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COVID-19 and its impact on higher education and the use of ICT by students of automation engineering at a technological university

COVID-19 y su impacto en la educación superior y el uso de las TIC por parte de los estudiantes de ingeniería de automatización en una universidad tecnológica

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Abstract

The impact of COVID-19 in the educational space has changed teaching-learning skills at all levels. The closure of schools and mode coming from many platforms and digital materials as a necessary technique to finish the school year. Due to this situation, this article is developed which outlines the following objectives: Evaluate the impact on the learning process due to COVID-19 in students of the Automation career of the Universidad Tecnológica del Sur de Sonora; during the time that the Academic Continuity Plan was carried out; narrate how they evaluate the obstacles they faced with the new modality of academic work. The research carried out is of a quantitative type in which the survey technique was applied to obtain a more general vision of how this new teaching-learning modality has impacted on students, finally technology is the main barrier to achieve a process comprehensive educational; according to the results, what can be improved in the educational modality of this new normal is selected.

Pandemic, COVID-19, Higher Education, Students, Online Learning

Resumen

El impacto de COVID-19 en el espacio educativo ha cambiado las habilidades de enseñanza-aprendizaje en todos los niveles. El cierre de las escuelas y la modalidad que viene de muchas plataformas y materiales digitales como una técnica necesaria para terminar el año escolar. Debido a esta situación, se desarrolla este artículo que plantea los siguientes objetivos Evaluar el impacto en el proceso de aprendizaje debido al COVID-19 en los estudiantes de la carrera de Automatización de la Universidad Tecnológica del Sur de Sonora; durante el tiempo que se llevó a cabo el Plan de Continuidad Académica; narrar cómo evalúan los obstáculos que enfrentaron con la nueva modalidad de trabajo académico. La investigación realizada es de tipo cuantitativo en la que se aplicó la técnica de la encuesta para obtener una visión más general de cómo ha impactado esta nueva modalidad de enseñanza-aprendizaje en los estudiantes, finalmente la tecnología es la principal barrera para lograr un proceso educativo integral; de acuerdo a los resultados se selecciona lo que se puede mejorar en la modalidad educativa de esta nueva normal.

Pandemia, COVID-19, Educación Superior, Estudiantes, Aprendizaje en línea

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Introduction

In Mexico, as in the rest of the world, the virus hit everywhere. Education was no exception, as public and private schools were closed and various forms of education were adapted to complete the school cycle already mentioned. Confinement as a preventive measure was introduced and altered the economy and social life as never before seen.

Coronavirus causes respiratory infections that can range from small colds to more serious illnesses. World Health Organization (WHO) (2020), Specifically, the coronavirus that has most recently emerged causing undocumented COVID-19 disease until the outbreak in Wuhan city in China in December 2019 and March 11, 2020 the WHO states in its assessment that COVID-19 is determined to be a pandemic.

Faced with the threat of the health situation, in Mexico, as in other countries, the decision was made to confine them, closing public and private spaces, and closing non-essential facilities. According to data provided by the Federal Ministry of Health, as of October 6, 2020, COVID-19 had left in Mexico 794,608 total cases and 82,348 deaths. (Government of Mexico, 2020)

Taking into account the impact on the daily life of the country and the need for change in education at the national level, we ask ourselves: How did the learning of university students affect this reality? Does virtual education replace the competencies of face-to-face learning? and what challenges does the virtual modality present? The Technological University of the South of Sonora was considered for research, specifically among engineering students in Automation Technologies.

This article proposes the following objectives:

Assess the impact on the learning process due to the COVID-19 pandemic on students at the Universidad Tecnológico del Sur de Sonora, specifically on engineering students in Automation Technologies.

Specific objectives were: to identify the technologies used by students during the time that the virtual classes conducted by the Technological University of the South of Sonora were applied.

To describe how students value the learning achieved through the technologies used, as well as to balance the obstacles faced by students with the new virtual classroom.

This study will allow us to identify what can be improved in a virtual education that will be present in this new normal.

The article begins by detailing the platforms and tools manipulated within the education sector as options for the classroom-learning process; it then discusses the impact of COVID 19 on higher education in Mexico and the virtual classroom plan at the Universidad Tecnológico del Sur de Sonora to end the current term. Likewise, the research methodology used is narrated and, finally, the results are presented in categories of analysis: the use of technology and obstacles in the new way of studying and evaluating the learning achieved.

Virtual education and its tools

Virtual education has emerged from the emergence of the Internet as an important tool in the field of Information and Communication Technologies (ICT) to enrich education. UNESCO (2020a) contributes with governments and other agencies involved to the application of technologies and thus promotes learning.

This modality makes it possible to apply constructive learning to people of any gender and age. However, it arises from the need to cover the educational programs of university students by health-related situations, so alternatives have been proposed that consist in the interaction of knowledge. With the skills of the teacher and the students and also with the assistance of different tools and platforms offered in the education system, the aim is to share information that will allow the teaching-learning process to be carried out in excellent terms.

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The need for progress in education and the pressure of the pandemic paves the way for the incorporation of different technological systems for their implementation and operation. As interpreted by authors Sánchez, Martínez and Torres (2020), this new modality and emerging environments have shocked and taken by surprise universities and society in general. The authors stress that:

> Teachers left the traditional classroom to which they have been accustomed for decades, to become obligated users of the technological tools that exist to interact remotely between themselves and their students, while having to deal with the personal pressures of confinement and its economic, health and emotional implications. (Sánchez, et al., 2020, p. 3)

The authors accept as a very important challenge to virtual education and as an essential element that will approve the constant progress to the changes that are happening in society regarding health, it is thought that it is a modality that will remain, so it will be essential to adapt it to the educational sphere 100 percent.

During these school periods, security is sought in a virtual platform structure and its tools that will allow academic progress in the curricula that are currently being consulted, despite the COVID 19 pandemic.

We accept virtual learning platforms, as Rodríguez (2009) characterizes them as the virtual space that integrates under the concept of platform an endless range of computer applications that are linked to each other and are installed on a server, with the aim of making it easier for teachers to manage, administer, process and distribute course strategies via the Internet.

Rodríguez (2009) presents a categorization of tools that each contains, among which the following are highlighted:

- Content distribution tools. They present repositories that allow you to attach files of specific information in different formats.
- Synchronous and asynchronous communication and collaboration tools. They allow communication between participants, a forum for discussion, exchange of information, and the formation of working groups that allow interaction on key issues.
- Monitoring and evaluation tools. These contain important elements for the development of questionnaires that allow students to measure their performance on specific topics. These applications make it possible to follow up the summative assessment, since they are responsible for yielding the results of the questionnaires designed in advance by the teacher.

It is important to stress that their use is notable for controlling the flow of information with which they interact. The most commonly used platforms are: In order to avoid COVID infection,19 it is a question of staying at home and looking for ways of virtual communication, such as platforms and tools that provide direct connectivity with students.

Impact of COVID-19 on higher education

Taking into account data provided by UNESCO at the end of March 2020, “the number of students affected by school closures in 138 countries amounted to 1. 37 billion, worldwide.

Also, about 60.2 million teachers worldwide were out of the classroom” (UNESCO, 2020b). Schools in all countries focused on finding the best platforms and tools to respond to an e-learning process that would solve this educational crisis.

The International Institute for Higher Education (IESALC) (UNESCO-IESALC, 2020) provided a set of recommendations for planning the transition to the new normal.

It is suggested that higher education institutions implement a three-stage model: distance learning continuity; resumption of face-to-face teaching activities as part of health measures; and restructuring of teaching models towards a hybrid model that includes face-to-face and virtual teaching.

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Tools

Zoom It is a tool for videoconferencing over the internet, it allows you to schedule virtual meetings, share information displayed such as documents, videos, presentations, among other features.

Meet It belongs to the services offered by Google, aimed at video conferences that allow users to interact by sharing information used in the educational and work environment.

E-mail It is an email that allows the exchange of information, files and data storage. Some of the most commonly used types are Gmail, Outlook, Hotmail, and Yahoo!

Facebook It is a social network that allows you to share messages, photos and videos. Provide instant messaging.

WhatsApp It is an application that allows the exchange of messages, videos, audios, documents, calls with one or more users through the internet.

Classroom It is a Google web service for educational purposes. It is a virtual classroom that facilitates the sending of information, such as files, photographs, links in an agile way, between users.

Moodle It is a platform that generates application resources for teaching-learning.

Drive It is the service that Google offers for storing information on the Internet. It allows the flow of information in the cloud.

YouTube Internet portal that allows users to register to view and share videos of all kinds of information.

Urges States to consider the role of higher education in stimulus plans for economic and social recovery; forge national consensus; establish a clear regulatory framework and promote international cooperation. (UNESCO-IESALC, 2020)

In this sense, the IESALC envisions a "new normal" based on the support to the community of students and teachers so that it can continue with a quality education and equity attached to technology, to give way when necessary to face-to-face education with activities that allow the safety of the community.

It is true that a number of teachers and students in Mexico joined a new study modality, At the same time a new reality of vulnerable teachers and students was visualized who did not have the necessary technology to join this new outgoing dynamic, the use of The need for computers, smart phones and Internet access exposed the disadvantages of many students and teachers in the country.

Taking into account that according to the National Survey on Availability and Use of Information Technologies in Homes (ENDUTIH) 2019, 43.0% of the population in Mexico aged 6 years or more is a computer user and it is estimated at 20.1 million the number of households that have internet (56.4%), either through a fixed or mobile connection and that the main activities of Internet users in 2019 corresponded to entertainment (91.5%), obtaining information (90.7%) and in communication (90.6%) (INEGI, 2020). Therefore, it can be seen that just over half of the homes have access to the internet and that education is not the main use, to this is added that the pandemic impacted the economic aspect of all families doing less affordable these goods and services.

In the document "Responses of Public Institutions of Higher Education in Mexico to face the crisis of COVID-19", the Undersecretary of Higher Education points out that given the situation of the virus, Institutions of Higher Education (IES) develop their actions in three main aspects: assistance to health authorities and support for citizens; maintain teaching, research and cultural activities with the support of the necessary digital tools and link with the productive sectors.

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On the other hand, the document specifies that the Higher Education System has 4.7 million students, 429,495 teachers, 188,646 non-teachers, 2,455 public HEIs and 3,949 private HEIs (Concheiro, 2020). In this way, a historical stage begins in all public and private schools throughout the country, with a new teaching-learning modality that has to face various technological, social and economic barriers.

Guidelines for Online UTS Academic continuity

The Technological University of the South of Sonora (UTS), an institution of higher education that was founded in September 2002, in the country the Technological Universities (UT), began in 1991 with the creation of the units of Aguascalientes, Nezahualcóyotl and Tula-Tepeji, and which currently has 66 schools distributed throughout the national territory, is emblematic of the purposes of diversification of the technology sector of higher education in Mexico, of the offer of intermediate professional training (the degrees of university technician and associate professional), as well as the intention to generate solutions to work demands on specialized technical training. (Trajectory of the model of technological universities, 1991-2009, p 3) Given the contingency generated by the pandemic and the urgency of the education sector to respond to the needs of its student population and teachers, in the month of April 2020 there is to know the guidelines of the teaching work for the follow-up and accompaniment of virtual classes and the guidelines for the student community on the development of virtual classes UTS Online.

Based on the proposed Academic Continuity guidelines, immediate activities were carried out focused on training teachers on how to design a class in a virtual learning environment. First, an institutional email was assigned to both teachers and students and through a series of Webinars they worked on, among other topics, the Inverted Class, Institutional Educational Resources, Google Education: Classroom, Drive, Meet, Office, Forms, Youtube and Zoom for teachers to acquire guidance on the tools necessary for their teaching techniques in coordination with the University of Arizona.

Methodology

The research carried out is quantitative. "In a quantitative research, the aim is to generalize the results found in a sample to a larger community or population.

The survey technique was applied, which allowed us to achieve a more general vision of how this new study modality has impacted on students. The questionnaire consisted of 7 items that, due to the pandemic, were sent to the students by the institutional mail issued by the University. The reagents were structured based on the following objectives:

Evaluate the impact on the learning process caused by COVID-19 in university students; balance which were the technologies most used by students during the period that the Online Academic Continuity guidelines were implemented ”; represent how students evaluate the learning achieved through the most used technologies and identify the obstacles that students resist with the new modality of virtual academic work.

Context and delimitation of the Investigation.

The research was carried out in the Engineering degree in Electronics and Automation, belonging to the Universidad Tecnológica del Sur de Sonora, Mexico, with the students who are currently studying the semester September - December 2021 from the Electronics and Automation groups The semester was taken as base for the investigation, it was worked in a virtual way through surveys.

Population and Sample

The population is the totality of electronics and automation students. The total population is 70 students officially registered by the UTS School Control System, thus, the sample size was 70 students using the non-probabilistic intentional sampling method.

The Google Suite for education forms service was used to send the questionnaire to the students' institutional accounts, which allowed them to be processed automatically by the same service.

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Results

Use of Technology and the new study mode

The sample was made up of a total of 70 electronics and automation students at the Engineering level. Due to the training of teachers in digital tools, the use of them increased, since the classes would be given virtually, the tools used were for the teacher's consideration.

In this sense, it was detected that the tools most used by teachers were Whats App and meet, followed by Zoom, Classroom and Moodle. The tools that were used less frequently were Facebook and You Tube.

The students consider that the most used tools and to achieve a more meaningful learning were Zoom, Meet, Classroom and Moodle

Figure 1 What tools did teachers use most frequently within their virtual classes?

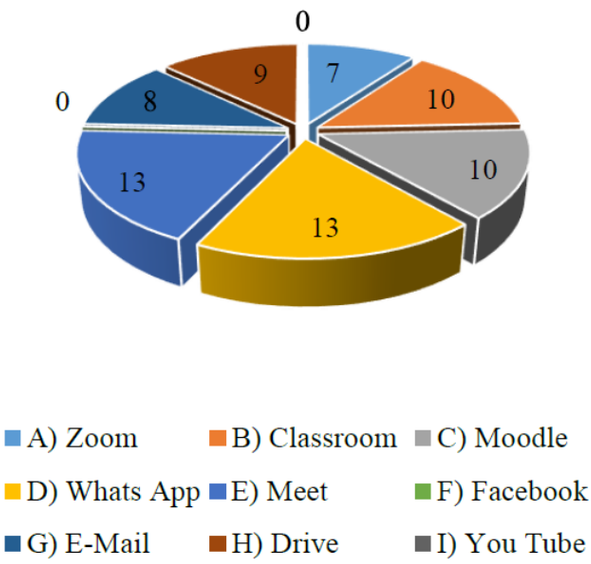

Figure 1

Figure 2 How do students compare their level of learning in this new modality with respect to classes in the classroom? 50 students answered that they learn more in face-to-face classes, 15 that they learn more in online class and 5 that there was no difference.

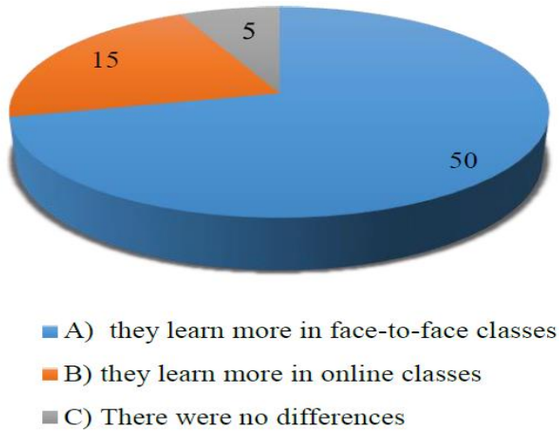

Figure 2

This new modality of online classes increased the work of students and teachers both in academics and in the technology trainings that they had to take along with their academic work.

Figure 3 How was the workload compared to the face-to-face classes? 35 students answered that there was a lot of work, 20 that the work was moderate, 8 that there was excess work and 7 that there was little work.

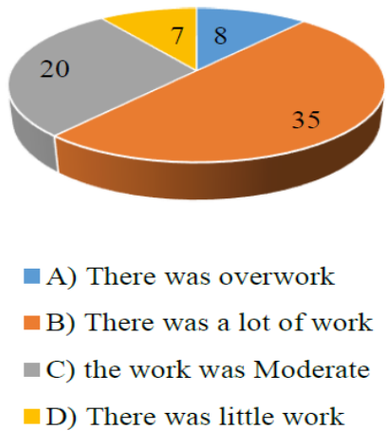

Figure 3

Higher education students with the impact of the COVID-19 pandemic faced the need to have technological equipment at home to continue with the semester, in this sense the surveyed students expressed 40 students who always had internet at home, 30 students that almost always and 0 rarely.

Figure 4 Did you have access to the internet during the online classes?

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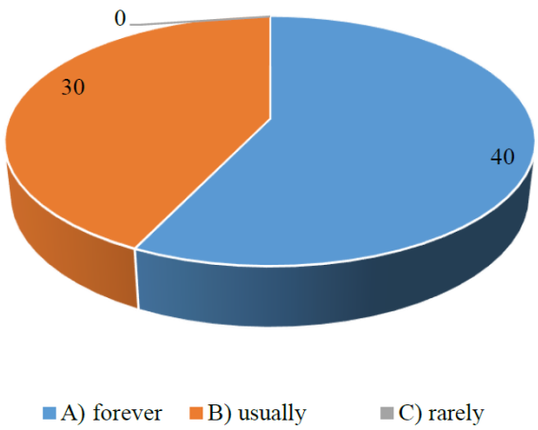

Figure 4

Regarding the equipment that the students used to connect to the Internet, 10 used desktop computers, 20 cell phones, 40 laptops, and 0 tablets.

Figure 5 What tools or equipment did you use to work online?

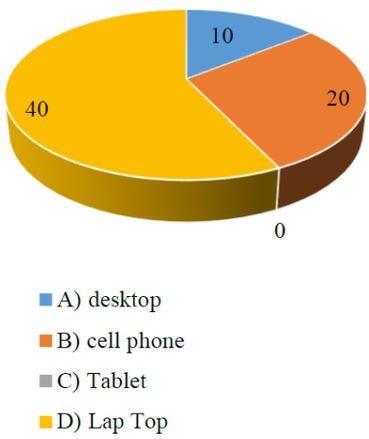

Figure 5

Students were asked what obstacles they faced in this new teaching modality. 10 students did not find any obstacle, while 30 of them said that the stability of the internet was irregular. 30 of them said that they did not have a computer at home, and they also mentioned that they saw as a barrier that the teacher had little contact with them.

As mentioned by Sánchez, Martínez and Torres (2020), teachers left traditional education and what it implied, to enter a new modality as users of technological tools in an obligatory and rapid way, while suffering the consequences of confinement and its impact on the economy, health and your personal relationships.

Evaluation of the learning achieved

To refer to the academic impact that this new modality originated in university students with respect to the evaluations, 56 students declared that only some of their objectives were met, 8 of them declared that all were met, 6 of them declared that none were met and 0 that he did not know.

Figure 6 To what extent were the objectives of the learning unit programs met?

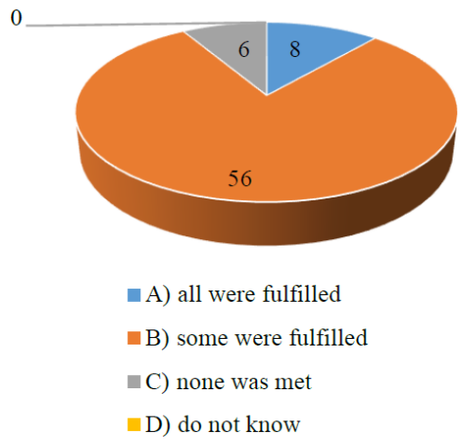

Figure 6

After the experience of finishing a virtual semester, 42 of the students prefer face-to-face classes, 19 online and 9 of them prefer hybrid.

Figure 7 Which modality do you prefer?

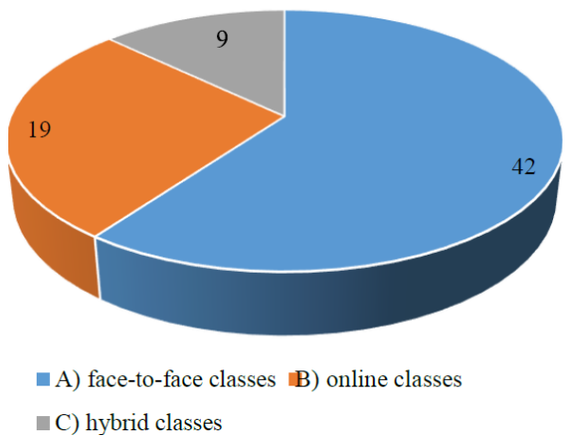

Figure 7

One of the problems faced in this new modality was that of the classes with practices because, due to the confinement, they could not be attended.

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Regarding the items, Barrón (2020) highlights that online education is undoubtedly necessary, but views it as insufficient, if the educational models, disciplinary content, and the evaluation of the teaching profession are not updated, as well as the academic-administrative management.

Conclusions

The impact of COVID-19 in the educational space has forced us to redirect the customary experiences of education at all levels. The use of digital platforms and tools for virtual education were mandatory resources to follow up on a school year that was just beginning at university.

Unfortunately, the university students became students of virtual education for which they were not prepared, having to handle the different platforms and technological resources that their teachers requested, coupled with the fact that the confinement led many of them to return to their places of origin, some of which are rural or indigenous communities with poor internet.

In terms of technology, the Zoom, Meet, Moodle and Classroom platforms were the most used by teachers and the You had and Facebook was part of the tools used to a lesser extent. An increase in the knowledge of the students in the management of educational platforms can be observed, however, they differ on their increase in the knowledge of the learning units, since they consider that they learn more in face-to-face classes.

The teachers' response to this contingency was to join the urgent training of the platforms and digital tools required to work in this new modality. It is important to consider that the teachers were faced with the challenge of having to update themselves in a very short time.

The Academic Continuity Plan proposed by the Universidad Tecnológica del Sur de Sonora in response to this contingency and its strategies and actions based on digital tools and applications contributed to concluding a semester in the best possible way in the face of a global problem that no one was facing. prepared. However, the way ahead remains a challenge, as it is evident that many of the students consider that the face-to-face class causes the greatest impact on their learning.

One of the problems faced in this new modality was that of the classes with practices because, due to the confinement, they could not be attended.

Regarding the items, Barrón (2020) highlights that online education is undoubtedly necessary, but views it as insufficient, if the educational models, disciplinary content, and the evaluation of the teaching profession are not updated, as well as the academic-administrative management.

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