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Scientific articles

Enseñanza híbrida como estrategia en educación media superior en el centro de estudio de bachillerato 5/12 Gregorio Torres Quintero

Hybrid teaching as a strategy in higher secondary education at the 5/12 Gregorio Torres Quintero high school study center

O ensino híbrido como estratégia no ensino médio no centro de estudos do ensino médio Gregorio Torres Quintero 5/12

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Resumen

El tema de la enseñanza híbrida como estrategia en la educación media superior, específicamente en el Centro de Estudios de Bachillerato 5/12 Gregorio Torres Quintero, abordó un aspecto crucial y controversial del proceso enseñanza-aprendizaje: la planeación didáctica. Esta investigación se realizó desde una doble perspectiva, enfocándose en las prácticas llevadas a cabo en el centro educativo conocido como "El Pedagógico".

El propósito principal de esta investigación cuantitativa, descriptiva y no experimental fue evaluar el impacto de la modalidad híbrida y determinar las dificultades que enfrentan tanto

alumnos como profesores en el ámbito académico. Para conocer los argumentos de ambos grupos, se evaluó el impacto de la modalidad híbrida en el Centro de Estudios de Bachillerato Gregorio Torres Quintero, ubicado en la ciudad de Navojoa, Sonora. La metodología incluyó la aplicación de un cuestionario de Google Forms a 24 docentes y 320 alumnos para identificar las dificultades encontradas.

Al concluir la investigación, se logró identificar el impacto de la modalidad híbrida en la enseñanza y el aprendizaje desde las perspectivas de docentes y alumnos.

Palabras clave: Tecnología educativa, Innovación pedagógica, Enseñanza sincrónica y asincrónica, Educación online, Aprendizaje combinado.

Abstract

The topic of hybrid teaching as a strategy in upper secondary education, specifically in the Gregorio Torres Quintero 5/12 Baccalaureate Studies Center, addressed a crucial and controversial aspect of the teaching-learning process: didactic planning. This research was carried out from a double perspective, focusing on the practices carried out in the educational center known as "El Pedagógico".

The main purpose of this quantitative, descriptive and non-experimental research was to evaluate the impact of the hybrid modality and determine the difficulties that both students and teachers face in the academic field. To know the arguments of both groups, the impact of the hybrid modality was evaluated at the Gregorio Torres Quintero High School Studies Center, located in the city of Navojoa, Sonora. The methodology included the application of a Google Forms questionnaire to 24 teachers and 320 students to identify the difficulties encountered.

At the conclusion of the research, it was possible to identify the impact of the hybrid modality on teaching and learning from the perspectives of teachers and students.

Keywords: Educational technology, Pedagogical innovation, Synchronous and asynchronous teaching, Online education, Blended learning.

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Resumo

O tema do ensino híbrido como estratégia no ensino médio, especificamente no Centro de Estudos do Bacharelado Gregorio Torres Quintero 5/12, abordou um aspecto crucial e polêmico do processo de ensino-aprendizagem: o planejamento didático. Esta investigação foi realizada numa dupla perspectiva, centrando-se nas práticas realizadas no centro educativo denominado "El Pedagógico".

O objetivo principal desta pesquisa quantitativa, descritiva e não experimental foi avaliar o impacto da modalidade híbrida e determinar as dificuldades que alunos e professores enfrentam no campo acadêmico. Para conhecer os argumentos de ambos os grupos, avaliou-se o impacto da modalidade híbrida no Centro de Estudos do Ensino Médio Gregorio Torres Quintero, localizado na cidade de Navojoa, Sonora. A metodologia incluiu a aplicação de um questionário do Google Forms a 24 professores e 320 alunos para identificar as dificuldades encontradas.

Ao final da pesquisa foi possível identificar o impacto da modalidade híbrida no ensino e na aprendizagem na perspectiva de professores e alunos.

Palavras-chave: Tecnologia educacional, Inovação pedagógica, Ensino síncrono e assíncrono, Educação online, Blended learning.

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Introduction

This research addresses what COVID-19 is and the strategies developed to achieve an effective teaching-learning process in the new hybrid modality, in addition to raising the problem and its general and specific objectives.

Faced with this situation, educational systems and their academic staff had to develop various strategies supported by technology. It was essential to understand and adapt the qualities of the original context when designing online educational strategies.

At the high school level, teachers implemented various technological strategies, adapting to the closure of educational institutions during the pandemic. This involved a change in the teaching method, adopting new technologies so as not to interrupt the students' learning process. The main strategy was for students to be able to take classes in real time, interacting directly with teachers through computers or devices. Classes were also recorded so that students could access them later.

The use of platforms such as Meet , Classroom , WhatsApp, etc. was highlighted as a crucial tool, providing access to class content and assignments. These platforms also allowed for feedback, albeit in a delayed manner, ensuring that students received quality instruction. Teachers not only used technological tools but also planned and distributed content effectively to meet the curricula.

Currently, at a point of transition towards the hybrid "virtual-in-person" modality, institutional goals are being achieved more easily. Conditions are being created for a successful implementation of this modality, with the aim of fully returning to the classrooms once the epidemiological traffic light allows it, following all the protocols and health and safety measures proposed by the health authorities.

The COVID-19 pandemic has led school leaders to strengthen various technological strategies, where leadership has been crucial in providing access to sources of information and knowledge. Modern teaching provides significant opportunities for students, making it necessary to understand and adapt the characteristics of the original context when designing online educational strategies for this period.

The contingency caused by COVID-19, as mentioned by the World Health Organization (WHO) (2021), has generated profound changes in the economy and health, with education being one of the most affected sectors. Many educators were not prepared to teach virtual classes, which posed a significant challenge.

To address this situation, the Higher Secondary Education Department implemented an intensive online training program for teachers. This program provided the strategies and knowledge necessary to manage information technologies and the platforms needed to teach classes and maintain interaction with students.

In this context, Garay et al (2020) point out that many higher education institutions around the world are considering the hybrid distance education modality. This modality allows students to have face-to-face moments, especially to cover the hours of experimental work in laboratories or workshops, where they can develop practical skills and attitudes.

For teachers, the change represented a great challenge, transforming the school dynamic and forcing them to use various virtual communication media such as Meet , Zoom, Classroom and WhatsApp. Training was essential to improve communication and take advantage of areas of opportunity.

Educational implementation turned every home into a classroom, requiring teachers to adapt specific spaces to teach. Many innovated in learning styles, supported by technological literacy.

This research was carried out at the Gregorio Torres Quintero 5/12 High School, located on Avenida Arivechi s/n and Sarabia, in Navojoa, Sonora. The sample included 240 students, distributed in 4 morning shift groups and 4 afternoon shift groups, as well as 24 teachers. The study was conducted during the period 2022-2023.

This project focuses on the hybrid modality that emerged as a strategy to strengthen face-to-face school activities that require more study time. The work aims to reveal the context in which students are involved, combining didactic sequences that mobilize learning in educational settings.

Based on accumulated experience, it seems that the most difficult stage, characterized by school closures and the adaptation of face-to-face programs to online mode, is behind us. With the progress in vaccination, a phase of response and reconstruction of educational services has begun, where the hybrid mode provides teachers with greater flexibility for teaching and more meaningful learning for students.

This research highlights how the teaching staff of the Gregorio Torres Quintero 5/12 High School Studies Center had to rethink their educational approach in the face of the health crisis. They not only implemented strategies to continue their work, but also made efforts to meet the expectations of the school community and the objectives of the institution.

The study shows that, in addition to willingness and commitment, teachers needed to update themselves to meet the challenges of the health crisis. The desire to fulfill their task was not enough; they had to make additional efforts to adapt to the new demands.

This research will answer the following question: How did teachers and students approach the continuity of the teaching-learning process during the COVID-19 pandemic?

Goals

General objective :

To analyze how teachers and students addressed the continuity of the teaching-learning process during the COVID pandemic.

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Specific objectives :

Determine the difficulties of students and teachers that impacted the academic field in hybrid education.

Evaluate the impact generated by the use of hybrid modality.

Theoretical references

This school was founded on October 24, 1985 by the teacher Jorge Moreno Porras. Its first activities were carried out at the Andrés García Gaxiola primary school, located in the Rosales neighborhood of the same city.

The institution began with four groups of 35 students each and a staff of 12 teachers and a secretary. Currently, the director is Dr. David Enrique Torres Morán and the vice-director is Lic. Loreto Sombre Lagarda .

This school was created with the objective of being a high school that would prepare students to enter normal education and obtain bachelor's degrees at the preschool and primary level. Originally, the institution was called the Centro de Bachillerato Pedagógico (Pedagogical High School Center), linked to the CREN Rafael Ramírez Castañeda. Shortly after, it was renamed Centro de Estudios de Bachillerato Pedagógico (Pedagogical High School Studies Center), and since September 1, 1991, it has been called the Centro de Estudios de Bachillerato Gregorio Torres Quintero (Gregorio Torres Quintero High School Studies Center).

Rodríguez Morales (2020) points out that the SARS-COV 19 coronavirus pandemic began on December 12, 2019 in Wuhan, China, with the first cases of viral pneumonia. The WHO declared a state of pandemic on March 11, 2020, drastically changing the functioning of educational systems.

Studies by Brooks et al. (2020) and Chatterjee and Chauhan (2020) explain that quarantine separates people exposed to a contagious disease to prevent the spread, while isolation separates the sick from the healthy.

Since then, education has moved to the virtual realm, supported by technology and the Internet, allowing for safe interaction between teachers and students.

With the arrival of vaccines, first for the highest risk groups and then for young people, the education system has begun to plan the gradual return to classrooms through a hybrid modality (in-person-virtual), following the protocols of the new normal.

García et al. (2020) point out three observable gaps in access to technology among young students:

1.- Access gap: This is the restriction specified when people do not have access to adequate connectivity, i.e. mobile devices, computers. This lack of technology has an economic or geographic origin.

2. - Usage gap : this is exposed when there is adequate connectivity at home, where it can be used, but people have fewer devices, driving them to restrict their use at certain times.

3.- Competence gap: integrates the previous ones and mentions the lack of adequate skills to make the most of digital tools and prevent risks or bad practices.

This author mentions that the current pandemic situation is beginning to accelerate the use of online education, demonstrating a problem called inequality in access to technology and its efficient application.

Social inequality after the pandemic was much more evident because many of the economic activities were diminished, seriously impacting the flow of cash generation in this interpretation Schmelkes (2020). provides an x-ray of what has happened in Mexico in this area regarding the impact of COVID-19 on higher education, pointing out that three factors converge in this: the economic problem, which is derived from the decrease in productive and commercial activity during the pandemic, and the consequent unemployment or loss of sources of income; the enormous digital divide, which goes hand in hand with socioeconomic inequality and overlaps it; and the difficulty on the part of higher education institutions to face the educational crisis that arises from the pandemic.

It is evident that even though our country is in a different phase from the initial one, there is no certainty that in the coming months there will be a social dynamic within the framework of normality, since the behavior of infected cases and deaths, although lower, continues to remain alive.

In relation to this the author Didriksson (2020) states that there is no safe scenario in the face of the current pandemic caused by COVID-19. Whether it is seen from the social or economic perspective, from the response of science or education, from health personnel or just from government actions, everything that was known will have to be thoroughly reviewed and see what is coming.

In this same vein, it is important to highlight that a government agenda must implement measures that allow all Mexicans affected by the pandemic to have more

promising scenarios in the economic-labor environment that allow them to have better living conditions for themselves and their families.

The pandemic has accelerated the need for online education, highlighting the inequality in access to technology and its efficient use. Schmelkes (2020) analyzes the impact of COVID-19 on higher education in Mexico, pointing out three main factors: the economic problems due to the decrease in productive and commercial activities, the enormous digital gap linked to socioeconomic inequality, and the difficulties of educational institutions to face the crisis.

The educational lag caused by the pandemic has generated an unfavorable outlook for education, but the national government has taken measures to mitigate the negative effects. With the 2030-2020 Plan, conditions are being created to restore and improve the educational system, gradually advancing in the leveling of content and achieving the goals and objectives of the school year.

The educational gap, accentuated by the pandemic, requires a firm commitment from school authorities to implement actions that update and strengthen the school community. The United Nations Organization (UN, 2021) establishes in its Sustainable Development Goal 4: guarantee inclusive, equitable and quality education, and promote lifelong learning opportunities for all.

To meet this challenge, intensive programs are being developed that seek to reduce educational gaps and ensure quality education.

Hybrid Teaching-Learning Model (Blended Learning) combines traditional and technological methods. This model was not fully implemented from the beginning, but was gradually adapted to available technologies, such as platforms and television, to bring education into homes.

In the traditional model, learning was synchronous and occurred in real time in the classroom, with direct interaction between teachers and students. Pedagogy was based on teacher authority, often limiting student participation.

During the pandemic, education was divided into synchronous and asynchronous learning, combining virtual and in-person classes through various platforms and means of communication such as email and WhatsApp. This approach allowed education to continue despite the restrictions.

Synchronous communications, according to Matías (2011), allow real-time interaction, regardless of distance, turning the world into a global and virtual village. This

method has allowed teachers to continue meeting educational schedules and objectives, even though not all students have equal access to technology.

The lack of uniformity in access to technologies has forced teachers to implement various strategies, such as recorded video calls so that students can access classes at any time. Castellanos et al. (2009) point out that the Internet acts as a third social environment, offering numerous possibilities in all areas of human activity.

Rosalía Arteaga (2020) highlights the importance of teacher training, led by educational organizations, to ensure that no school-age student is excluded, thus strengthening the public education system.

Teaching strategies and good practices in the use of technology, in the face of the pandemic, teachers in Mexico, especially at the higher level, made an effort to comply with their study plans despite their limited skills in information technologies. They looked for different ways to teach their classes from home using the available devices.

Teachers faced significant challenges, such as a lack of technological skills, Internet connection problems, and student apathy in completing their assignments. Baelo (2009) points out that teaching systems are constantly innovating, and there is a growing interest in using virtual education models to improve learning, offering a flexible and quality alternative for those who cannot access face-to-face education.

Gómez - Nashiki (2008) defines good teaching practice as one in which the teacher applies his or her competencies, knowledge and socio-emotional skills to innovate in teaching and facilitate student learning in a specific context.

This new educational approach commits teachers to providing a comprehensive education, moving from being authorities to facilitators and companions in the teaching-learning process. Students, for their part, have had to adapt, building their own knowledge in an adverse context with digital resources, autonomously seeking information to complement what they have learned virtually.

Constructivism, as proposed by Abbott and Ryan (1999), maintains that each student structures his or her knowledge of the world in a unique way, integrating new experiences and understandings into a subjective structure that allows him or her to establish meaningful relationships with the environment.

In this hybrid context, schools must provide the necessary elements for teachers and students to perform their roles with the least number of problems. However, improving

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connectivity and updating teaching resources remains a pending challenge for educational authorities.

The authors present different approaches and emphases in their studies, there is a general consensus on the challenges and need for adaptation in education during the pandemic. The transition to hybrid mode has been an effective response, but it remains crucial to improve connectivity and teaching resources to ensure inclusive and quality education. In addition, the digital divide and socioeconomic inequality must be addressed comprehensively to offer equitable opportunities to all students.

Methodology

To develop this article, quantitative research of a descriptive, non-experimental scope was used during the pandemic. The participants were 240 students, 4 morning shift groups, 4 afternoon shift groups, and 24 teachers from the Centro de Estudios de Bachillerato 5/12 Gregorio Torres Quintero high school in Navojoa, to whom a Google Forms survey was applied to measure the impact of COVID-19 on Hybrid Education.

According to Hernández Sampieri (2014), the quantitative research approach is used to investigate how people perceive and experience their environment, considering their points of view and meanings according to their age. This approach is ideal for describing the characteristics of the teaching-learning process in the context of hybrid education implemented in higher secondary education.

Descriptive studies are essential to accurately show the dimensions of a phenomenon, event, community or context. At this stage, the researcher defines what will be measured (concepts, variables, components, etc.) and who the data will be collected from (people, groups, communities, etc.). This ensures that the results accurately reflect the reality of the context in which they are developed.

Participants

selected using convenience sampling, inviting students to participate through their institutional emails and study groups.

Application procedure

Survey preparation: The questionnaire was developed using Google Forms , ensuring that the questions were clear and concise to avoid bias and misunderstandings.

Convocation: Online sessions were scheduled through Google Meet to explain to students the importance of research and the procedure for answering the survey. These sessions were held at times accessible to most students.

Meet sessions , the survey link was shared in the meeting chat. Additionally, the link was sent via email and instant messaging groups to ensure maximum participation.

Data collection: Students were given 6 months to complete the survey. During this period, periodic reminders were sent to encourage participation.

Data analysis: Once responses were collected, the data was exported to a spreadsheet for analysis. Statistical software was used to calculate frequencies, percentages, and other descriptive statistics to provide a clear overview of the results.

Presentation of Results

Graphs and tables: The data was presented using tables and graphs that illustrated the different percentages and trends observed in the responses.

Interpretation of results: Data were interpreted, highlighting key findings regarding students' knowledge and perceptions of the research topic. Findings were discussed in the context of existing literature and recommendations for future research and policy were proposed.

Results of the survey applied to the students

The survey applied to students at the Gregorio Torres Quintero High School 5/12 Studies Center revealed several notable aspects about their situation and preferences during the pandemic. The majority of students are 17 years old (64.4%) and a significant number are female (64%). Most households have between 3 and 5 people (83.2%), and the most common technological tool is the cell phone (52.5%).

Although 77.6% of students have access to the Internet at home, a considerable proportion do not due to budgetary (47.7%) and infrastructure (23.4%) constraints. Internet access is mainly wired and wireless (53.5%), and most students share the service with an average of 3 to 5 people (60.7%).

As for their academic performance, 74.4% of students have not failed any subjects. However, lack of connectivity (60%) and low interest (20%) are the main reasons for failure. Interaction with teachers has been mostly positive, with 67% of students rating it between 8 and 10.

Classroom was the most commonly used platform by teachers (70.1%), and workbooks were considered the strategy with the greatest impact during the pandemic (59%). Most students preferred to enroll in person in previous and current semesters.

The main reasons for considering dropping out of school included lack of resources (60%) and lack of interest (40%). Students spent an average of 8 hours a week on classes and homework (44.9%). Social media was the main means of disseminating information about the school (93.5%).

During the pandemic, 59.5% of students attended virtual classes, and hiring Internet services was the most significant extra expense (68.3%). The main difficulties faced were the lack of interaction with the teacher (47.7%) and the absence of feedback (40.2%).

The advantages of distance education included the possibility of working and studying (50.5%) and saving time (43%). Finally, if given the choice, most students would prefer the face-to-face modality (53%), although a considerable proportion prefer the virtual (24%) and hybrid (23%) modalities.

These results underscore the importance of improving technological infrastructure and connectivity to ensure quality education in any modality, as well as the need for teaching strategies that maintain student interest and participation.

Results of the survey applied to teachers

The results of the survey applied to teachers at the Gregorio Torres Quintero High School 5/12 Studies Center reveal significant findings about teachers' perception and adaptation to hybrid education. Most teachers have considerable seniority, with 38.4% having 40 years of experience, and the majority have a master's degree (75%).

Satisfaction with tools for hybrid education is high, with 87.5% of teachers agreeing or strongly agreeing with their effectiveness. However, connectivity challenges persist, with 70% of teachers reporting connectivity difficulties at least occasionally.

In terms of interaction, most teachers (54.2%) interact with students one to three times per week, but attendance at virtual meetings is low, with only 50% of students attending regularly according to 20.8% of teachers. Submission of assignments is done mostly on a weekly basis (75%).

Problems identified include lack of reading habits and technical issues, each reported by 30% of teachers. Despite these challenges, half of teachers (50%) fully agree with continuing the hybrid system, although 25% disagree.

Regarding modality preference, 53% of teachers prefer the in-person modality, while 24% prefer the virtual and 23% the hybrid. These results indicate a tendency towards the traditional model, although they recognize the importance and benefits of the virtual and hybrid modalities.

In summary, teachers have shown remarkable adaptation to hybrid education, but the need to improve connectivity and resolve technical issues is evident. The preference for in-person learning suggests that, although new technological strategies are valued, the interaction and structure of the traditional teaching model is still appreciated.

Nevertheless, this study has provided valuable insight into how hybrid learning can be implemented and the challenges encountered by teachers and students. The results highlight the importance of improving technological infrastructure and providing ongoing training to teachers to maximize the benefits of hybrid learning.

Discussion

This study provided valuable insight into the implementation of hybrid teaching in the context of the Centro de Estudios de Bachillerato 5/12 Gregorio Torres Quintero during the COVID-19 pandemic. However, it is important to highlight the limitations that emerged during the research, as well as compare them with similar studies.

Limitations of the study

Unequal access to technology: Although there was significant effort by the institution to provide quality education in a hybrid mode, inequality in access to technology represented a notable barrier. Approximately 23.4% of students faced technological infrastructure restrictions, which negatively impacted their participation. This phenomenon has been pointed out by García et al. (2020) as a "digital divide", a recurring limitation in contexts of low technological access.

Lack of technological skills: Both teachers and students showed initial difficulties in adapting to digital tools, which limited the effectiveness of teaching and learning. This situation coincides with studies such as that of Garay et al. (2020), which indicate that digital literacy remains a major challenge in the transition to hybrid models.

Limited interaction in hybrid mode: Despite efforts to encourage interaction between students and teachers, many students reported a lack of feedback and little direct interaction, which resulted in a less meaningful learning experience. Research such as Baelo (2009) also

indicates that synchronous interaction in hybrid environments tends to be less fluid than in the face-to-face model.

Connectivity issues: Connectivity difficulties, reported by 70% of teachers and a considerable percentage of students, hampered active participation in classes. This limiting factor has also been documented in international studies (Chatterjee and Chauhan , 2020), which highlight that unstable connectivity affects the continuity of learning.

Lack of study habits and motivation: Some students pointed out a lack of motivation and limited interest as factors that impacted their academic performance. This problem has been identified in other studies (Schmelkes, 2020), where distance education increased school dropout and educational lag.

Comparison with similar studies

Impact on academic performance: This study revealed that the majority of students maintained an acceptable academic performance, with 74.4% of respondents with no failed subjects. However, other studies such as those by Didriksson (2020) show that, in less technologically prepared contexts, the negative impact on performance was greater .

Preference for educational modalities: The preference for the face-to-face modality (53%) stands out in the present study, a trend also observed in research carried out by Gómez-Nashiki (2008), which highlights the importance of face-to-face interaction in the training process.

Flexibility of the hybrid model: This study highlights that the hybrid modality offered more flexible learning opportunities, similar to the conclusions of Matías (2011), who emphasizes that synchronous and asynchronous learning can complement the needs of students by providing access to resources at different times.

Teacher training: As in research such as Arteaga (2020), this study emphasizes the need for teacher training to overcome technological and pedagogical barriers. Intensive training was essential for teachers to adapt to the new teaching model.

Equity in education: The digital divide and socioeconomic inequalities were common limitations both in this study and in others carried out in similar contexts, such as the one pointed out by Schmelkes (2020). These barriers must be addressed to ensure equitable and quality education.

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The limitations of the study highlight the need to improve technological infrastructure, continuously train teachers, and ensure equitable access to educational resources. Compared to similar research, recurring patterns of inequality in technological access, connectivity issues, and challenges in adapting to the hybrid model are observed. However, the findings also suggest that this modality has great potential to promote flexibility and educational continuity if existing barriers are overcome. This analysis reinforces the importance of comprehensive educational policies that address digital divides and foster inclusive teaching at all levels.

Conclusion

This research addressed the nature of COVID-19 and the strategies implemented to achieve an effective teaching-learning process in the new hybrid modality.

High school teachers implemented technological strategies to adapt to the closure of educational institutions, using platforms such as Meet , ZOOM, Classroom and WhatsApp to continue educating students.

The hybrid modality, which combines traditional and technological methods, allowed students to take classes in real time and access the recordings later. Although significant progress was made, challenges persisted, such as inequality in access to technologies and the need for teacher training.

The pandemic highlighted the digital divide and socioeconomic inequality, especially affecting students with fewer resources. To face these challenges, the national government implemented measures such as the 2030-2020 Plan to restore and improve the educational system, promoting inclusive and quality education.

The transition to hybrid mode has allowed educational institutions to meet their objectives and goals, adapting to new demands and improving the quality of the teaching-learning process. However, it is crucial to continue working on improving connectivity and updating teaching resources to ensure that all students can benefit from this modality.

In response to the research question How did teachers and students address the continuity of the teaching-learning process during the COVID-19 pandemic?, we can point out that the COVID-19 pandemic caused a significant reconfiguration in the education sector. In Mexico, as in other countries, teachers had to quickly adapt their teaching methods, familiarizing themselves with new technologies and platforms to ensure educational continuity.

Main adaptations

The COVID-19 pandemic presented numerous challenges to the education system, forcing teachers and students to quickly adapt to new ways of teaching and learning. One of the most significant changes was technological upgrading. Teachers learned to use platforms such as Zoom, Google Meet , and Microsoft Teams to deliver virtual and interactive classes. This involved not only teaching itself, but also resolving technical issues related to connectivity and student access to devices. Training in these digital tools allowed teachers to maintain educational continuity and offer a more dynamic and flexible learning experience.

Furthermore, with the advance of the pandemic and the implementation of health traffic lights, teachers began to combine virtual and in-person teaching. This hybrid modality allowed them to reinforce content and advance the academic program more effectively, taking advantage of the best of both worlds: the flexibility of online classes and the direct interaction of in-person classes.

During in-person teaching, strict sanitary measures were implemented, such as the use of face masks, antibacterial gel and maintaining social distancing. Attendance was organized by rotation to reduce the number of students in the classrooms, thus minimizing the risk of contagion. These measures were essential to ensure the safety of students and teachers.

The situation also called for additional flexibility and support. Flexibility was offered in deadlines and assessment formats to accommodate students' emotional and logistical difficulties. Constant communication between teachers, students, and parents was essential to maintaining educational continuity. This flexibility helped reduce stress and anxiety, allowing students to better adapt to the new circumstances.

On the other hand, the need to adapt to distance education encouraged students to become more autonomous, improving their time management and independent study skills. This experience fostered the development of key competencies for self-directed learning and personal responsibility in the educational process.

These changes and adaptations brought with them significant benefits. Both teachers and students improved their technological skills, which is beneficial in the long term. Familiarity with various digital tools prepares both groups for a future where technology will play an increasingly important role in education and work. The pandemic also accelerated the adoption of new pedagogical methodologies, such as project-based learning and the use

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of open educational resources. These innovations have proven effective in fostering student engagement and motivation, promoting more active and participatory learning.

Finally, the integration of tools such as virtual simulations and augmented reality enriched the educational experience. These technologies allow students to interact with content in a more immersive and practical way, improving the understanding and retention of information. In conclusion, despite the challenges imposed by the COVID-19 pandemic, the adaptations made in the educational field have had significant positive impacts. The improvement in digital skills, innovation in pedagogical methodologies and the enrichment of the educational experience are lasting benefits that will strengthen the educational system in the future.

The adoption of hybrid education during the pandemic has proven to be a resilient and effective solution, allowing the continuity of the educational process and fostering digital and self-taught skills in students. Although it presents challenges such as the digital divide, this flexible and adaptive educational model is a positive legacy of the pandemic that will likely influence the future of post-COVID-19 education.

Future lines of research

This study suggests several areas for future research. First, it would be useful to conduct comparative studies in different educational contexts and with larger samples to assess the generalizability of our findings. Furthermore, exploring methods to improve connectivity and access to technology, as well as the effectiveness of different pedagogical strategies in hybrid modalities, is essential.

Another interesting line of research would be to examine the long-term impact of hybrid education on academic performance and digital skills development in students. Finally, investigating teachers' perceptions and experiences in more depth may provide a more complete understanding of training and support needs during the transition to hybrid teaching.

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Annexes

Survey

The results obtained from the sample of participants are shared, being important to know the activities carried out by the teacher and student in the hybrid modality, of the Gregorio Torres Quintero Baccalaureate 5/12 study center.

Survey applied to students

Table 1 Percentage of students according to their age

Ask	Percentage
What is the age of the student?	
17	64.4%
18	31.8%
19	1.0%
20	2.8%
Source: own elaboration	

Table 2 Gender distribution among students

Ask	Percentage
Student gender?	
Female	64%
Male	35%
Fountain: own elaboration	

Table 3 Number of people living in the student's home

Ask	Percentage
How many people live in your home?	
Between 3 and 5 people	83.2%
More than 5 people	13.1%
2 people	3.7%
Fountain: own elaboration	

Table 4 Technological tools available in students' homes

Ask	Percentage
What tools do you have in your home?	
Television	15%
Desktop/laptop computer	20%
Tablet	10.5%
Cellular	52.5%
Other	2.0%
Fountain: own elaboration	

Table 5 Internet availability at home

Ask	Percentage
Do you have internet?	
Yeah	77.6%
No	22.4%
Fountain: own elaboration	

Table 6 Reasons for lack of internet at home

Ask	Percentage
If you do not have Internet at home, answer: Why don't you have Internet?	
The household budget is not enough	47.7%
The company's infrastructure does not reach the area where I live	23.4%
Other	28.9%
Fountain: own elaboration	

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Table 7Internet access

Ask	Percentage
Type of Internet access?	
Dial-up access	20.1%
ADSL access	3.2%
Access via telephone network	15.2.%
Wired access	23.4%
Wireless access	30.1%
Satellite access	8%
Fountain: own elaboration	

Table 8 Sharing Internet access

Ask	Percentage
If you have Internet service, how many people use the service?	
More than 5 people	21.5%
Between 3 and 5 people	60.7%
2 people	10.3%
Other	7.5%
Fountain: own elaboration	

Table No. 9 Failure of previous subjects

Ask	Percentage
How many subjects have you failed from previous semesters?	
None	74.4%
A subject	9.3%
Between 2 and 4 subjects	6.5%
Between 5 and 6 subjects	4.3%
Between 7 and 8 subjects	4.7%
More than 8 subjects	0.8%
Fountain: own elaboration	

Table 10 Reasons for failure

Ask	Percentage
What reasons contributed to failing the subject?	
Lack of connectivity	60%
Lack of interest	20%
Social isolation	20%
Fountain: own elaboration	

Table 11 Interaction with the teacher

Ask	Percentage
What was your rating for interaction with the teacher?	
1	0.9%
2	0%
3	0.9%
4	1.9%
5	3.7%
6	6.3%
7	7.3%
8	12%
9	23%
10	44%
Fountain: own elaboration	

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Table 12 Platforms used by teachers

Ask	Percentage
What platform did your teacher use to stream class and assign homework?	
Email	0%
WhatsApp	26%
Classroom	70.1%
Teams	3.1%
Others	0.8%
Fountain: own elaboration	

Table 13 Predominant platforms in the previous semester

Ask	Percentage
What platform did you predominantly use last semester?	
Meet	11.1%
Facebook	6.5%
Classroom	53%
Institutional platform	2.8%
Email	0%
WhatsApp	26.6%
Fountain: own elaboration	

Table 14 Strategy with the greatest impact on academic training during the pandemic

Ask	Percentage
What strategy do you think had the greatest impact on your academic training during the pandemic?	
Workbook	59%
Facebook	2.7%
WhatsApp	38.3%
Fountain: own elaboration	

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Table 15 Registration form for the previous semester

Ask	Percentage
How was your registration carried out in the previous semester? (2021-2)?	
Personally	80.3%
Online	19.7%
Fountain: own elaboration	

Table No. 16 Registration form for the current semester 2022-1

Ask	Percentage
The way in which the student carried out his/her registration for the semester (2022-1)?	
Personally	92.5%
Online	7.5%
Fountain: own elaboration	

Table 17 Reasons for dropping out of school

Ask	Percentage
Have you ever thought about dropping out of school? If so, why?	
Yeah	
Due to lack of resources	60%
Lack of interest	40%
Fountain: own elaboration	

Table No. 18 Hours dedicated to the development of classes, activities and tasks

Ask	Percentage
How many hours a week do you dedicate to developing classes, activities and tasks?	
8 Hours	44.9%
20 Hours	13.3%
15 Hours	15.9%
Less than 15 hours	22.3%
6 hours	0.9%
1 to 3 hours	0.9%
More than 20 hours	0.9%
12 hours	0.9%
Fountain: own elaboration	

Table 19 School media

Ask	Percentage
What means of dissemination does the school have?	
Wall newspaper	5.6%
Social networks	93.5%
Frills	0.9%
Fountain: own elaboration	

Table 20 Class attendance modality during the pandemic

Ask	Percentage
Was class attendance during the pandemic?	
Hybrid	34.2%
In person	6.3%
Virtual	59.5%
Fountain: own elaboration	

Table 21 Expenses generated by receiving online classes

Ask	
Taking classes online: What kind of extra expenses does it generate?	Percentage
Data package	29%
Hiring Internet services	68.3%
Others	2.7%
Fountain: own elaboration	

Table 22 Difficulties faced in distance learning

Ask	Percentage
What kind of difficulties do you face due to distance learning?	
Lack of interaction with the teacher	47.7%
Lack of feedback	40.2%
Lack of interaction with peers	10.3%
For me none	0.9%
Not understanding the activities	0.9%
Fountain: own elaboration	

Table 23 Advantages of receiving distance classes

Ask	Percentage
What advantages do you think there are to receiving distance education?	
I can work and study	50.5%
Economy of time	43%
Flexible schedule	6.5%
Fountain: own elaboration	

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Table 24 Preference for class modality

Ask	Percentage
If you were given the choice of teaching method, would you choose?	
In person	53%
Virtual	24%
Hybrid	23%
Fountain: own elaboration	

Survey applied to teachers

Table 1 Gender of teachers

Ask	Percentage
What is the gender of teachers?	
Female	54.2%
Male	45.8%
Fountain: own elaboration	

Table 2 Years of teaching seniority

Ask	Percentage
Years of seniority of teachers?	
28 years old	4.3%
31 years old	4.3%
35 years	4.3%
37 years old	4.3%
40 years	38.4%
41 years old	10.8%
42 years old	9.3%
44 years old	11.3%
53 years old	4.3%
58 years old	8.7%
Fountain: own elaboration	

Table 3 Type of teaching position

Ask	Percentage
What is your type of square?	
Base	66.7%
By contract	33.3%
Fountain: own elaboration	

Table 4 Level of education of teachers

Ask	Percentage
Degree of education?	
Mastery	75%
Doctorate	12.5%
Degree	8.3%
Post doctorate	4.2%
Source: Own elaboration	

Table 5 Semester in which teachers teach classes

Ask	Percentage
What semester do you teach?	
First semester	16.7%
Second semester	37.5%
Third semester	8.3%
Fourth semester	37.5%
Fifth semester	8.3%
Sixth semester	37.5%
Fountain: own elaboration	

Table 6 Number of groups that the teacher serves weekly

Ask	Percentage
Approximately how many groups do you serve per week?	
1	
2	

3	12.8%
4	13%
5	16.7%
6	14.7%
7	16.7%
8	9.4%
9	16.7%
10	
Fountain: own elaboration	

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hybrid education

Ask	Percentage
How satisfied are you with the tools for hybrid education at your school?	
Totally disagree	8.3%
Disagree	
Neither in agreement nor in disagreement	4.2%
OK	41.7%
Totally agree	45.8%
Fountain: own elaboration	

Table 8 Student interaction during the pandemic

Ask	Percentage
How often did you interact with students virtually during the pandemic?	
Daily	25%
One to three times a week	54.2%
Hardly ever	20.8%
Never	0%
Fountain: own elaboration	

Table 9 Attendance at virtual meetings

Ask	Percentage
What percentage of students attended virtual meetings?	
100%	
50%	20.8%
30%	33.3%
10%	33.3%
Other	12.6%
Fountain: own elaboration	

Table 10 Presentation of tasks by students

Ask	Percentage
The student presents tasks in a manner	
Daily	25%
Weekly	75%
Fortnightly	
Monthly	
Biannual	
Fountain: own elaboration	

Table 11 Difficulty in hybrid connectivity

Ask	Percentage
As a teacher, did you experience difficulty with connectivity in the hybrid mode?	
Never	
Hardly ever	30%
Sometimes	37%
Almost always	33%
Always	
Fountain: own elaboration	

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Table 12 Problems detected during the process

Ask	Percentage
What problems have you detected during the process?	
Lack of reading habit	30%
Technical problems	30%
Attention deficit	20%
Lack of empathy	20%
Fountain: own elaboration	

Table 13 Continuity of the hybrid system

Ask	Percentage
Do you think the hybrid system should continue?	
Totally agree	50%
Disagree	25%
Neither agree nor disagree	25%
Fountain: own elaboration	

Table 14 Preference for teaching modality

Ask	Percentage
If you were given the choice of teaching method, would you choose?	
In person	53%
Virtual	24%
Hybrid	23%
Fountain: own elaboration	