Modelo educativo en b-learning: caso práctico Centro Universitario UAEM Valle de Teotihuacán

Educational model in b-learning: practical case UAEM Valle de Teotihuacán university center

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Sandoval Trujillo S.
Universidad Autónoma del Estado de México, México
sjsandovalt@uaemex.mx
http://orcid.org/0000-0001-6966-7135

Ruiz Reynoso A.
Universidad Autónoma del Estado de México, México
amruizr@uaemex.mx
http://orcid.org/0000-0003-4294-2912

Hernández Bonilla B.
Universidad Autónoma del Estado de México, México
behernandezb@uaemex.mx
http://orcid.org/0000-0003-0925-7286

Ramírez Cortés V.
Universidad Autónoma del Estado de México, México
vramirezc@uaemex.mx
http://orcid.org/0000-0001-6541-6769

Resumen

El modelo *b-learning*, el cual se basa en la enseñanza-aprendizaje a través de Internet con interacciones síncronas y asíncronas, es considerado como una alternativa valiosa para mantener la continuidad en la interacción didáctica, a pesar de la separación física entre docentes y alumnos. En tal sentido, esta investigación se enfoca en la implementación de un modelo educativo *b-learning* en la licenciatura en Contaduría del Centro Universitario UAEM Valle de Teotihuacán (CUVT). En concreto, se ha diseñado un estudio de caso para evaluar cualitativamente la capacidad de utilizar herramientas digitales integradas en un modelo *b-learning* mediante un diseño metodológico de investigación acción. En tal sentido, se recopilaron datos a través de observaciones *in situ* y la aplicación de encuestas para determinar la disposición e interés de los estudiantes y docentes por el uso de estas plataformas. En conclusión, se puede indicar que si bien existen estudios sobre el *b-learning* en varios centros educativos, no se ha investigado en el programa educativo de Contaduría, por lo cual se destaca la importancia de esta investigación para explorar y comprender mejor cómo implementar y aprovechar dicho modelo en ese contexto educativo.

Palabras clave: *b-learning*, educación superior, modelo educativo.

Abstract

The research focuses on implementing a b-learning educational model in the bachelor's degree in accounting at the Centro Universitario UAEM Valle de Teotihuacan (CUVT). The revolution in information and communication technologies has transformed higher education, demanding greater innovation in face-to-face, blended and distance education models, to take full advantage of these technologies. The b-learning model, based on teaching-learning through the Internet with synchronous and asynchronous interactions, is considered a valuable alternative to maintain continuity in didactic interaction, despite the physical separation between teachers and students. It is a case study, which qualitatively evaluates the ability to use digital tools integrated in a b-learning model, through an action research methodological design, data will be collected through on-site observations, the application of surveys to determine the willingness and interest of students and teachers for the use of these platforms. Although there are studies on b-learning in several educational centers, it has not been investigated in the Accounting educational program. It highlights the importance of this research to explore and better understand how to implement and take advantage of the b-learning model in this educational context.

Resumo

O modelo b-learning, que se baseia no ensino-aprendizagem através da Internet com interações síncronas e assíncronas, é considerado uma alternativa valiosa para manter a continuidade na interação didática, apesar da separação física entre professores e alunos. Neste sentido, esta pesquisa centra-se na implementação de um modelo educacional b-learning na licenciatura em Contabilidade do Centro Universitário Valle de Teotihuacán (CUVT) da UAEM. Especificamente, foi desenhado um estudo de caso para avaliar qualitativamente a capacidade de utilização de ferramentas digitais integradas num modelo de b-learning através de um desenho metodológico de investigação-ação. Neste sentido, os dados foram recolhidos através de observações in loco e da aplicação de inquéritos para determinar a vontade e interesse de alunos e professores na utilização destas plataformas. Concluindo, pode-se indicar que embora existam estudos sobre b-learning em diversos centros educacionais, ele não foi investigado no programa educacional de Contabilidade, razão pela qual se destaca a importância desta pesquisa para explorar e compreender melhor como implementar e aproveitar esse modelo nesse contexto educacional.

Introduction

This research aims to enrich the field of "Use of technology in educational processes" through the implementation of a Blended educational model Learning known as b- learning . This model seeks to satisfy the goals of Higher Education Institutions by addressing the needs and opportunities of students to improve their academic performance, all supported by new educational modalities; The advancement of science has had an impact on educational systems, evolving towards models and methodological proposals that allow us to go beyond the classroom, into hybrid teaching. (Benavides, 2022)

According to Bartolomé (2004) b- learning It is a blended learning, for Coaten (2003) it is that way of learning that combines face-to-face teaching with non-face-to-face technology, and Brenan (2004) conceives it as any possible combination of learning media. Therefore, b- learning is understood as the blended educational model where different media are used for learning, some of these media are written and others through

communication technologies, this model does not contribute to learning more except in a different, developing new competencies and skills in the student; The b- learning modality shows a high level of acceptance by students, that is, students achieve significant learning by achieving their goals in the courses and obtaining good grades. (Zermeño, *et al.* 2019).

According to Aguado, (2005) proposes the model in three fundamental elements: a solid instructional model for the development of generic competencies, an e-learning tool that supports the instructional model, and the support of professionals to complement and optimize the learning model. learning. Through this approach, the paper suggests that it is possible to harness the benefits of e-learning while maintaining the advantages of traditional training, thus achieving effective and comprehensive competency development.

Among the outstanding advantages of a virtual platform is its ability to promote the comprehensive training of students and ensure the success of the teaching-learning process (Castro, 2007). This is achieved by stimulating interest in learning, enhancing intellectual skills, facilitating the understanding of content, promoting student participation and encouraging the development of creativity; Likewise, higher education has experienced a significant transformation driven largely by the constant advances in information and communication technologies. These technologies have enabled virtual education as a teaching-learning modality, such as mobile systems, platforms, tools. technological and virtual systems (Alfaro, *et al.* 2023).

An Internet-based educational model represents a significant innovation by optimizing the resources available in academic environments, Considering that, as Gómez and Calvo (2010) mention, innovation is not restricted to the creation of new products, it also implies small gradual changes to improve processes or structures. In addition, it contributes significantly to professional training by training students in skills related to information and communication technologies (Gee , 1981) cited in (Salinas, 2008).

Cabero (2006) argues that the success of e-Learning does not depend merely on the technological infrastructure, such as learning platforms, but on a wide range of pedagogical factors that include the technological competencies of teachers and students, institutional support, content. , social interactivity, communication tools, methodologies, e-activities, evaluation, and the roles of the teacher and the student. These elements are essential to creating effective, quality learning environments that go beyond simple access to information and promote a meaningful educational experience .

In 1999, the University Corporation for Internet Development was established, with the mission of consolidating academic projects taking advantage of the Internet.

Initially made up of prominent educational institutions such as the National Autonomous University of Mexico, the Metropolitan Autonomous University, the University of the Americas, the University of Guadalajara, the Autonomous University of Nuevo León, the National Polytechnic Institute and the Technological Institute of Higher Studies of Monterrey (Barrón, 2004), this initiative marked the beginning of growth in the offer of online academic programs. Nowadays, it is common to see people studying from the comfort of their homes or workplaces.

However, a survey among undergraduate students reveals a low use of technological resources in their learning process (Pérez, 2012). They are mostly used as means of communication and socialization. At the same time, teachers show reluctance in the use of these resources, considering that they are not necessary for the development of their teaching units and that work on the blackboard is sufficient.

Consequently, the teaching and learning processes in the Accounting degree at the Autonomous University of the State of Mexico (UAEM) UAEM Valle de Teotihuacán University Center campus require modification. This involves the implementation of educational tools provided by information and communication technologies to expand the learning environment of students through educational flexibility.

Methodology

The methodology used in this research is framed in a qualitative approach, based on the understanding and deepening of the phenomena. According to Hernández , *et al.* (2010), this method involves the exploration of the perspectives of the participants in relation to their context, with the purpose of understanding their points of view about the use of information and communication technologies, specifically virtual platforms (Gros, 2007), in the field of face-to-face education. This approach is appropriate when the topic of study has not been widely researched, although b- learning has been the subject of study in several educational centers, no study has been carried out in this regard in the degree in Accounting at the UAEM Valle de Teotihuacán University Center. .

In the field of the application of information and communication technologies to face-to-face education, qualitative studies have experienced notable growth. For example, the work of Turpo (2010) analyzed the context and development of the b- learning educational model in the Ibero-American university system, using observation techniques and identification of experiences to analyze the content of this study modality.

Furthermore, Ocampo, *et al.* (2015) carried out a qualitative study on teachers' perceptions of the use of b- learning to strengthen work skills. This study, carried out at

the Autonomous University of the State of Hidalgo, was based on phenomenological analysis through interviews, observations and questionnaires in order to obtain the desired results.

Likewise, Bravo, *et al.* (2010) from the Polytechnic University of Madrid carried out a study on the use of b- learning systems in university teaching. They used a qualitative approach through a 32-question survey with the objective of evaluating the implementation of this technology at the university center, where training is given in person.

Research design

The methodological design of the research adopted the action research modality, which, according to Hernández, *et al.* (2010), focuses on solving practical problems and improving specific practices, offering information for decision-making aimed at structural reforms. This approach derives from the objective of modifying the current educational model of the degree in Accounting at the UAEM Valle de Teotihuacán University Center with an innovative one based on b- learning , with the intention of contributing to the comprehensive training of students.

According to Creswell (2005) cited by Hernández, et al. (2010), the action research design is characterized as practical, with the researcher leading the implementation of an action plan to generate change through the study of local practices. Likewise, from the perspective of Álvarez- Gayou (2003) cited by Hernández, *et al.* (2010), this design was carried out with an emancipatory vision by trying to sensitize teachers about their teaching methods and the need to improve it.

The methodology involved surveying students to evaluate their technological resources, their technology use habits, and their ability to work with computers. This analysis revealed that resources are not being used, which led to the formulation of a plan to design an educational model for the degree in Accounting, based on virtual learning environments. This model was implemented in a learning unit, its results were evaluated and necessary adjustments were made, which culminated in a change that improved the educational quality of the degree.

In addition, surveys were carried out with both students and teachers. The students were asked about the technological resources to which they have access, their frequency of use, their most common activities on the Internet and the teaching methodologies used by teachers. Their willingness to change the educational model and their willingness to work on virtual platforms was also investigated (Sánchez, 2009).

Teachers were surveyed about their willingness to modify the current educational model, their use of technological resources in teaching and their willingness to work in virtual environments, considering the impact of information and communication technologies in the teaching process. -learning (Vélaz , 2010).

Finally, an additional survey was administered to the students after having used the platform in the learning units of "Contributions of Moral Persons", "Social Security" and "Special Taxes" during a school period. The objective was to know their perception about the use of the virtual platform in the CUVT Accounting Degree, with the purpose of specifying its properties, characteristics, profiles and interests related to variables such as academic activities, teaching and perception of learning, as detailed. in table 1.

Table 1. *Definition of research variables.*

Variables	Dimensions	Definition
Access to information and communication technologies.	– Technologies – Places	Inquire about the access that students and teachers have in relation to technologies, whether at the study center, at home or in a cafe.
Use of information and communication technologies.	– Applications – Regularity – Internet	Determine the ability to use information and communication technologies that undergraduate students and teachers have in order to evaluate the possibility of implementing the use of a virtual platform.
Current educational model .	– Transformation – Applications	Educational interaction, mediated by technology, is an innovative field of knowledge, which will depend on the types of content to be treated, the teaching activities and the evaluative approaches used.
Virtual learning platforms.	– Willingness to use them – Use of virtual platforms	Virtual Learning Environments (VLE) can be implemented even in school education modalities for the design of an innovative strategic model.
Teaching academic activities.	– Activities – Time	Evaluating the teacher's use of the platform will help ensure that its application in undergraduate teaching is truly beneficial.
Perception about learning.	- Virtual platform - Innovation	Analyze whether the student considers that its use favors learning, interest and development of technological skills, integration, initiative, collaborative work, among others, useful for their professional development.
Advantages of using the virtual platform.	- Saving - Ease	Determine the advantages of using the virtual platform in teaching the degree in Accounting.

Note: The importance of ICT in education, focusing on access, use, and perceptions towards virtual platforms among students and teachers. It highlights the need to evaluate the willingness and capacity to integrate technologies into the educational model, seeking to improve teaching and learning. Emphasis is placed on pedagogical innovation, the advantages of virtual platforms such as time savings and ease of use,

and how these can favor the development of skills relevant to students' professional future.

Population and sample

The sample of this study was made up of students between 18 and 24 years old, both men and women, and teachers between 30 and 65 years old, also of both genders. All of them were part of the Accounting degree at the UAEM Valle de Teotihuacán University Center, which had an enrollment of 134 students and 18 teachers.

The sampling method used was non-probabilistic with voluntary participants. Students and teachers were asked to collaborate in answering surveys sent through an email link. Those who were willing participated voluntarily. Techniques that resorted to case-type or expert samples were not applied. Furthermore, in line with qualitative research, opportunity sampling was used, allowing random individuals to present themselves to the researcher when necessary, thus contributing to the development of the research.

The calculation of the sample of the student population was carried out considering a reliability percentage of 90% derived from the size of the population of 134 students, through the following formulas:

$s^2 = 0.9\ (1-0.9) = 0.09$

$\sigma^2 = (.\ 10)^2 = .01$

$n^1 = S^2 / \sigma^2 = .09^2 / .01^2 = 81$

$n = n^1 / 1 + (n^1/N) = 81 / (1 + (81/134)) = 50$

According to the ideal sample size, it was established that 50 participants would be necessary for the study. To carry out this selection, the research project was presented in detail to the four groups of the degree in question. Subsequently, the voluntary collaboration of the students was requested to respond to a survey designed specifically for the study, which was administered online.

The focus of this study was the innovation of the existing educational model in the Bachelor's degree in Accounting, which was originally based on a flexible model by competencies established in the Curriculum since 2003. However, in conversations with the students of the eighth semester they express that this model is traditional and monotonous. A change towards an educational model based on b- learning was proposed , with the aim of taking advantage of the technological resources available both in the academic environment and in the home environment.

The context of this research focused on the community of the Accounting degree at the UAEM Valle de Teotihuacán University Center. Students and teachers participated

during the spring 2016 school term. At that time, the student enrollment consisted of 134 students, who attended classes from Monday to Friday from seven in the morning to one in the afternoon. In addition, there were 18 teachers: four full-time teachers who were present in the academic space from Monday to Friday from seven in the morning to three in the afternoon, and 14 subject teachers with variable schedules depending on the academic load.

The bachelor's students were over 18 years old and most were financially dependent on their parents or guardians. Some worked part-time in various establishments, such as department stores, accounting firms, or family businesses.

Solid relationships with the academic environment were observed. The researcher was part of the teaching staff in that space and maintained close relationships with both students and teachers, who demonstrated a willingness to collaborate in the research. The directors of the Institution gave their consent to carry out the study, facilitating access without presenting any inconvenience.

Variables and Indicators

The research variables were detected from the categories, which were included in: Information and communication technologies, Educational models through virtual platforms and Academic culture through virtual platforms, according to these categories the variables identified are :

- Access to information and communication technologies.
- Use of information and communication technologies.
- Current educational model.
- Virtual learning platforms.
- Teaching academic activities.
- Perception about learning.
- Advantages of using the virtual platform.

Details about the indicators derived from these variables and the instruments used for data collection are presented in tables 2, 3, 4 and 5. These tables are aligned with the type of research carried out and the objectives set at the beginning of the study.

Table 2. *Evaluation of data collection instruments.*

Requirements	Survey 1		Survey 2		Survey 3	
	Yeah	No	Yeah	No	Yeah	No
Identification data	√		√		√	
Instructions	√		√		√	
General data	√		√		√	
Objective questions	√		√		√	
Logical sequence	√		√		√	
Questions with the possibility of being answered by the respondents	√		√		√	
Writing at the educational level of the participant	√		√		√	
Provide all possible alternatives	√		√		√	
Contains confusing questions		√	√	√	√	√

Note: Data collection instruments

Reliability, according to Hernández , *et al* . (2010), is related to the consistency and coherence in the results when a repeated measurement is applied to the same subject or object. In this study, observation at different times, even during different learning units, demonstrates that the information obtained is reliable. Furthermore, the consistent results of the surveys administered at two different times support the conclusion that the information collected is reliable.

Table 3. *Category one research variables.*

Category	Variable	Dimension	Indicator	Instrument
Technology of the information and communication	Access to information and communication technologies	Technologies	What technologies do you have access to?	Observation and survey
			Do you have a smart cell phone?	
		Places	Where do they have access to tics ?	Survey
			Do you have Internet at home?	
	Use of information and communication technologies	Applications	What are the applications they use?	
			What is the use they give to technologies?	
		Regularity	How regularly do you use social media?	
			How regularly do you check email?	
			How regularly do you go to the Internet cafe?	
		Internet	What applications do you use on the Internet?	
			Will the use of online applications benefit vocational training?	

Note: The table explores Information and Communication Technologies (ICT), focusing on the access and use of these technologies. Observations and surveys are used to assess everything from smart device ownership to how often specific apps are used and Internet access. This research details how people interact with ICT in different environments and with what regularity, seeking to understand the potential impact of online applications on professional development. By addressing both access and use, the study aims to reveal the integration of ICT in everyday life and its relevance for vocational training.

Table 4. *Category two research variables.*

Category	Variable	Dimension	Indicator	Instrument
Educational models through virtual platforms	Current educational model	Transformation	Do you consider that the current educational model requires a modification?	Survey
		Applications	What online applications can be used in the educational model?	
	Virtual learning platforms	Willingness to use them	Do you agree to work on a virtual platform?	
			Do you require training to use virtual platforms?	
		Use of virtual platforms	Have they taken any online courses or conferences?	
			Will the use of virtual platforms benefit the in-person educational model?	

Note: The transition towards innovative educational models through virtual platforms is addressed, highlighting the perception of the need to transform the current model and the willingness to use online technologies. Through surveys, the openness of the educational community towards the integration of online applications in teaching, the willingness to adapt to virtual learning environments, and previous experience with online courses or conferences are explored. In addition, the need for training for the effective management of these platforms is investigated, evaluating whether their inclusion could benefit the face-to-face educational model. This approach suggests a recognition of digitalization as a key element for educational evolution, highlighting the importance of the preparation and adaptability of teachers and students in this process.

Table 5. *Category three research variables.*

Category	Variable	Dimension	Indicator	Instrument
Academic culture through virtual platforms	Teaching academic activities	Activities	The teaching activities uploaded by the teacher contribute to learning.	Survey
			The reading forums are related to the contents and objectives of the learning unit.	
			The tasks are appropriate to the contents and objectives of the learning unit.	
			Wikis contribute to collaborative work.	
		Time	The time given to carry out the activities is sufficient.	
	Perception about learning	Virtual platform	The use of the platform contributes to learning.	
			The platform can be used in face-to-face classes.	
			The use of this type of platforms could be incorporated into all learning units.	
		Innovation	The use of platforms like this favors the mastery of technologies.	
			It is interesting to work in this educational modality.	
			The use of the platform contributes to developing skills necessary for professional training.	
	Advantages of using the virtual platform	Saving	The use of the platform contributes to saving paper.	
			Using the platform allows you to save money on printing.	
		Ease	Working on the platform allows you to carry out activities from anywhere.	

			Using the platform is simple.	

Note: Highlights the impact of virtual platforms on academic culture, evaluating teaching activities, perception of learning, and innovation through surveys. Highlights how online activities, such as forums and wikis, encourage collaborative learning and are aligned with educational objectives. In addition, the importance of adequate time to complete tasks is highlighted and how the use of these platforms can enrich both in-person and virtual teaching, promoting technological mastery and the development of professional skills. The advantages include economic savings and flexibility, highlighting the ease of access from anywhere and the contribution to saving resources.

Analysis of data

A free trial version of Atlas.ti 7 software was used to analyze data from the surveys. The purpose was to describe in detail the characteristics of the study subjects. In addition, the measurement of the variables was carried out in order to establish their relationship with the independent variable. This approach made it possible to explain the need to implement an educational model based on b- learning for the degree in Accounting at the UAEM Valle de Teotihuacán University Center.

Docs Drive were used to support and facilitate the interpretation of the results. These graphs were related to the proposed variables and were aligned with the defined objectives, thus contributing to the corroboration of the proposed hypotheses.

In addition to the quantitative analysis carried out with the Atlas.ti 7 software, the qualitative evaluation of the use of information and communication technologies by students and teachers was complemented, as well as the students' perception of the virtual platform. Additional quantitative analysis was performed using SPSS statistical software. This analysis allowed us to detect measures of central tendency such as the mean, median and mode, providing a more complete and detailed perspective of the results obtained in the surveys.

Validity and Reliability

According to Hernández, *et al.* (2010), validity refers to the degree to which an instrument effectively measures the variable it is intended to evaluate. In this research, observation and surveys were used to measure variables such as the willingness of students and teachers to implement an educational model in b- learning through digital platforms in teaching the degree in Accounting. These techniques turned out to be effective in achieving the stated objectives.

The validity of the surveys was based on the judgment of experts, five teachers from the UAEM Valle de Teotihuacán University Center, specialists in information technologies in the area of information technology and computing, made observations and offered suggestions that contributed to improving the surveys applied. Their recommendations were oriented towards content validity, evaluating to what extent the surveys measured the desired variables and whether they met the necessary requirements for an instrument of this type (see Table 3.2: Evaluation of data collection instruments).

Through the surveys, the perception of students and teachers about the need to modify the current educational model of the degree in Accounting was evaluated, focusing on a model that takes greater advantage of information and communication technologies. Their willingness to use online digital platforms as didactic strategies in learning was also explored.

The results obtained from the survey "Use of the CUVT Bachelor of Accounting virtual platform" provided information on the perception of students in relation to academic teaching activities through the use of the platform, their assessment in terms of contributions to learning and the advantages they perceive in its use. The questionnaire applied followed a Likert-type format, where the options ranged from 1= totally agree to 4= totally disagree, and the results were analyzed using the SPSS statistical program.

The observation technique was implemented in two different groups of the Accounting degree. In the case of the sixth grade group of the bachelor's degree, during the Parcel Simulation class in a computer classroom, where the estimated average age of the students was 21 years. The researcher obtained permission from the teacher to passively participate and observe for one hour, as detailed in Table 6.

Table 6. *Observation in the sixth semester accounting group.*

Descriptive notes	Interpretation
It was eleven in the morning, the atmosphere was relaxed, the young people came from breakfast, turned on the computer equipment and the first thing they did was open Facebook, they reviewed what was new they had and when the teacher approached they immediately changed the screen to show that They were working on the Comprehensive Accounting software (COI), one boy put on his headphones and started listening to music for himself and working, another played music from YouTube at a moderate tone and the teacher allowed it, his classmates suggested what music to play. They constantly change pages between Facebook, YouTube, other Internet pages that interested them and COI. They spoke intermittently to the teacher to ask any questions regarding the program and its functions. All students have a Facebook account, the majority have a smart cell phone, during class they send messages on WhatsApp while they work, talk with their classmate and listen to music.	This data collection technique shows that the students of the Bachelor's degree in Accounting at the UAEM Valle de Teotihuacán University Center have good access to information and communication technologies at school and at home through cell phones. Their interest in electronic applications on the Internet is mainly in Facebook and YouTube, then they carry out the activities that the teacher suggests in the software or electronic applications that they request.

Note: It analyzes how virtual platforms transform education, based on the perception of teaching activities, learning, and innovation. It highlights the promotion of collaborative work through forums and wikis, the importance of reasonable deadlines for tasks, and how these tools enrich face-to-face and distance education. This approach reinforces technological mastery and professional skills, offering benefits such as saving resources and the flexibility to study from anywhere. The survey suggests a positive assessment of virtual platforms, underlining their role in improving academic culture and educational efficiency.

In the Accounting Simulation session of the eighth semester, an observation was carried out at 9:00 am, lasting an hour and a half. In this instance, the researcher was integrated in a participatory manner. The average age of the students was estimated to be 22 years, as specified in table 7.

Table 7. *Observation in the eighth semester accounting group .*

Descriptive notes	Interpretation
As a teacher of the group, a practice was assigned to be solved by the students, the first thing they did was meet in a circle with their friends to work collaboratively, one of them read the problem, others suggested how to answer it, there was no shortage of who was playing on the cell phone, sending text messages or WhatsApp, checking Facebook or email, even searching the Internet for any information or questions from her classmates who asked her, in the end she just copies the results to her classmates, a young woman brought her computer and solved the exercises in For her, the researcher went from one team to another observing how they worked and resolving doubts if there were any. It was observed that most of the students have smart cell phones.	Students of the Bachelor's degree in Accounting at the UAEM Valle de Teotihuacán University Center have access to information and communication technologies personally, cell phone and laptop, including some telephone service package with Internet. The way they dress, the cell phones they carry, even the backpacks they have reveal that their economic condition is favorable, which allows them to have access to various technologies. They develop well in collaborative work, they know and use various telephone applications.

Note: Observation reveals how university students use mobile technologies and collaboration to solve academic tasks. The mix of focus and distraction stands out, with some students searching for information online while others are distracted by social networks or messages. The widespread presence of smartphones indicates significant access to technology, reflecting a favorable economic condition that facilitates this access. In addition, the students' ability to work in groups and their familiarity with various applications are highlighted, suggesting an effective integration of technology in their learning.

The data obtained from direct observation in two different groups within the degree were analyzed using Atlas.ti 7. This analysis gave rise to a matrix that displays the connections between the categories proposed for the research, as described in detail in the table 8 in terms of results associated with these categories.

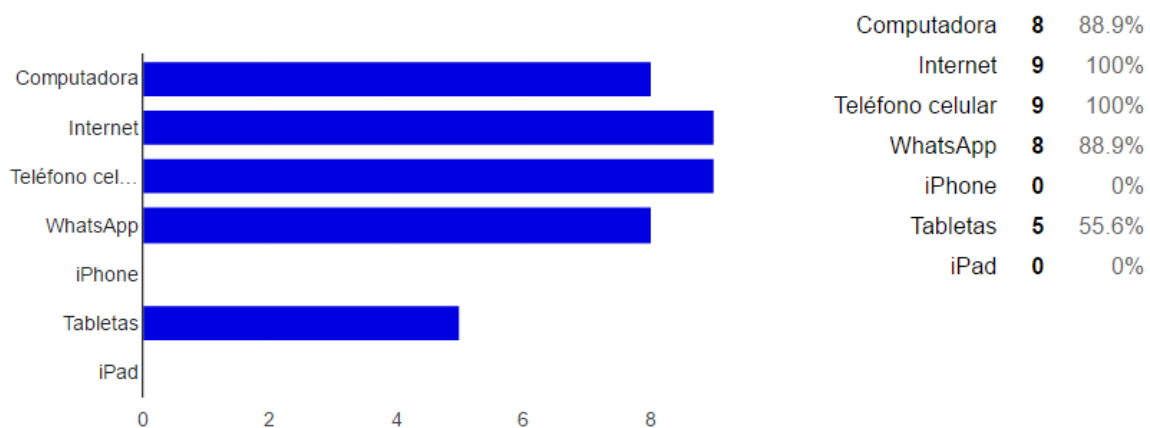**Table 8.** *Results relationship matrix with categories .*

Categories Observation results	Technology of the information and communication.	Educational models through virtual platforms.	Academic culture through virtual platforms.
Access to tics	+	+	Insufficient information to determine relationship
Use of social networks and online applications	+	+	Insufficient information to determine relationship
Interest in Internet applications	+	+	+

Note: World globalization has contributed to the boom of the internet and technologies.

Through the survey applied to a sample of 50 students of the Bachelor's Degree in Accounting at the UAEM Valle de Teotihuacán University Center, the following results were obtained:

According to the data collected which is shown in Figure 1, it can be stated that students have broad access to technology. All students surveyed have access to the Internet and own a cell phone. In addition, almost 90% have a personal computer and use WhatsApp, while more than half have electronic tablets. These results demonstrate that students have significant access to technology in their daily lives.

Figure 1. *Technologies to which they have access.*

Computadora	8	88.9%
Internet	9	100%
Teléfono celular	9	100%
WhatsApp	8	88.9%
iPhone	0	0%
Tabletas	5	55.6%
iPad	0	0%

Note: The graph shows that access to the internet and cell phones is universal (100%) among respondents. The computer has a high penetration (88.9%), similar to the use of WhatsApp (88.9%). Tablets have significant adoption (55.6%). Notably, no iPhone or iPad users are registered (0%), which may indicate preferences for other brands or a non-representative sample of Apple users.

As shown in Figure 2, a pattern of application use is evident where the Internet occupies first place in preference. Next in order of frequency is the use of Office applications. On the other hand, it is observed that applications related to the accounting field, such as COI, NOI and SAE, are the least used by users. This pattern suggests a marked preference for general-purpose tools over those specifically linked to the accounting area.

Figure 2. *Most used applications.*
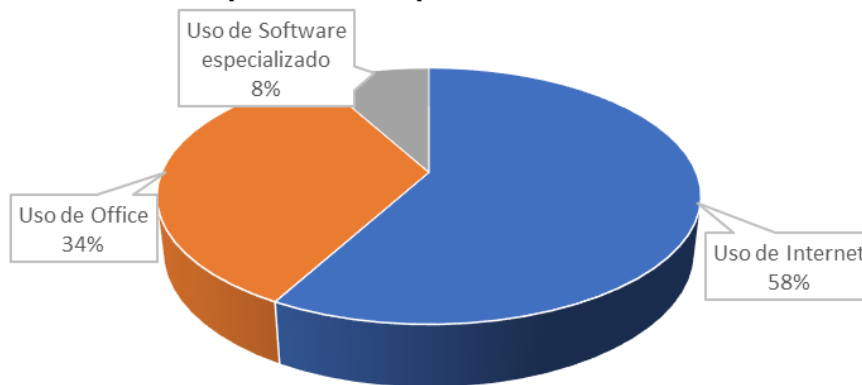
Note: The graph shows Internet use predominates with 58%, reflecting its importance in daily activities. Office usage represents 34%, indicating a strong reliance on standard productivity tools. Specialized software, although essential for certain functions, has the lowest percentage at 8%, suggesting more limited adoption.

The visual representation in Figure 3 reveals a pattern of preference in the use of digital applications. It stands out that social networks top the list as the most used, closely followed by email and YouTube. In addition, there is considerable use of search engines and chat applications. On the other hand, it is identified that forum and blog platforms are the least used compared to other applications, indicating less interaction by users in this type of online environments.

Figure 3. *Application uses*
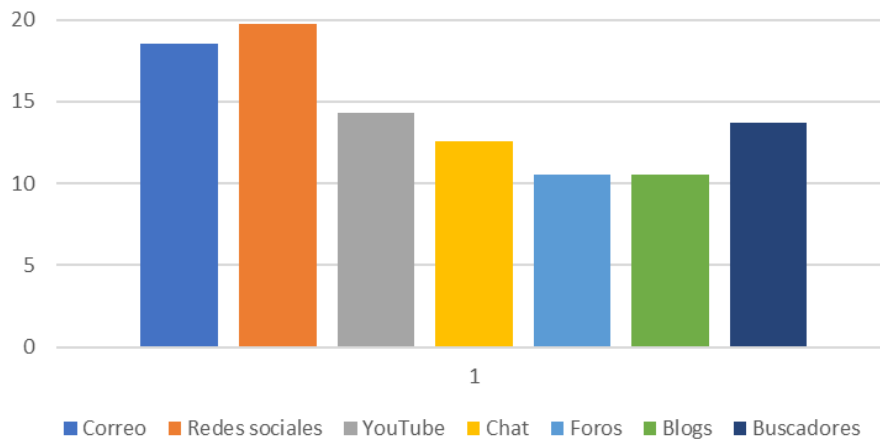
Note: The applications are used by students in all their activities, both social and learning, their use changes over time as they offer greater possibilities of activities to users. The representation reveals that access to information and communication technologies is predominant in the school environment, reaching 90% of students. In addition to school infrastructure, access to these technologies is observed in homes, Internet cafes and, in some cases, in work environments. This outlook highlights the critical importance of technology infrastructure in schools, as well as the widespread growth of technology within homes.

These findings underscore that students have the opportunity to take advantage of digital resources both inside and outside of the school environment, leading to significant benefits for their learning and academic development.

Figure 4. *Places where they access tics .*

|		
Casa	**33**	66%
Escuela	**45**	90%
Trabajo	**16**	32%
Café internet	**28**	56%
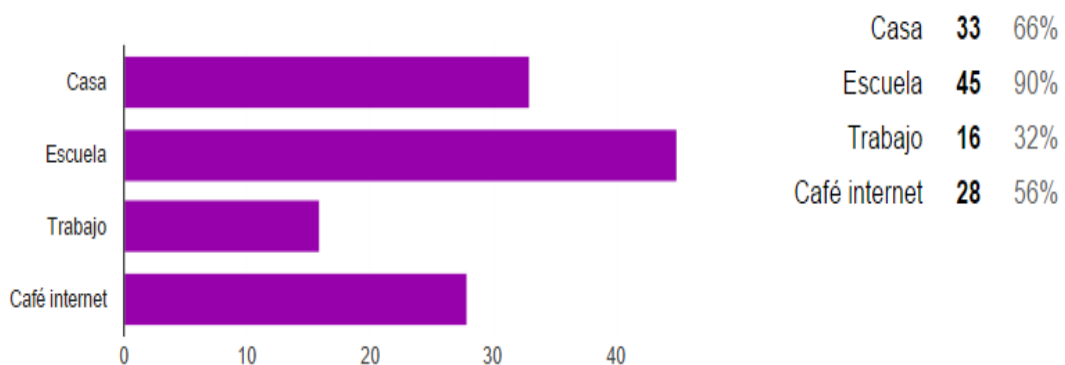
Note: Access to technologies must contribute to learning in order to reduce inequalities and combat poverty. The graph shows places of internet access, with the school leading (45 people, 90%), followed by the home (33, 66%). Fewer people use the Internet in cafes (28, 56%) and at work (16, 32%). This indicates a strong preference for using the Internet in educational institutions and at home, with workplaces and cafes being less popular for this purpose.

Figure 5 details the information on students' Internet access. According to the data collected, it stands out that 56% of students have an Internet connection in their homes. This indicates that the majority have stable and available access from the comfort of their home, which makes it easier for them to access online resources, participate in academic activities and research from their personal environment.

Furthermore, it is noted that a significant group of students who lack Internet access in their homes go to Internet cafes to meet this need. These students visit these establishments weekly, some once or twice, while a smaller percentage do so more frequently, between three and six times a week. This demonstrates their dependence on Internet cafes to access online resources, complete academic assignments, and communicate digitally.

These results underline the relevance of ensuring equitable access to the Internet and addressing the digital divide. Although most students have access at home, those who lack this option rely on alternatives such as Internet cafes. To ensure equal educational opportunities, it is essential to continue expanding Internet access in homes and promote solutions that allow all students to benefit from information and communication technologies.

Figure 5. *Internet access at home.*
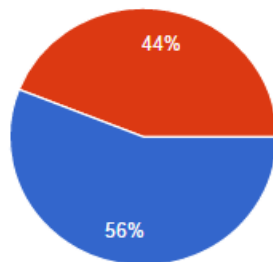


| Si | 28 | 56% |
| No | 22 | 44% |

Note: The internet allows you to explore and get to know the world at least virtually, this favors learning and professional development. The graph shows a "yes" or "no" poll with close results. 56% (28 people) voted "yes", while 44% (22 people) voted "no". This indicates a division of opinion, but with a slight majority in favor of "yes".

Figure 6 reveals students' email usage habits may vary depending on academic and personal needs. Email is typically used as a critical tool for formal communication, such as exchanging information between students and instructors, submitting assignments, inquiring about academic material, and participating in course-related discussions.

Additionally, email is often used for personal purposes, such as coordinating extracurricular activities, communicating with classmates for group projects, and, in some cases, to contact potential employers or professionals in the field of study of interest.

Students may have different frequencies of email use, with some checking their inbox several times a day to stay on top of updates, while others may check it less regularly, specifically attending to relevant or important notifications.

Figure 6. *Weekly regularity with which they check email.*

| Diario | 12 | 24% |
| Una o dos veces | 28 | 56% |
| De tres a seis veces | 10 | 20% |
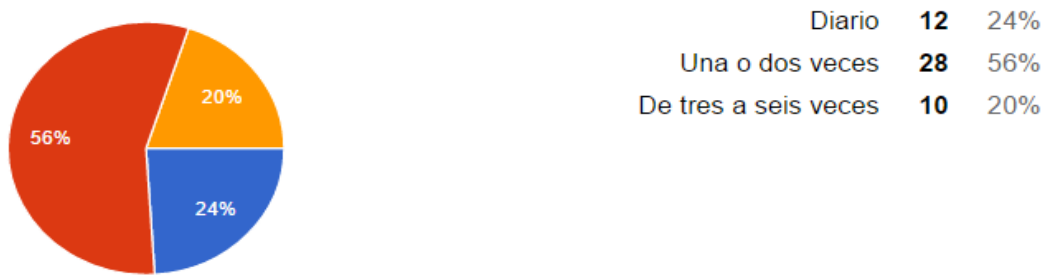
Note: Email has fallen into disuse due to the boom in social networks, which communicate more quickly and to more people at the same time. illustrates the frequency of an activity. 56% of those surveyed do it once or twice, this being the majority. 24% do it daily, and 20% between three and six times, which indicates a tendency towards occasional rather than daily completion.

The majority of students, 56%, check their email once or twice a week, according to the data collected. Furthermore, it is observed that 12% of students check their email daily, while 10% do so three to six times a week. These results suggest that, although email is used regularly by the majority, its daily use is not as frequent among students.

On the other hand, Figure 7 illustrates that the majority of students, representing 54%, use social networks daily. This finding shows a high dependence and considerable frequency in the use of social networks as a means of communication, social interaction and consumption of online content. Furthermore, it stands out that 13% of students use them once or twice a week, while 10% do it three to six times a week.

Figure 7 . *Weekly regularity with which they use social networks.*

| Diario | 27 | 54% |
| Una o dos veces | 13 | 26% |
| De tres a seis veces | 10 | 20% |
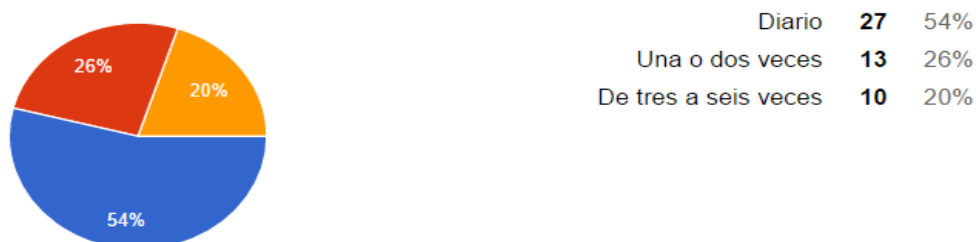
Note: Social networks are the preferred means of communication for young people, although more and more adults and seniors are also beginning to use them. shows that more than half of the participants, 54%, carry out an activity daily. 26% do it once or twice, and the remaining 20% between three and six times. This suggests that the activity is part of the daily routine for the majority of respondents.

These findings highlight the relevance of understanding the different usage patterns of both email and social media among students. While email is used more frequently on a weekly basis, social media is an essential part of the daily routine of most students. These habits have significant implications for communication and the way information is shared in educational settings.

It is essential that educators and institutions consider these usage patterns when designing communication strategies and promoting responsible use of social networks. Despite the prominence of social media, email remains a relevant communication channel that should not be overlooked in academia.

Furthermore, Figure 8 shows that 45% of students use the Internet primarily to perform academic tasks. In second place are social networks, being used by a significant percentage of students. Last but not least, there is the use of the Internet to watch videos and listen to music, occupying a less prominent place in students' online activities.

Figure 8. *Uses of the internet*
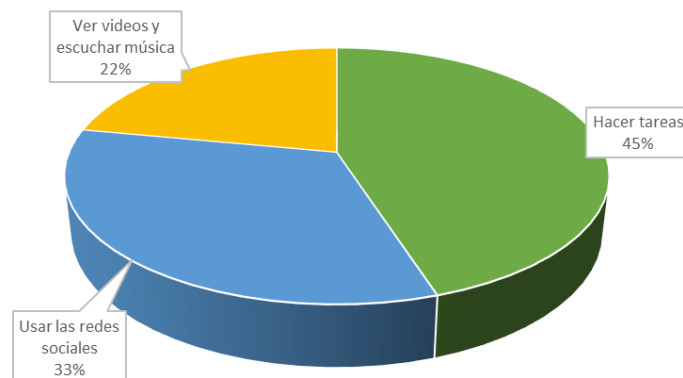
Note: The Internet not only allows you to browse, perform tasks and enjoy leisure activities, its use is increasingly broader, for advertising, marketing and financial transactions, among others. The graph shows how people distribute their time into three activities: the majority, 45%, is dedicated to doing tasks. The use of social networks occupies 33%, while watching videos and listening to music represents 22%. This indicates that, although there is a clear focus on academic or work responsibilities, significant time is also allocated to digital leisure.

Access to online courses and lectures has become a fundamental part of contemporary education. According to the data presented in Figure 3.9, 65.3% of students have had the opportunity to participate in an online course or conference at some point. This figure represents a significant shift in traditional learning methods, where physical classrooms and in-person lectures used to be the norm.

The expansion and increasing accessibility of online educational platforms have allowed students to explore a wide variety of topics and gain knowledge remotely. The ability to take courses and participate in conferences online has opened up new opportunities, as students can access high-quality educational content from any location and at any time. This is especially beneficial for those with busy schedules, as they can adapt their learning to their individual convenience and pace. Additionally, the diversity of online courses and lectures available spans multiple disciplines and areas of interest, allowing students to explore new topics, deepen their understanding, and broaden their academic perspectives.

Participation in online courses or conferences also encourages the development of digital skills and the capacity for autonomous learning. Students are challenged to use online platforms, interact with digital content, and participate in collaborative learning activities through virtual means. These skills are increasingly valued in the world of work and academia, offering students an additional advantage in their personal and professional growth.

Figure 9. *How many have taken online courses.*

| Si | **32** | 65.3% |
| No | **17** | 34.7% |

Note: Online learning is a modality that more and more people are joining to continue preparing, or to update themselves. The graph shows a clear majority of 65.3% who answered "Yes" compared to 34.7% who said "No", reflecting a predominant tendency or preference towards the affirmative option among the survey participants.

Figure 10 highlights that 72% of students consider that the current educational model needs to be transformed, evidencing the urgency of substantial changes in the educational system. These results reflect the generalized perception of students about the deficiencies or limitations they perceive in the current educational model.

The high proportion of students who advocate an educational transformation show a majority that the current model does not fully satisfy their expectations and needs. This opinion can be attributed to different factors, such as the lack of adaptation to technological advances, the rigidity of teaching methods or the disconnection between the curriculum and the demands of the world of work, among other aspects.

Given that students are fundamental elements in the educational process, their perspective is crucial to identifying areas for improvement and designing effective changes. Their opinions reflect their daily experience in the classroom and their vision for how education could be more relevant, motivating, and preparatory for their future.

It is important to emphasize that these results do not necessarily imply a total ineffectiveness of the current educational model. However, they do suggest that there is room for improvement and evolution. Education is a field in constant evolution and adaptation to the changing needs of society and the work environment. Therefore, it is essential to listen to students' voices and consider their perspectives when planning educational changes.

Figure 10 . Consideration of transformation of the educational model.

| Si | 36 | 72% |
| No | 14 | 28% |

Note: The Covid-19 pandemic demonstrated the effectiveness of hybrid educational models, which more and more Higher Education Institutions are adopting. presents the results of a survey where the majority, 72%, answered "Yes", which suggests a consensus or significant acceptance of the question asked. In contrast, only 28% have answered "No", indicating a minority. The marked difference between the two answers could imply a strong opinion or preference towards the affirmative option. This type of distribution could be indicative of a clear trend or strong support for the proposal or situation presented to the participants.

The revealing data of 90% of students who would be in favor of the integration of online applications in an educational model highlights the importance given to technology in the educational process. This high percentage shows students' recognition of the potential benefits that online applications can contribute to their professional preparation. Students understand that using these applications can simplify their access to educational

resources, encourage interaction, enable collaboration, and adapt to their different learning styles.

Students' willingness to adopt online applications as part of their professional training reflects their openness to technology. They understand that the integration of digital tools can improve their educational experience and prepare them more effectively for their future career.

Furthermore, this favorable attitude towards online applications may be motivated by the increasing demand for digital skills in the current labor market. Students are aware of the importance of becoming familiar with technological tools and online platforms to adapt to an increasingly digitalized work environment.

Embracing an educational model that incorporates online applications also indicates students' willingness to explore new ways of learning and adopt more flexible and personalized approaches. Technology offers them opportunities to learn at their own pace, access up-to-date information, and connect with experts and professionals in their fields of interest, as seen in Figure 11.

Figure 11 . *Need for the use of ICTs in the educational model.*

Si	**45**	90%
No	**5**	10%

Note: Globalization requires that teaching models be transformed by promoting the use of technologies. shows a majority of 90% who chose the "Yes" option, compared to a small 10% who chose "No". This indicates an almost unanimous consensus in favor of the affirmative option. Such disparity in responses may reflect a strong conviction or widespread agreement on the issue in question among respondents.

Figure 12 reveals the multiple tools identified by students that could be used in a new educational model. These include discussion forums, video conferences, virtual platforms, social networks, blogs, email and, lastly, YouTube. Additionally, some students also suggested incorporating wikis as part of these tools.
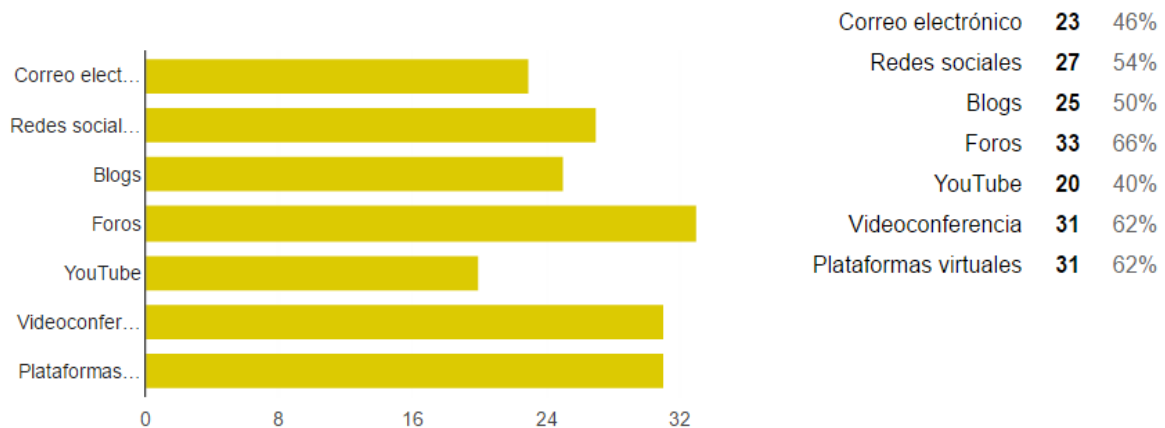
The variety of tools mentioned reflects students' recognition of the diversity of educational approaches that can be leveraged through technology. Discussion forums and videoconferences facilitate online interaction and collaboration, stimulating the exchange

of ideas and the collective construction of knowledge. For their part, virtual platforms offer access to online educational resources and simplify the delivery of educational content in an organized manner.

Social media and blogs provide opportunities for communication and individual expression, as well as social learning. Email remains a widely used communication tool for interaction between students and teachers. Finally, YouTube represents a vast repository of audiovisual content that can complement and enrich the learning process.

The proposal to incorporate wikis as an educational tool demonstrates the willingness of students to actively participate in the creation and sharing of knowledge. Wikis enable collaboration and joint editing of content, promoting collaborative learning and the development of research and writing skills.

Figure 12 . *Web tools to use.*

Correo electrónico	23	46%
Redes sociales	27	54%
Blogs	25	50%
Foros	33	66%
YouTube	20	40%
Videoconferencia	31	62%
Plataformas virtuales	31	62%

Note: The Internet makes it possible for didactic learning plans to be multiple and varied for the benefit of learning, shows the use of different digital tools. Forums are the most used with 66%, followed closely by videoconferences and virtual platforms with 62%. Social networks and blogs also have a significant presence with 54% and 50% respectively. The use of YouTube is the least frequent at 40%, and email is at 46%. This suggests a preference for online communication and collaboration tools.

For many young people, traditional blackboard classes have lost relevance; They perceive them as boring and uninteresting, with some even falling asleep in class. Therefore, developing an innovative b- learning education model , taking advantage of the tools available on the Internet, could make the learning process more attractive for students. This would not only involve them in the use of electronic media, but would provide them with comprehensive training, increasing their competitiveness in the labor market upon graduation (Porter, 1993).

From the survey applied to the 17 teachers of the Accounting degree at the UAEM Valle de Teotihuacán University Center, it is important to note that all teachers express a

willingness to use virtual platforms. It is relevant to mention that some of these teachers are over 50 years old and may have difficulties with the use of the Internet and information technologies in general. Despite this, they show a willingness to modify their traditional teaching methods, requesting prior training in the use of these tools.

Based on this data analysis, the viability of changing the current educational model for one of b- learning has been demonstrated , taking advantage of the resources available on the Internet. As a result, the virtual platform called "Bachelor in Accounting UAEM Valle de Teotihuacán" was created, which was implemented by Professor Sendy Janet Sandoval Trujillo in teaching the learning units of "Contributions of Moral Persons" and "Social Security and Special Taxes", carrying out the corresponding evaluation about the students' perception of the use of said platform.

Regarding academic activities, the descriptive statistical analysis carried out through SPSS determined that 100% of the students agree that the activities programmed by the teacher through the platform (such as forums, assignments, questionnaires, wikis) , among others) contribute to the learning process and are aligned with the contents and objectives of the learning units. Likewise, it is considered that the time given to carry out these activities is sufficient, as detailed in table 9. The average values in each of the dimensions of the variable range between 1.2 and 1.8, which demonstrates a positive disposition to work with this type of platforms.

Table 9. *Descriptive statistics of academic activities variable.*

	N	Minimum	Maximum	Half	Typical deviation
Gender	55	1	2	1.36	.485
Activities -contribute to learning	55	1	3	1.27	.525
Forums - are related to UA content and objectives	55	1	2	1.31	.466
Tasks - correspond to UA content and objectives	55	1	2	1.27	.449
Wikis - promote collaborative work	55	1	3	1.84	.536
Time to carry out activities is enough	55	1	4	1.64	.729
Valid number (according to list)	55				

Note: Teachers have the obligation to adequately plan activities that promote their students' learning, in addition to being attractive to them.

The results of the research agree with the contributions made by Silva, Fernández and Astudillo (2015). It is established that the b- learning approach in Higher Secondary Education not only provides innovative educational methods supported by pedagogical principles and accessible to certain student groups, but also promotes the development of skills such as critical thinking, creativity and competence in the technology management. These findings are aligned with the current educational demands discussed by Belloch (2013) and Morita, García and Escudero (2020).

The findings of this study carried out at the UAEM Valle de Teotihuacán University Center highlighted the fundamental importance of integrating new technologies in an educational model that combines face-to-face and virtual methods to introduce innovative strategies in the teaching process. During this analysis, it became evident that the adoption of these technological tools, within the framework of an educational approach that amalgamates the face-to-face and the virtual, effectively facilitated the introduction of new perspectives and learning tactics (Mezzadra and Bilbao, 2010). .

This fusion of technological resources with traditional methods in a blended education context not only facilitated the inclusion of more dynamic teaching methods, but also promoted an environment in which students were motivated to actively participate and cultivate critical skills in response. to the constantly changing and technologically driven environment in which they operate.

In accordance with the ideas presented by Benavides (2022), it is highlighted that b- learning is distinguished by its flexibility, adaptability and interactivity, consolidating itself as the main teaching and learning option supported by technologies in the current context. There is a general consensus on the crucial importance of hybrid teaching to improve educational processes, although different positions arise in relation to the elements necessary for its optimization in the pedagogical field, such as teacher training, access to adequate technological resources and connectivity, among other aspects. The trends associated with this approach indicate the emergence of innovative strategies that are integrated with new technologies, such as Gamification, Flipped Classrooms and Mobile- learning .

The implementation of a specific virtual platform at the UAEM Valle de Teotihuacán University Center will allow students to access the content of the subjects in a convenient way, giving them access to programs, objectives, educational materials, tasks, evaluations and other resources that promote autonomy in the construction of knowledge. These aspects coincide with what was raised by Ruiz (2021), who emphasizes the importance of having clarity in the use of technological platforms for educational

purposes, as well as the relevance of the individuals involved acquiring the necessary skills to achieve the desired knowledge.

Conclusions

learning educational model in the Accounting degree at the UAEM Valle de Teotihuacán University Center reflects the clear preference of current students for learning methods that are supported by information and communication technologies. This inclination shows the need for online tools that not only provide them with motivation, but also adapt to their individual learning styles, thus boosting their commitment to academic training.

In today's knowledge society, greater participation and commitment of students in their educational process is demanded, making full use of available technologies. Therefore, the transformation of the current educational model becomes essential, prioritizing the use of these technological tools. In this context, b- learning is presented as a highly relevant and effective option.

The UAEM Valle de Teotihuacán University Center has the appropriate conditions in terms of infrastructure, teacher training and student willingness to carry out the transformation of the educational model of the degree in Accounting through a b-learning approach . The creation of a specific virtual platform will allow students to access information on the learning units according to their convenience, where they will be able to find programs, objectives, teaching materials, tasks, grades and other resources that promote the generation of knowledge in an efficient way. autonomous.

The results obtained in this research showed that the students of the degree in Accounting have solid skills in the management of information and communication technologies. In addition, they showed a genuine willingness and interest in working with the educational model designed for face-to-face education, recognizing the benefits that the technologies available on the Internet provide in the teaching-learning process.

For their part, teachers expressed their willingness to adapt their teaching strategies in order to make their classes more dynamic and attractive for young people. Likewise, they are open to using the virtual platform designed, as long as they receive the necessary training to integrate these tools effectively into their study plans and teaching activities.

Future lines of research

learning educational model in the face-to-face teaching of the degree in Accounting at the UAEM Valle de Teotihuacán University Center. Likewise, it would be essential to determine what new tools could be integrated into this model in order to further enrich the educational process.

Explore and evaluate the long-term impact of the b- learning educational model on academic performance, student retention, acquired skills and job placement of graduates in the field of Accounting (Cabero, 2009).

Extend the implementation of the b- learning model to other disciplines within the same institution to analyze its effectiveness in different educational contexts and its potential impact on student learning.

Investigate and evaluate the effectiveness and acceptance of new educational tools and emerging technologies in the context of the b- learning model , considering their influence on motivation, student-teacher interaction and active learning.

Develop more effective and personalized training strategies for teachers, focused on the optimal pedagogical use of virtual technologies and platforms in b- learning environments , considering their needs and levels of previous experience.

Conduct qualitative studies that delve into students' experience with the b- learning model , exploring their perception, motivation, perceived challenges and identified benefits in comparison with other educational models.

Investigate the socioeconomic and labor impact of graduates who have experienced the b- learning educational model in terms of employability, adaptation to digital work environments and their contribution to innovation in the accounting field.

These lines of research could expand knowledge about the b- learning model , providing new perspectives and contributing to the continuous development of innovative educational strategies in the training of accounting professionals.

A subsequent line of research would be to evaluate the application of the educational model in b- learning in the teaching process of the degree in Accounting at the UAEM Valle de Teotihuacán University Center in the face-to-face-mixed system, as well as to determine what new tools can be incorporate into said model.

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