Artículos científicos

Evidencia empírica de la actitud de estudiantes universitarios ante la educación online en tiempos de covid-19

Empirical evidence of the attitude of university students towards online education in times of Covid-19

Evidências empíricas da atitude dos universitários face à educação online em tempos de Covid-19

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Resumen

El objetivo de la presente investigación fue realizar un análisis descriptivo sobre la actitud de los estudiantes de la Facultad de Contaduría y Administración de la Universidad Veracruzana, campus Coatzacoalcos, hacia la educación *online* durante el periodo de pandemia por la covid-19. Para el procesamiento de la información, se utilizaron datos cuantitativos recolectados con una encuesta que se aplicó a 425 estudiantes por medio de Google Forms. Con los datos recolectados se aplicó una secuencia metodológica para analizar la percepción de la muestra.

El estudio fue cuantitativo, de alcance descriptivo y de corte transversal. Los resultados muestran evidencia empírica en torno a que los estudiantes poseen una actitud poco favorable hacia la educación *online* debido a la carencia de infraestructura, escasa interacción social, estrés y ansiedad. Estos resultados sirven de pauta para diseñar programas educativos (PE) de este tipo en la UV y en otra universidad.

Palabras clave: educación *online*, actitud de estudiantes, universidad.

Abstract

In this research, a descriptive analysis is carried out on the attitude of the students of the Faculty of Accounting and Administration of the Universidad Veracruzana, Coatzacoalcos campus, towards online education during the period of the Covid-19 pandemic. Regarding the processing of information, quantitative data collected with a survey that was applied to 425 students through Google Forms was used. With the data collected, a methodological sequence was applied to analyze the perception of the sample, the study is quantitative with a descriptive and cross-sectional scope. The results show empirical evidence that students have an unfavorable attitude towards online education, this is due to the lack of infrastructure, little social interaction, difficulties in teamwork, stress and anxiety. These results provide guidelines for the design of Educational Programs (EP) of this type at the UV and any other university.

Keywords: Online education, student attitude, university.

Resumo

Nesta pesquisa, é realizada uma análise descritiva sobre a atitude dos alunos da Faculdade de Contabilidade e Administração da Universidad Veracruzana, campus Coatzacoalcos, em relação à educação online durante o período da pandemia do Covid-19. Quanto ao tratamento das informações, foram utilizados dados quantitativos coletados com uma pesquisa aplicada a 425 alunos por meio do Google Forms. Com os dados coletados, foi aplicada uma sequência metodológica para analisar a percepção da amostra, o estudo é quantitativo com escopo descritivo e transversal. Os resultados mostram evidências empíricas de que os alunos têm uma atitude desfavorável em relação à educação online, isso se deve à falta de infraestrutura, pouca interação social, dificuldades no trabalho em equipe, estresse e ansiedade. Esses resultados fornecem diretrizes para o desenho de Programas Educacionais (EP) desse tipo na UV e em qualquer outra universidade.

Palavras chave: Educação online, atitude estudantil, universidade.

Introduction

Currently, Information and Communication Technologies (ICT) have managed to enter people's daily lives, which has impacted the way they interact, study and even work. This arrival of the internet has generated changes in people's daily activities. In fact, in the last two decades, new generations (children and adolescents) have faced the digital world, weaving new forms of communication and socialization through the use of the Internet and electronic devices (Ávila, 2013; Malo and Figuer , 2010 ; Lira Pérez, 2013), which has also impacted the economic, political, social and educational contexts.

Indeed, education has had to evolve and adopt the use of tools, such as those provided by ICT and the Internet, in order to offer online educational programs in various educational sectors (public and private). For this reason, it is considered appropriate to have an approach to the experiences of students who experienced the *online modality* from the moments of global uncertainty caused by covid-19, which triggered a series of challenges for the population and higher education (Benítez *et al* ., 2020; Gómez and Silas, 2016; Silas and Vázquez, 2020).

online classes have taken center stage for universities, although the need to establish mechanisms that allow their effective implementation has also been perceived. During the covid-19 pandemic, the confinement of the university population had to resort to *online* classes as an improvised strategy that influenced the usual processes of teaching-learning, research, tutoring, networking, among others that migrated to the context of virtuality (Hernández, 2020; Ordorika , 2020). However, this transition entailed structural changes, which even affected the study plans and programs themselves, as well as the training of academics, administrative and technical personnel (Fardoun *et al* ., 2020; Gutiérrez, 2020).

In the specific case of students' attitude towards *online education* , Hernández *et al* . (2018) point out that attitude is a determining factor in making decisions about the success of this modality, since this component is the basis for students to manage self-taught and enriching learning (Baelo , 2009; Failache *et al* .,2020). In other words, attitude is considered a triggering element of satisfaction that is conditioned by the technical and economic support that students have (Jiménez and Ruiz, 2021), although to do so they must have the tangible and intangible means that allow education in line.

However, regarding these technological resources, in 2020 the National Institute of Statistics and Geography (Inegi , 2020) reported that 43.6% of Mexican families lack an internet connection, and only 44.3% of Mexican households have a computer. These figures reveal data that universities must consider to offer online classes .

Although this type of education represents an opportunity for many people, it also reflects the unequal gap in terms of the conditions of people to access it. For example, an unstable network and the lack of technological tools are some of the situations that affect school

dropouts in this modality (Albalá and Guido, 2020; Hurtado, 2020; Unicef, 2020), which causes problems that must be addressed through expansion of the academic offer and comply with the inclusion purposes established by the General Law of Higher Education.

Therefore, the objective of this work is to analyze the attitude of university students towards *online education* in times of covid-19. For this, the enrollment of the Faculty of Accounting and Administration (FCA) of the Universidad Veracruzana (UV), Coatzacoalcos campus, was chosen. With this, we seek to show empirical evidence about this phenomenon to contribute with pertinent recommendations that strengthen educational purposes.

Literature review

Online education

Currently, the phenomenon of globalization causes changes in society's lifestyles and daily activities. These transitions emerge over time and together, with technological advances, they have managed to transform the world. One of the greatest and most revolutionary consequences of these changes is known as the Internet, which is now characterized by being affordable and easy to use, which is why it has become indispensable for the daily work of human beings (Bani et al . , 2021; Feng *et al* ., 2022).

From this phenomenon, the digital era was born and with it the arrival of ICT, which function as a source of entertainment and recreation; However, they have also been incorporated into industry, commerce, services and education (Li and Che, 2022). ICT, therefore, is already an essential part of the teaching and learning processes (Mubeen *et al* ., 2020).

However, derived from the covid-19 pandemic, and due to confinement, all educational institutions had to completely migrate the educational system to virtuality, which could be achieved thanks to the support of different digital platforms and tools. This, of course, was not the educational sector's first encounter with virtuality, given that, in previous decades, higher education institutions (HEIs) already incorporated actions related to distance education (Almendingen et al., 2021 *;* Alturise *et al* ., 2021; Kawasaki *et al* ., 2021).

Distance education (EaD) originated in 1933, when an educational model began to be incorporated in Sweden where education by postal mail was implemented with the aim of offering greater study opportunities in that country (Di Giacomo et al . *,* 2021). At that time, EaD was understood as the act of teaching and learning through print media, over long distances and with two-way communication with the teacher. That is, this system was born with the objective of educating those individuals who lacked opportunities to access conventional education (Mubeen *et al* ., 2020 ; Clara *et al.,* 2023).

In the American continent, the adoption of distance education began to have greater scope in the 1980s, when the United States created the Distance Learning Association, which

became an important means of dissemination (Wang et al . ., 2022); On the other hand, the Distance Education Consortium-Network was also born, which sought to have inter-American cooperation on topics that correspond to distance education.

In Mexico, EaD becomes more relevant when the National Institute for Adult Education (INEA) was created in 1981 with the purpose of developing strategies for the evaluation of adult learning, as well as accrediting and certifying basic education for adults. and young people aged 15 years and over, who have not completed or completed said studies (Inegi, 2020).

EaD , therefore, seeks to reinvent the conventional educational model and resorts to literacy alternatives through the union of electronic and conventional tools, such as the telegraph, postal mail, radio, television, telephones and textbooks. This meant an important advance in education, especially for developing countries, such as Mexico, Colombia, Peru and Chile (Baelo , 2009; Fardoun *et al* ., 2020 ; Lawns *et al.* ,2022). Technological advancement promoted distance education to become *online* education because, thanks to the arrival of the Internet and smart devices, communication could be faster and more efficient, which replaced the conventional educational model with the modality *online* (Dominguez *et al* ., 2013; Esperón and Ley, 2005). In this framework, it is attributed that the concept of distance education has been transformed into the new concept known as *online education* .

However, Valdez *et al* . (2020) mention that the concepts of distance education and *online education* are different, although they share some characteristics, since both lack synchronous communication between the teacher and the student. Likewise, Gutiérrez (2020) conceives distance education as the main factor to promote online education, since both concepts are closely linked, with the only difference that the latter responds to the use of smart devices and the Internet.

For his part , Hernández (2018) makes a classification of the concepts where he points out that although distance education is carried out asynchronously, it can also be mixed; That is, students, if they do not attend an educational center regularly, can do so sporadically, since they have a physical infrastructure to do so. On the contrary, *online* education is the model where information and access to education is found on the Internet and is done through blogs, email, institutional platforms, forums, etc. Furthermore, although it can be carried out asynchronously, it is carried out in total virtuality, which demands greater self-management skills from students (Bani *et al* ., 202 1; Rosiles *et al.,* 2020).

online education requires computer knowledge and skills because all activities and the learning mode in general are carried out through electronic devices. This modality has worked as a strategy to permeate learning and strengthen student skills (Naaj *et al* ., 2021) because many HEIs currently offer online courses to contribute to education and the expansion of knowledge. This means that as long as the individual has smart devices and access to the

internet, they can train under this modality regardless of the time or place they live (Drelich *et al* ., 2021).

However, it should be noted that the emergency generated by covid-19 took the educational sector by surprise, since not all HEIs were familiar with this virtual system, so adapting to this "new normal" was a controlled challenge that allowed cope with the confinement and temporary closure of universities (Conceição *et al* ., 2021; Gewalt *et al* ., 2022).

For this, there was a need to maintain communication through smart devices and with the help of platforms such as Zoom, Meet , Teams , etc. (Ramos *et al* ., 2020). In addition, these activities were accompanied with other digital and institutional resources that were implemented for virtual learning (Escobio *et al* ., 2021).

Now, although online education offers benefits such as those indicated in the previous paragraphs, it should also be noted that it presents disadvantages in terms of the interest and self-motivation of university students (Drelich *et al* ., 2021)), since if they are not motivated enough to continue their studies, they may suffer from uncertainty, anxiety and depression, which can lead to dropping out of school or more serious problems (Sundarasen *et al* ., 2020; Tang *et al* .,2022).

Dimensions of online education

Online education is characterized by being self-taught and attitudinal. In addition, it requires the preparation of *online platforms* , trained academics, etc., as well as technological equipment and internet access for those enrolled in the university. In other words, the incorporation of digital media into education implies challenges for both teachers and students (Fardoun *et al* ., 2020; Gutiérrez, 2020).

As mentioned , the attitude of university students is a triggering factor that allows measuring whether the studies carried out through technology are timely and efficient, since this component is the basis for knowing if students are experiencing self-taught and enriching learning. (Clara and Vega, 2021; Failache *et al* ., 2020; Hernández *et al* ., 2018). Furthermore, the student's attitude serves to determine the quality of specialized and economic technical support, essential elements to guarantee an efficient (Jiménez and Ruiz, 2021), competitive (Valencia *et al* ., 2022), inclusive (Sánchez *et al* .,) education. 2021), international (Otero *et al* ., 2019) and accessible to all (Otero *et al* ., 2022).

In the case of Mexico, Inegi (2020) has reported various statistics that ensure that *online education* is a challenge for people due to the limitations in accessing digital media and tools. Likewise, the report of the Survey for Measuring the Impact of covid-19 on Education (Ecovid-ED, 2020) (Inegi, 2021) reported that 2.0% of the population between 3 and 29 years old did

not complete the school year that He was studying during the pandemic due to the lack of contact with his teachers, the limited job offer for parents and the lack of computers and internet at home. In this sense, the unequal gap in the field of education in digital environments conditions people on the resources available to them and impacts school dropouts (Albalá and Guido 2020; Clara and Vega, 2020; Hurtado, 2020; Unicef, 2020).

On the other hand, a great challenge for students and academics regarding online education is the capacity and ability to properly use ICT; In this sense, public universities in Mexico face important challenges to design efficient models that guarantee quality *online education.* Some of the difficulties are observed in the acquisition of digital platforms, teachers trained to teach through a computer and little student-teacher interaction (Domínguez *et al.* , 2013; Esperón y Ley, 2005; Guerrero *et al* ., 2020). Likewise, little computer knowledge constitutes a greater challenge when educating online, which can generate frustration for students, since learning in a system in which they were not familiar is usually the cause of problems such as anxiety, stress. and anger (Reyes and Trujillo, 2020).

Regarding the attitudinal component of students towards online education, the perception of usefulness of this modality stands out. Some university students consider it boring, exhausting and unstimulating, which results in a negative attitude that is reflected in their lack of commitment during online classes (Vinuesa and Fernández, 2016). These adverse situations negatively impact students' attitudes toward their education, since the stress caused by connectivity problems, technology, and learning difficulties influences demotivation (Cervantes López *et al* ., 2021).

To address these challenges, Borges (2015) proposes a series of actions aimed at improving students' attitudes towards online learning. This includes effective time management, assessing expectations, training teachers and promoting interaction, collaboration between students to avoid monotony and boredom and, above all, fostering student attitude, as This is a crucial factor when making learning decisions (Estrada *et al* ., 2020). In other words, since students must adapt to online teaching and learning methodologies, their behavior and attitude play an important role in their academic performance (De las Salas et al., 2014 *)* .

Online education during covid-19

Online education has gained greater acceptance, especially since the start of the Covid-19 pandemic. However, the experiences of this modality highlight the need to establish public policies and mechanisms that allow universities to offer undergraduate and postgraduate programs that are accessible in terms of costs, materials and time, so that people can carry out university studies and, In this way, contribute to the development of countries.

Empirical studies, such as that of Shadnaz *et al* . (2021), conducted on engineering students, have shown that these students experience dissatisfaction due to logistical and technical problems, challenges in the learning and teaching process, concerns about privacy and security, as well as the lack of practical training. These results agree with the conclusions of Alturise (2020), who found that students have difficulties in virtual learning, particularly in resolving doubts, which decreases their ability to solve problems and collaborate in teams.

On the other hand, authors like Radu *et al* . (2020), Śliwa *et al* . (2021), Drelich *et al* . (2021), Li and Che (2022), Tang *et al* . (2022) and Ortadeveci *et al* . (2022) suggest that although students have embraced online education, they have also experienced demotivation, a deterioration in their physical and mental health, as well as higher levels of stress and anxiety. Likewise, Fatonia 's research *et al* . (2020) indicate that medical student satisfaction varies depending on whether the content is primarily theoretical or practical, and Mubeen *et al* . (2020) note that students in advanced semesters may feel less comfortable with online education.

On the other hand, research such as that of Kawasaki *et al* . (2021), Hempel *et al* . (2021) and Tran *et al* . (2022) suggest that some students are motivated by online learning due to the flexibility of time, autonomy in their studies, and savings in transportation costs to study centers. However, these investigations also indicate that there are significant challenges in managing virtuality, insufficient technological infrastructure, and limited communication with teachers, which can affect student motivation.

In short, online education has become an integral part of formal education programs around the world. The levels of satisfaction, educational quality and attitude of the students are key factors that determine the success of a program in this modality, although there are still challenges related to the management of virtuality, technological infrastructure and communication, which can influence the attitude and motivation of students.

Method

This research was developed from a quantitative approach (Jiménez, 2020; Sánchez, 2019). Likewise, and considering that attitude is a qualitative variable, a transversal descriptive approach was also implemented, in accordance with what was proposed by Hernández *et al* . (2018) and following the analysis objective indicated by Arias González *et al* . (2020). The processing of the collected data involved the analysis of categorical and ordinal variables (Gamboa, 2017), for which a survey was used using the Google Forms tool (Álvarez Gutiérrez, January 5, 2017), and subsequently the data were processed. data using SPSS statistical *software* , version 25.

Collection instrument

Mehra and Omidian (2012) and Hernández *et al* . (2018) carried out analyzes on the attitude of university students towards online education, and in both investigations a questionnaire was proposed to evaluate this phenomenon. Therefore, in this study it was decided to use this instrument (Questionnaire to Evaluate Student Attitude towards Online Education [CAEEO]), although with certain adaptations according to the needs of the current research and the characteristics of the student population of the UV. Table 1 presents the elements that make up the CAEEO.

Table 1. Components of the CAEEO questionnaire

Dimensions	Items	Scale
Perception of usefulness	1-28	1: Strongly disagree 5: Strongly agree
Intention to use online learning	29-36	
Easy to use	37-42	
Pedagogical and technical support	43-50	
Virtual Learning Stressors	51-57	
General: Gender, educational program, accredited online courses and age.		

Sources: Own elaboration with information from Mehra and Omidian (2012) and Hernández

et al . (2018)

It should be noted that the CAEEO is a validated instrument; However, due to the adaptations made based on the characteristics of the unit of analysis, a pilot test was carried out and through a confirmatory factor analysis a Cronbach's alpha of 0.952 was obtained, a result that indicates the very good consistency of the scale (Oviedo and Campo, 2005). Therefore, the CAEEO scale is considered ideal for collecting information on students' attitudes toward *online education.*

Sample

For the selection of the study population, it was necessary to recognize the unit of analysis, that is, students from the FCA of the UV, Coatzacoalcos campus. Of the population of 1,175 students enrolled in the February-July 2022 semester, it was decided to consider a representative sample, following a proportional stratified probabilistic sampling (with 95% confidence and 5% error) and using the convenience technique. Thus, information was collected from 425 students from four educational programs enrolled in person. Table 2 shows the distribution of the sample.

Table 2. Sample distribution

Educational programs	Population (N)	Calculation*	Sample (n)
Administration	378	(n1) = 425/1175 * 378	137
Accountancy	366	(n2) = 425/1175 * 366	133
Business Management and Direction	281	(n3) = 425/1175 * 281	102
Software Engineering	150	(n4) = 425/1175 * 150	53
Total	1175		425

Netquest calculator to obtain sample size. The data were obtained with the use of the proportional stratified sampling formula; Once the strata were organized, simple random sampling was used so that all students had the same opportunity to participate.

Table 3 shows the characteristics of the students surveyed. The majority (58%) are women and 94% have completed three semesters *online* ; Regarding age, 42% are between 18 and 20 years old and 57% are between 21 and 23 years old.

Table 3. Analysis of the characteristics of the students that make up the sample

Gender	N	%	Number of online courses	n	%
Female	248	58	3	400	94
Male	177	42	2	25	6
Total	425	100	Total	425	100
Age	18-20 years	21-23 years	24 years or older	Total	
n	178	243	4	425	
%	42	57	1	100	

Source: Own elaboration with information processed in SPSS, version 25

Analysis method

The analysis method was structured in steps to achieve a descriptive level (Hidalgo, 2019), since it was taken into account that the research is proposed from a quantitative approach to analyze attitude. For the analysis, it was necessary to recognize that the study variable was measured through categorical variables and using an ordinal scale (Hedeker , 2008). In this sense, the methodological design involves a descriptive analysis of the variables (figure 1).

To begin data processing it was necessary to identify the variable (C auas, 2015); In this case, it corresponds to the categorical type, which is why its processing was carried out with an analytical approach (Vázquez *et al* ., 2010). Subsequently, the data were prepared and processed through SPSS, version 25, in order to carry out the analytical phase, where the variables were prepared for a cross-analysis (López and Fachelli , 2015). For this, the "visual grouping" technique was used (Vilà *et al* ., 2014) for each study dimension, so that they could be crossed with the variables sex and educational program. Then, cross tables were made taking

into account each dimension with its respective analysis of results (Reguant *et al* ., 2018). Finally, the results were contrasted to establish the main conclusions and recommendations (Brito, 2015), the process is shown visually in figure 1.

Figure 1 . Methodological sequence to empirically demonstrate the attitude of students
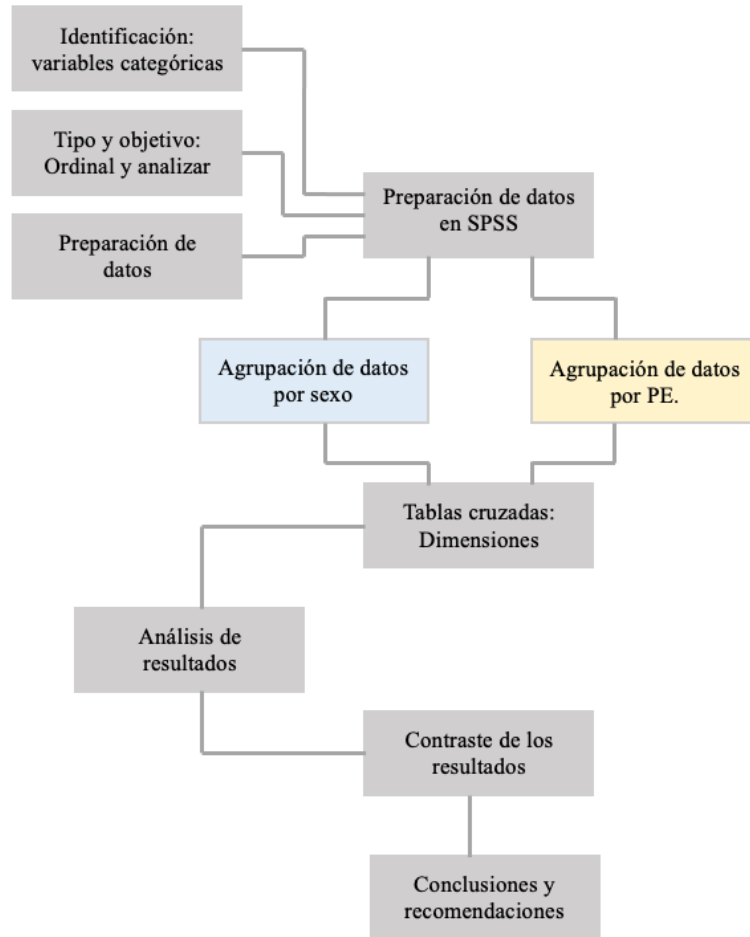
Source: self made

Results

The results of this research provide empirical evidence on the attitude of university students towards the implications of distance education, which emerged in response to the covid-19 pandemic. In this context, an analysis of the results was carried out taking into account the dimensions that make up the CAEEO instrument.

Table 4 shows the evidence of the attitude towards online education in relation to the perception of usefulness by students, considering the gender of the respondents. It is observed that women, to a greater extent, perceive that online strategies are useful in the educational field in times of uncertainty. Regarding an analysis by educational program, men who study a degree in Administration, Accounting and Business Management and Management (LGDN) consider that the tools used during the pandemic were useful for their classes. However, in the case of

undergraduate students in Computer Science and Systems (LIS), the perception is different, which could be due to the nature of their program. In the case of women, LGDN students perceive greater usefulness, while LIS students neither agree nor disagree regarding the usefulness of online education. These results are shown below in table 4.

Table 4. Analysis of the *perception of usefulness dimension*

Gender	Dimension	Scale	Educational programs				
			THE	L.C.	LGDN	LIS	Total
Male	Perception of usefulness	Totally agree	1 2.1%	0 -	2 4.9%	0 -	3 1.7%
		OK	6 12.8%	3 6.4%	2 4.9%	4 9.5%	fifteen 8.5%
		Neither agree nor disagree	27 57.4%	23 48.9%	22 53.7%	18 42.9%	90 5.8%
		In disagreement	eleven 23.4%	17 36.2%	13 31.7%	16 38.1%	57 32.2%
		Totally disagree	2 4.3%	4 8.5%	2 4.9%	4 9.5%	12 6.8%
	Total		47 100%	47 100%	41 100%	42 100%	177 100%
Female	Perception of usefulness	OK	13 14.4%	6 7%	5 8.2%	3 27.3%	27 10.9%
		Neither agree nor disagree	52 57.8%	47 54.7%	37 60.7%	3 27.3%	139 56%
		In disagreement	23 25.6%	31 36.0%	17 27.9%	4 36.4%	75 30.2%
		Totally disagree	2 2.2%	2 23 %	2 3.3%	1 9.1%	7 2.8%
	Total		90 100%	86 100%	61 100%	eleven 100%	248 100%
Total	Perception of usefulness	Totally agree	1 0.7%	- -	2 2 %	- -	3 0.7%
		OK	19 13.9%	9 6.8%	7 6.9%	7 13.2%	42 9.9%
		Neither agree nor disagree	79 57.7%	70 52.6%	59 57.8%	twenty-one 39.6%	229 53.9%
		In disagreement	3. 4 24.8%	48 36.1%	30 29.4%	twenty 37.7%	132 31.1%
		Totally disagree	4 2.9%	6 4.5%	4 3.9%	5 9.4%	19 4.5%
	Total		137 100%	133 100%	102 100%	53 100%	425 100%

Source: Own elaboration with data processed in SPSS, version 25

Table 5 analyzes the dimension *intention to adopt e-learning* ; Specifically, it can be seen that students do not agree to accept *e-learning* as a tool in the learning process. Likewise, learning through *online education,* from the students' perception, is viewed as an element with

areas of opportunity for efficient education. The results for this dimension are shown in table 5.

Table 5. Analysis of the dimension *intention to adopt e-learning*

Gender	Dimension	Scale	Educational programs				
			THE	L.C.	LGDN	LIS	Total
Male	Intention to adopt *e-learning*	Totally agree	1 2.1%	2 4.3%	0 0.0%	1 2.4%	4 23 %
		OK	10 21.3%	2 4.3%	7 17.1%	6 14.3%	25 14.1%
		Neither agree nor disagree	twenty-one 44.7%	fifteen 31.9%	fifteen 36.6%	12 28.6%	63 35.6%
		In disagreement	9 19.1%	13 27.7%	16 39.0%	13 31.0%	51 28.8%
		Totally disagree	6 12.8%	fifteen 31.9%	3 7.3%	10 23.8%	3. 4 19.2%
	Total		47 100%	47 100%	41 100%	42 100%	177 100%
Female	Intention to adopt *e-learning*	Totally agree	4 4.4%	2 23 %	1 1.6%	0 0.0%	7 2.8%
		OK	16 17.8%	9 10.5%	7 11.5%	4 36.4%	36 14.5%
		Neither agree nor disagree	37 41.1%	29 33.7%	22 36.1%	3 27.3%	91 36.7%
		In disagreement	25 27.8%	30 34.9%	25 41.0%	1 9.1%	81 32.7%
		Totally disagree	8 8.9%	16 18.6%	6 9.8%	3 27.3%	33 13.3%
	Total		90 100%	86 100%	61 100%	eleven 100%	248 100%
Total	Intention to adopt *e-learning*	Totally agree	5 3.6%	4 3.0%	1 1.0%	1 1.9%	eleven 2.6%
		OK	26 19.0%	eleven 8.3%	14 13.7%	10 18.9%	61 14.4%
		Neither agree nor disagree	58 42.3%	44 33.1%	37 36.3%	fifteen 28.3%	154 36.2%
		In disagreement	3. 4 24.8%	43 32.3%	41 40.2%	14 26.4%	132 31.1%
		Totally disagree	14 10.2%	31 23.3%	9 8.8%	13 24.5%	67 15.8%
	Total		137 100%	133 100%	102 100%	53 100%	425 100%

Source: Own elaboration with data processed in SPSS, version 25

Table 6 provides data on the ease of use of *online education* . In general, and for each PE, it can be seen that they neither agree nor disagree about whether the virtual modality is easy, which is perhaps due to training and access to new technologies and platforms.

Regarding the gender of the students, the *online modality is facilitated for women* , and for PE the largest number of responses was obtained by the LA .

Table 6. *Ease of use* dimension

Gender	Dimension	Scale	Educational programs				
			THE	L.C.	LGDN	LIS	Total
Male	Easy to use	Totally agree	1 2.1%	1 2.1%	2 4.9%	1 2.4%	5 2.8%
		OK	12 25.5%	10 21.3%	9 22%	7 16.7%	38 21.5%
		Neither agree nor disagree	29 61.7%	25 53.2%	19 46.3%	twenty-one fifty %	94 53.1%
		In disagreement	4 8.5%	7 14.1%	eleven 26.8%	9 21.4%	31 17.5%
		Totally disagree	1 2.1%	4 8.5%	0 0%	4 9.5%	9 5.1%
	Total		47 100%	47 100%	41 100%	42 100%	177 100%
Female	Easy to use	Totally agree	2 2.2%	- -	- -	- -	2 0.8%
		OK	twenty 22.2%	25 29.1%	13 21.3%	1 9.1%	59 23.8%
		Neither agree nor disagree	54 60%	44 51.2%	38 62.3%	8 72.7%	144 58.1%
		In disagreement	eleven 12.2 %	17 19.8 %	10 16.4 %	2 18.2 %	40 16.1 %
		Totally disagree	3 3.3%	0 0%	0 0%	- -	3 1.2%
	Total		90 100%	86 100%	61 100%	eleven 100%	248 100%
Total	Easy to use	Totally agree	3 2.2%	1 0.8%	2 2.0%	1 1.9%	7 1.6%
		OK	32 23.4%	35 26.3%	22 21.6%	8 15.1%	97 22.8%
		Neither agree nor disagree	83 60.6%	69 51.9%	57 55.9%	29 54.7%	238 56%
		In disagreement	fifteen 10.9%	24 18%	twenty-one 20.6%	eleven 20.8%	71 16.7%
		Totally disagree	4 2.9%	4 3 %	0 0%	4 7.5%	12 2.8%
	Total		137 100%	133 100%	102 100%	53 100%	425 100%

Source: Own elaboration with data processed in SPSS, version 25

Table 7 shows the evidence on the perception of pedagogical and technical support. The results indicate that students neither agree nor disagree about *online education* . Furthermore, LA and LC students are the ones who evaluate it best, while the rest disagree more. The same happens in the case of women.

Table 7. *Pedagogical and technical support* dimension

Gender	Dimension	Scale	Educational programs				
			THE	L.C.	LGDN	LIS	Total
Male	Pedagogical and technical support	Totally agree	- -	1 2.1%	2 4.9%	- -	3 1.7%
		OK	eleven 23.4%	6 12.8%	9 22%	7 16.7%	33 18.6%
		Neither agree nor disagree	27 57.4%	28 59.6%	17 41.5%	24 57.1%	96 54.2%
		In disagreement	8 17%	8 17%	13 31.7%	9 21.4%	38 21.5%
		Totally disagree	1 2.1%	4 8.5%	0 0%	2 4.8%	7 4 %
	Total		47 100%	47 100%	41 100%	42 100%	177 100%
Female	Pedagogical and technical support	Totally agree	5 5.6%	1 1.2%	- -	1 9.1%	7 2.8%
		OK	28 31.1%	18 20.9%	fifteen 24.6%	2 18.2%	63 25.4%
		Neither agree nor disagree	44 48.9%	48 55.8%	38 62.3%	4 36.4%	134 54%
		In disagreement	eleven 12.2%	18 20.9%	8 13.1%	4 36.4%	41 16.5%
		Totally disagree	2 2.2%	1 1.2%	0 0%	0 0%	3 1.2%
	Total		90 100%	86 100%	61 100%	eleven 100%	248 100%
Total	Pedagogical and technical support	Totally agree	5 3.6%	2 1.5%	2 2 %	1 1.9%	10 2.4%
		OK	39 28.5%	24 18%	24 23.5%	9 17%	96 22.6%
		Neither agree nor disagree	71 51.8%	76 57.1%	55 53.9%	28 52.8%	230 54.1%
		In disagreement	19 13.9%	26 19.5%	twenty-one 20.6%	13 24.5%	79 18.6%
		Totally disagree	3 2.2%	5 3.8%	0 0%	2 3.8%	10 2.4%
	Total		137 100%	133 100%	102 100%	53 100%	425 100%

Source: Own elaboration with data processed in SPSS, version 25

Table 8 shows significantly that students agree that learning in the *online modality* is complex, which is due to the difficulties of each student and the conditions to receive this type of education. Likewise, men who study Bachelor's Degrees in Business Management and Management and Software Engineering are more in agreement that this modality causes them stress, and each PE is on the same page.

Table 8. Stressor dimension *of virtual education*

Gender	Dimension	Scale	Educational programs				
			THE	L.C.	LGDN	LIS	Total
Male	*E-learning* stressors	Totally agree	1 2.1%	1 2.1%	2 4.9%	- -	4 23 %
		OK	10 21.3%	5 10.6%	13 31.7%	eleven 26.2%	39 22%
		Neither agree nor disagree	32 68.1%	29 61.7%	19 46.3%	22 52.4%	102 57.6%
		In disagreement	2 4.3%	9 19.1%	7 17.1%	8 19%	26 14.7%
		Totally disagree	2 4.3%	3 6.4%	0 0%	1 2.4%	6 3.4%
	Total		47 100%	47 100%	41 100%	42 100%	177 100%
Female	*E-learning* stressors	Totally agree	1 1.1%	- -	1 1.6%	- -	2 0.8%
		OK	23 25.6%	13 15.1%	12 19.7%	1 9.1%	49 19.8%
		Neither agree nor disagree	55 61.1%	56 65.1%	39 63.9%	9 81.8%	159 64.1%
		In disagreement	10 11.1%	fifteen 17.4%	8 13.1%	0 0%	33 13.3%
		Totally disagree	1 1.1%	2 23 %	1 1.6%	1 9.1%	5 2 %
	Total		90 100%	86 100%	61 100%	eleven 100%	248 100%
Total	*E-learning* stressors	Totally agree	2 1.5%	1 0.8%	3 2.9%	- -	6 1.4%
		OK	33 24.1%	18 13.5%	25 24.5%	12 22.6%	88 20.7%
		Neither agree nor disagree	87 63.5%	85 63.9%	58 56.9%	31 58.5%	261 61.4%
		In disagreement	12 8.8%	24 18%	fifteen 14.7%	8 15.1%	59 13.9%
		Totally disagree	3 2.2%	5 3.8%	1 1 %	2 3.8%	eleven 2.6%
	Total		137 100%	133 100%	102 100%	53 100%	425 100%

Source: Own elaboration with data processed in SPSS, version 25

Discussion

Online education represents a significant challenge for public universities in Mexico and Latin America, especially due to poverty and inequality (Pérez, 2020). The results presented in this study, therefore, highlight the importance of understanding the attitude of university students, which will provide valuable information for the design of formal online educational programs (Ramos *et al* ., 2020).

In addition, it should be noted that online education also presents difficulties related to access to resources and infrastructure necessary to carry out efficient and high-quality classes (Escobedo and Ayala , 2021). These results indicate that students may not be fully prepared or have the appropriate attitude to face the demand for an education that requires autonomy and self-regulation.

On the other hand, empirical evidence shows that students have varied opinions about the usefulness of online education, and this may be related, as Asgari suggested *et al* . (2021), with the difficulties that this modality entails. This is consistent with previous research by Hempel *et al* . (2021), Tran *et al* . (2022) and Kawasaki *et al* . (2021). Additionally, during the pandemic, online education posed additional challenges, such as the need to be connected in real time.

In other words, online learning, as an adoption strategy, turned out to be a considerable challenge for students. If learning in the face-to-face modality was already complicated, this new modality, with its infrastructure and internet access problems, represented an even greater challenge, as mentioned by Alturise (2020), Azlan *et al* . (2020) and Rado *et al* . (2020). Regarding the perception of the ease of online education, students show moderate agreement, which may be related to their level of preparation and willingness to take responsibility for their own education.

Regarding pedagogical and technical support, students express a negative perception about its effectiveness, attributing it to the lack of infrastructure (Rado *et al* ., 2020) and the limited interaction between students and teachers (Alturise , 2020). Regarding the stress associated with learning, Drelich 's research *et al* . (2021) supports the idea that students experience higher levels of stress and anxiety in virtual activities compared to in-person ones.

In general, it is observed that the attitude of students towards online education is moderately positive. However, depending on the educational program or gender, some indecision, confusion and stress are perceived among students. These results offer a starting point to explore the elements necessary to offer an effective modality that has a positive impact on student training.

Conclusions

In this research, the attitude of undergraduate students from the FCA of the UV, Coatzacoalcos campus, towards online education was analyzed. The study achieved its objective, since empirical evidence was provided about the attitude of students towards this modality of education, which suggests that students do not have a unanimous and positive perception of online education.

These divergent attitudes stem from a number of issues, including the need to adopt autonomous learning strategies, the presence of stress, infrastructure and internet access problems, as well as limitations in the pedagogical support provided in online classes and university platforms.

The results obtained provide valuable opportunities for the UV to rethink the mechanisms and procedures used in the formalization of online educational programs. Furthermore, it is suggested that policies be designed to improve infrastructure conditions so that students can access this modality more effectively and without limitations.

Future lines of research

From this empirical debate, two main lines of research are proposed: the first focuses on investigating the characteristics that make an online educational program efficient, for which all university stakeholders must be involved. The second line involves the design of online education programs with a futuristic vision, since the growing trend towards the decrease in face-to-face education must be considered.

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