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Scientific articles

Estudio comparativo de modelos pedagógicos de aprendizajes híbrido y presencial en la educación superior

Comparative study of pedagogical models of hybrid and face – to – face learning in higher education

Estudo comparativo de modelos pedagógicos de aprendizagem híbrida e presencial no ensino superior

Jessica Garizurieta Bernabe
Universidad Veracruzana, México
jgarizurieta@uv.mx
https://orcid.org/0000-0002-1443-4737

Luis Alejandro Gazca Herrera
Universidad Veracruzana, México
lgazca@uv.mx
https://orcid.org/0000-0001-7637-2909

Resumen

Los modelos pedagógicos son la pieza clave para responder a las dificultades que los estudiantes enfrentan durante su proceso de enseñanza-aprendizaje, asimismo, su estudio contribuye al mejoramiento de las prácticas pedagógicas. Esta investigación comparativa aborda la problemática de identificar el modelo educativo más efectivo entre el híbrido y el presencial en la enseñanza superior, focalizada en una experiencia educativa. Su objetivo es evaluar y comparar ambos escenarios pedagógicos para mejorar prácticas educativas. Se adoptó un enfoque cuantitativo, de tipo descriptivo y transversal, utilizando un instrumento diseñado específicamente para medir variables relacionadas con la conducción, seguimiento y evaluación del proceso de aprendizaje. Los resultados revelan un mejor aprovechamiento en el grupo experimental (híbrido), con una aprobación del 100% y calificación promedio superior al grupo de control (presencial). Las conclusiones muestran la mayor efectividad del modelo híbrido en el contexto evaluado, resaltando su contribución a la adaptación

tecnológica en la educación y su potencial para optimizar el aprendizaje. Este estudio aporta a la originalidad al comparar directamente estos modelos en un contexto universitario real, proporcionando evidencia valiosa para la toma de decisiones pedagógicas.

Palabras clave: Gestión del aprendizaje, prácticas pedagógicas, entornos de aprendizaje

Abstract

Pedagogical models are crucial in addressing the difficulties students encounter during their teaching-learning process. Furthermore, studying these models contributes to the improvement of pedagogical practices. This comparative research tackles the challenge of identifying the most effective educational model—hybrid or face-to-face—within the context of higher education. The study aims to evaluate and compare these pedagogical approaches to enhance educational practices. A quantitative, descriptive, and cross-sectional approach was employed, using an instrument specifically designed to measure variables related to the conduct, monitoring, and evaluation of the learning process. The results indicate better outcomes in the experimental group (hybrid), with a 100% pass rate and a higher average grade compared to the control group (face-to-face). The conclusions demonstrate the superior effectiveness of the hybrid model in the evaluated context, emphasizing its contribution to technological adaptation in education and its potential to optimize learning. This study is original in that it directly compares these models in a real university setting, providing valuable evidence for pedagogical decision-making.

Keywords: Learning management, pedagogical practices, learning environments.

Resumo

Os modelos pedagógicos são a chave para responder às dificuldades que os alunos enfrentam durante o seu processo de ensino-aprendizagem; da mesma forma, o seu estudo contribui para a melhoria das práticas pedagógicas; Esta pesquisa comparativa aborda o problema de identificar o modelo educacional mais eficaz entre o híbrido e o presencial no ensino superior, focado em uma experiência educacional. Seu objetivo é avaliar e comparar ambos os cenários pedagógicos para melhorar as práticas educativas. Adotou-se uma abordagem quantitativa, descritiva e transversal, utilizando um instrumento especificamente concebido para medir variáveis relacionadas à condução, monitoramento e avaliação do processo de aprendizagem. Os resultados revelam melhor aproveitamento no grupo experimental (híbrido), com 100%

de aprovação e nota média superior ao grupo controle (presencial). As conclusões mostram a maior eficácia do modelo híbrido no contexto avaliado, destacando a sua contribuição para a adaptação tecnológica na educação e o seu potencial para otimizar a aprendizagem. Este estudo contribui para a originalidade ao comparar diretamente estes modelos num contexto universitário real, fornecendo evidências valiosas para a tomada de decisões pedagógicas.

Palavras-chave: Gestão da aprendizagem, práticas pedagógicas, ambientes de aprendizagem.

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Introduction

In recent years, the rapid advancement of technologies has brought about transformations in various sectors of society. In the educational sphere, it is evident how technological developments have influenced teaching and learning models, enabling educational processes to adapt to social needs (Vargas-Murillo, 2021). This adaptation was particularly evident during the COVID-19 pandemic when educational institutions had to leverage information and communication technologies (ICT) to transition from traditional in-person education to distance learning models (Mamani-Cori et al., 2021).

Consequently, teachers had to quickly train themselves to use educational platforms and create teaching materials that could be shared virtually instead of in person (Aguilar Gordón, 2020; Escalona Ríos, 2023; Viñas, 2021). This situation brought increased relevance to the hybrid education model, which, although not a new concept, gained significant importance during the pandemic (Suárez-Guerrero & García Ruvalcaba, 2022; Viñas, 2021).

Specifically at the Universidad Veracruzana (UV), the pandemic implied not only changes in the conception of students and teachers, in relation to the design and distribution of teaching, but also an adaptation of the institutional infrastructure, in order to be able to incorporate ICT in actions that allow students to be supported. To this end, “it implemented the hybrid classrooms project, in which conventional classrooms were equipped with hardware and software devices for online communication in real time” (Universidad Veracruzana [UV], 2024, para. 2) . To date, the UV has 430 hybrid classrooms (Universidad Veracruzana [UV], 2023a) , and through it has sought to promote new ways of developing learning activities, whether in person, virtual or hybrid (UV, 2024) .

Of all the hybrid classrooms at the University, 169 are located in Xalapa and of these, 11 are in the Faculty of Accounting and Administration, positioning it as the faculty with the largest

number of hybrid classrooms in the region (UV, 2023a) ; which represents an area of opportunity for the generation of innovative educational strategies. From this perspective, and with the purpose of determining the most effective way to use these resources to promote student learning, it is considered pertinent to compare the experiences in the teaching and learning process and the results achieved, between the hybrid modality and in person.

This last point is significant given that learning scenarios vary in relation to the nature of the learning content and the discipline, as well as the characteristics of the students, the size of the group and the time and resources available (Girela *et al.*, 2021) . Therefore, it is expected that with the results, the teacher will be able to carry out adequate learning management; That is, it can create effective teaching scenarios, optimizing the available resources, in order to facilitate the acquisition of knowledge and skills by students (Crespo Andrade and Weise, 2021) .

Conceptual framework

Effective learning management involves the development of planning strategies, work methods, assessment processes, and skill-building activities that genuinely facilitate learning (Crespo Andrade & Weise, 2021; Girela et al., 2021; Vargas-Murillo, 2021). To achieve this, the educational approach under which the teaching-learning process will be developed must be defined, since, in relation to the educational modality, “the learning objectives are specified and appropriate teaching strategies are selected” (Rivadeneira-Pacheco *et al.*, 2024, p . In general, and considering the environment, methods and ways to transmit knowledge, three educational models are recognized: face-to-face or traditional, distance and mixed or hybrid (Aguilar Gordón, 2020; Escalona Ríos, 2023; Palacios-Díaz, 2022; Rama, 2021; Vargas-Murillo, 2021 ;

For years, the traditional modality, also known as face-to-face education, has dominated educational systems. In this environment, students not only acquire knowledge but also develop socialization, communication, and conflict management skills through interaction with people who have different perspectives, beliefs, and customs (Aguilar Gordón, 2020). Therefore, its development is considered integral. This model is characterized by the development of the educational process in a shared space with clearly defined roles (Aguilar Gordón, 2020; Escalona Ríos, 2023). For this model to be effective, it is essential that the teacher, who plans the educational strategies to be implemented, and the students, who

engage in the learning process by analyzing and transforming information into knowledge, both actively participate (Escalona Ríos, 2023).

Initially, the pedagogical approach of the traditional model placed the teacher as the main transmitter of knowledge, thereby promoting passive learning and memorization (Rama, 2021; Rivadeneira-Pacheco *et al.,* 2024) . Over time this dynamic has changed, giving rise to active learning in the classroom, through activities such as: group discussions, debates, problem solving and practical activities (Rivadeneira-Pacheco *et al.,* 2024) , which They encourage student participation in their learning process. Subsequently, changes in the demands and needs of students, together with technological advances, led to a transformation in the face-to-face model, moving from a teaching-learning process focused on the theory taught by the teacher, to one with greater emphasis on the use of teaching resources (Rama, 2021) .

Likewise, educational dynamics were also influenced by the ability that technology offers to create different educational environments and media, giving rise to distance educational modalities “as an educational disruption compared to traditional education” (Rama, 2021, p. 28) and “a way to reach populations that do not have access to conventional education” (Palacios-Díaz, 2022, p. 10) . In this model, the role of the students goes from being a simple recipient of information to a generator of it, and that of the teacher goes from a generator to a guide (Aguilar Gordón, 2020) . Thus, meaningful learning oriented towards the practical application of knowledge and a deeper understanding of concepts is encouraged (Rivadeneira-Pacheco *et al.,* 2024) .

Authors such as Escalona Ríos (2023), Núñez and Obesso (2021), Palacios-Díaz (2022) and Rama (2021), identify two approaches within the distance model: online and virtual. It is considered that, in the online or e-learning model, the interaction between the teacher and the students is bidirectional and through an environment mediated by ICT (Escalona Ríos, 2023; Núñez & Obesso, 2021; Rama, 2021) known as Learning Management Systems (LMS) or Learning Platforms (PL) (Rama, 2021; Vargas-Murillo, 2021) . In this environment, the teaching-learning process is autonomous, encouraging students to assume responsibility for their own learning process through the exploration of didactic resources and individual understanding of concepts (Rivadeneira-Pacheco *et al.* , 2024). . While, in the virtual model, the intensive use of technological components together with reality interpretation systems, makes possible the interaction of students in a three-dimensional environment (Palacios-Díaz, 2022) , and consequently, an educational experience similar to the in-person one. In

this type of environment, the aim is to optimize class time under an inverted learning approach in which, prior to class discussion and practical activities, students reviewed the teaching material and investigated the topic (Rama, 2021 *;*

The above gave rise to the transversal integration of digital technology, and with it, the configuration of the hybrid or mixed model which, through various personalized formats, combines the best of traditional methods and digital environments (Escalona Ríos, Suárez-Guerrero and García Ruvalcaba, 2022 ; As in the virtual model, in this model students are immersed in interactive teaching environments and actively construct their own learning, with the difference that the hybrid model makes their participation possible both in real time (synchronous) and deferred (asynchronous), using virtual connection tools or within virtual spaces such as: forums, videos, among others.

To promote meaningful learning in the hybrid modality, there is no single application format, since it depends on the characteristics of the educational offer of each institution and its physical and technological capacity (Universidad Veracruzana, 2022; Viñas, 2021) . In general, five types of scenarios are recognized for the hybrid modality: in-person facilitator and in-person and/or remote students, in-person facilitator and virtual students, virtual facilitator and in-person students, virtual facilitator and two or more groups in different classrooms, two facilitators in different classrooms, in-person group and monitor (Universidad Veracruzana, 2022) . Whatever the format chosen, it is essential to plan face-to-face and virtual teaching strategies based on the content (Escalona Ríos, 2023) ; Therefore, it is necessary to generate an instructional design that integrates “Information and Communication Technologies (ICT), Technologies for Learning and Knowledge (TAC) and Collaborative Online Technologies or Technologies for Collaborative Learning (TOC)” (University Veracruzana, 2022) .

In this model, the use of a hybrid classroom is the main learning mediation strategy, to be able to adapt interactions to the themes of the educational programs and guarantee greater use of all resources (Escalona Ríos, 2023; Universidad Veracruzana, 2022). . In this sense, it is possible to find hybrid models where a face-to-face class is offered, and then the learning is done online, or on the contrary, the initial learning is online and this is later complemented in the classroom, and in some other formats. , learning is generated simultaneously in person and remotely (Viñas, 2021) .

Reference frame

Within the aforementioned context, it is possible to observe that educational practices have experienced significant changes in relation to technological development, since the basis of the face-to-face model are traditional teaching resources, such as: books, blackboards, posters, maps, graphs, among others (Rama, 2021) , while, in the hybrid and distance model, the basis is the use of technological teaching resources (Palacios-Díaz, 2022; Rama, 2021; Viñas, 2021) , making it possible to obtain them outside the educational field (Aguilar Gordón, 2020) . However, whatever the modality chosen, it must be clear that the triangle of educational quality, student coverage, and equipment and production costs changes from one modality to another (Rama, 2021) , so support is essential. of a physical and technological infrastructure, which is provided by the educational Institution (Escalona Ríos, 2023) .

Over eighty years, the Universidad Veracruzana has positioned itself as the main house of higher education in the State of Veracruz, generator of knowledge, promoter of culture and committed to the development of the country through a sustainable vision. Its coverage and area of influence is based on five regions that cover 27 municipalities throughout the entire state territory, where it offers 357 educational programs at the Higher Technical, Bachelor's and Graduate levels in various modalities (Secretary of Institutional Development, 2023). .

Although the University incorporated the mixed modality (in-person-online) in 2015, it was not until the pandemic that it was forced to create spaces that allowed learning beyond the classroom, through the use of ICT and digital environments (Veracruzana University, 2022) . To this end, the UV carried out the hybrid classrooms project, which had the objective of equipping the largest number of classrooms with the technological resources necessary to achieve online communication in real time (Universidad Veracruzana, 2023b) .

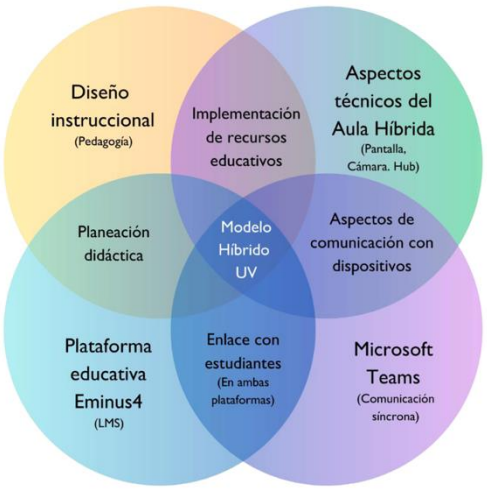
As a result of the above, to date around 125 million pesos have been invested in equipping traditional classrooms in the five university regions, making it possible to have a total of 430 hybrid classrooms, of which 169 are in the Xalapa region, 95 in the Veracruz region, 60 in the Orizaba-Córdoba region, 61 in the Poza Rica-Tuxpan region and 45 in the Coatzacoalcos-Minatitlán region (Universidad Veracruzana, 2023a) .

After the pandemic, the University reconsidered the use of hybrid classrooms as a technological tool designed to promote the creation of diverse learning environments, whether through in-person or remote sessions, workshops, laboratories, and online courses, mixed or flipped classes (Veracruzana University, 2022, 2023b) . This allowed around 3,241 activities related to various learning environments to be registered in hybrid classrooms by

2023, such as: webinars, tutorials, mirror classes, monitoring of reception work, training and various academic events (Aguilar Sánchez, 2023) .

Regarding the teaching of classes in hybrid mode, as already said, each educational institution establishes its own operational approach to the hybrid model and the way in which learning should be managed, in relation to the technological and pedagogical tools with which account. In Figure 1, it is possible to see the hybrid model implemented by the UV, for learning management it combines technical aspects, such as: screen, camera and Hub, with pedagogical aspects related to instructional design, didactic planning and the use of communication devices such as Microsoft Teams for scheduling synchronous sessions and the institutional platform Eminus 4.0 for planning educational experiences, asynchronous activities and generating automated evaluations (Universidad Veracruzana, 2023b) .

Figure 1. UV hybrid approach



Source: Universidad Veracruzana (2023b, p. 3)

Likewise, given the regulations, the scenarios in which classes can be carried out are: in-person facilitator and in-person and/or remote students, in-person facilitator and virtual students, although the scenario of two facilitators in different classrooms, in-person group and monitor, since the Institution promotes the use of hybrid classrooms for mirror classes with other Universities.

Materials and method

The research was conducted using a descriptive and cross-sectional quantitative approach. Considering the phenomenological aspect of the study, the aim was to identify the meanings of the experience from the students' perception of the variables involved in having classes under different pedagogical models.

The analysis involved a comparative study to understand the complexity of the relationships between variables in an experimental group (classes with a hybrid approach) and a control group (classes with traditional face-to-face approaches). Different pedagogical models were applied to assess students' perceptions of their learning process.

The educational experience (subject or subject), activities and evaluation process were applied in a similar way to avoid bias in the research, in the same way the academic staff who taught the educational experience was the same for both groups. By applying this method, the effectiveness of the intervention was evaluated by measuring with greater precision the results of the students' learning process.

Instrument design

In the field of educational research, the design of the instruments plays a fundamental role in the reliability of the results obtained. That is why for this research, an operationalization process was carried out in the identification of the object of study and the creation of the dimensions, indicators and items, with scales that were aligned with the objective of the research. Linguistic adequacy was ensured to avoid bias and ensure that the instrument was understandable to students, directly addressing the topic of study and protecting the privacy of the data collected.

In the design, categorical variables such as age, sex, type of enrollment and implemented pedagogical model were considered, which were useful for the inferential analyses. In the same sense, the instrument was made up of three dimensions, the first called process conduction, which measured the use of the technological resources used by the teacher in teaching his class; the second dimension called process monitoring with two indicators that measured the assessment of the teaching process and communication and; The third dimension called process evaluation measured the final satisfaction of the course. A dichotomous item of perception of the implemented pedagogical model was considered, which was used for a hypothesis test. Table 1 shows the design of the instrument.

Table 1. Operationalization for instrument design

Dimension	Indicators	Items
Conducting the learning process	Use of technological resources	During the course he used computer equipment.
		During the course he used a video projector.
		During the course he made use of network connectivity.
		During the course he used the EMINUS institutional platform.
		During the course he used the communication tool Teams
Monitoring of the learning process	Process assessment	During the course, analysis, discussion and/or debate on the contents of the Educational Experience was promoted.
		During the course he reviewed the activities and evaluations in the agreed time, making observations on them.
		During the course, a technological tool was used to review and provide feedback on the activities.
		During the course, the feedback provided was related to the activities delivered and the contents of the Educational Experience.
		During the course, the contents were linked to real practice.
	Communication	During the course, the development of an environment of respect and trust was encouraged.
		During the course, achievements and activities well carried out were highlighted.
		During the course, technological communication tools were used to answer your questions.
		During the course, the communication channels allowed efficient attention.
Evaluation of the learning process	Overall satisfaction	Course activities promoted meaningful learning.
		The technological tools used contributed to your learning.

Source: Own elaboration

Validity and reliability of the instrument

To determine the correct design of the instrument, the Cronbach's Alpha technique was applied, which is a coefficient used to measure the reliability and internal consistency of a research instrument. According to Statologos (2023) this method is essential because it indicates how well a set of items measures a single construct or concept. A high alpha suggests that the items are correlated with each other, which is desirable in an instrument. However, a very high alpha could indicate redundancy between items. On the other hand, a low alpha may suggest that the items are not well correlated or that the instrument measures multiple constructs. In general, an alpha greater than 0.7 is considered acceptable, although some authors recommend values higher than 0.90 to 0.95.

The instrument was applied to a pilot test of 30 students, the result of Cronbach's Alpha was 0.903 as shown in Table 2, which indicates high internal consistency in the research instrument. This means that the items are highly correlated with each other and therefore effectively measure the same construct (Salazar-Estrada and Mora-Valentín 2019).

Table 2. Summary of case processing.

		N	%
Cases	Valid	30	100.0
	Excludeda	0	.0
	Total	30	100.0

Cronbach's alpha	number of elements
.903	16

Source: Own elaboration

Definition of study subjects

The subjects of study in research are the people, groups, phenomena or any other entity that are the object of observation, analysis or experimentation in a scientific study. These subjects are selected according to the objectives and nature of the research, and may include individuals, communities, and samples of materials, among others (American Psychological Association 2020).

In the case of this research, the study subjects were the students of the Universidad Veracruzana of the Faculty of Accounting and Administration of the Bachelor's Degree in Administration, generation 2021, who took the educational experience of compensation

administration. One group was considered experimental, exposed to the condition in which the class was taught under a hybrid pedagogical approach, the second control group used for comparative purposes took the class under the traditional face-to-face class approach. The total number of students (census) of each group were considered; table 3 shows the frequency distribution.

Table 3. Study subjects in the research

pedagogical model	Section	Group type	F	%
In person	1	control	34	56
Hybrid	2	Experimental	27	44
Total			61	100

Source: Own elaboration

Results

The descriptive results of the research provided a detailed view of the phenomenon. The observational and quantitative nature of the study proved useful in exploring the causes and related effects of the variables.

As shown in Table 4, regarding the categorical results in terms of age, the most frequent responses were in the 20-21 years old range, with 80%; 64% of the participants were women and 36% were men. Significant data related to accreditation shows that the group that took classes with the hybrid approach had a 100% pass rate, with a general grade average of 8.1. In contrast, the face-to-face class group had an 85% pass rate with a general average of 7.56, indicating that those who participated in the hybrid approach achieved better results.

Table 4. Results of the categorical variables.

Age	F	%	Sex	F	%	Cluster	They approved	%
18-19	2	3	Male	22	36	control	29	85
20 – 21	49	80				Experimental	27	100
22 – 23	8	13	Female	39	64	Cluster	Average Final Grade	
More than 23	2	3				control	7.56	
Total	61	100	Total	61	100	Experimental	8.10	

Source: Own elaboration

Continuing with the descriptive study, measures of central tendency were used with the analysis of means and standard deviations. Table 5 shows the results of the comparison of the experimental and control groups. Regarding the dimension of conduction of the learning

process, in the results of the averages it can be seen that the perception of the students of the experimental group (hybrid approach) was of a higher assessment of the use of technology (equipment, connectivity and systems).) with respect to the control group. These results imply the alignment of technological resources with respect to the pedagogical model of the hybrid approach, which means that correct use of the model was carried out.

Regarding the dimension of monitoring the learning process, the results of the experimental and control groups do not present significant differences, however, we can highlight two areas in which the control group had a more favorable perception, one of them was that the review of the activities or evaluations were carried out within the established times, carrying out the pertinent observations; In the same sense, better results were obtained in terms of developing an environment of respect and trust during the course. With these results, it is observed that the coincidence of space and time in face-to-face educational environments generates greater confidence with respect to courses that make greater use of technological tools.

Regarding the evaluation dimension of the learning process, the highest was achieved by the experimental group, determining that the course activities and the use of technological tools contributed to their learning. Finally, 93% of the students in the experimental group expressed that the pedagogical model to deliver the educational experience was appropriate for their learning process; in the case of the control group the result was 88%, so there is a greater satisfaction of the experimental group.

Table 5. Means and standard deviations

Item	Experimental group		Control group	
	Average	Standard Deviation	Average	Standard Deviation
1. During the course he used computer equipment.	3.85	0.46	3.32	0.98
2. During the course he used a video projector.	3.93	0.27	3.56	0.66
3. During the course he made use of network connectivity.	3.96	0.19	3.53	0.83
4. During the course he used the EMINUS institutional platform.	3.96	0.20	3.85	0.50
5. During the course he used the Teams communication tool.	3.74	0.71	2.18	1.29
6. During the course, analysis, discussion and/or debate on the contents of the Educational Experience was promoted.	3.33	0.78	2.94	1.01
7. During the course he reviewed the activities and evaluations in the agreed time, making observations on them.	3.33	0.73	3.47	0.83
8. During the course, a technological tool was used to review and provide feedback on the activities.	3.81	0.48	3.56	0.70
9. During the course, the feedback provided was related to the activities delivered and the contents of the Educational Experience.	3.33	0.73	3.44	0.82
10. During the course, the contents were linked to real practice.	3.70	0.72	3.44	0.79
11. During the course, the development of an environment of respect and trust was encouraged.	3.19	0.96	3.42	0.83
12. During the course, achievements and activities well carried out were highlighted.	3.19	0.92	3.18	1.03
13. During the course, technological communication tools were used to answer your questions.	3.26	0.94	3.29	0.87
14. During the course, the communication channels allowed efficient attention.	3.19	0.96	3.24	0.96
15. Course activities promoted meaningful learning.	3.48	0.70	3.44	0.82
16. The technological tools used contributed to your learning.	3.56	0.64	3.41	0.82
Hypothesis testing question.	Yeah	No	Yeah	No
17. You consider that the pedagogical model to deliver the educational	93%	7%	88%	12%

experience was appropriate for your learning process.				

Source: Own elaboration.

In general, the teaching-learning process shows better results in the experimental group, it is important to highlight that the fact that it is a relatively smaller group than the control group is due to the student's enrollment decision, therefore that, given what the teaching-learning process of the hybrid model implies compared to the traditional model, those students who were in the experimental group have an inclination towards self-management of their learning, which, in turn, is related to the fact that, in the control group, approval is lower.

Correlation between dimensions

The correlation between dimensions in this research is a technique that allowed us to understand how the variables that made up each dimension were related. To carry out the analysis, the IBM SPSS Statistics software was used, grouping the variables of each dimension to generate a single one. Since the assumptions of normality or linearity of the data were not met, they were analyzed with the use of non-parametric statistics through tables crossed with Kendall's Tau_b method. The results for the experimental group are shown in table 6 and for the control group in table 7.

Table 6. Correlation between dimensions of the Experimental group

Dimensions			Driving	Follow-up	Assessment
Kendall's tau_b	Driving	Correlation coefficient	1,000	.046	-.024
		Sig. (bilateral)	.	.783	.895
		N	26	26	26
	Follow-up	Correlation coefficient	.046	1,000	.710 **
		Sig. (bilateral)	.783	.	,000
		N	26	27	27
	Assessment	Correlation coefficient	-.024	.710 **	1,000
		Sig. (bilateral)	.895	,000	.
		N	26	27	27
**. The correlation is significant at the 0.01 level (two-sided).					

Source: Own elaboration.

As can be seen in Table 6, given the result of the relationship of the driving dimension with respect to the monitoring and evaluation dimensions, it is null, this is based on the fact that the following (bilateral) > 0.05 therefore, the technological elements of the driving dimension have no relationship with the monitoring and evaluation of the course; however, the result of the relationship between the monitoring dimension and the evaluation dimension does have a significant relationship given that the sig. (bilateral) < 0.05, the correlation coefficient being .710, which is called high. With all of the above, the result for the experimental group indicates that for students it is important that the teacher correctly monitors the course in terms of promotion, analysis, discussion and/or debate on the contents of the educational experience, in the In the same sense, it is essential to review the activities in a timely manner since it frames the relationship between one dimension and another.

Table 7. Correlation between dimensions of the Control group.

Dimension			Driving	Follow-up	Assessment
Kendall's tau_b	Driving	Correlation coefficient	1,000	.498 **	.382 **
		Sig. (bilateral)	.	,000	.008
		N	34	33	34
	Follow-up	Correlation coefficient	.498 **	1,000	.704 **
		Sig. (bilateral)	,000	.	,000
		N	33	33	33
	Assessment	Correlation coefficient	.382 **	.704 **	1,000
		Sig. (bilateral)	.008	,000	.
		N	34	33	34
**. The correlation is significant at the 0.01 level (two-sided).					

Source: Own elaboration

The results of the correlations in the control group indicate that there are relationships between the dimensions of driving, monitoring and evaluation, this is based on the result of the sig. (bilateral) which is less than 0.05. Regarding the correlation coefficient, the driving dimension with respect to monitoring is .498, which is considered moderate; on the other hand, the driving dimension with respect to evaluation gives a result of .382, which is low. Regarding the result of the monitoring dimension with respect to the evaluation, it shows a value of .704 which is considered high. In accordance with the above, it can be seen that in the control group the relationship exists between the dimensions of driving with monitoring and that of monitoring with that of evaluation, therefore, unlike the experimental group, there is a greater relationship between the dimensions, Consequently, there is greater dependence on the way in which the teacher teaches his classes in the face-to-face option.

Hypothesis testing

As described in the descriptive results section, 100% of the students in the experimental group passed and the general average was 8.1 and a passing average of 1.07. In the case of the control group, 85% passed with a general average of 7.56 and an approval average of 1.12. It is important to comment that, based on the coding of the results of the hypothesis question, the closer the mean is to the value 1, the greater the acceptance of the pedagogical model . For the hypothesis test, a significance level of 95% was considered, the following hypotheses are stated:

H0=8.1

Satisfaction with the pedagogical model that benefited the learning process of the experimental group is at least 90% of the students.

H1=8.1

The greatest satisfaction with the pedagogical model that benefited the learning process of the experimental group is less than 90% of the students.

Table 8. Hypothesis test T for one sample.

Statistics for a sample						
	N	Average	Dev. Deviation	Dev. Average error		
VAR00003	27	1.07	.267	.051		
Test for a sample	Test value = 1.07					
	t	gl	Sig. (bilateral)	Mean difference	95% confidence interval of the difference	
					Lower	Superior
VAR00003	.079	26	.937	.004	-.10	.11

Source: Own elaboration

As can be seen in table 8 the value of sig. (bilateral) > 0.05, so hypothesis H0 is not rejected and it is proven that at least 9 out of 10 students are satisfied with the pedagogical model of the hybrid approach.

Discussion

The success of the hybrid model is not merely about "injecting more technology," but rather about an ambitious process capable of integrating technological, cognitive, relational, and pedagogical elements (Montañez López, 2022). Therefore, its construction must begin with defining dimensions such as class size, media, interaction possibilities, digital teacher training, and the teaching and learning process, including conducting, monitoring, and evaluating activities (Hodges et al., 2020; Núñez & Obesso, 2021).

Among these dimensions, the hybrid model implemented by UV shows greater strength in communication and interaction possibilities, thanks to the resources provided by the institution and its hybrid classrooms. This setup guarantees direct interaction between students and teachers, making it almost indistinguishable from a traditional class in terms of maintaining similar socialization opportunities.

However, although the hybrid model can accommodate a larger number of students, we agree with Hodges et al. (2020) that the face-to-face model remains more in demand. In a hybrid setting, the size of the class can limit monitoring strategies. In our study, the control group was relatively larger than the experimental group, and the confidence level regarding the monitoring process was lower in the experimental group. This was primarily due to the lack of timely review of activities, in contrast to the control group, where reviews were conducted in person.

This could also be related to the closeness and predisposition that a teacher exhibits in a face-to-face setting, which students tend to value during the monitoring of their classes (Area Moreira et al., 2022). Therefore, as mentioned by Rama (2021) and Vargas-Murillo (2021), it is crucial for teachers to focus on content development and align follow-up actions to facilitate better skill development and self-regulation in students' learning (Area Moreira et al., 2022).

This point also relates to the dimension of digital teacher training. The success of the hybrid model largely depends on the trust that teachers build with their students and their openness to adopting new technologies (Escalona Ríos, 2023; Skelton-Macedo & Gregori, 2022). We concur with Girela et al. (2021) and Area Moreira et al. (2022) that the effectiveness of the model is influenced by the teacher's training, particularly in terms of the "applied methodology and the humanization of relationships that shape the outcome of the educational process" (Skelton-Macedo & Gregori, 2022, p. 4).

Concerning the model's effectiveness, it is crucial to revisit the observations of Skelton-Macedo and Gregori (2022, p. 4), who argue that innovation in pedagogical approaches is most effective when it fosters the development of self-taught and flexible students. As evidenced by the results and in line with Viñas (2021), the hybrid teaching model enhances student outcomes by leveraging technology and personalizing learning experiences. However, "some authors suggest that not all students are yet mature enough to succeed in this modality" (Skelton-Macedo & Gregori, 2022, p. 11). Additionally, factors such as the bidirectional nature of interactions, connectivity issues, and the diversity of students' technological resources (Escalona Ríos, 2023) can negatively impact the model's success and should be carefully considered.

These points underscore that the effectiveness of the teaching and learning process depends on the initial dimensions, as well as the appropriate combination of technology with a diverse range of remote and in-person learning opportunities (Núñez & Obesso, 2021; Viñas, 2021). Additionally, the quality of internet access and the platforms facilitating interactions (Rama, 2021) are critical. By addressing these factors, it is possible to bridge the gap between in-person and virtual education, effectively utilizing the strengths of both contexts (Montañez López, 2022).

Conclusion

For many years, traditional learning theories have been the foundation upon which traditional face-to-face educational approaches were built. However, since the evolution of digital technology, educational models have expanded beyond the traditional classroom, leading to a diversity of educational modalities aimed at providing greater effectiveness in the learning process. Among these is the hybrid model.

The hybrid model combines in-person and virtual learning situations and teaching methods, making it a comprehensive approach to the teaching and learning process. According to the approval index results, the effectiveness of this model surpasses that of the traditional in-person model. Although the in-person model offers direct interaction and connection with teachers and classmates, the hybrid model enriches this experience by adding the flexibility and accessibility provided by technology. For active participation to be truly effective in the hybrid environment, it is essential for teachers to continuously train in digital skills, enabling them to implement strategies that maximize the use of technology and motivate students to engage in their learning process.

Additionally, it is crucial to remember that every educational model should aim to improve and facilitate the students' learning process. Therefore, before implementing the hybrid model, teachers must carefully consider the technological resources available to them, the evaluation strategies, and the teaching tools, to ensure the effectiveness of its application.

In conclusion, the integration of the hybrid model into the design of educational programs can offer a more enriching and adaptable experience for university students in the current educational landscape.

Future lines of research

The pandemic triggered by COVID-19 in 2020 has left lasting marks that still persist today. In this scenario, hybrid teaching has emerged as a vital tool, providing fundamental support for teaching and learning processes by combining presence in the classroom and virtuality with the use of technological tools. It has become a crucial component of pedagogical evolution, marking a radical change in our perception of learning and teaching.

Although the purpose of this research was to carry out a comparative study between face-to-face and hybrid educational options, it will be necessary to establish future lines of research that contemplate the evaluation of purely online and virtual options, considering not only a specific area of knowledge as was the economic-administrative, it will be necessary to consider others such as techniques or humanities to identify the students' preference regarding their teaching and learning process. In parallel, the importance of integrating teaching staff perspectives into future research is recognized. Since teachers play a crucial role in student education, their acceptance and conviction towards these emerging modalities are essential for their successful implementation.

In summary, as we move forward in this new educational era, it is essential to continue exploring, adapting and improving teaching modalities. The inclusion of diverse perspectives and disciplines in future research will enrich our understanding and application of these educational options, ensuring that education remains relevant, effective and accessible to all in a constantly changing global context. The pandemic has offered us a unique opportunity to rethink and revitalize education, preparing future generations for a world that continues to evolve at an unprecedented pace.

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Contribution Role	Author(s)
Conceptualization	Jessica Garizurieta "Principal" Barnabas Luis Alejandro Gazca Herrera “the same”
Methodology	Luis Alejandro Gazca Herrera "main" Jessica Garizurieta Barnabas "same"
Software	Luis Alejandro Gazca Herrera
Validation	Luis Alejandro Gazca Herrera
Formal Analysis	Jessica Garizurieta Barnabas
Investigation	Jessica Garizurieta "Principal" Barnabas Luis Alejandro Gazca Herrera “the same”
Resources	Jessica Garizurieta "Principal" Barnabas Luis Alejandro Gazca Herrera “the same”
Data curation	Jessica Garizurieta "Principal" Barnabas Luis Alejandro Gazca Herrera “the same”
Writing - Preparation of the original draft	Luis Alejandro Gazca Herrera "main" Jessica Garizurieta Barnabas "same"
Writing - Review and editing	Luis Alejandro Gazca Herrera "main" Jessica Garizurieta Barnabas "same"
Display	Jessica Garizurieta "Principal" Barnabas Luis Alejandro Gazca Herrera “the same”
Supervision	Jessica Garizurieta Barnabas
Project Management	Luis Alejandro Gazca Herrera
Fund acquisition	N/A