aspects of learning subjects that require laboratory work (Gutiérrez *et al.*, 2022).

Regarding academic performance, most students stated that it was good, while a low percentage rated it as bad or very bad. The factors identified that negatively influenced his performance included the lack of connectivity of the teacher and the scarce availability of consultancies. These findings coincide with the results obtained by Adnan and Anwar (2020), who in their study found that students perceived that the lack of communication and the teacher's availability to provide advice affected their learning process. In face-to-face classes, students often participate actively in academic activities due to face-to-face interaction with the teacher and their peers, a dynamic that could not be replicated during remote classes.

Another point of interest was to know how much work the students had during the classes, and more than half of the respondents said that this was excessive. Similar results have been reported in other studies, where it is highlighted that the unexpected change to distance teaching without any preparation made teachers choose to saturate students with tasks (Santana *et al.*, 2022). In addition, the demand for the delivery of work, coupled with difficulties with the internet connection, has negatively affected the emotional state of students (Durán-Lizárraga *et al.*, 2022).

Regarding the perception of students about the performance of teachers during the ERE modality, the majority opinion ranged between regular and good; However, seven out of ten participants stated that teachers are not adequately trained for this model of distance education. This situation differs from the perspective of Chilean students, where only 22.6% make this assertion (Armijos *et al.*, 2022). It is important to note that many of the difficulties experienced by students also affected the majority of teachers. In addition, many teachers had to teach and care for their children simultaneously, which could limit the time to train for online teaching (Alba-Linero *et al.*, 2020).

Recent research indicates that the digital competence of teachers has not yet reached an optimal level (Zempoalteca *et al.*, 2023). Although many teachers may have a good handle on technology, several agree that this is not enough to stimulate learning in the remote mode, either synchronous or asynchronous. Therefore, it is necessary to design pedagogical

proposals that integrate technology with the aim of improving the learning teaching process (Pérez and Rodríguez, 2021).

Finally, to the question of how much students agree to continue classes in the distance mode, four out of ten expressed a preference for face-to-face classes. A similar percentage was observed in students from Saudi Arabia, where 37% prefer face-to-face teaching (Rawashdeh *et al*., 2020).

The general perception of many students is that learning in the remote modality requires more work and time to perform tasks compared to the face-to-face modality, especially among students in the health area (Rosario-Rodríguez *et al*., 2020). However, there is also research indicating that students would prefer a hybrid modality, where they can combine practical online and face-to-face laboratory activities (Brockman *et al*., 2020). Therefore, it is necessary to address professional and management aspects through the training of teaching competencies from a local context of the university, and support this effort by designing or redesigning specific curricula for mixed virtual environments, supported by adequate infrastructure, as well as redefining the profile of teachers in this new dynamic (Zempoalteca *et al*., 2023).

One of the limitations of this study was the nonrandom selection of the sample, which restricts the ability to generalize the results. It would be of great interest to conduct research that includes the perspective of teachers in addition to that of students, in order to obtain a broader picture of the challenges faced by teachers during the ERE, and examine digital teacher competence in computer-aided education. Another important limitation was that, when conducting a cross-sectional study, it is not possible to establish a causal relationship between the variables.

CONCLUSIONS

From the analysis carried out it can be concluded that most of the students had the necessary technological resources for the ERE, and only a small percentage had the need to move to another place to continue their classes in the distance modality. Most of the students used an asynchronous virtual environment, in this case, Sivea; however, the use of the Teams platform was also observed in a smaller proportion, since it allows collaboration in real time. This shows that, despite the fact that UNISON had a continuous pre-contingency training program, Many teachers are unaware of the technological tools that enable students to promote active learning during distance learning.

It was found that the majority of respondents had no difficulties in managing virtual platforms, especially men and those belonging to the area of Engineering and Natural and Exact Sciences; However, some

hesitation prevailed regarding their process of adaptation to the ERE. When analyzing according to gender and educational program, it was evident that, in this sample of students, women faced greater challenges in adapting to this modality compared to men, particularly in the Life and Social Sciences programs. On the other hand, those enrolled in Engineering and Economic-Administrative managed to adapt more easily. It is clear that the individual characteristics of students, such as their discipline of study or previous training, influence the process of adaptation to distance education.

It was noted that most students perceived that their academic performance during distance classes was good. Those who did not perform satisfactorily attribute it to the lack of communication on the part of the teacher and the scant advice received. This situation not only occurred in the Mexican population, but was a common factor in various countries.

Regarding the academic performance of the teacher, most of the students indicated that it was from regular to good; however, the majority also highlights that teachers are not prepared to teach online. It is clear that teaching through virtual platforms requires planning and designing strategies that motivate students, so it is necessary to continue promoting digital skills in both teachers and students, in order to acquire, master and apply these tools to facilitate the technology-mediated teaching-learning process.

Finally, it is concluded that most students prefer to return to the classroom. It is important to note that this study was conducted at the beginning of the pandemic and reflects the opinions of students who made the transition to the ERE suddenly, which possibly introduced a bias due to the short time to adapt.

The results of this research can provide evidence of the need to promote among teachers the use of mostly synchronous digital environments, as well as the search for didactic strategies for asynchronous environments, in order to create a motivating environment for students. Likewise, it is suggested to develop research on the perception of students about teaching in the virtual modality in a context that is not conditioned by the pandemic.

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