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Impact of the online propaedeutic course of the students of the Faculty of Engineering of the Universidad Autónoma de Campeche, during the last 5 years

Impacto del curso propedéutico en línea en los alumnos de la Facultad de Ingeniería de la Universidad Autónoma de Campeche, durante los últimos 5 años

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Abstract

The use of virtual learning environments has been introduced to schools for a long time, however, in recent years due to the confinement due to the COVID-19 pandemic in 2020, higher education (and at all levels educational) suffered a change too fast and therefore the use of these virtual platforms was accelerated to comply with the confinement regulations implemented by the governments of the world. For this reason, the implementation of the online preparatory course to enter engineering and level their knowledge, considering the previous situation, becomes significant as it impacts the training of the engineer. To apply the online propaedeutic course, a survey was carried out before and after it in Google Form with the aim of knowing the perception of the use of this modality of the course. What led to relate what was specified in other studies where it is expressed that today's youth are digital natives, but without a doubt we are also sociable by nature, so we need to interact to learn and relate, which requires the intervention and guidance of a teacher.

College preparatory course, On-line, Mathematics, Khan Academy

Resumen

El uso de los entornos de aprendizaje virtual se fue introduciendo a las escuelas por mucho tiempo atrás, sin embargo, en los últimos años a causa del confinamiento por la pandemia del COVID-19 en el 2020, la educación superior (y en todos los niveles educativos) sufrió un cambio demasiado rápido y por ello se aceleró el uso de estas plataformas virtuales para cumplir con las normas del confinamiento implementadas por los gobiernos del mundo. Por este motivo se hace significativo como impacta a la formación del ingeniero la implementación del curso propedéutico en línea para ingresar a la ingeniería y nivelar sus conocimientos considerando la situación precedente. Para aplicar el curso propedéutico en línea se levantó una encuesta antes y después del mismo en Google Formulario con el objetivo de saber la percepción del uso de esta modalidad del curso. Lo que condujo a relacionar lo precisado en otros estudios donde se expresa que la juventud de hoy son nativos digitales, pero sin duda también somos sociables por naturaleza, por lo que necesitamos interactuar para aprender y relacionarnos, lo cual requiere de la intervención y orientación de un profesor.

Curso propedéutico, En línea, Matemáticas, Khan Academy

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Introduction

Virtual learning environments have been present for a long time as complementary strategies in the teaching-learning processes, in which the use of ICTs stand out for their great benefits and contributions in the face-to-face or blended learning modality (Morales-Alarcón, et al., 2021).

Since 2018, the Faculty of Engineering of the Autonomous University of Campeche (UACAM), presented the initiative to implement an online or virtual propaedeutic course, due to the need of students to level or regularise them with the basic knowledge of mathematics and successfully pursue the chosen engineering. Therefore, the academy decided, due to the calendar and the work structure of the UACAM (Canto Canul & Salazar Uitz, 2019), for a self-managed online propaedeutic course for new students, taking care of the basic mathematics topics for their review. The web-based learning platform Khan Academy (KA) was chosen, which has a variety of functionalities, allowing the scheduling of activities and the creation of personalised courses, with an extensive variety of educational material (Pérez Armijo, 2021).

From 2018 to 2022, the self-management virtual propaedeutic course has been developed through the KA platform, the acceptance of this resource in incoming students, from March 2020, takes relevance, given that the National Education System has faced an unprecedented challenge, implementing distance classes before the temporary closure of schools, impacting both the conclusion of the 2019-2020 school cycle and in the current 2020-2021 cycle (INEGI, 2021). Because of the mandatory confinement, not allowing people to travel meant that classes were online synchronously or asynchronously. Given this situation, questions arose as to whether this educational system could be adequate, and the objective of the study was to explore the quality of education in higher education in times of pandemic by the COVID-19 (Malpica Rodríguez, et al., 2022).

Therefore, it is significant to study how new students perceive the virtual mode course? The studies on how the training of engineers is impacted by classes in a virtual environment are as follows and some coincide:

> Most of the students prefer to take mathematics classes face-to-face, because the virtual environment is not the same, and they do not have stable internet access, which means that they have to review the recordings afterwards, which causes them to lose interest (García Avalos, et al., 2022).
>
> The results indicate preferences for face-to-face classes, insufficient mastery of digital tools and applications and the need to improve the online modality. Progress was noted in the development of digital competences and in adapting to the new model (Banda Muñoz, 2022).
>
> The results obtained indicate that the level of e-learning is at a regular point, where it is considered that the virtual modality should be different from the face-to-face one. However, most students are moderately satisfied with the virtual classes. Finally, this new modality is influenced by numerous factors such as the technological access of the students and the methodology of the teaching staff, among other factors (Rivera, et al., 2021).

It is said that our youth belong to a digital generation and for them it is natural to use and access technology. However, they are social beings, students need to interact with their peers (Diaz-Garay, et al., 2021).

On the other hand, it should not be forgotten that engineering education has an eminently practical component. It is important that the educational process is characterised by being interactive and collaborative, under the guidance of the teacher (Diaz-Garay, et al., 2021).

Methodology

The virtual propaedeutic course, which has been carried out through the KA platform since 2018, presents a series of activities to prepare students in Engineering with basic mathematics topics. Table 1 shows the number of activities and the number of students who took the course:

Propaedeutic Course	Year				
	2018	2019	2020	2021	2022
Activities	182	182	168	189	187
Students	266	244	270	231	225

Table 1 Number of activities and students in the propaedeutic course from 2018 to 2022
Source: Own elaboration

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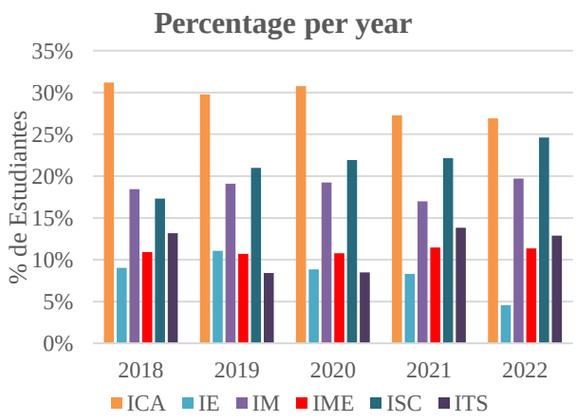
Every year a number of activities are selected to be taken from the KA platform, these vary only because the contents are updated on the platform, these activities are chosen due to the need exposed in the academy of basic sciences and mathematics of the Faculty of Engineering. The activities are as a whole: Videos, Exercises, Quizzes, Tests and Articles.

The students take a diagnostic exam before doing this activity, the duration of the course is one month before the first day of classes, then when the course ends and the activities are overdue, they take a final exam to measure how well they have taken advantage of the course.

The diagnostic exam and the final exam are conducted through the Google Form platform and are divided into two sections: the first is a survey on how they perceive the use of this course modality and the second section is a test of knowledge of basic mathematics, before and after taking the course.

The propaedeutic course was aimed at new students entering the Faculty of Engineering: Computer Systems Engineering (ISC), Civil Engineering and Administration (ICA), Mechatronics Engineering (IM), Electrical Mechanical Engineering (IME), Energy Engineering (IE) and Software Technology Engineering (ITS), from 2018 to 2022, as presented in Graph 1, the engineering with the highest income is ICA followed by ISC and IM.



Graphic 1 Percentage of incoming engineering students by year
Source: Own elaboration.

Results

In the diagnostic survey the question was asked: Which study method do you prefer to study, the possible answers were:

1. Studying from notes taken in class.
2. Going to the library / consulting books.
3. Reading digital books (PDF, e-book, other).
4. Watching videos on an internet platform (e.g. Youtube).

Graphic 2 shows the study preference of the students before presenting the virtual propaedeutic course by year, in 2018 and 2019 the study preference remained constant and approximately the same for both Studying from notes taken from classes and Watching videos on an internet platform, for 2020 the preference for Studying from notes taken from classes increased by five percentage points, it is worth highlighting the most notable change in preference that occurred from 2020 to 2021 where the preference for Watching videos on an internet platform increased by 21 percentage points. However, by 2022, the preference to Watch videos on an internet platform decreased by 9 percentage points and the same percentage increase in the preference to Study from notes taken from classes. While Going to the library/Consulting books and Reading digital books (PDFs, e-books, other) have remained at a minimum, it is noted that the preference Going to the library/Consulting books in 2022 is less than half of what it was in 2018.

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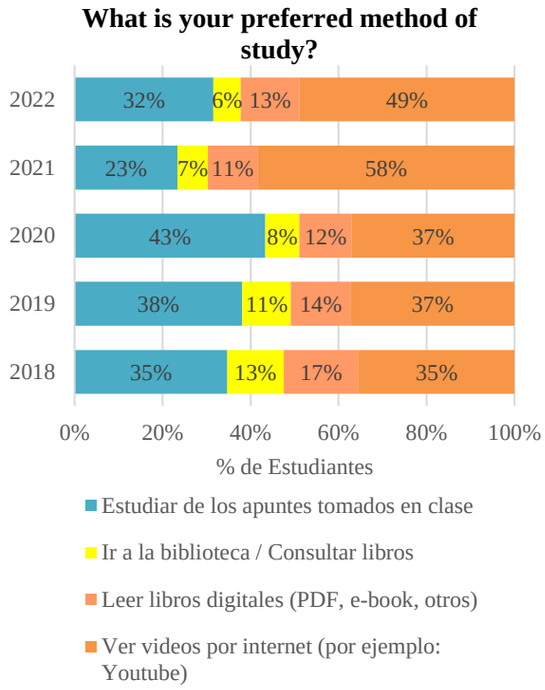
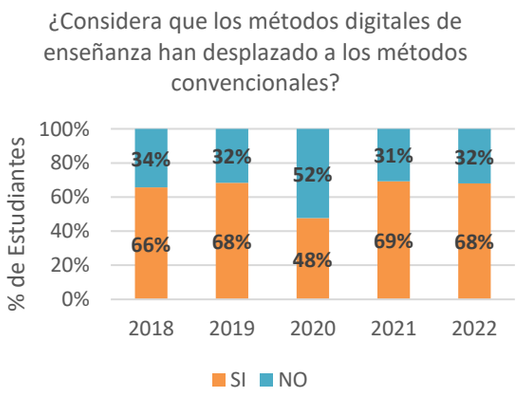


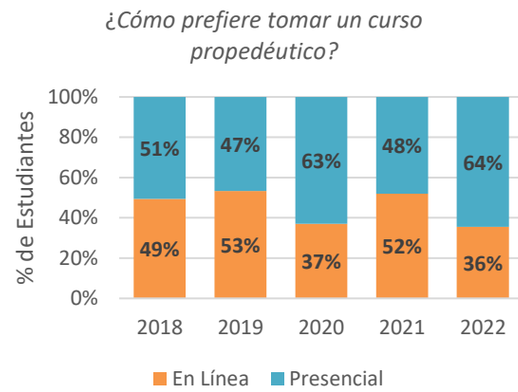
Graphic 2 Initial survey question: Which method do you prefer for studying?
Source: Own elaboration

In the same survey, the following question was asked: Do you consider that digital teaching methods have displaced conventional methods, with two possible answers YES and NO as shown in Graph 3. In 2018 and 2019, the majority of students (66% and 68% respectively) considered that they had been displaced. However, in 2020, 48% of incoming students considered that conventional methods had not been displaced. In the following two years, 2021 and 2022, the trend returned to the previous trend with 69% and 68% respectively of students considering that conventional methods had been displaced by digital methods in teaching.



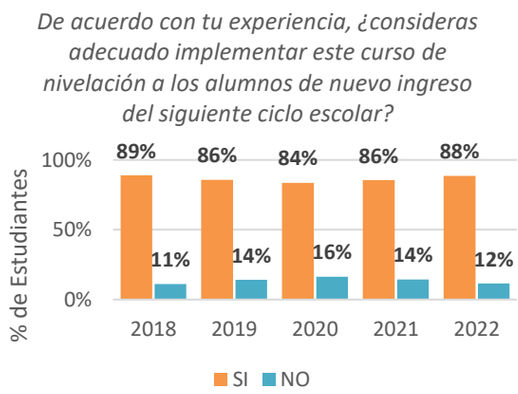
Graphic 3 Initial survey question: Do you consider that digital teaching methods have displaced conventional methods?
Source: Own elaboration

Another question asked in the diagnostic test was: How do you prefer to take an introductory course? The result is shown in Graph 4: in 2018 and 2019 the course had a preference of approximately 50% and 50% face-to-face and online respectively; on the other hand, in 2020 the face-to-face course rose 13 percentage points, in 2021 it returned to an approximate preference of 50% both face-to-face and online, however, for the year 2022 it again had an upturn of 14 percentage points.



Graphic 4 Initial survey question: How would you prefer to take an introductory course?
Source: Own elaboration

In the final exam, the question was asked: According to your experience, do you consider it appropriate to implement this leveling course for incoming students for the next school year? Graph 5 shows that more than 80% of incoming students, who took the virtual propaedeutic course from 2018 to 2022, agree with this modality.



Graphic 5 Final survey question: Do you consider it appropriate to implement this leveling course for incoming students for the next school year?
Source: Own elaboration

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Conclusions

The study methods used by incoming students at the Faculty of Engineering of the UACAM, according to the survey, as shown in Figure 2 are very questionable, during the years prior to the COVID-19 pandemic, a similar preference is maintained between choosing to study from notes taken from classes and watching videos on an internet platform, However, by 2021, once accustomed to confinement and online classes, the preference for Watching videos on an internet platform is reversed. This shows that a higher percentage of students prefer to study in class after a few months of confinement; on the other hand, there is also a trend, considering that more than a year of confinement has passed, that watching videos on an internet platform tends to be more preferred by students. In 2022, with the opening of schools and the regularisation of face-to-face classes, the study preference will again tend to normalise as before the pandemic, with the expectation that next year, in 2023, it will return to the same percentages of preference as in 2018 and 2019. This can be associated with that studied by García Avalos, Velázquez López, Vargas Almeida, & Sepúlveda Palacios in 2022 (García Avalos, et al., 2022), Banda Muñoz in 2022 (Banda Muñoz, 2022) and Rivera, Gutiérrez, Solis, & Araúz-Takakuwa in 2021 (Rivera, et al., 2021).

In Graph 3 Initial survey question: Do you consider that digital teaching methods have displaced conventional methods, a similar reasoning can be used, as virtual learning environments were being introduced to the day-to-day student activities, about 70% of students considered that these digital teaching methods were displacing conventional teaching methods, until before 2020 when the change to distance learning modality came virtually, approximately the same percentage of students considered that conventional methods had not been displaced and vice versa, showing a resistance to this modality. A similar trend can be seen in the study methods used, normalising after a year and a half of being in confinement.

Graph 4 shows that the online and face-to-face propaedeutic courses have approximately equal numbers of followers, about 50% for both preferences in 2018 and 2019, but in 2020 there is about 10% more preference for the face-to-face course, and the same in 2022.

The previous paragraphs, which refer to the surveys before presenting the online propaedeutic course, relate to what Diaz-Garay, Noriega-Araníbar, & Ruiz-Ruiz stated in 2021 (Diaz-Garay, et al., 2021), we are social beings by nature, which is why we resist the distance learning modality at the beginning of the pandemic; we need to interact to learn and relate, which requires the intervention and guidance of a teacher.

Graph 5 is the result of the survey after presenting the online propaedeutic course, more than 80% of the students who participated in the course every year, in the 5 years that this course has been applied, consider it appropriate to continue implementing it. This can be related to what was stated by Diaz-Garay, Noriega-Araníbar, & Ruiz-Ruiz in 2021 (Diaz-Garay, et al., 2021), where it expresses that today's youth are digital natives (Prensky, n.d.).

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