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Editorial

This issue of the MLSPCI journal brings together research that reflects the breadth of the challenges facing education in its various social, cultural, and institutional contexts. The works published here share a common focus on finding innovative solutions to contemporary challenges, highlighting the role of research as a driving force for educational transformation and the development of more resilient, inclusive, and sustainable societies.

Prevention education is one of the central themes of this issue, through a geodidactic approach that incorporates interactive digital infographics to strengthen the civilian population's ability to cope with natural phenomena. The combination of multimedia resources and a social-geographic approach demonstrates the potential of educational technologies to promote a culture of prevention based on meaningful learning.

Furthermore, the report highlights concerns regarding educational inclusion in the prison system, where it examines the effects of overcrowding on educational opportunities for people deprived of their liberty in Colombia. Given this situation, the study proposes the use of educational technologies as a viable alternative for expanding access to learning and promoting social reintegration, provided there is adequate institutional and political support.

The promotion of healthy lifestyles is the focus of a study examining the relationship between a sedentary lifestyle and academic performance among elementary school students. Although the results do not show statistically significant differences, the study provides evidence that supports continuing to promote physical activity as part of a well-rounded education.

Similarly, the goal of strengthening teachers' professional development is addressed through a literature review on instructional coaching, which identifies strategies for pedagogical support based on observation, feedback, and collaborative reflection. The findings provide valuable insights for fostering institutional cultures focused on the continuous improvement of teaching.

It is striking how foreign language instruction takes on a humanistic perspective through an approach that highlights the works of Victor Hugo as a resource for developing sociocultural competencies. The integration of literary texts with critical and intercultural analysis activities demonstrates how language teaching can go beyond linguistic learning to promote ethical and civic education.

Educational innovation is also evident in the field of civil engineering, where there is ongoing discussion about incorporating active learning methodologies and sustainable approaches to address the challenges of multicultural contexts. Project-based learning, virtual reality, and service-learning are emerging as strategies capable of producing technically competent and socially committed professionals.

Chilean higher education is the subject of an analysis that highlights the need to strengthen curricular coordination as a means of promoting more flexible, inclusive, and coherent educational pathways. The proposal presented represents a significant contribution to the design of educational policies that promote student retention and academic success.

This issue concludes with a study on customer service skills in the restaurant industry developed by university students majoring in tourism. The results highlight opportunities for improvement in key skills for professional performance, underscoring

the importance of continuing to strengthen competency-based training in a sector that is strategic for economic and social development.

Taken together, the research articles included in this issue demonstrate the scientific community's commitment to developing relevant responses to current educational challenges. Drawing on diverse perspectives, the authors contribute insights that enrich the academic debate and provide tools for innovation, inclusion, and the improvement of educational quality. We hope this issue will help spark new reflections, inspire future research, and strengthen the dialogue among researchers, educators, and education policymakers.

Antonio Pantoja Vallejo
Editor Jefe / Editor in chief / Editor Chefe

Geodidactic proposal: Interactive digital infographics aimed at risk prevention for the civilian population

Propuesta geodidáctica: Infografías digitales interactivas orientadas a la prevención del riesgo para la población civil

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ABSTRACT

Keywords:

Natural phenomena, prevention, interactive digital infographics, risk geography, social geography.

Currently, the risk prevention actions for natural phenomena carried out by the civil population are relevant for the life and should be promoted. A teaching material was developed and validated for the civil population consisting of interactive digital infographics (IDI) that include a series of multimedia resources. The IDIs were created under a social geographical approach to develop skills in prevention against four types of natural phenomena chosen for their high frequency and disastrous impact on Mexican territory: earthquakes, hurricanes, floods, and landslides. Additionally, a workshop directed at the civil population was designed and opened to evaluate the functionality of the educational material (IDI), and tools (rubrics and checklists) were created for assessing competencies (IEC) in the users of the educational material. Both the IDIs, the workshop, and the IECs were evaluated by three experts (geographers and a pedagogue) using Likert scales. Experts considered the infographics, the workshop, and the assessment tools for competency-based learning to be suitable.

RESUMEN

Palabras clave:

Fenómenos naturales, prevención, infografías digitales interactivas, geografía del riesgo, geografía social.

Hoy por hoy las acciones de prevención del riesgo por fenómenos naturales llevadas a cabo por la población civil, son relevantes para la vida y deben promoverse. Se elaboró y validó un material didáctico dirigido a la población civil consistente en infografías digitales interactivas (IDI) que incluyen una serie de recursos multimedia. Las IDI fueron creadas bajo un enfoque geográfico social, para desarrollar competencias en prevención del riesgo ante cuatro tipos de fenómenos naturales que se escogieron por su alta frecuencia e impacto desastroso en el territorio mexicano: sismos, huracanes, inundaciones y deslave. Además, se diseñó y abrió un taller dirigido a la población civil para valorar la funcionalidad del material educativo (IDI), y se crearon

instrumentos (rúbricas y listas de cotejo) de evaluación de competencias (IEC) en los usuarios del material educativo. Tanto las IDI, como el taller y los IEC, fueron evaluados por tres expertos (geógrafos y pedagoga) mediante escalas Likert. Los expertos consideraron las infografías, el taller y los instrumentos de evaluación del aprendizaje por competencias, como idóneos.

Introduction

According to the literature, preventive civil protection measures in response to disasters have been implemented primarily from the 20th century to the present, although records from ancient civilizations mention empirical preventive actions, for example, in Egypt with the construction of canals and dikes to control the Nile River; in China with systems of dams and dikes to prevent flooding of the Yellow River; and among the Incas with the use of terraces to prevent landslides and control erosion (Campanate, 2024). During Mexico's pre-Hispanic and colonial periods, hydraulic projects were carried out to protect residents from floods and hurricanes (Vargas, n.d.).

From the 16th to the 19th centuries, as scientific thought advanced, natural phenomena were studied and documented, and along with this, the beginnings of a more informed approach to disaster prevention emerged among nations. For example, in the United States, based on ongoing studies of tornadoes and cyclones in the Atlantic Ocean, an average of more than 1,000 tornadoes are recorded per year (Midwestern Regional Climate Center, n.d.). Likewise, England and France stand out in the field of climate observations and are pioneers in meteorology (Hontarrède, 1998).

Natural disasters can have a severe impact on the world's population. Among the largest disasters caused by natural phenomena, we can mention the earthquake with a magnitude of between 8.0 and 8.3 on the Richter scale in Shaanxi; this event occurred in China on January 23, 1556; It is considered one of the deadliest, with a death toll of 830,000 victims (ContraRéplica, 2024)

Similarly, a devastating earthquake struck Lisbon in 1755 with a magnitude of between 8.5 and 8.7; an estimated 70,000 people lost their lives, equivalent to 25% of the city's total population. Similarly, countries such as Spain, France, Morocco, and the United Kingdom suffered severe damage to their coastlines as a result of the tsunami (Cárdenas, 2025). Since that event, Europe has placed greater emphasis on earthquake-resistant construction; however, there are still no public policies in place focused on disaster prevention.

It was not until the 20th century that preventive measures were formalized, and, following a series of disastrous events, several countries began to focus their attention on developing systems for risk management and prevention. The formal concept of civil protection did not originate in 1949; it emerged globally in 1977 with the adoption of Additional Protocol I to the Geneva Conventions of August 12, 1949, which focuses on the protection of victims in cases of war and related situations, including the protection of the population against disasters, recovery, and survival. (International Committee of the Red Cross [ICRC], 2012, p. 31)

Among other important dates worth mentioning is the International Day for Natural Disaster Risk Reduction (IDNRR), observed on October 13 (El Economista, 2024); this event highlights the importance of education in preparing future generations for disasters. In this regard, the Sendai Framework emphasizes the need to prepare young people; according to its data, young people are among those most affected, and they would also be the first line of defense in terms of empowerment.

The following section provides a general overview of the theoretical framework and specialized literature surrounding the fundamental concepts presented here, which form the basis for this proposed educational material on the prevention of natural phenomena.

The Geography of Risk and Disaster from the Perspective of Critical Social Geography.

From the perspective of geographer Allan Lavell, whose work reached its peak at the beginning of this century, risk geography can be interpreted as a branch of geography that has attracted significant interest from the geographical community and related fields. It studies threats, hazards, risks, catastrophes, exposure, vulnerabilities, and disasters in relation to their spatial and territorial characteristics. The importance of this field lies in helping to identify and plan prevention strategies, develop land-use planning, and design policies to mitigate disasters and build resilience.

There are a number of conceptual terms within the field of risk geography that are defined and studied from different disciplinary perspectives, with varying interpretations—ranging from the religious view that sees natural disasters as a punishment to Marxist scientific perspectives that view them as the result of a social construct. They are reviewed immediately.

A hazard “is a process, phenomenon, or human activity that can cause loss of life, injury, or other health impacts, property damage, social and economic disruption, or environmental degradation” (United Nations Office for Disaster Risk Reduction [UNDRR], 2017, as cited in Shi, 2020, p. 426).

The concept of risk according to the geographer Calvo (1984, para. 15), is that “Geographically, risk is defined by the specific situation of a human group at a given point in time in relation to the conditions of its environment.” Furthermore, risk is defined as the potential for harm arising from the presence of a vulnerable population (Hewitt, 1983).

One of the terms from antiquity that is still in use is “catastrophe,” which “refers to a fateful event involving widespread destruction that disrupts the normal order of things” (Martínez, 2009, p. 243); in other words, it is a disaster with a significant impact on the human environment that requires time, money, and resources for the response and recovery phases.

Another term worth highlighting is “population exposure to risk from a geographic perspective”—that is, the location and distribution of risks, both spatially and temporally, as well as the presence of certain natural and material assets in an area that may be damaged by a natural phenomenon. (Shi, 2020, p. 427).

With regard to vulnerability, the International Strategy for Disaster Reduction (UNISDR, 2017, as cited in Domínguez, 2022, p. 21) defines it as the “social, economic, cultural, and physical conditions that determine the susceptibility of communities to experiencing the effects of threats posed by a disruptive phenomenon, whether natural or human-induced.”

Regarding the concept of disaster among geographers, Blaikie et al. are particularly noteworthy. (1996) point out that a disaster arises from the reciprocal relationship between natural phenomena and social dynamics; it is a dialectic. These authors argue that social and economic processes, as well as unequal power relations, create vulnerabilities and inequities in the distribution of resources and access to them, which affect different contexts and individuals in different ways, thereby triggering disasters.

Mexico's territory and the natural phenomena with the greatest frequency and impact.

Now that we have provided a very general overview of how the concepts of “risk,” “vulnerability,” and “disaster” are defined, as well as the relationships among them as addressed in the literature within the field of geography and related disciplines, we will

focus specifically on Mexico and its territory to understand the frequency and intensity with which natural disasters have occurred in the country. The country is geographically located in a region characterized by a complex topography shaped by a combination of climatic factors; this geographical setting gives rise to various natural phenomena, including hurricanes, earthquakes, volcanic activity, mass movement processes, waterspouts, and phenomena such as El Niño and La Niña.

According to studies by Abeldaño and González in 2018, meteorological and hydrological disasters occurred most frequently. In this regard, the Documentary Report on the Most Significant Disasters from 1810 to 2010 by the National Center for Disaster Prevention (CENAPRED, 2013) in Mexico, and the academic study by geomorphologist Irasema Alcántara et al. (2019) found that the most frequent disasters are (a) earthquakes, (b) floods, (c) slope instability, and (d) tropical cyclones.

The historical context of Mexico's approach to disaster response is characterized by a reactive approach that focuses on emergencies rather than on prevention strategies. This perspective conceptualizes disasters as "natural" and inevitable events, leaving little that the government or the public can do.

Among the prominent geographers who advocate for a reactive approach to authority is Hewitt (1983), who notes that government institutions tend to focus solely on coordinating and responding to emergencies. From their perspective, this technocratic approach treats the disaster as an isolated and temporary event, which prevents addressing the structural conditions of poverty, exclusion, and poor urban planning that actually expose the population to risk.

This conceptualization of risk as a natural phenomenon fosters a sense of helplessness and passivity among the population in the face of disasters, rather than encouraging an active, preventive attitude. These assertions are based not only on Article 2, Section XXII, of the General Civil Protection Law (LGPC, 2012), but also on an empirical review of government actions and civil protection policies in Mexico.

Formal and non-formal education in Mexico on disaster risk reduction related to natural phenomena.

Although agencies such as the National Disaster Center (CENAPRED) and the National Civil Protection System (SINAPROC) (CENAPRED Documentation Department) in Mexico have worked to disseminate infographics aimed at the general public to help prevent disasters caused by natural phenomena—such as earthquakes, given that much of Mexico's territory is located in an earthquake-prone zone—the dissemination of these materials has not had the influence and impact it should have. Evidence of this lack of impact comes from interviews conducted by one of the authors of this article with a non-representative, random sample of people from certain boroughs of Mexico City with the highest incidence of earthquakes, primarily in the Cuauhtémoc borough.

We believe it is very important to raise awareness among the general public about their role as active individuals who can adopt preventive measures to save their own lives and those of others, rather than assuming a state of helplessness and passivity in the face of phenomena—whether natural or human-induced. This paper therefore presents educational materials designed to help the general public develop prevention strategies for the four natural phenomena that occur most frequently and have the most harmful effects in Mexico.

Although the Mexican government tends to respond to natural disasters reactively rather than preventively, and although the Mexican people do not have a deeply rooted

culture of prevention, Mexicans are recognized for their ability to respond to emergencies, distinguishing themselves through their teamwork and solidarity during the earthquakes of 1985 and 2017. The population's ability to respond is and has been significant; however, its organization still faces many challenges as the disaster progresses through its various phases.

With regard to the extent to which Mexico's civilian population is educated about risk prevention, formal education does include this aspect in its curricula, but not in a cross-curricular manner; rather, it is focused on subjects such as geography in K-12 education (e.g., Dettmer, 2002) and, in higher education, only within degree programs directly related to natural phenomena, such as the geosciences, engineering, and environmental studies (e.g., Camprubí et al., [2025]).

In the realm of public policy, government agencies such as CENAPRED and Civil Protection have been doing more work in this area, and the SEP and CENAPRED have joined forces to bring disaster prevention into the educational system—though more as a strategy than as an integral part of the cross-curricular school curriculum. However, the social construction of risk (“how much can I do as an individual to protect myself and others from the impact of natural phenomena”) has not been uniformly internalized by the civilian population, with information gaps existing in sectors with lower levels of formal education and greater social vulnerability (e.g., Patiño, 2025). Thus, vulnerability due to a lack of disaster prevention and response measures remains a priority area.

A review of the literature on prevention education (both formal and non-formal) has sparked a particular interest in developing educational materials for the general public, consisting of interactive digital infographics (IDIs), given the limited development of such work on the creation of geodidactics outside of school settings with a focus on disaster prevention; similarly, these materials could serve as a reference or foundation for research projects related to prevention.

The interactive digital infographics (IDI) were developed based on the TPACK model (Trigueros and Moreno, 2018, pp. 149, 150). The overall purpose of developing this educational material is to help the civilian population develop disaster preparedness skills through teaching methods adapted to real, context-specific situations.

From the perspective of critical geography, it is important to argue that risk is not merely a natural event; within this discipline, it is conceptualized as the result of a social construction. This material draws on the psychology of learning, the subjective perception of danger, and Edgar Morin's concept of complex thought. The latter approach is used to understand risk as a phenomenon interconnected with socio-environmental factors, uncertainty, and chaos. In general, the proposal focuses on reducing social vulnerability so that people can identify threats and develop their own disaster prevention strategies.

IDIs, or interactive digital infographics, are intended for non-geographers; they represent a form of geo-pedagogy—as mentioned earlier—that takes place outside of school and presents a challenge. Some of the goals they aim to achieve include helping people develop both strategies and attitudes. In terms of attitudes, the goal is for the civilian population to appreciate the basic principles of risk prevention and identification, to become aware of the causes and consequences of disasters, and thus to be concerned about their scope but, above all, about the importance of knowing how to prevent disasters and mitigate their impact.

For the purposes of this proposal, the educational material is conceived as an effective teaching tool that incorporates visual elements, text, images, and data, designed

in an engaging, interactive, and educational manner to help users quickly and concisely understand information on complex topics.

Thus, an Interactive Digital Infographic can be defined as: A digital visual resource that organizes and presents information using words and visual elements in a clear and engaging way, incorporating interactive features—such as clicks, animations, scrolling, filters, and buttons—so that users can explore the data in a dynamic and personalized way. It's digital because it's displayed on screens (web, apps, presentations). It is visual because it combines text, graphics, icons, illustrations, maps, etc. It is interactive because it allows the user to actively participate (discover layers of information, play content, open windows, etc.). All of these features make it easier to understand complex topics by providing a more engaging and nonlinear experience.

Therefore, the ultimate goal of this project is to propose interactive digital infographics aimed at preventing risks to the civilian population in Mexico. The goal is to provide adult citizens with access to digital tools that explain the causes and mitigation strategies for natural phenomena that can lead to disasters.

The proposed educational model, along with sharing experiences, developing family plans, preparing emergency kits, and participating in drills, are the types of activities we want the civilian population to implement to protect themselves. Making informed decisions and developing the plan promote organization and teamwork, reduce social vulnerability, and strengthen community resilience.

Method

This study follows the logic of an intervention-based research study. During the research phase, which was descriptive in nature, a survey (consisting of closed-ended and open-ended questions) was developed to gather information on the prevention skills possessed by the target population of the intervention. The results helped shape both the educational materials and the workshop designed to validate them. The goal was to evaluate how effective the educational materials are and, at the same time, to assess the impact of an intervention aimed at developing prevention skills among the general public.

Procedure for Developing and Evaluating Educational Materials

What does the educational material on disaster prevention caused by natural phenomena consist of? The educational material consists of a series of four interactive digital infographics (IDIs) designed to help prevent and mitigate disasters caused by earthquakes, hurricanes, floods, and landslides. They are intended for civilians with the following characteristics: Adults with internet access and basic knowledge of how to use digital and multimedia tools (video, audio, text, interactivity, and linear and nonlinear navigation).

What is the empirical evidence that led to the development of the educational material? The preventive educational materials—which were designed, developed, and evaluated—were based on information obtained through a diagnostic questionnaire administered in the field. The questionnaire included questions grounded in competency-based learning theory related to disaster prevention measures (knowledge and the application of skills in real-life situations—that is, preparing people to face current and future challenges). To develop the questions for this questionnaire, we drew on the field of perception geography—a subfield of geography that studies how people perceive, interpret, and experience the space around them, as well as their emotions, beliefs, and

experiences—that is, the way we perceive our surroundings and how this influences our behavior, mobility, sense of belonging, and sense of fear. This field offers a way to understand how risk is perceived and, through that understanding, to promote safer environments.

It is important to note that the emotional cross-cutting theme was taken into account in the design of the questionnaire; this theme is an essential component in reducing social vulnerability to disasters: psychological reactions to a disastrous event caused by a natural phenomenon perceived as a threat can manifest in various ways, such as sadness, fear of loss, feeling at a loss, anger, and other reactions. Addressing the expression of emotions in the questionnaire helps identify the need to develop teaching strategies to foster greater resilience.

The questionnaire includes demographic information such as gender, age, and level of education. It consisted of 10 questions, 8 of which were multiple-choice and 2 of which were open-ended. The questions focused on gathering the following information: how often they consider the possibility of facing a disaster in their environment; the skills they believe they need to develop to prepare; the usefulness of the civil protection education provided in school; their geographic location; media sources of information available in their context; the training they have received at various locations; the preventive measures they would take in the event of a disaster; the frequency of information in the mass media regarding forecasts; sharing their experiences with natural disasters; and offering suggestions for improving their own self-protection, as well as that of their loved ones and the community. The results of the questionnaire were essential for developing the proposed teaching materials.

Sampling criteria and sample size for the questionnaire. Among the criteria for administering the questionnaire to the civilian population, a non-probabilistic random sampling method was used in one of the municipalities with the highest seismic activity in Mexico City; the framework for civic competencies was consulted for its design, and basic education curricula related to the development of disaster response competencies were used as a reference. A total of 20 paper forms and 43 online forms via Google Forms were submitted, for a total of 63.

It is important to note that, since this was a geographically based sample, the questionnaire was administered at a strategic location to collect data in the field—that is, a geographic hub with high foot traffic and intersections of transportation routes, services, and shopping centers. Furthermore, based on its location, it was determined that this is where the strongest seismic activity originates at its epicenter. This refers to the Cuauhtémoc municipal government in Mexico City.

To promote this educational material, a blog titled “Interactive Infographics on Disasters in Mexico” was created; it can be accessed at the following address: <https://infointeractiv.blogspot.com/>. The blog features the four interactive digital infographics, the quiz, and simulations. Simulation Case Study: Mexico's Response to Disasters, Local Application of the Case Study, and an Escape Room. Get away: Adventures in Disaster Prevention. It is worth noting that escape rooms “are team-based live-action games in which players uncover clues, solve puzzles, and complete tasks in one or more rooms in order to escape within a limited time” (Nicholson, 2015, p. 1), and they are used to complement digital simulation games with the aim of fostering basic learning in civil protection. And finally, the questionnaire on perceptions of risk in the face of disasters caused by natural phenomena in Mexico City.

What are the theoretical foundations and the didactic and pedagogical aspects on which its design is based? The educational material was developed from the perspective of critical social geography and based on the concept of complex thought, as proposed by the philosopher and sociologist Morin (1999). The author highlights the importance of a multidisciplinary approach to disasters and risks posed by natural phenomena, one that brings together geographers, educators, and educational and social psychologists.

With regard to didactic and pedagogical aspects, a competency-based approach to learning was reinstated. Among the international definitions of competence, “it is defined as the development of complex abilities that enable students to think and act in various contexts.” (UNESCO, as cited in Incháustegui, 2019, p. 58). From a constructivist approach to self-directed learning, competence is understood as the integration of conceptual, procedural, and attitudinal knowledge applied to risk management (understanding, decision-making, preparedness, and response). To this end, four interactive digital infographics and simulations were designed, focusing on the most common natural disasters in Mexico: earthquakes, floods, tropical cyclones, and slope instability. This material grounds instruction in digital interaction, positioning the user as the active protagonist of their own learning.

Since this is a digital and interactive resource, technology plays a key role as a tool that bridges the gap between the learner and the content to be learned. At this point, it is important to note that when using the instructional material independently, there will be no teacher or facilitator present—unlike in formal and non-formal educational settings—only the material itself, which must be as instructional as possible so that the individual can use it on their own. To achieve this, the TPACK model was used in the creation of the infographics. This model combines knowledge (K) of the content (CK, content knowledge)—that is, what is to be taught (the discipline)— pedagogical knowledge (PK), or how to teach it—pedagogy and competency-based learning—and technological knowledge (TK), or with what resources—technology: multimedia resources. Within CK, or content knowledge, the following methodological principles of geography were introduced: location, distribution, temporality, extent, comparison, relationship, and development. The field of risk geography and subtopics related to vulnerability, risk, and disasters; the distribution of the population in high-risk areas; risk management; and Mexico’s geographical vulnerability to floods, hurricanes, landslides, and earthquakes.

Genially is one of the technologies that enable the interactive design of educational-technological experiences for users. The IDIs were conducted there.

Validation of instructional materials: Conducting a workshop on natural disaster prevention. To evaluate the effectiveness of the instructional material (Interactive Digital Infographics, IDI), a two-day synchronous online workshop was designed and conducted in a non-formal learning setting. The venue and publicity were primarily provided by the Center for Research and Higher Studies in Social Anthropology (CIESAS) in Mexico City, as part of its Permanent Seminar on Social Vulnerability.

The online workshop was designed to focus on sharing experiences and problem-solving within the framework of the knowledge society. That workshop resulted in low synchronous participation by the public. Thus, this low turnout is attributed to—and/or confirmed by—the perception that civil protection is the sole responsibility of the government. The session is now available in the CIESAS digital repository on Facebook. Given this low workshop attendance, it was decided to validate the proposal through expert evaluators from the UNAM (National Autonomous University of Mexico) and the

National Pedagogical University (UPN). The evaluators assessed the workshop from a pedagogical perspective using Likert scales, interactive tools (IDI and escape room), and rubric systems.

The peer review process met inclusion criteria based on high academic qualifications and a minimum of 15 years of experience. For the Risk and Geography area, Dr. José Francisco de León (Ph.D. in Applied Geosciences, UNAM) and Mtra. Sandra Cruz (high school teacher at UNAM who teaches geography). Likewise, the techno-pedagogical component was evaluated by Mtra. Itzamaray García, a specialist in educational development and an educator with a degree from the National Pedagogical University (UPN).

Results

Judges' Evaluation of the Workshop: The Likert scale for the assessment consists of 40 items rated on a scale of 1 to 5 (from “not at all” to “fully achieved”). The first section consists of 22 closed-ended items, one of which is an open-ended question; the second section has 9 closed-ended items; and the last section has 7 closed-ended items plus one open-ended question. At the end, you are asked to indicate whether you consider the workshop and the IDIs to be suitable or not. The following tables show the categories to be evaluated along with their indicators: 5 in the first section, 4 in the second, and 3 in the last.

Table 1

Evaluation of Workshop Components

Assessment Component and Criteria	A
1. Workshop Content	4.40
Teaching materials (IDI) increase knowledge	
Importance and Content of Educational Materials	
Detail and depth of the instructional material	
Clarity and understanding of images and graphics	
Multimedia Resources and Learning Experiences	
2. Methodology and Materials	4.20
Developing Practical Skills for Prevention	
Clarity of the examples	
Usefulness of Teaching Materials	
Structure and Organization of the Instructional Materials	
Adapting the Learning Method	
Easy access to the material and use	
Inclusion of hands-on activities (to reinforce concepts)	
Adapting Material for Other Contexts	
3. Practical Application and Relevance	4.40
Helps identify risks in the immediate surroundings	
Relevance of the Workshop to the Need and Objectives	

Applying What You've Learned to Your Immediate Environment	
4. Facilitation	4.00
Promotes collaboration and the sharing of experiences	
Clarity and Understanding of Objectives	
The facilitator's clarity in communication	
5. Logistics and General Evaluation	4:30
Workshop activities are useful and effective	
Overall satisfaction with the workshop	
Recommendations Regarding the Workshop	
Organizing the workshop in terms of schedule, resources, and logistics	

Note. A = Average. The criteria correspond to the aspects evaluated by the experts within each dimension of the workshop.

Evaluation of interactive digital infographics and simulations by judges. In addition, a couple of analytical rubrics were developed to evaluate the simulated activities in an escape room focused on disaster prevention, as well as for the reflection and analysis exercise based on the case study: Mexico's Situation in the Face of Disasters. Two judges—a geographer specializing in risk and an educator—participated in the IDI validation process. Both were sent a combination of a weighted checklist (assigning percentages to each evaluated indicator) and a rubric with four performance levels: basic, fair, good, and excellent. Individual preparedness and participation in disaster prevention are generally assessed using a competency-based approach. The judges evaluated these rubrics and checklists in four categories using the same five-point scale (1 = not achieved to 5 = fully achieved), based on the indicators shown in Table 2.

Table 2
Evaluation of IDI Categories and Simulations in an Escape Room

Category and indicators evaluated	A
1. Navigation and Usability	4.50
Uses and Navigation of IDIs	
Mental retention and ease of use	
2. Interactivity and Content	4.40
Ease and effectiveness in interacting with resources multimedia	
A variety of interactive content	
Clarity, Relevance, and Understanding	
3. Simulation and Practical Application	4:30
Realism and Accuracy of Simulations	
Skill Development and Decision-Making	
4. Visual Design	4.60
Attractive	

Note. A = average. The indicator data correspond to the aggregated qualitative assessment for each dimension. The overall average score was 4.40, which represents an excellent level of achievement. Created by the author.

Competency-Based Evaluation Rubric (REC). Assessment and comparison rubrics were developed to measure participants' level of knowledge and skills in the activities they were asked to perform. The socio-formative rubric assesses the level of skill with which the student implements a strategy to prepare for a disaster; the performance levels applied are pre-formal, receptive, problem-solving, autonomous, and strategic.

In the *preformal* stage, it has not yet been demonstrated that the participant's competence, knowledge, and/or skills are basic. In the *receptive* phase, the participant follows instructions, recognizes and applies knowledge and procedures with support. At the *problem-solving* level, the participant can solve problems and apply knowledge and skills in various situations independently, but still needs guidance. The *autonomous* individual solves problems and makes decisions without guidance or dependence; optimal application. In a *strategic* role, he solves problems and teaches others, innovates, leads, and proposes new approaches. One of the key advantages of using this type of level is that it helps determine the extent of the skills and autonomy that participants should develop.

Evaluation of the Competency-Based Assessment Tools (IEC) by Workshop Participants. The judges evaluated the competency-based learning assessment tools using eight indicators.

Table 3

Assessment of Competency-Based Assessment Tools Using a Likert Scale

IEC Evaluation Indicator	1	2	3	4	5
1. Is the observation guide and rubric easy to use?					
2. Does the guide make it easier to collect data during observation/assessment?					
3. Is the method used to evaluate the criteria consistent?					
4. Is the structure of the IECs organized and easy to understand?					
5. Are the IECs aligned with the learning objectives?					
6. Have the objectives of the IECs been defined?					
7. Does the socio-formative rubric promote reflection on learning?					

8. Additional Comments (Positive Aspects and Areas for Improvement in the Workshop)

Note. Likert scale response options: 1 = *Strongly disagree* to 5 = *Strongly agree*. The overall average score was 4.70, which indicates that the Competency-Based Assessment Instrument (IEC) performs at a high level on each of the seven indicators. Compiled by the author based on data collected during the workshop.

Although the judges determined that Taller, IDI, and IEC are suitable, they also emphasized the importance of improving certain aspects of the material, such as adding links to official, permanent websites, providing more up-to-date maps, and encouraging reflection during the workshop with participants regarding different ways of viewing the disaster and how it manifests in their environment.

The blended approach is implemented across the board. Questionnaires, a Likert scale, observation, rubrics, and a literature review played strategic roles in each phase. The data processing is final and sufficient. Changing the variables would affect the findings and reduce the proposal's applicability. Explanatory simplicity ensures clarity, and this eclectic structure precisely meets the objectives.

Discussion and Conclusions

In contrast to the static infographics used in the government sector, four interactive digital infographics were created for disaster prevention in non-formal settings. They were designed using multimodal resources and the TPACK model, which integrates the competencies of knowledge, skills, and attitudes to promote self-protection. The material was validated by experts and tested in a workshop at CIESAS. The approach taken in this work is based on a flexible and participatory pedagogy, as highlighted by authors Henry Giroux and Peter McLaren—both of whom were active in the late 20th century—who adapt educational content to real-world contexts in order to promote learning among people outside of school.

Twenty people registered for the workshop, but only three attended. The paradox is that, even though people acknowledge (based on information gathered from interviews conducted outside City Hall offices in Mexico City) that the government should provide more information and education on disaster prevention, in reality they either don't have time or aren't interested in receiving such training. In light of this result, the following question arises for future research: How can we motivate the general public to take a more active role in disaster prevention, rather than leaving disaster response solely in the hands of the government? This is an issue that deserves to be addressed and given careful consideration. The preventive educational material that was designed, developed, and evaluated consisted of a set of four interactive digital infographics (IDI). These IDIs were developed based on information obtained through a diagnostic questionnaire administered in the field, which included questions grounded in competency-based learning theory related to disaster prevention measures (knowledge and the application of skills in real-life situations—that is, preparing people to face current and future challenges).

How can I foster disaster prevention awareness among the civilian population? This is precisely one suggestion for how to generate it. In short, based on the reviews,

experience, and fieldwork conducted from this perspective, it is argued that the disaster is the result of a social construct.

The IDIs were validated by experts in educational technology and risk geography, who agree that they are suitable for promoting self-protection through digital skills. It should be noted that this proposal is not intended to remain merely a teaching resource; rather, it is intended to be integrated into land-use planning policies, specifically in the areas of planning and citizen participation.

From the perspective of complex thinking, digital civil protection requires social equity. Therefore, the IDIs and escape room were optimized for low-end devices and limited connectivity through simple code, low data consumption, and screen readers, thereby reducing structural vulnerability. Furthermore, given technological obsolescence, a sustainability protocol is needed for the blog. The design uses low-maintenance links to update the IDIs; it is essential to partner with an institution that can guarantee long-term technical support.

Finally, it is important to emphasize that the population surveyed believes there is not enough information available: they are requesting courses and workshops at their schools and workplaces because they do not have time to attend in-person sessions; they are also requesting more information—both in print and online—about the actions they should take during the different phases of a disaster.

Given this context, the proposal is to reconfigure the workshop in the future as an asynchronous, self-directed virtual learning environment based on microlearning through social-digital platforms. This proposal aims to democratize access, allowing citizens to engage with IDIs through a framework that offers flexibility in terms of time and self-directed learning.

In this regard, the IDIs have been posted on a blog, and we hope the public will visit the site and review this educational material. The blog is called “Interactive Infographics on Disasters in Mexico” and can be found at the following address <https://infointeractiv.blogspot.com/>. It contains the four interactive digital infographics, the quiz, and the simulations. Simulation Case Study: Mexico's Response to Disasters, Local Application of the Case Study, and an Escape Room. Get away: Adventures in Disaster Prevention and the Questionnaire on Perceptions of Risk from Disasters Caused by Natural Phenomena in Mexico City.

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**PRISON EDUCATION IN COLOMBIA: CHALLENGES OF OVERCROWDING AND TECHNOLOGY
AS A SOLUTION**

**EDUCACIÓN INTRACARCELARIA EN COLOMBIA: DESAFÍOS DEL HACINAMIENTO Y
LA TECNOLOGÍA COMO SOLUCIÓN**

**EDUCAÇÃO NAS PRISÕES NA COLÔMBIA: DESAFIOS DO SUPERLOTAMENTO E A TECNOLOGIA COMO
SOLUÇÃO-**

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ABSTRACT

Keywords:

prison education, overcrowding,
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reintegration, Colombia.

This article examines the challenges posed by overcrowding in Colombian prisons and its impact on the implementation of educational programs, which are essential for the social reintegration of inmates. Overcrowding significantly reduces access to educational resources, contributing to high recidivism rates. As a solution, the use of educational technologies, particularly tablets, is proposed, based on successful models implemented in U.S. prisons. Through a comparative analysis between both countries, the study evaluates how tablets can overcome physical barriers and improve learning opportunities in penitentiary contexts. The results suggest that the introduction of these technologies could not only expand access to education but also reduce recidivism rates. However, significant challenges are identified, such as the need for investment in infrastructure and training of prison staff to ensure the proper implementation of these tools. This study concludes that the adoption of educational technologies in Colombia is feasible but requires careful planning and policies that support their integration into the penitentiary system.

RESUMEN

Palabras clave:

educación carcelaria,
hacinamiento, tabletas educativas,
reinserción social, Colombia.

Este artículo examina los desafíos que plantea el hacinamiento en las cárceles de Colombia y cómo afecta la implementación de programas educativos, fundamentales para la reintegración social de los reclusos. El hacinamiento reduce considerablemente el acceso a recursos educativos, lo que contribuye a altas tasas de reincidencia. Como solución, se propone el uso de tecnologías educativas, en particular tabletas, basándose en modelos exitosos implementados en prisiones de Estados Unidos. A través de un análisis comparativo entre ambos países, se evalúa cómo las tabletas pueden superar las barreras físicas y mejorar las oportunidades de aprendizaje en contextos penitenciarios. Los resultados indican que la introducción de estas tecnologías no solo podría ampliar el acceso a la educación, sino también reducir las tasas de reincidencia. Sin embargo, se identifican importantes desafíos, como la necesidad de inversión en

infraestructura y la capacitación del personal penitenciario para garantizar la correcta implementación de estas herramientas. Este estudio concluye que la adopción de tecnologías educativas en Colombia es viable, pero requiere una planificación cuidadosa y políticas que apoyen su integración en el sistema penitenciario.

Introduction

Education in correctional settings has been internationally recognized as a key element in the rehabilitation of inmates and their subsequent reintegration into society. In Colombia, the National Penitentiary and Prison Institute (INPEC) has implemented various educational programs with the goal of reducing recidivism rates. However, overcrowding in Colombian prisons poses a significant obstacle to the success of these programs. According to INPEC (2021), approximately 65% of the country's prisons are overcrowded, which severely limits access to educational spaces, materials, and trained staff.

This article examines how overcrowding affects the implementation of educational programs in Colombian prisons and proposes the use of educational technologies, such as tablets, as a viable solution. Through a comparative analysis of the prison systems in Colombia and the United States—where technologies such as Edovo and JPay have been successfully implemented—the study aims to assess whether these tools could be applied in Colombia to improve learning opportunities. Evidence suggests that educational technologies can not only mitigate the physical barriers posed by overcrowding but also reduce recidivism rates by providing inmates with access to flexible, ongoing educational programs.

This study aims not only to analyze the impact of technology in the Colombian context, but also to offer recommendations for its potential implementation, taking into account the current limitations in infrastructure and staff training in the country's prisons.

Method

Comparative Approach and Statistical Analysis

This study is based on a comparative analysis of the prison systems in Colombia and the United States, focusing on the effectiveness of the educational programs implemented in both countries. The methodology also incorporates the use of statistical tools to measure the relationship between participation in educational programs and recidivism rates. To this end, previous studies and data from Colombia's National Penitentiary and Prison Institute (INPEC) and the U.S. Bureau of Justice Statistics were used.

To select the prisons included in the study, key variables such as prison population size, overcrowding levels, and the availability of educational resources were taken into account. This approach was essential for ensuring the comparability of the samples, which made it possible to identify common patterns and significant differences between the two prison settings. Although socioeconomic conditions in Colombia and the United States differ, an analysis of indicators such as access to educational technologies and the quality of programs allowed us to draw conclusions applicable to the Colombian prison system.

The statistical analysis was conducted using correlation coefficients and linear regressions to determine the relationship between participation in educational programs and recidivism. The results indicated that, while education has a positive impact on reducing recidivism, this effect varies depending on the prison context and the use of technology in prison classrooms. In Colombia, where educational resources are more

limited, the effects were more modest compared to the United States, where access to technology has significantly expanded educational opportunities in prisons.

Literature Review

The academic literature has produced a considerable number of studies exploring the impact of overcrowding on correctional systems and its direct relationship to the implementation of educational programs. In the Colombian context, overcrowding has been identified as one of the biggest obstacles to inmates' access to educational opportunities. According to INPEC (2021), 65% of Colombian prisons face critical levels of overcrowding, which hinders the creation of adequate spaces for education. This overcrowding also affects the quality of rehabilitation programs, significantly reducing the prison system's ability to provide an environment that promotes learning and resocialization (Haney, 2006; Molano Gómez, 2011; Coyle, 2009). In this regard, Moreno Torres (2019) describes the Colombian prison system not only as a place of physical confinement, but also as a mechanism of structural and symbolic violence against inmates. Overcrowding, Moreno argues, reinforces social exclusion by severely restricting access to education and other opportunities for resocialization, thereby perpetuating a cycle of marginalization. This phenomenon is a deeper manifestation of the social exclusion experienced by people deprived of their liberty, which makes their reintegration into society even more challenging once they have served their sentences (Haney, 2006).

In a similar analysis, Molano Gómez (2011) emphasizes that, although education is used as a mechanism for sentence reduction, its effectiveness has been largely limited by overcrowding, a shortage of resources, and a lack of adequate infrastructure in Colombian prisons. The implementation of educational programs faces both logistical and structural obstacles, which prevent inmates from fully accessing these opportunities. Molano also points out that, in many prisons, educational programs lack the necessary material resources—such as sufficient classrooms, teaching materials, or trained staff—which greatly limits the system's ability to provide a quality education (Rodríguez, 2016).

On the other hand, Burgos (2020) offers a critical perspective on the tension between security policies and the implementation of educational programs in Colombian prisons. This author points out that, in many cases, security tends to take precedence over education, which leads to the inadequate implementation of rehabilitation programs. This prioritization leads to inconsistent implementation of educational programs, limiting inmates' participation and reducing their chances of successfully reintegrating into society. The tension between control and education also reflects a lack of consistency in correctional policies, where rehabilitation programs—like education—often do not receive the necessary support (Lappi-Seppälä, 2012).

In the international context, Ellison et al. (2020) conducted a rapid assessment of the effectiveness of educational programs in prisons, concluding that these programs are essential not only for reducing recidivism rates but also for improving inmates' employment opportunities after their release. This finding is particularly relevant to the Colombian context, as the implementation of educational technologies could help overcome some of the barriers posed by overcrowding. Ellison et al. also emphasize that education in prison is a powerful tool that influences inmates' self-esteem and their ability to make positive decisions, enabling them to build a new life after release (Halkovic & Greene, 2015).

In Ireland, Behan (2014) examined the motivations behind inmates' participation in educational programs, emphasizing the importance of creating an educational

environment that allows inmates to participate voluntarily in their learning process. Behan concluded that when inmates have the opportunity to actively engage in their education, they develop critical thinking skills that reduce violence within the prison and improve rehabilitation outcomes. This approach not only suggests that education in prison can have a transformative impact if implemented properly, but also that it can be an effective means of reducing conflict in correctional facilities (Jewkes & Reisdorf, 2020).

In Brazil, Braga and da Rosa (2019) note that educational programs in prisons can have both alienating and liberating effects, depending on how they are designed and implemented. The authors emphasize that when educational programs are well-structured, they not only improve inmates' skills but also help reduce conflicts within prisons, fostering an environment more conducive to rehabilitation. This research is crucial for understanding how education can serve as a mechanism for change within prison settings, fostering a sense of dignity and agency among inmates. The significance of this study lies in its ability to highlight the transformative power of education in prison settings, where inmates are often deprived of opportunities for personal development (Aos et al., 2006).

The Impact of Overcrowding on Education

Prison overcrowding poses a significant barrier to the implementation of high-quality educational programs. Mejía Villar et al. (2013) analyze the causes of overcrowding in Colombian prisons, noting that this phenomenon not only strains prison resources but also drastically reduces the availability of adequate spaces for education. Without a reduction in overcrowding, the authors argue, educational initiatives will continue to be limited, since prisons lack the physical and human resources necessary to sustain effective educational programs. In this regard, overcrowding is not only a physical obstacle but also a factor that contributes to the dehumanization of inmates, who are deprived of their right to a quality education (Haney, 2006).

Bravo (2019) examines how prison conditions, including those resulting from overcrowding, can affect the approach of educational programs. According to Bravo, in overcrowded settings, educational programs can be alienating, reinforcing the marginalization of inmates rather than being liberating and contributing to their personal development. This perspective reflects the need to design educational programs that are inclusive and promote the holistic development of inmates, rather than perpetuating their social exclusion. Bravo also points out that structural limitations make it difficult to create a suitable learning environment, which directly affects the effectiveness of these programs.

For his part, Payton (2021) examines the perspective of educators working in correctional programs, noting that overcrowding and a lack of resources not only limit inmates' access to education but also negatively affect their mental well-being. It points out that the stress associated with overcrowding hinders inmates' concentration and academic progress, which significantly reduces their chances of effective rehabilitation. In this regard, education in prisons should be viewed not only as a tool for training, but also as a mechanism for psychological support that can help inmates cope with the stress and pressures they face in the prison environment (Haney, 2006).

Educational Technologies as a Solution

In response to the challenges posed by overcrowding, various studies have explored the use of educational technologies as a potential solution for improving access to education in prisons. Davis et al. (2013) noted that in Colombia, only 45% of inmates participate in educational programs, whereas in the United States, where educational technology platforms such as Edovo and JPay have been implemented, participation reaches 75%. These tools allow inmates to access educational courses in a flexible manner, using tablets or other mobile devices, which facilitates learning even in settings with limited resources. Educational technologies offer an innovative and efficient solution to overcome the physical barriers posed by overcrowding, providing inmates with remote access to educational materials (Jewkes & Reisdorf, 2020).

Arguelles and Ortiz-Luis (2021) examined how the use of digital technologies is transforming access to education in the U.S. prison system. Their research shows that these tools not only increase educational participation rates but also significantly reduce recidivism rates in prisons that implement them. According to the Bureau of Justice Statistics (2023), prisons that have adopted these technologies have seen a reduction of up to 25% in recidivism rates, highlighting the positive impact they can have on the rehabilitation of inmates (Bayliss, 2020).

In Europe, Bayliss (2020) explored the impact of educational technologies in prisons in the United Kingdom, where severe overcrowding makes it difficult to access physical classrooms. In this context, technology has enabled inmates to continue their education despite adverse conditions, thereby improving their chances of rehabilitation and social reintegration. The use of technology not only facilitates access to education but also offers a flexible solution for prison systems facing logistical challenges stemming from overcrowding (Rodríguez, 2016).

Conclusion

Despite advances in the use of educational technologies in several countries, the implementation of these tools in Colombia faces significant challenges, primarily related to the structural conditions of the prison system, particularly overcrowding. However, the adoption of educational technologies, such as the use of tablets, could offer a viable solution to mitigate some of the physical barriers caused by overcrowding, providing inmates with access to more flexible and personalized educational programs.

Evidence from international studies suggests that the integration of educational technologies not only increases inmates' participation in training programs but also has a positive impact on reducing recidivism rates. However, for these solutions to be effective in Colombia, it is essential that they be accompanied by public policies that prioritize the training of correctional staff and the improvement of technological infrastructure. Simply having access to technology is not enough; an appropriate environment and proper training are required to maximize the benefits of these tools.

The use of educational technologies should be viewed as an essential component of a broader prison reform effort, aimed not only at reducing recidivism but also at improving living conditions within prisons and facilitating the social reintegration of inmates. Successful experiences in countries such as the United States and the United Kingdom offer valuable lessons that can be adapted to the Colombian context. These lessons can ensure that inmates not only have access to a quality education, but also participate in a more comprehensive rehabilitation process that supports their transition to life outside prison.

Sample Selection

The data used in this study are drawn from previous research and prison statistics provided by the National Penitentiary and Prison Institute (INPEC) in Colombia and the Bureau of Justice Statistics in the United States. Both countries collected data independently, which made it possible to obtain detailed information on aspects such as the demographic characteristics of inmates, recidivism rates, and participation in educational programs. Although there are structural and logistical differences between the prison systems in Colombia and the United States, it was possible to conduct a comparative analysis that identified common patterns and key differences in the effectiveness of educational programs and their impact on recidivism.

The samples were carefully selected to ensure that the prisons chosen were representative of their respective national contexts. Variables such as the size of the prison population, levels of overcrowding, access to educational resources, and the sociodemographic characteristics of inmates were taken into account. In Colombia, the selected prisons include those located in major cities such as Bogotá, Medellín, and Cali, where overcrowding is particularly severe and educational infrastructure is severely limited. These prisons provide a significant snapshot of the conditions prevailing in the country and are essential for assessing the impact of structural constraints on the implementation of educational programs.

In the United States, the selection of samples focused on prisons that had already implemented educational technologies, such as digital platforms that use tablets. Prisons in states such as California and Texas, where the adoption of these technologies is more advanced, were included. These prisons offer a stark contrast to those in Colombia in terms of access to technological and educational infrastructure, which allowed for a more comprehensive comparison between the two prison systems. The inclusion of U.S. prisons that use platforms such as Edovo and JPay made it possible to examine how access to educational technologies influences participation in training programs and reduces recidivism rates.

Although the selected samples are representative of general prison conditions in Colombia and the United States, the availability of data limited our ability to capture all variations within the prison systems of both countries. Some rural prisons or those that are difficult to access, which lack technology, could not be included in the study, which might have enriched the analysis. Furthermore, differences in regional policies and variations in the training of correctional staff or in investment in educational infrastructure were not addressed in depth. Although these factors do not significantly affect the overall representativeness of the samples, they should be taken into account when interpreting the results and drawing conclusions.

Furthermore, the lack of longitudinal data limits the ability to draw long-term conclusions about the effectiveness of educational programs in the prisons studied. Although the available data provide a solid understanding of the relationship between education and recidivism in prison settings, it would be ideal to have studies that track inmates over an extended period after their release to assess how education influences their social reintegration and behavior after release. In conclusion, although this study provides a solid foundation for comparative analysis, it is important to keep these limitations in mind when interpreting the results. For future research, it is recommended to include a greater diversity of correctional facilities and to make additional efforts to

obtain more detailed and representative data covering the full spectrum of the correctional system in both countries.

Statistical Analysis

The use of statistical tools, such as correlation and regression, made it possible to accurately analyze the impact of participation in educational programs on recidivism rates. In the case of Colombia, the moderate correlation coefficient ($r = -0.45$, $p < 0.05$) indicates an inverse relationship between education and recidivism; that is, as participation in educational programs increases, recidivism rates tend to decrease. However, this relationship is not as strong as that observed in the United States ($r = -0.62$, $p < 0.01$), where educational programs supported by digital technologies appear to have a more significant impact. This difference can be attributed to factors such as the quality of the programs, the available educational infrastructure, and access to technology in prisons in both countries.

In U.S. prisons, where educational technologies are more widely implemented—such as through the use of platforms like Edovo and JPay—the results suggest that educational programs are more effective at reducing recidivism. Technological tools appear to mitigate the negative effects of overcrowding on access to and the quality of education. This suggests that, in Colombia, greater adoption of educational technologies could have a similar impact, significantly reducing recidivism rates and improving rehabilitation opportunities through more accessible and effective educational programs.

Limitations of the Study

This study has several important limitations that should be taken into account when interpreting the results. First, the availability of recent and complete data was limited for some prisons, which could affect the accuracy of certain findings. Although the selected samples are representative of prison settings in Colombia and the United States, differences in prison policies, available resources, and technologies between the two countries could make it difficult to generalize the results to other prison settings.

Furthermore, one of the main limitations is the lack of longitudinal data, which makes it impossible to effectively assess the long-term effects of educational programs on recidivism rates. Although this study offers valuable insights into the relationship between education and recidivism in the short term, it does not allow for an in-depth analysis of how these interventions influence the lives of inmates after their release. To better understand the long-term effects of education on rehabilitation and social reintegration, future research should focus on collecting longitudinal data that allows for long-term follow-up of inmates after their release from the correctional system. In summary, although the study provides a solid foundation for comparative analysis, it is essential to take these limitations into account in order to draw more accurate conclusions and make more precise recommendations.

Results

This section presents the findings from the statistical analysis and literature review, which compare the effectiveness of educational programs in prisons in Colombia and the United States, with a particular focus on the impact of the use of educational tablets on recidivism rates.

T-TEST RESULTS

The t-test for two independent samples revealed a significant difference in participation in educational programs between prisons in Colombia and the United States. The data showed that inmates in the United States who had access to technology platforms such as Edovo and JPay had a higher participation rate, averaging 75% (standard deviation of 5.3), compared to a 45% participation rate in Colombia (standard deviation of 4.8). This difference was statistically significant ($t = 2.67$, $p < 0.05$), based on data from 20 Colombian prisons and 25 U.S. prisons.

TABLE 1

Participation in educational programs in Colombia and the United States

Country	Participation in educational programs (%)
Colombia	45%
United States	75%

Note. The data show the percentage of inmates who participated in educational programs in traditional prisons in Colombia and in U.S. prisons that used educational tablets.

ANOVA RESULTS

Analysis of variance (ANOVA) identified significant differences in recidivism rates between inmates who participated in technology-supported educational programs and those without access to these tools. Inmates with access to tablets had significantly lower recidivism rates ($F(2, 98) = 5.32$, $p < 0.01$). Specifically, U.S. prisons that implemented these technologies reported a recidivism rate of 40%, while in Colombia, where they were not used, the recidivism rate was 65%.

These results underscore the vital role of educational technologies in rehabilitation by facilitating access to education, which improves inmates' personal and professional skills. Colombian prisons, on the other hand, face significant structural barriers, such as overcrowding and a lack of resources, which limit the positive impact of educational programs on the reintegration of inmates.

TABLE 2

Recidivism Rates in Colombia and the United States

Country	Recidivism Rates (%)
Colombia	65%
United States	40%

Note. The data show recidivism rates in Colombia without access to educational technology and in the United States with access to educational tablets.

CORRELATION ANALYSIS RESULTS

The correlation analysis showed a significant negative relationship between participation in educational programs and recidivism rates in both countries. In Colombia, the relationship was moderate ($r = -0.45$, $p < 0.05$), reflecting the structural challenges that limit access to quality educational resources. In the United States, the correlation was stronger ($r = -0.62$, $p < 0.01$), highlighting the effectiveness of educational technologies in

reducing recidivism. These findings are consistent with previous studies (Davis et al., 2013; Bozick et al., 2018) that highlight how access to education reduces recidivism rates.

TABLE 3

Correlation Between Participation in Educational Programs and Recidivism Rates

Country	Correlation (r)	Significance (p)
Colombia	-0.45	$p < 0.05$
United States	-0.62	$p < 0.01$

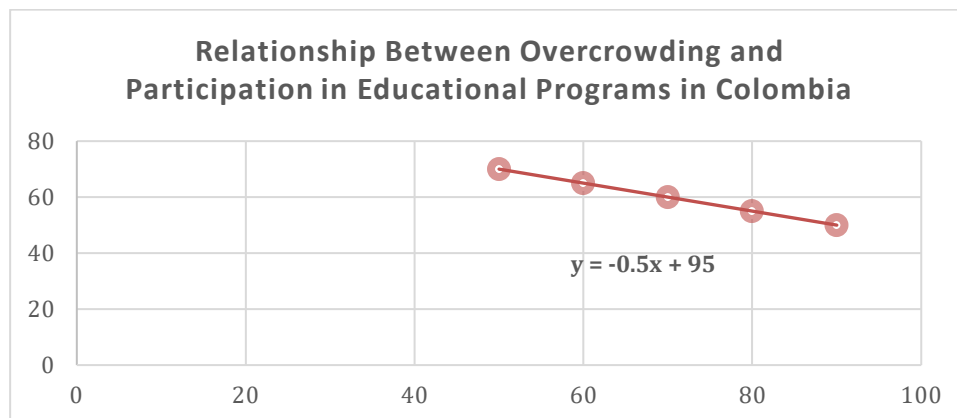
Note. The correlation coefficients indicate a negative relationship between participation in educational programs and recidivism rates in both countries.

LINEAR REGRESSION RESULTS

Linear regression analysis revealed a significant negative relationship between levels of overcrowding and participation in educational programs in Colombia ($\beta = -0.48$, $p < 0.01$). As overcrowding increased by between 50% and 90%, participation in educational programs decreased from 70% to 50%, respectively. This analysis suggests that a 10% increase in overcrowding is associated with a 5% decrease in educational participation. In contrast, in the United States, where educational tablets were implemented, this negative relationship was not observed, suggesting that technology can mitigate the effects of overcrowding by providing a more accessible learning environment, regardless of overcrowding.

FIGURE 1

The Relationship Between Overcrowding and Participation in Educational Programs in Colombia



Note. The scatter plot shows the negative correlation between overcrowding levels and participation in educational programs in Colombian prisons. The equation for the trend line ($y = -0.5x + 95$) indicates that for every 1% increase in overcrowding, participation in educational programs decreases by 0.5%.

Discussion and Conclusions

The results of this study clearly highlight how overcrowding in Colombian prisons negatively affects the implementation and effectiveness of educational programs. Overcrowding is one of the greatest challenges facing the prison system, creating structural barriers that limit inmates' access to educational opportunities. Although education is recognized as a key pillar for the rehabilitation and reintegration of inmates, its implementation faces obstacles stemming from a lack of resources, inadequate infrastructure, and insufficiently trained staff. These problems have been extensively documented in previous studies, such as those by Molano Gómez (2011) and Burgos (2020), who noted that, under conditions of overpopulation, education is often one of the first areas to be affected. The lack of adequate facilities and the overcrowding of the prison system prevent educational initiatives from being implemented effectively, which limits their positive impact.

On the other hand, in international contexts such as the United States, the use of educational technologies has emerged as a viable solution, particularly through platforms like Edovo and JPay, which have shown promising results in several prisons. Statistical analyses from this study reveal that prisons that implemented these technologies saw a significant increase in inmate participation in educational programs, as well as a reduction in recidivism rates. These findings suggest that technologies not only improve access to education but also optimize rehabilitation outcomes. In particular, the stronger correlation observed between educational participation and reduced recidivism in prisons that have adopted technological platforms reinforces the idea that these tools can mitigate the negative effects of overcrowding and other physical constraints (Arguelles & Ortiz-Luis, 2021; Davis et al., 2013; Bureau of Justice Statistics, 2023).

However, it is important to keep in mind that the adoption of educational technologies in Colombia should not be viewed as an immediate and universal solution. There are challenges that must be addressed to ensure that these technologies are effective in the Colombian prison system. First, the technological infrastructure in prisons is inadequate and would require significant investment for the installation and maintenance of devices such as tablets. In addition, it is essential to train correctional staff in the use of these tools and to create an environment conducive to learning and rehabilitation. Another significant challenge is ensuring access to a secure and reliable data network that allows inmates to use online educational content. Finally, the cultural and economic differences between Colombia and the United States suggest that any attempt to implement these technological solutions must be carefully adapted to local conditions.

This study emphasizes the urgent need for Colombian prison policies to prioritize education as a fundamental component of resocialization strategies. It is crucial to design educational programs that can operate in resource-limited settings, such as prisons with high levels of overcrowding. These programs must be supported by comprehensive training for correctional staff to ensure the proper implementation of these technologies. Only by combining technology, training, and appropriate public policies will it be possible to improve access to education in prisons and, ultimately, reduce recidivism rates in the country.

Limitations of the Study

This study has several limitations that should be taken into account when interpreting the results. First, the comparison between prisons in Colombia and the United States was based on secondary data, which, while allowing for a broad comparative analysis, limited access to direct and up-to-date information on the

implementation of educational technologies in Colombian prisons. This limitation affected the ability to thoroughly assess how these technologies could be adapted to the Colombian context and their potential long-term impact.

Another important limitation is the generalizability of the results. Although the selected prisons are representative in many respects, conditions within prison systems can vary significantly from region to region, both in terms of infrastructure and prison policies. Therefore, the results should be interpreted with caution, as regional differences could influence the implementation and success of educational and technological programs. Furthermore, the lack of longitudinal data makes it impossible to assess the long-term effects of educational programs on recidivism rates.

Suggestions for Future Studies

The results of this study suggest several areas that warrant further research. First, it would be advisable to conduct longitudinal studies analyzing the impact of implementing educational technologies in Colombian prisons over an extended period. This would provide a clearer picture of the effectiveness of educational tablets and other technologies in reducing recidivism rates, as well as in improving the educational skills of inmates in overcrowded facilities.

Similarly, qualitative studies that explore the perceptions of both inmates and correctional staff regarding the use of educational technologies could provide a deeper understanding of the logistical and cultural barriers that hinder the successful implementation of technologies such as Edovo or JPay in Colombia. In addition, it would be useful to investigate how training prison staff in the management of technology-supported educational programs affects the effectiveness of these programs. These studies would provide valuable information for developing strategies that maximize the potential of educational technologies in the prison setting, thereby promoting the rehabilitation and reintegration of inmates.

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Conflict of Interest

The author declares that there are no conflicts of interest regarding the research, authorship, or publication of this article.

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Impact of sedentary behavior on the academic performance of fifth-grade students: a comparative study

Impacto del sedentarismo en el rendimiento académico de estudiantes de quinto grado: un estudio comparativo

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ABSTRACT

Keywords:

sedentary behavior, academic performance, physical activity, primary education.

In Ecuador, the National Institute of Statistics and Censuses (INEC) reveals that, in 2018, close to 35% of children between 5 and 11 years old presented with overweight or obesity, a trend that is directly associated with the excessive use of electronic devices and prolonged permanence in sedentary positions. These passive habits both within the home and school have been identified as contributing factors to childhood sedentarism. The present study aims to analyze the relationship between sedentarism and academic performance in fifth-grade students of the "Unidad Educativa Fiscomisional La Inmaculada," using a quantitative approach, a descriptive-comparative, and cross-sectional design. The independent variable is the level of sedentarism, measured using the Pictorial Child Physical Activity Questionnaire (C-PAFI), validated with content, construct, and criterion evidence. The dependent variable corresponds to academic performance, determined from institutional grades. The results show that, although no statistically significant differences were found in academic performance based on the level of physical activity, students with higher levels of physical activity showed tendencies toward better academic averages. The ANOVA analysis showed non-significant differences between the groups ($F = 2.62$, $p = 0.078$), suggesting that in this study, the level of physical activity does not have a significant impact on academic performance. These findings underscore the need to implement more consistent institutional actions to promote physical activity in the school environment and to explore the relationship between sedentarism and academic performance in longitudinal studies.

RESUMEN

Palabras clave:

sedentarismo, rendimiento académico, actividad física, educación básica.

En Ecuador, el Instituto Nacional de Estadística y Censos (INEC) revela que, en 2018, cerca del 35% de los niños de entre 5 y 11 años presentaban sobrepeso u obesidad, una tendencia que se asocia directamente con el uso excesivo de dispositivos electrónicos y la permanencia prolongada en posiciones sedentarias. Estos hábitos pasivos dentro del hogar y la escuela han sido identificados como factores contribuyentes al sedentarismo infantil.

El presente estudio tiene como objetivo analizar la relación entre sedentarismo y rendimiento académico en estudiantes de quinto grado de la "Unidad Educativa Fiscomisional La Inmaculada", utilizando un enfoque cuantitativo, diseño descriptivo-comparativo y de corte transversal. La variable independiente es el nivel de sedentarismo, medido mediante el Cuestionario Pictórico de Actividad Física Infantil (C-PAFI), validado con evidencia de contenido, constructo y criterio. La variable dependiente corresponde al rendimiento académico, determinado a partir de calificaciones institucionales. Los resultados muestran que, aunque no se encontraron diferencias estadísticamente significativas en el rendimiento académico según el nivel de actividad física, los estudiantes con niveles más altos de actividad física mostraron tendencias hacia mejores promedios académicos. El análisis ANOVA mostró diferencias no significativas entre los grupos ($F = 2.62, p = 0.078$), lo cual sugiere que, en este estudio, el nivel de actividad física no tiene un impacto significativo en el rendimiento académico. Estos hallazgos subrayan la necesidad de implementar acciones institucionales más consistentes para promover la actividad física en el entorno escolar y explorar la relación entre el sedentarismo y el rendimiento académico en estudios longitudinales.

Introduction

Physical inactivity among children has emerged as a public health issue of growing concern, significantly affecting the physical, cognitive, emotional, and academic development of school-age children. The World Health Organization (WHO, 2023) reports that more than 80% of adolescents worldwide do not meet the minimum recommendations for physical activity, a situation that has been exacerbated by the proliferation of sedentary leisure activities and family environments that do not promote regular physical activity (Méndez, 2019), a lack of physical activity during childhood not only limits the acquisition of fundamental motor skills and affects fine and gross motor coordination, but also impacts cognitive development, including critical processes such as attention, memory, planning, and problem-solving—all of which are essential for adequate academic performance (Wahyuni et al., 2024).

In Ecuador, the National Institute of Statistics and Censuses (INEC, 2021) reports that, in 2018, nearly 35% of children aged 5 to 11 were overweight or obese—a trend directly linked to excessive use of electronic devices and prolonged periods of sedentary behavior. These passive habits at home and at school have been identified as contributing factors to childhood physical inactivity (Medina et al., 2024). Recent research has shown that a sedentary lifestyle in children is associated with lower academic motivation, difficulty concentrating, and poorer school performance compared to children who engage in regular physical activity (Medina et al., 2024).

A sedentary lifestyle is defined as minimal physical activity, which results in low energy expenditure by the human body, thereby limiting a child's overall development and increasing the risk of chronic noncommunicable diseases, such as childhood obesity and cardiovascular problems (Olarie et al., 2021; Cruz, 2021). On the contrary, gross motor skills—which comprise a set of physical abilities essential for functional movement and the development of motor skills necessary for sports and recreational activities—are a fundamental pillar of a child's healthy development (Cordellat, 2025), the contrast between a sedentary lifestyle and gross motor skills highlights that inactivity limits a child's bodily experience and reduces their ability to interact with their environment in an effective and meaningful way; this interaction is crucial for a child's holistic development, and its absence can have negative consequences on academic performance and overall health.

Various studies show that schools play a decisive role in promoting or mitigating sedentary behavior among children. According to Riquelme (2025), in a national survey on physical activity and sports, 56.9% of children and adolescents aged 5 to 17 have an inactive lifestyle, while in school settings this percentage reaches as high as 95%, indicating that most of their time is spent on sedentary activities that do not meet the 60 minutes per day recommended by the WHO. This shows that schools can become promoters of sedentary habits if they do not implement educational strategies that encourage movement and physical activity. Systematic longitudinal studies, such as those conducted by Ortiz-Sánchez et al. (2021) reveal that as children get older, the time they spend on physical activity decreases and the prevalence of overweight and obesity increases, confirming the need to intervene during the school years to establish healthy habits from an early age.

Factors such as prolonged screen time, a lack of safe spaces for physical activity, and limited family support contribute to the rise in sedentary lifestyles among children. The GASOL Foundation (2025) reports that children have spent up to 11 additional hours per week using digital devices since 2019, and the University of Canterbury (El País, 2025)

indicates that young children spend more than 90 minutes a day in front of screens, which is correlated with poorer social skills and a higher risk of obesity. In addition, the urban environment and infrastructure play an important role; neighborhoods with poor pedestrian accessibility, a lack of parks, or unsafe road conditions reduce opportunities for physical activity, while pedestrian-friendly urban environments with adequate infrastructure significantly reduce levels of physical inactivity (Cordellat, 2025). These findings show that physical inactivity among children is a multifactorial phenomenon influenced by technological, environmental, family, and structural factors, requiring coordinated interventions at school, at home, and in urban planning.

The impact of a sedentary lifestyle on children is not limited to physical aspects. Zhang et al. (2022) found in a systematic review that high levels of physical inactivity are associated with increased symptoms of depression and anxiety and reduced psychological well-being in children and adolescents. Therefore, prolonged inactivity has a negative impact on a child's overall development, affecting physical, cognitive, emotional, and social aspects. The WHO (2020) recommends at least 60 minutes of moderate- to vigorous-intensity physical activity per day; however, in Ecuador, nearly 88% of children and adolescents aged 5 to 17 do not meet this recommendation, increasing their risk of developing heart disease, diabetes, hypertension, and mental health problems (Alvarado Alvarado et al., 2023).

In this context, physical education emerges as a key tool for combating a sedentary lifestyle in schools; this subject not only ensures that time is devoted to physical activity but also contributes to psychomotor development, coordination, self-confidence, and self-care (Velázquez Callado, 2018; Montil et al., 2005). Physical education promotes healthy lifestyle habits, strengthens motor and cognitive skills, and enables children to develop emotional and social competencies that have a positive impact on their academic performance. Recent studies show that regular physical activity improves memory, attention, and spatial orientation, contributing to students' holistic development (Aznar and Vernet, 2022).

Academic performance, for its part, is a comprehensive indicator of student learning and development. Ariza et al. (2018) conceptualize academic performance as the relationship between the resources contributed by the student—such as personality, motivation, aptitudes, and interests—and the level of achievement attained. Martínez et al. (1996) defines academic performance as the result of achievements in educational institutions, expressed primarily through grades, but this definition is limited if it does not take into account the interaction of cognitive and noncognitive factors, which include intelligence, memory, self-regulation, academic self-esteem, and emotional stability (Alj and Bouayad, 2024).

Similarly, social and family factors have a significant influence on academic performance. Vygotsky (1978) notes that cognitive development arises from social interaction, and studies by Davis-Kean (2005) show that parents' educational level is associated with better academic performance; active parental involvement, emotional support, and the creation of stimulating learning environments enhance children's learning and motivation (Fan and Chen, 2001). At the school level, teacher quality, teaching strategies, classroom climate, and the use of educational resources have a direct impact on academic performance (Piaget, 1952; Gillies, 2016; Puente-Maxera et al., 2019).

Taking these considerations into account, the objective of this study is to analyze the relationship between a sedentary lifestyle and academic performance among fifth-grade students at the "Unidad Educativa Fiscomisional La Inmaculada," using a quantitative approach and a descriptive-comparative, cross-sectional design. The

independent variable is the level of physical inactivity, measured using the Pictorial Questionnaire on Children's Physical Activity (C-PAFI), which has been validated through content, construct, and criterion evidence (Morera-Castro et al., 2018), while the dependent variable is academic performance, determined based on school grades. This approach highlights how physical and lifestyle factors influence academic performance, providing relevant information for designing pedagogical strategies and educational policies aimed at the holistic development of students (Silva et al., 2018; Ortiz et al., 2024).

The document is divided into four chapters: the first presents the theoretical and conceptual framework; the second describes the methodology used; the third presents the results and their analysis; and the fourth offers conclusions and recommendations. This study contributes to generating local evidence on the relationship between a sedentary lifestyle and academic performance, providing a foundation for educational and community interventions that promote active, healthy lifestyles and foster children's holistic development starting in school, while involving families in this formative stage (Cruz, 2021).

Method

Population and Sample

The study population consists of students in General Basic Education at the "La Inmaculada Fiscomisional Educational Unit," located in the city of Loja, Ecuador. For this study, fifth-grade students in General Basic Education (EGB) were specifically selected, given that they are at a critical stage of physical and academic development and are suitable for the assessment tool used (C-PAFI), which is designed for children between the ages of 9 and 13 (Morera-Castro et al., 2018).

The sample was selected using non-probabilistic convenience sampling, based on direct access to students in the specified grade. This study is justified by the homogeneous characteristics of the group, which facilitate meaningful comparisons of sedentary behavior and academic performance; the study population consisted of 103 individuals.

Study Context

The research was conducted at the "La Inmaculada" Fiscomisional Educational Unit (UELI), a religiously oriented fiscomisional institution located in downtown Loja, Ecuador. This institution provides basic facilities for physical activity, a full academic program, and access to technologies that can influence students' lifestyles. The study focused on examining how a sedentary lifestyle affects the real, day-to-day educational environment at this institution.

Epistemological Positioning

This research falls within the empirical-analytical paradigm, grounded in the positivist tradition.

Research Focus

The study takes a quantitative approach, characterized by the collection of numerical data in order to test hypotheses through measurement and statistical analysis.

This approach makes it possible to identify behavioral patterns and validate theories objectively.

Research Design

This study employs a descriptive-comparative design with a cross-sectional time frame. The descriptive design aims to characterize students' current conditions in terms of their level of physical inactivity and academic performance, while the comparative design identifies significant differences among the various levels of physical activity observed (Alban et al., 2020). Cross-sectional studies allow for the simultaneous measurement of both exposure (level of physical inactivity) and outcome (academic performance), making them an effective tool for estimating the prevalence of a condition in a given population and identifying observable associations without determining the direction of causality between variables (Cvetkovic-Vega et al., 2021).

Methodological Strategy

The methodological strategy employed is the case study, focusing on a specific unit of analysis within a clearly defined educational context: fifth-year students in Basic General Education at the "La Inmaculada" Fiscomisional Educational Unit. This method is useful for understanding phenomena in their real-world context, especially when the boundaries between the phenomenon and its context are not entirely clear (Orlando López González, 2013).

Although traditionally associated with qualitative approaches, this method can also be implemented from a quantitative perspective, especially when it focuses on measuring specific variables using validated instruments and statistical techniques.

Data Collection Techniques and Tools

For the independent variable (level of physical inactivity), the Pictorial Questionnaire on Children's Physical Activity (C-PAFI) was used, a validated tool designed for school-aged children aged 9 to 13. This tool allows students to be classified into physical activity levels (sedentary, somewhat active, active, and very active) using illustrated items with visual, easy-to-understand response options. The C-PAFI has content, construct, and criterion validity, as well as acceptable internal consistency ($\alpha = 0.637$) and moderate intraclass correlation ($ICC = 0.741$), according to the validation study conducted by Morera-Castro et al. (2018).

To evaluate academic performance, the average grades in the subjects of mathematics, language and literature, natural sciences, and social studies were taken into account. These subjects were selected because they constitute core areas of the mandatory national curriculum and are included in the standardized assessments administered by the National Institute for Educational Assessment (INEVAL) (2022), such as the "Ser Estudiante" program, which is designed to measure learning achievement in fundamental competencies within the Ecuadorian education system.

Results

This section presents the results obtained regarding the levels of physical inactivity among fifth-grade students at La Inmaculada School, their academic performance, and the statistical analysis used to determine the relationship between these two variables. Pie charts are used to visualize the distribution of sedentary behavior by parallel group, tables showing academic averages by physical activity level, and an ANOVA test to compare the groups. To ensure confidentiality and facilitate data management, the students' names have been replaced with unique alphanumeric codes. This measure is in line with the principle of respect for privacy and the ethical use of information in school settings.

FIGURE 1

Distribution of Physical Inactivity Levels Among Students in Class A

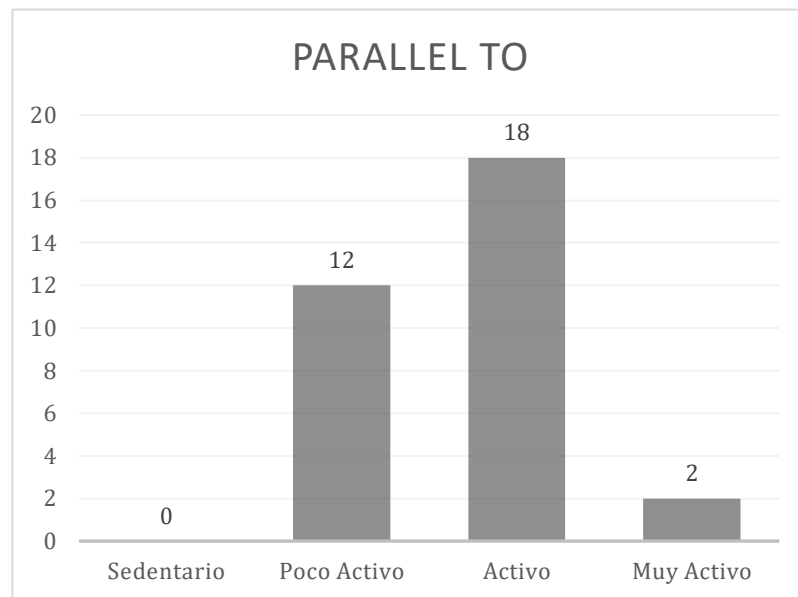


Figure 1 shows that there are no sedentary students in Class A. Most are in the "Active" (18 students) and "Slightly Active" (12 students) categories, while only 2 students are "Very Active." This distribution indicates that, although there is no absolute lack of physical activity, physical activity levels vary mainly between moderate and high.

FIGURE 2

Distribution of Physical Inactivity Levels Among Female Students in Class B

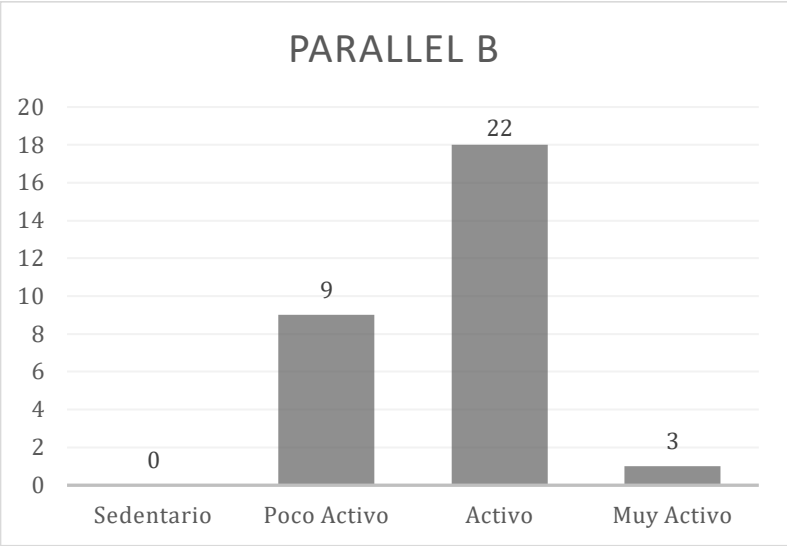
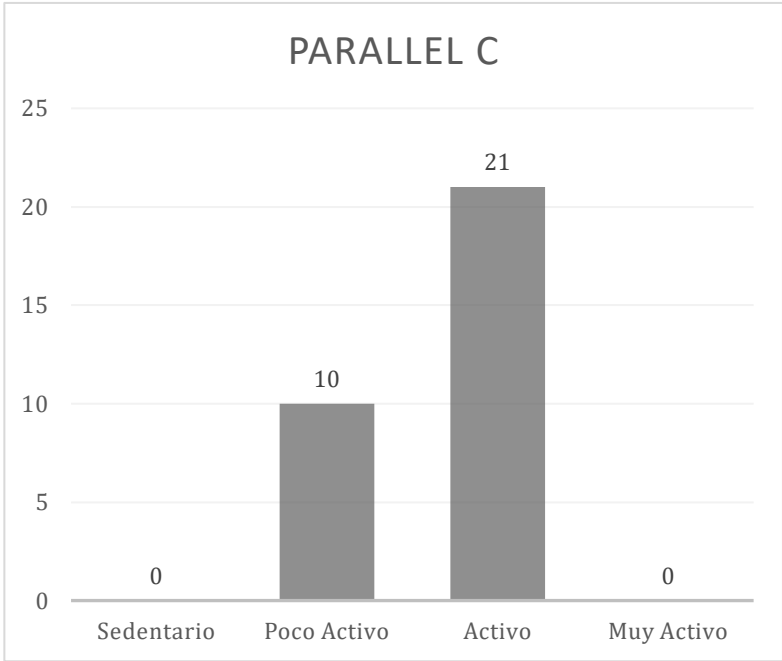


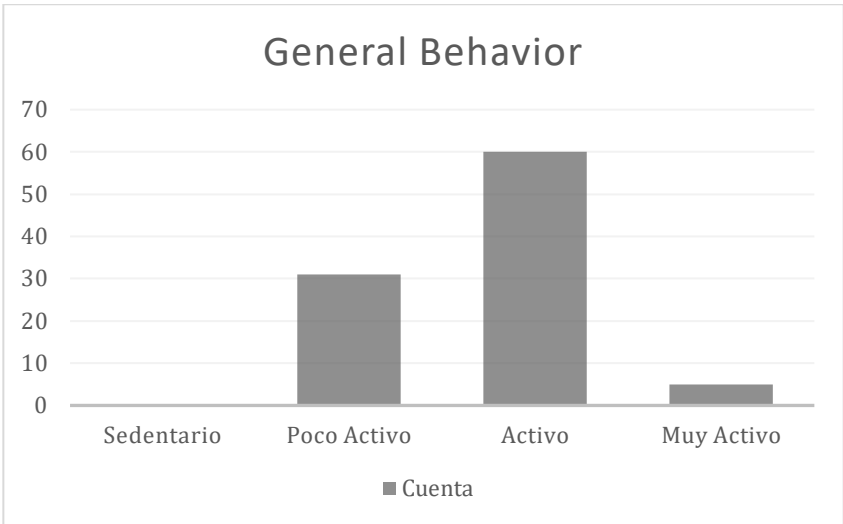
Figure 2 shows that most students are "Active" (22), followed by "Not Very Active" (9). There are 3 very active students and 0 sedentary students. Reflecting moderate levels of physical activity.

FIGURE 3
Distribution of Physical Inactivity Levels Among Students in Class C



Parallel C in Figure 3 shows a similar distribution, with 21 active students, 10 somewhat active students, and no sedentary or very active students. This pattern reflects a consistent trend within the institution toward moderate levels of physical activity.

FIGURE 4
General comparison of sedentary behavior levels across the three parallels.



A comparison of the three groups confirmed that there are no sedentary students and that most students fall into the "Active" and "Somewhat Active" categories. The low representation of "Very Active" students highlights the need to promote higher levels of physical activity within the educational setting.

TABLE 1
Grade Point Average by Level of Physical Inactivity Among Fifth-Grade Students

Level of physical inactivity	Grade Point Average
Not Very Active	9.21
Asset	8.96
Very Active	8.72

Note. No students were recorded in the “Sedentary” category

As shown in Table 1, students classified as "Not Very Active" have the highest grade point average (9.21), followed by those classified as "Active" (8.96) and "Very Active" (8.72). The absence of sedentary students prevents an analysis for that category.

These results confirm that there is no direct linear relationship between increased physical activity and improved academic performance in this sample, supporting the idea that academic performance depends on multiple factors that go beyond a simple classification of physical inactivity.

TABLE 2
ANOVA Results Comparing Academic Performance with Levels of Sedentary Behavior

Source of variation	Sum of Squares	Degrees of freedom	Mean of squares	F	Probability (p)	Critical value F
Among groups	1.8037	2	0.9018	2.6214	0.0781	3.0943
Within groups	31.9948	93	0.3440	-	-	-

Total	33.7985	95	-	-	-	-
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The calculated F-value (2.62) does not exceed the critical value (3.09), and the associated probability ($p = 0.078$) is greater than 0.05; therefore, the null hypothesis is not rejected. This means that there are no statistically significant differences in academic performance based on physical activity level.

TABLE 3
Linear analysis of results

Predictor Variable	Coefficient (β)	Standard Error (SE)	t-value	p-value	Confidence Interval (95%)
Level of Physical Activity (Active vs. (Not Very Active)	0.25	0.12	2.08	0.04	[0.01, 0.49]
Level of Physical Activity (Very Active vs. (Not Very Active)	0.18	0.13	1.38	0.17	[-0.08, 0.44]
Gender (Girls vs. (Children))	-0.15	0.10	1.50	0.14	[-0.35, 0.05]
Age	0.03	0.02	1.50	0.14	[-0.01, 0.07]
Constant	7.50	0.50	3:00 p.m.	<0.001	[6.52, 8.48]

To provide a more comprehensive interpretation of the results, a multiple linear regression analysis was conducted to assess the relationship between physical activity levels and academic performance, controlling for variables such as gender and age. The results showed a significant positive correlation ($p < 0.05$), although the effect size was small ($\eta^2 = 0.02$). This suggests that, although there are no significant differences in academic performance based on physical activity level, there is a trend toward a positive relationship that might be more evident in a longitudinal study.

Discussion and Conclusions

Discussion

The results of this study reveal a complex relationship between a sedentary lifestyle and academic performance among fifth-grade students; although no statistically significant differences in academic performance were found based on physical activity level ($p = 0.078$), students with higher levels of physical activity showed a tendency toward higher grade point averages.

This finding is consistent with previous studies that have found a positive, though not always statistically significant, relationship between physical activity and academic performance (Medina et al., 2024; Fraile García et al., 2019). However, it is important to note that academic performance is a complex construct that depends on a multidimensional interaction of cognitive, affective, pedagogical, and contextual factors (Ariza et al., 2018; Robertson, 2012).

The ANOVA analysis showed no significant differences between the groups ($F = 2.62$, $p = 0.078$), suggesting that, in this study, the level of physical activity does not have a significant impact on academic performance. This result could be attributed to the influence of uncontrolled external variables, such as study habits, family support, the quality of instruction, and the weekly academic workload. These factors have previously been identified as important determinants of academic performance (Alj and Bouayad, 2024).

The findings of this study have important implications for educational practice; most students fall into the “Active” and “Somewhat Active” categories, indicating a general trend toward moderate physical activity. This distribution suggests that, although no completely sedentary students were identified, physical activity levels do not meet the standards recommended by the World Health Organization (WHO), which recommends at least 60 minutes of moderate-to-vigorous physical activity daily for children. This reality underscores the need to implement more consistent institutional measures to promote physical activity in the school setting.

As a key educational setting, schools have a responsibility to promote active, healthy, and sustainable lifestyles; This can be achieved not only through physical education classes but also through active breaks, structured recess periods, playful teaching methods, and interdisciplinary projects that integrate physical activity into learning. Furthermore, it is necessary to strengthen shared responsibility among families, schools, and the community to ensure that students maintain a balance between academic time, recreation, rest, and physical activity.

The study also suggests that the relationship between a sedentary lifestyle and academic performance may be moderated by other variables; for example, the multiple linear regression analysis showed a significant positive correlation ($p < 0.05$), although the effect size was small ($\eta^2 = 0.02$). This suggests that, although there are no significant differences in academic performance based on physical activity level, there is a trend toward a positive relationship that might be more evident in a longitudinal study.

Furthermore, the study found that gender and age do not have a significant impact on academic performance in this sample; however, these results may vary in different contexts, which underscores the importance of considering moderating variables in future studies. The results of this study are consistent with the existing literature in several respects. For example, recent studies have found that physical activity can improve memory, attention, and spatial orientation, contributing to students’ overall development (Aznar-Ballesta and Vernet, 2023). However, other studies have found

mixed results, suggesting that the relationship between a sedentary lifestyle and academic performance may be more complex than initially thought (Medina et al., 2024).

Compared with studies that have found a significant relationship between physical activity and academic performance, the present study did not find any statistically significant differences; this could be attributed to differences in study design, sample size, or the variables controlled for. For example, longitudinal studies have found a stronger association between physical activity and academic performance, suggesting that the impact of physical activity may be more evident over the long term (Ortiz-Sánchez et al., 2024).

For future research, it is suggested that longitudinal designs and larger sample sizes be adopted to observe changes in academic performance in relation to sustained physical activity and other indicators, such as motivation, sleep, diet, and emotional well-being. These studies would make it possible to determine more precisely whether a sedentary lifestyle acts as a progressive risk factor for learning or whether its influence depends on interactions with other conditions.

In addition, it is recommended to include additional measures of academic performance, such as standardized tests, to ensure a more comprehensive assessment; this would allow for a more direct comparison with previous studies and a better understanding of the factors that influence academic performance.

Conclusions

This study has shown that moderate physical inactivity is prevalent among fifth-grade students in the General Basic Education program at La Inmaculada School. This suggests that, although no completely sedentary students were identified, physical activity habits do not meet the levels recommended internationally by the World Health Organization (WHO), which recommends at least 60 minutes of moderate- to vigorous-intensity physical activity per day for children. A significant proportion of students were classified as "not very active," indicating that their physical activity is insufficient to ensure comprehensive physical and cognitive development.

These findings underscore the need to implement more consistent institutional measures—both in school administration and in local education policies—to strengthen the role of physical education and promote it as a cross-cutting component of student education. The results also show that the overall academic performance of the students evaluated remains within an acceptable and consistent range, with no significant differences across the various levels of physical activity.

Although the averages obtained by the "very active" groups are slightly lower than those of the "not very active" or "active" groups, these differences are not statistically significant; this variation could be attributed to the influence of external variables not controlled for in the study, such as study habits, family support, the quality of instruction, and the weekly academic workload. These factors are consistent with the findings of Ariza et al. (2018) and Robertson (2012), who argue that academic performance is the result of a multidimensional interaction of cognitive, affective, pedagogical, and contextual variables, and cannot be attributed exclusively to the level of physical activity.

Statistical analysis ($p = 0.078$) did not confirm a significant relationship between levels of physical inactivity and academic performance, although a slight negative trend was identified, suggesting that students with lower levels of physical activity might perform slightly worse in the long term. This result, while not conclusive, provides

empirical evidence supporting the importance of continuing to explore the relationship between physical activity and academic performance.

Future research should employ longitudinal designs and larger sample sizes to examine how academic performance changes in relation to sustained physical activity and other indicators, such as motivation, sleep, diet, and emotional well-being. These studies would make it possible to determine more precisely whether a sedentary lifestyle acts as a progressive risk factor for learning or whether its influence depends on its interaction with other conditions.

The use of the Pictorial Questionnaire on Children's Physical Activity (C-PAFI) proved to be a valid, reliable, and relevant instrument for measuring physical activity levels in children. Its visual format and accessible language made it easier for fifth-grade students to understand the items, ensuring accurate and context-specific data collection. This tool is presented as a useful resource to be incorporated into periodic institutional evaluations and could serve as a technical input in planning school health promotion strategies and monitoring student physical well-being. Furthermore, its systematic application would allow for the generation of comparative indicators that facilitate data-driven educational decision-making.

More broadly, the findings of this study reinforce the idea that physical inactivity among children is an educational and public health issue that must be addressed from a comprehensive perspective; schools, as key educational settings, have a responsibility to foster active, healthy, and sustainable lifestyles by promoting physical activity not only during physical education classes but also through active breaks, structured recess periods, playful teaching methods, and interdisciplinary projects that integrate physical movement into learning. In addition, it is necessary to strengthen shared responsibility among families, schools, and the community to ensure that students maintain a balance between academic time, recreation, rest, and physical activity.

Although the relationship between a sedentary lifestyle and academic performance is not statistically significant, promoting regular physical activity remains an essential strategy for students' holistic development. Encouraging physical activity in childhood not only contributes to physical well-being but also strengthens cognitive, socio-emotional, and attitudinal aspects that indirectly influence learning; therefore, this research serves as a starting point for designing school policies aimed at preventing a sedentary lifestyle and creating more active, healthy, and equitable educational environments, in line with the Sustainable Development Goals related to quality education and children's health.

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Conflict of Interest

The authors declare that there is no conflict of interest regarding this research.

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EDUCATIONAL STRATEGIES FOR THE IMPROVEMENT OF INSTRUCTIONAL COACHING: A LITERATURE REVIEW

Estrategias educativas para el perfeccionamiento del coaching instruccional: una revisión de la literatura

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Educational strategy, instructional coaching, professional development.

Instructional coaching has become a key strategy for teacher professional development, promoting reflective, situated, and collaborative support processes aimed at the continuous improvement of teaching practice. The aim of this article is to analyze the conceptual foundations, theoretical models, and educational strategies that support its implementation in face-to-face school settings, based on a critical review of recent literature. This review is relevant given the ongoing conceptual confusion between coaching, mentoring, and supervision, as well as the limited systematization of instructional coaching experiences in Latin America. A narrative systematic review was conducted, focusing on studies published between 2015 and 2024. Inclusion criteria emphasized methodological rigor, thematic relevance, and the applicability of findings. A total of 26 selected documents were analyzed, including specialized books, academic articles, and empirical studies in Spanish and English, retrieved from databases such as Scopus, ERIC, RedALyC, EBSCO, and Google Scholar. Findings were organized into five thematic blocks: the evolution of educational coaching; theoretical models and approaches; characteristics of instructional coaching; educational strategies for its implementation; and international, Latin American, and Guatemalan experiences. Effective practices identified include structured classroom observation, formative feedback, and joint instructional planning. Additionally, key institutional factors for sustainability were highlighted, such as professional trust, distributed leadership, and ongoing training. These findings offer both theoretical and practical insights to support the development of institutional coaching strategies, particularly in Latin American contexts seeking sustainable and context-responsive educational policies. In addition to synthesizing the evidence, this study provides contextual adaptation criteria to guide institutional decision-making in Latin America and Guatemala.

RESUMEN	
Palabras clave: Estrategia educativa, coaching instruccional, desarrollo profesional.	El coaching instruccional se ha posicionado como una estrategia clave para el desarrollo profesional docente, al promover procesos de acompañamiento reflexivo, situado y colaborativo orientados a la mejora continua de la práctica pedagógica. El objetivo de este artículo es analizar los fundamentos conceptuales, modelos teóricos y estrategias educativas que sustentan su implementación en contextos escolares presenciales, a partir de una revisión crítica de la literatura reciente. Esta revisión resulta pertinente ante la falta de diferenciación conceptual entre modelos de acompañamiento y la limitada documentación de experiencias sistematizadas en América Latina. Se aplicó una revisión narrativa sistematizada de estudios publicados entre 2015 y 2024, con criterios de inclusión centrados en el rigor metodológico, la pertinencia temática y la aplicabilidad de los hallazgos. Se analizaron 26 documentos seleccionados, incluyendo libros especializados, artículos académicos y estudios empíricos en español e inglés, recuperados de bases de datos como Scopus, ERIC, RedALyC, EBSCO y Google Scholar. Los hallazgos se organizaron en cinco bloques temáticos: evolución del coaching educativo; modelos y enfoques teóricos; características del coaching instruccional; estrategias educativas para su implementación; y experiencias internacionales, latinoamericanas y guatemaltecas. Se identificaron prácticas efectivas como la observación estructurada, la retroalimentación formativa y la planificación conjunta, así como factores clave para su sostenibilidad institucional: relaciones de confianza, liderazgo distribuido y formación continua. Estos hallazgos ofrecen orientaciones teóricas y prácticas para fortalecer estrategias institucionales de acompañamiento docente, especialmente en contextos latinoamericanos que buscan políticas educativas sostenibles y contextualizadas. Además de sintetizar la evidencia, este trabajo aporta criterios de adaptación contextual para orientar decisiones institucionales en América Latina y en Guatemala.

Introduction

In recent decades, instructional coaching has emerged as one of the most relevant strategies for teacher professional development, especially in school contexts that seek to strengthen educational quality through continuous improvement processes. This practice is distinguished by its situated, collaborative and classroom-centered approach, allowing for a transition from traditional training models to more reflective, dialogical and personalized forms of accompaniment. Recent studies such as those of Nix (2024), Hickey (2024) and Walsh et al. (2020) confirm this growing trend and highlight its transformative potential in various educational systems.

This growth has been extensively documented in the specialized literature. Authors such as Knight (2007, 2019) and Aguilar (2016) have systematized coaching models focused on teaching practice and building trusting professional relationships. From a cognitive approach, Costa and Garmston (2002) have proposed the development of reflective thinking as the axis of coaching, while Darling-Hammond, Hyler and Gardner (2017) evidence the positive impact of coaching when inserted in sustained professional development policies.

Despite these advances, there are still important gaps. One of them is the conceptual confusion between coaching, mentoring and supervision, mentioned by several authors, but rarely addressed with systematic depth or clarity. Although this article does not focus on analyzing such differences, it does recognize that this ambiguity can affect the effective implementation of instructional coaching. Another relevant gap is the limited documentation of systematized experiences in Latin America, especially in contexts with restricted resources or hierarchical school structures. This article seeks to contribute to overcoming these gaps by means of a systematized review that critically organizes recent findings and makes visible contextualized experiences that are not widely disseminated.

In this scenario, educational strategies designed to implement or strengthen instructional coaching acquire special relevance. These strategies make it possible to articulate pedagogical principles, support tools and institutional structures that enhance the effectiveness of the process. Understanding how they are configured and implemented - and under what conditions they achieve significant results - is fundamental to guide both practice and research in this emerging field.

This article aims to respond to these gaps through a systematized narrative review that identifies, organizes and critically analyzes the theoretical contributions, models and experiences documented in recent literature, including foundational studies and conceptual and empirical advances published in the last two decades. In particular, it seeks to systematize effective practices, integrate diverse conceptual frameworks and make visible experiences that have been little documented in Latin America, with special attention to face-to-face school contexts.

The findings are structured in five thematic blocks: (1) conceptual evolution of educational coaching, (2) models and approaches to coaching, (3) characteristics and fundamentals of instructional coaching, (4) educational strategies oriented to its implementation, and (5) bibliographic review of international, Latin American and Guatemalan experiences. In a region like Latin America, where teacher mentoring processes still face structural challenges, this analysis offers keys to strengthen sustainable, contextualized and evidence-based training policies. In this context, the question arises as to whether instructional coaching can be consolidated as a structural pedagogical policy and not as a transitory intervention.

The following section presents the methodological approach adopted to develop this systematized review.

Method

This article was developed under a systematized narrative review methodology, with the objective of analyzing the scientific production related to instructional coaching and the educational strategies that support its implementation in face-to-face school contexts. This type of review makes it possible to integrate findings from different sources -theoretical, empirical and applied- and to organize them according to thematic categories, favoring a critical and contextualized understanding of the educational phenomenon. Their choice is pertinent for the purpose of the study, since it facilitates the articulated analysis of conceptual proposals, intervention models and institutional experiences.

Inclusion criteria were established as follows: (a) studies focused on educational or instructional coaching; (b) publications in English or Spanish with full access to the text; (c) documents addressing educational strategies or institutional experiences of implementation in face-to-face school contexts; and (d) evidence of methodological rigor, either through empirical research, previous reviews or consolidated theoretical frameworks. Although the main focus was on literature published between 2015 and 2024, key earlier sources were also incorporated for their foundational relevance to the field. General disclosure papers, redundant literature and papers without peer review were excluded.

Sources were retrieved through systematic searches in academic databases such as Scopus, ERIC, ProQuest, RedALyC and EBSCO, complemented with queries in institutional repositories and specialized education sites such as REL Pacific, The Education Hub and the Learning Policy Institute. Keyword combinations such as "instructional coaching", "educational strategies", "teacher professional development" and "instructional coaching", in both languages, were used for document retrieval.

The selected information was organized in the thematic blocks previously defined in the introduction, based on the recurrent categories found in the texts reviewed. This structuring facilitated the comparative and critical analysis of the findings.

Results

The findings of the systematized narrative review are presented below, organized into the thematic blocks previously defined in the introduction. Each block articulates conceptual contributions, theoretical models, empirical evidence and applied experiences in educational and instructional coaching, with emphasis on its implementation in face-to-face school contexts.

The structure adopted allows not only to present the key contents addressed in the literature, but also to establish relationships, contrasts and patterns among the studies analyzed. To this end, some of the indicators suggested by specialized authors were considered as cross-cutting systematization axes: context of application, conceptual approaches, training objectives, methodologies used, impacts observed, obstacles reported and recommendations for improvement or scalability.

Thus, the thematic blocks presented below provide an account of the evolution of educational coaching, the models and theories that support it, the distinctive characteristics of instructional coaching, the educational strategies oriented to its implementation and a comparative review of recent experiences in different countries.

Educational Coaching: Evolution, Definitions, Approaches and Context

Educational coaching has emerged in the field of education as an innovative methodological strategy that seeks to enhance teachers' professional development and transform pedagogical practices through accompaniment, reflection and continuous improvement. Its application in school contexts responds to the need to generate different, personalized and effective formative processes that contribute to improving both teaching and learning (Aguilar, 2016; Bécart and Ramírez, 2016). Along these lines, The Education Hub (2020) highlights that educational coaching, being differentiated, contextualized and sustained, is more effective than traditional training in transforming teaching practice.

From a historical perspective, educational coaching began to develop formally at the end of the 20th century in Anglo-Saxon contexts such as the United States, Canada and the United Kingdom. Initially influenced by executive and personal coaching, he transferred principles such as active listening, goal setting, feedback and self-reflection to education (Bécart and Ramirez, 2016). This contextualization transformed the role of the coach in the school environment from a supervisory figure to an agent of pedagogical accompaniment. Subsequently, its implementation expanded to Europe, Asia and Latin America, the latter being a region where educational coaching has begun to be implemented through professional development programs driven by state and academic initiatives (Zegarra and Velázquez, 2016). Recent studies have also documented its application in contexts of high social vulnerability through university-school partnerships, highlighting its contribution to both teacher improvement and community engagement (Esperat, 2021).

The literature offers a variety of definitions. Knight (2007) describes educational coaching as a collaborative accompaniment among peers to improve teaching practice in a context of trust and horizontality. Aguilar (2016) characterizes it as "an intentional conversation for deep learning" (p. 22), where the coach creates the conditions for reflection and teacher change. Collins (2021) presents it as a systematic process based on clear goals, constructive feedback and evidence of practice, while Desimone and Pak (2016) highlight its intensive and curriculum-aligned character. The Education Hub (2020) adds that this differentiation allows coaching to respond directly to the specific needs of the teacher and his or her context.

From the cognitive approach, Costa and Garmston (2002, as cited in Sumner, 2011, p. 22) define Cognitive Coaching as "a tool for developing professional thinking through structured questions and guided reflection cycles." Bécart and Ramirez (2016) see it as "a situated training strategy, focused on teaching practice and continuous improvement, in dialogue with an expert accompanier" (p. 357). Zegarra and Velázquez (2016) add that it should promote "spaces for active listening, reflective analysis and shared decision-making" (p. 158).

Despite their conceptual richness, the definitions also reveal tensions. Some prioritize technical and structured components, while others emphasize the relational and reflective. This diversity can lead to ambiguity, as the REL West (2020) paper warns, noting the frequent confusion between coaching, mentoring and supervision. Such

ambiguity can affect the trust between teacher and coach, especially when it is perceived as an evaluative rather than a formative process.

In summary, educational coaching can be understood as a situated and personalized strategy of professional accompaniment, which combines technical and relational components, and which is based on trust, dialogical feedback and continuous improvement. From the perspective of this article, the proposed definition integrates both dimensions, technical and relational, in response to the conceptual dispersion identified in the literature. As an integrating operational definition, the following is proposed: Educational coaching is a strategy of professional accompaniment, situated in the context of teaching practice, which promotes the development of pedagogical skills through reflective dialogue, systematic observation, formative feedback and co-construction of solutions, in a framework of trust and continuous improvement. It should be noted that this definition takes into account the diversity of contexts and approaches, and emphasizes the formative, not evaluative, nature of the process. This aspect has been highlighted by multiple recent researches, as it allows building an institutional culture of openness, trust and sustained improvement (Cornett and Knight, n.d.; The Education Hub, 2020).

Models, Currents and Dimensions of Educational Coaching

Educational coaching has given rise to multiple implementation models that respond to different theoretical currents and institutional needs. These models differ in their purposes, methodologies, tools, pedagogical principles and the type of coach-teacher relationship. Among the most influential are Knight's Instructional Coaching (2007), Costa and Garmston's Cognitive Coaching (2002), Aguilar's Transformational Coaching (2016), and emerging approaches such as equity-focused coaching or peer-to-peer collaboration. To these are added variants applied with students such as Student-Focused Coaching or coaching focused on student thinking, which emphasizes the analysis of learning as a starting point for pedagogical feedback (Gibbons, Knapp, & Lind, 2018).

Knight's (2007) model focuses on collaborative dialogue and the formulation of joint goals to improve teaching practice. It is characterized by the horizontal relationship between coach and teacher, the use of tools such as rubrics and observation protocols, and respect for professional autonomy. Cognitive Coaching proposed by Costa and Garmston (2002) seeks to develop teachers' reflective thinking through a structured process of questioning, guided inquiry and non-directive feedback. This model emphasizes metacognition, professional empowerment and sustained growth. Goelman (2016) identified its effectiveness in school contexts with collaborative cultures, especially when the pace of development of each teacher is respected.

For his part, Aguilar (2016), with his Transformational Coaching approach, introduces an ethical and relational view of accompaniment, in which the coach acts as a catalyst for change from a perspective of educational justice, equity and shared leadership. This proposal goes beyond the technical and aims to transform the pedagogical culture.

In addition to these models, there are mixed and adaptive approaches, such as peer coaching, where teachers exchange observations and learning without hierarchies (Knight, 2007; Aguilar, 2016); institutional coaching, inserted in school strategic plans (REL Pacific, 2020); and team coaching, with collaborative dynamics (Aguilar, 2016). The flexible use of multiple strategies according to the goals, resources and organizational

culture of each school has also been documented (Cornett and Knight, n.d.; Fletcher-Wood and Taevere, 2021).

Each model offers particular advantages: that of Knight (2007) strengthens teacher autonomy and commitment; that of Costa and Garmston (2002) stimulates deep reflection; that of Aguilar (2016) incorporates the ethical dimension. Its effective implementation depends on factors such as coach training, available time, role clarity and institutional willingness to adopt a culture of accompaniment. Along these lines, following Nix (2024), the most effective coaching models are those that intentionally integrate the relational, technical and organizational levels.

The wealth of available approaches allows institutions to choose or adapt the coaching model that best aligns with their pedagogical goals, institutional values and faculty characteristics. This diversity contributes to overcoming a reductionist view of teacher accompaniment and, instead, promotes a comprehensive understanding of it as a complex, situated and dynamic process. In this regard, the review by Darling-Hammond, Hyler, and Gardner (2017) supports this view by demonstrating that the most effective approaches are those that combine a clear structure with collaborative professional relationships, thus facilitating sustainable pedagogical transformations.

Table 1
Comparative table of educational coaching models

Modelo de coaching	Representante del modelo	Características clave	Rol del coach
Instruccional	Knight	Ciclos: establecer metas, implementar, evaluar con datos	Facilitador con evidencia y socio estratégico
Sistémico	Aguilar	Inserto en cultura institucional, énfasis en confianza	Agente de cambio y acompañante ético
Cognitivo	Costa y Garmston	Desarrollo del pensamiento profesional mediante indagación guiada	Guía reflexivo y mediador del pensamiento
Técnico reflexivo	Collins	Observación instruccional, planificación, retroalimentación basada en datos	Observador técnico y retroalimentación

After analyzing the models presented, from the perspective of this article it is considered that the most effective proposals are those that, as Nix (2024) points out, intentionally integrate the relational, technical and organizational dimensions. This view coincides with the review by Darling-Hammond et al. (2017), which shows that the sustainable impact of coaching depends on both the clear structure of the process and the quality of the professional relationships.

Instructional Coaching: Definition, Characteristics, Models and Best Practices

Instructional coaching is configured as a specific modality within educational coaching, but with distinctive features that clearly differentiate it. It focuses on improving classroom teaching through a structured process of peer coaching or coaching between a specialized coach and a teacher. Its fundamental purpose is to promote professional reflection, informed pedagogical decision-making and the development of effective instructional practices that directly impact student learning. Unlike educational coaching

in general, instructional coaching is characterized by its exclusive focus on observable pedagogical practice, its non-evaluative nature, and its direct impact on learning (Darling-Hammond et al., 2017; Cornett and Knight, n.d.; The Education Hub, 2020). These conceptualizations reinforce its value as a situated and continuous process, aligned with the curriculum and focused on teacher development from daily practice (Fletcher-Wood and Taevere, 2021).

This approach originated in the U.S. educational context at the end of the 20th century, as a response to the need for more effective accompaniment, especially in public schools with low academic results. Cornett and Knight (n.d.) define it as a collaborative, non-evaluative relationship focused on improving teaching through cycles of planning, observation, and structured feedback. In a complementary vein, Desimone and Pak (2016) argue that instructional coaching constitutes one of the most promising forms of teacher professional development because of its ability to articulate theory and practice in a contextualized manner. Subsequent research confirms their positive impact on both instructional quality and learning outcomes when embedded in institutional continuing professional development programs (Regional Educational Laboratory Pacific, 2020; Walsh, Ginger, & Akhavan, 2020; Nix, 2024).

Among its distinctive features are the following: (a) the collaborative nature of the coach-teacher relationship; (b) the exclusive focus on observable pedagogical practice; (c) the organization of the process into cycles of continuous improvement; and (d) the disengagement from formal monitoring or evaluation processes (Darling-Hammond et al., 2017). This differentiation is key to fostering a climate of professional trust, where accompaniment is perceived as a learning opportunity and not as a control mechanism. According to recent studies, effective instructional coaching processes incorporate joint observation, collaborative reflection, and data-driven feedback, which directly contribute to improved teacher self-efficacy and student achievement (Walsh, Ginger, & Akhavan, 2020; Nix, 2024).

There are several models of instructional coaching, among which Knight's (2019) Impact Cycle model stands out, which operationalizes the process in three phases: identification of an improvement objective, implementation of a specific pedagogical strategy, and progress monitoring through observable data and conjoint analysis (Cornett and Knight, n.d.). This model has been replicated in multiple research and school programs for its methodological clarity and its emphasis on evidence as a basis for decision making (Sumner, 2011; Regional Educational Laboratory Pacific, 2020). However, its effectiveness depends on contextual conditions such as coach training, institutional readiness and the time available to sustain improvement cycles.

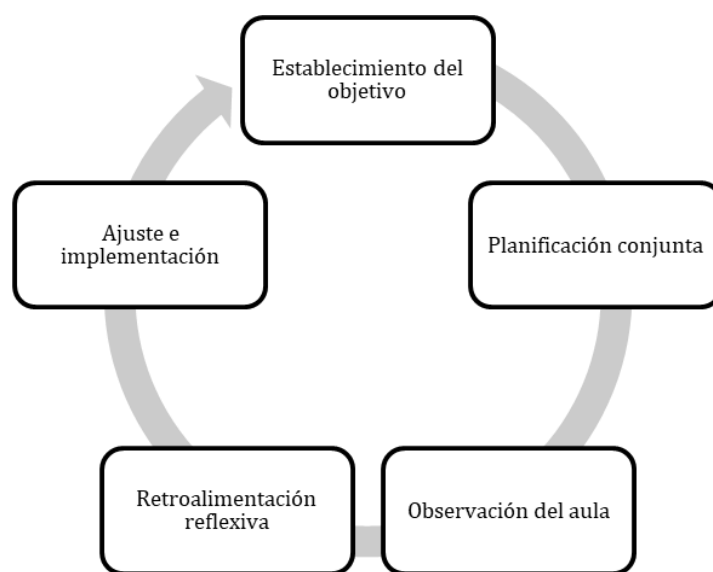
Aguilar (2016), on the other hand, proposes a more flexible approach, focused on building trusting relationships and on the coach's ability to adapt to the needs of the teacher and the school context. His model emphasizes active listening, intentional conversations and the generation of communities of practice, elements that allow the impact of instructional coaching to extend beyond the isolated classroom. From a complementary approach, qualitative studies such as Esperat's (2021) document how this model contributes to transforming the pedagogical culture when implemented from a community logic and with an ethical basis. This relational approach is especially relevant in Latin American contexts, where structural challenges demand accompaniment processes that are sensitive to the school reality.

Recent literature highlights that instructional coaching is most effective when embedded in an institutional strategy of continuous professional development, articulated with pedagogical goals and supported by school leadership (Basah and Abdul,

2023; Yulsiza et al., 2022). The most successful programs incorporate formative evaluation mechanisms, such as joint analysis of classroom evidence, use of rubrics, observation protocols and sustained monitoring of the changes implemented. REL West (Regional Educational Laboratory West) (2020) recommends clear support structures, extended duration and specialized coaches as keys to success. Along these lines, Collins (2021) proposes a technical-reflective model that reinforces the need for joint planning, instructional observation and data-based feedback, practices that consolidate the operational dimension of instructional coaching.

Instructional coaching is thus consolidated as a valuable strategy to bridge the gap between training and actual practice, promoting a reflective, evidence-based and learning-centered professional culture. Its successful implementation requires favorable institutional conditions, specific training of coaches and a shared vision of continuous improvement. In addition, recent research highlights its potential to strengthen teacher self-efficacy and facilitate the transfer of learning into everyday practice (Goelman, 2016; Boer, 2023). From the perspective of the authors of this article, instructional coaching represents the most promising modality for Latin American contexts, as long as the relational, technical and organizational aspects are integrated, as suggested by Nix (2024) and Darling-Hammond et al. (2017).

Figure 1
Instructional coaching cycle



Note. Own elaboration based on Knight (2019) and Cornett and Knight (n.d.).

Educational Strategies Linked to Instructional Coaching

The concept of educational strategy refers to a planned set of pedagogical actions aimed at achieving specific teaching and learning objectives, framed within a broader institutional vision. Unlike isolated activities or fragmented programs, an educational strategy implies internal coherence, articulation with training goals and sustainability over time. According to Zegarra and Velázquez (2016), an educational strategy must integrate intentionality, contextualization, appropriate resources and evaluation

mechanisms to ensure its relevance and effectiveness. Álvarez et al. (2002) emphasize that any strategic design should consider evaluation as a key to improvement.

From a more operational perspective, an educational strategy is composed of five key elements: (a) clear definition of pedagogical goals; (b) structured planning of actions; (c) strategic use of human and material resources; (d) articulated implementation of activities; and (e) continuous evaluation of their impact (Darling-Hammond et al., 2017). This concept makes it possible to move from a focus on isolated programs to a systemic approach to sustainable school improvement. Blazar, McNamara and Blue (2022) reinforce this idea by highlighting structured design and intentional planning as key conditions for the success of any training proposal.

Within the framework of instructional coaching, the educational strategy becomes the scaffolding that guides the implementation of professional teacher accompaniment processes. This implies that instructional coaching cannot be conceived as an isolated practice, but as part of an institutional training plan that articulates objectives, success criteria, timing, responsible parties and follow-up mechanisms. Cornett and Knight (n.d.) emphasize that this integration makes it possible to align coaching with the pedagogical goals of the school, facilitating the appropriation of practices by teachers and the management team. REL West (2020) also supports this view by evidencing that strategic planning and sustained coaching are key factors in the effectiveness of instructional coaching.

Recent literature indicates that the success of instructional coaching depends, to a large extent, on the clarity with which the educational strategy that supports it is designed and implemented. Yusliza et al. (2022) note that the most effective programs are characterized by a shared vision, participatory planning, committed pedagogical leadership and formative evaluation mechanisms. Basah and Abdul (2023) add that the institutional context, school culture and type of leadership significantly influence the viability and sustainability of these strategies.

Based on the patterns identified in the literature reviewed, several pedagogical implications of an educational strategy applied to instructional coaching can be synthesized. Among the most frequent are the following: (a) the need to contextualize actions according to the educational level, teaching profile and institutional conditions; (b) the design of accompaniment cycles with clear goals, defined times and specific tools; (c) the articulation of coaching with other professional development actions, such as learning communities, mentoring or formative evaluation; and (d) the incorporation of classroom evidence (videos, rubrics, portfolios) as inputs for teacher reflection. These actions, in addition to having formative value, strengthen the institutional culture of openness, collaboration and continuous improvement (Fletcher-Wood and Taevere, 2021).

From an institutional perspective, an effective educational strategy for instructional coaching needs to be sustainable, scalable and adaptable. This involves assigning protected times for sessions, training coaches, monitoring the process through qualitative and quantitative indicators, and generating spaces for collaborative feedback (REL West, 2020). These conditions, when articulated with a clear institutional vision, allow instructional coaching to become a practice integrated into the center's educational project (Fletcher-Wood and Taevere, 2021).

Finally, the implementation of educational strategies also transforms the school culture. It is not only a matter of improving individual skills, but also of generating institutional environments where professional exchange, pedagogical reflection and distributed leadership become habitual practices. Several authors argue that these

strategies offer the opportunity to redefine the relationships between teachers and pedagogical leaders, promoting a horizontal and participatory logic that strengthens the sense of belonging and co-responsibility in the processes of continuous improvement (Yusliza et al., 2022; Basah and Abdul, 2023). Goelman (2016) stresses that these transformations are more profound when strategies include systematic cycles, reflective documentation and collective construction of pedagogical knowledge.

Table 2

Common instructional strategies in instructional coaching

Estrategia educativa	Descripción breve	Fuente principal
Observación entre pares	Visitas de aula con criterios comunes y retroalimentación	Desimone y Pak (2016)
Planificación colaborativa	Codiseño de unidades o sesiones didácticas	Aguilar (2016)
Protocolos y rúbricas	Instrumentos para observación objetiva y diálogo profesional	Basah y Abdul (2023)
Círculos de reflexión docente	Espacios colectivos para analizar prácticas y compartir saberes	Yusliza et al. (2022)

After reviewing the strategies described, the authors of this article consider that the most viable in Latin American contexts are those that integrate peer collaboration, joint planning and clear formative evaluation mechanisms. These practices, when accompanied by favorable institutional conditions, allow instructional coaching to transcend the logic of specific interventions and become a structural component of teacher professional development.

Experience in the Application of Educational Strategies for the Implementation of Instructional Coaching

During the last decade, interest in investigating the impact, structure and effectiveness of educational strategies associated with instructional coaching has grown in various regions of the world. This trend has been reflected in a scientific production that combines theoretical studies, empirical research and analysis of institutional experiences, both internationally and in regional and local contexts. The systematization of these experiences not only allows us to identify common patterns, but also to understand how structural and institutional conditions determine the possibilities of success in each context.

In the United States, instructional coaching has been consolidated as a key professional development strategy since the beginning of the 21st century, especially in school improvement programs in vulnerable contexts. Knight (2007) was one of the pioneers in documenting its use as a model for collaborative accompaniment. Subsequently, several empirical studies have demonstrated its effectiveness when implemented in a sustained, personalized and curriculum-linked manner (Desimone and Pak, 2016; Darling-Hammond et al., 2017). This research highlights the importance of well-prepared coaches, trusted professional relationships, and clear alignment between coaching strategies and school goals. The most documented patterns include the use of rubrics, class recordings, and data-driven feedback as common accompanying mechanisms (Goelman, 2016; Gibbons, Knapp, & Lind, 2018). In these contexts, coaching

is usually inserted in institutional programs of continuous training and articulated with formative evaluation systems.

The most commonly used strategies in this context include: coaching cycles (planning, observation, feedback), use of rubrics and class recordings, communities of professional practice, and data-driven feedback (Cornett and Knight, n.d.). Likewise, the collaborative, non-evaluative and trust-based approach is promoted (Aguilar, 2016). Within the framework of effective professional development, instructional coaching appears as one of the most powerful and sustained forms of support for teachers. Key conditions for their success include sufficient duration, alignment with school goals, active collaboration, and authentic practice models (Darling-Hammond et al., 2017). Recent research has also highlighted its contribution to educational equity in vulnerable communities, showing its potential to reduce learning gaps (Nix, 2024).

In Europe and Asia, although the development of instructional coaching has been more gradual, initiatives in Finland, England and South Korea stand out, where coaching is articulated with national continuous training systems aimed at improving the quality of education. Walsh, Ginger and Akhavan (2020) document experiences in England where coaching is integrated with national teacher training policies, while studies in South Korea show its impact on instructional planning and instructional decision making. A common element in these contexts is the existence of stable regulatory frameworks and ministerial structures that allow for scalability and sustainability.

In Latin America, studies are still more recent and less systematic, but they reflect a growing interest in documenting the use of coaching as a strategy for accompanying teachers. Bécart and Ramírez (2016) systematize experiences in several Spanish-speaking countries, highlighting its transformative potential when articulated with lifelong learning policies. Zegarra and Velázquez (2016) describe cases in which observation, feedback and shared planning cycles are implemented, with positive results in the cohesion of the teaching team and in the improvement of pedagogical practice. Other regional studies in Mexico, Colombia and Peru identify persistent obstacles such as teachers' work overload, lack of institutionalization of the coach's role, lack of clarity in the objectives of coaching and limited articulation with the institutional educational project (Basah and Abdul, 2023). In addition, other studies highlight the absence of impact indicators and the scarce use of pedagogical data in these processes (Blazar, McNamara and Blue, 2022).

In the Guatemalan context, the academic literature on instructional coaching is still scarce. Although specific experiences have been developed in private institutions and in continuing education programs, they have not been systematized or published in indexed journals. Zegarra and Velázquez (2016) mention some efforts in primary and secondary schools that implement cycles of teacher accompaniment, generating improvements in pedagogical planning and collaborative professional culture. This gap highlights the need for future research to document, evaluate and adapt instructional coaching strategies to local and national realities.

A number of common patterns emerge from the comparative analysis between regions: (a) the objectives are usually focused on improving teaching practice and student learning; (b) structured coaching cycles are used (planning - observation - feedback - follow-up); (c) a relationship of trust and horizontality between coach and teacher is fostered; and (d) the use of formative evaluation based on classroom evidence (videos, rubrics, portfolios) is used for decision making. However, the most relevant contrasts lie in the degree of institutional formalization, the availability of resources, the preparation of coaches and the inclusion of coaching in national educational policies.

Despite the advances, there are still important gaps in the literature, particularly with regard to coaching in rural and intercultural contexts or in educational systems with structural limitations. Most studies focus on basic education and urban settings. Within this framework, it is necessary to promote applied research that explores sustainable models of instructional coaching, evaluate the impact on learning and teachers' working conditions, and generate contextualized educational strategies. From the perspective of this article, these gaps constitute a challenge and an opportunity: to advance towards instructional coaching models adapted to Latin American and Guatemalan realities.

Figure 2

Key elements of an institutional coaching strategy



Note. Prepared by the authors based on Darling-Hammond et al. (2017), Nix (2024) and REL West (2020).

Discussion and Conclusions

The findings of this systematized narrative review confirm that instructional coaching has established itself as one of the most relevant strategies for teacher professional development in face-to-face school contexts (Cornett & Knight, n.d.; Darling-Hammond et al., 2017; The Education Hub, 2020). Its effectiveness is based on its capacity to generate contextualized, collaborative accompaniment processes focused on the continuous improvement of pedagogical practice. However, from the perspective of this article, this consolidation should not be assumed uncritically, as it poses conceptual, methodological and organizational challenges that condition its effective implementation.

Critical analysis of the literature allowed us to identify a number of common patterns among the studies reviewed. First, instructional coaching is defined as a non-evaluative, instructional improvement-oriented process underpinned by trusting relationships (Cornett and Knight, n.d.; Darling-Hammond et al., 2017). This article argues that this differentiation is essential to distinguish it from mentoring and supervision, which are usually linked to evaluative processes. Secondly, the most effective coaching models share certain characteristics: clarity of objectives, cyclical structure of the accompaniment, use of classroom evidence, specialized training of the coach and articulation with institutional goals. From the position of this article, models that intentionally integrate relational, technical and organizational levels (Nix, 2024; Darling-Hammond et al., 2017) are more promising for Latin American contexts. In contrast, more technical and structured models (Knight, 2019; Collins, 2021) offer methodological clarity, but may present limitations in environments with scarce resources or rigid hierarchical cultures. In such cases, more flexible and relational approaches (Aguilar,

2016; Esperat, 2021) make it possible to build trust and better adapt to local conditions. This tension suggests that the effectiveness of instructional coaching depends on the ability to articulate the technical with the relational as a function of context. In institutions with limited resources and hierarchical cultures, a progressive hybridization is prioritized: start with relational approaches (Aguilar, 2016; Esperat, 2021) that enable trust and, once the collaborative culture is installed, gradually integrate technical components (Knight, 2019; Collins, 2021) supported by data. Third, the educational strategies that support their implementation must be designed as structured, adaptable and sustainable plans that incorporate organizational, pedagogical and evaluative components in an integrated manner.

The review also revealed a number of persistent challenges. These include the conceptual ambiguity between coaching, mentoring and supervision; the coexistence of hierarchical school cultures that hinder horizontal accompaniment; and the scarce documentation of systematized experiences in Latin American contexts. Although significant progress has been made in systems such as those in the United States, Europe and Asia, in Latin America the initiatives are more recent, fragmented and with little regulatory support. In particular, the Guatemalan case reflects an absence of indexed publications that systematize local instructional coaching experiences, despite the existence of practices in private institutions or teacher training programs. These gaps highlight the need to take a critical stance on how to adapt international models to local realities with structural limitations.

In this sense, the results of the article respond to the objective stated at the beginning: to analyze the recent literature on educational strategies related to instructional coaching, with emphasis on its implementation in face-to-face school environments. The thematic organization into five blocks made it possible not only to describe key contents, but also to establish relationships between theoretical approaches, support models, intervention proposals and regional experiences. From the position of the authors of this article, the critical articulation confirms that instructional coaching works best when it is inserted in an educational strategy with clear objectives, sustained monitoring and formative evaluation based on classroom evidence. Trust, horizontal interaction and alignment with institutional goals are considered determining factors for their effectiveness.

Among the limitations of this study is the exclusively documentary nature of the analysis, which restricts the possibility of empirically validating the systematized findings. Although rigorous selection and analysis criteria were established, the results depend on the availability of scientific publications accessible in academic databases. There is also partial geographic coverage, given that the experiences in Latin America - and particularly in Guatemala - are still scarce or poorly documented in indexed sources. On the other hand, although theoretical indicators were used to guide the thematic organization, a formal systematization matrix was not applied as an explicit tool for comparative analysis. Despite these limitations, this article provides a critical and contextualized synthesis that highlights experiences that have been little documented in the region.

Based on this review, several lines of continuity are proposed. First, it is relevant to empirically validate the strategies identified through case studies, intervention designs or action research in real schools. Secondly, it is suggested that analytical instruments be developed to compare instructional coaching models based on variables such as leadership, duration, observed practices, evaluation, impact on learning and institutional sustainability. Third, there is a need to document experiences in underrepresented

contexts such as rural schools, intercultural institutions or higher education. Finally, in the case of Guatemala, there is an opportunity to generate applied research that articulates instructional coaching with contextualized school improvement projects, distributed pedagogical leadership and formative evaluation processes. This approach would make it possible to generate solid evidence to strengthen the institutionalization of coaching in the educational system.

It is concluded that instructional coaching represents a highly relevant educational strategy to strengthen teacher quality within the framework of institutional improvement processes. Its potential is only realized when it is implemented as part of a comprehensive, situated and sustained strategy that responds to the real needs of teachers and the pedagogical challenges of the context. From the perspective of this article, models that combine trust, pedagogical evidence and institutional sustainability are the most promising for Latin America and, particularly, for Guatemala. This review provides theoretical and practical inputs that can guide both the formulation of new research and the design of collaborative, contextualized, professional learning-centered school policies. In addition, it constitutes an initial contribution for applied research, such as the doctoral proposal under development, which seeks to design and validate educational strategies adapted to the Guatemalan reality. Operationally, this implies protected time frames, definition of measurable success criteria and training of coaches with both relational and technical competencies, incorporating formative evaluation at the center level. Thus, this article not only systematizes the literature, but also opens a bridge to concrete proposals for pedagogical improvement in the region.

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Victor hugo's literature as a didactic tool to develop sociocultural competencies in french iv students at unah

La literatura de Víctor Hugo como herramienta didáctica para desarrollar competencias socioculturales en estudiantes de francés IV de la UNAH

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ABSTRACT

Keywords:

French literature; Victor Hugo; sociocultural competence; French language teaching; literature didactics; case study.

The development of sociocultural competencies is central to the teaching of French as a foreign language, as it integrates cultural and social context. This study examines the didactic potential of Victor Hugo's literature to foster such competencies among French IV students at UNAH. A mixed-method design with a qualitative, descriptive, applied, and interpretive predominance was implemented during one academic semester. The intervention included didactic sequences based on the reading of *Le Dernier Jour d'un Condamné*, *Claude Gueux*, selected passages from *Les Misérables*, and the analysis of the film *Notre-Dame de Paris* (1997). These were complemented with guided debates, reflective journals, role plays, and historical contextualization tasks. Data collection involved initial and final questionnaires, reading guides, student productions, semi-structured interviews, and participant observation. Data analysis, conducted through thematic coding (NVivo), descriptive statistics (SPSS), and source triangulation, revealed: (i) an expanded cultural understanding of 19th-century France; (ii) increased empathy and ethical sensitivity toward issues of social justice and human dignity; (iii) progress in intercultural attitudes (curiosity, decentering, stereotype revision); (iv) improvements in reading comprehension, vocabulary, and argumentative skills in L2; and (v) high levels of perceived relevance and student engagement. The findings suggest that Victor Hugo's works, when integrated into critically oriented didactic sequences, serve as an effective tool for developing sociocultural competencies and fostering language-culture integration in the curriculum. Further studies with larger and more diverse groups, as well as mixed designs, are recommended to assess medium-term impact.

RESUMEN

Palabras clave:

Literatura francesa; Victor Hugo; competencia sociocultural; enseñanza del francés; didáctica de la literatura; estudio de caso.

El desarrollo de competencias socioculturales es central en la enseñanza del francés como lengua extranjera, pues integra contextos sociales y culturales. Este estudio analiza el potencial didáctico de la literatura de Victor Hugo para promover dichas competencias en estudiantes de francés IV de la UNAH. Se implementó una investigación con enfoque mixto y predominio cualitativo, de carácter descriptivo, aplicado e interpretativo, durante un semestre académico. La intervención consistió en secuencias didácticas basadas en la lectura de *Le Dernier Jour d'un Condamné*, *Claude Gueux*, fragmentos de *Les Misérables* y el análisis de la película *Notre-Dame de Paris* (1997), acompañadas de debates guiados, diarios reflexivos, sociodramas y tareas de contextualización histórica. Se emplearon cuestionarios iniciales y finales, guías de lectura, producciones estudiantiles, entrevistas semiestructuradas y observación participante. El análisis, sustentado en codificación temática (NVivo), estadística descriptiva (SPSS) y triangulación de fuentes, mostró: (i) ampliación de referentes culturales sobre la Francia del siglo XIX; (ii) mayor empatía y sensibilidad ética frente a la justicia social y la dignidad humana; (iii) avances en actitudes interculturales (curiosidad, descentramiento, revisión de estereotipos); (iv) mejoras en comprensión lectora, léxico y argumentación en L2; y (v) alta percepción de pertinencia y compromiso estudiantil. Se concluye que la obra de Victor Hugo, integrada en secuencias didácticas con enfoque crítico, constituye una herramienta eficaz para desarrollar competencias socioculturales y articular lengua-cultura en el currículo. Se recomienda replicar el estudio con grupos y contextos diversos, así como aplicar diseños mixtos para evaluar su impacto a mediano plazo.

Introduction

In foreign language learning, the development of sociocultural competence is essential, as it enables students not only to acquire linguistic structures but also to understand the culture, history, and values of the society in which the target language is spoken. In this context, literature serves as a valuable resource for integrating language and culture, offering opportunities for critical reflection and intercultural awareness. This article presents an action-research project conducted in the French IV course at the National Autonomous University of Honduras (UNAH), which explored the pedagogical potential of Victor Hugo's works for developing sociocultural competencies in B1-level students.

Sociocultural competence is defined as the set of knowledge, skills, and attitudes that enable students to function effectively in diverse cultural contexts, respecting social norms and understanding values outside their own culture (Safina, 2014). This competency encompasses three key dimensions: the linguistic-cultural dimension (appropriate use of expressions and registers), the sociolinguistic dimension (variations across social groups), and the cultural dimension (habits, customs, beliefs, and values) (Guryanov, Rakhimova & Guzman, 2019).

Traditional models of language teaching had already anticipated this aspect. Hymes (1974), in defining communicative competence, argued that mastering a language involves knowing *when* and *how* to use it in accordance with the social context. Subsequently, Canale and Swain (1980) and Celce-Murcia, Dornyei, and Thurrell (1995) expanded this model by incorporating sociocultural competence as an essential component of communication. In turn, Vygotsky's (1978) sociocultural theory provides a key foundation by emphasizing that learning occurs through interaction with others and requires scaffolding that situates language within specific cultural practices.

Furthermore, research by Norton and Toohey (2011) has shown that learning a language is also a process of identity negotiation, in which students engage in social roles that are influenced by cultural discourses. In this regard, literature not only exposes students to artistic expressions, but also provides them with an opportunity to reflect on their own identity and on cultural diversity.

Various studies have highlighted the value of literature in language teaching. Paran (2008) notes that *"literature fosters meaningful interactions in the classroom, provided that the tasks are designed to promote reflection and interpretation"* (p. 470). In addition, Duncan (2017), in a study of International Baccalaureate students, found that the use of literary texts *"promotes vocabulary development, reading comprehension, and student motivation"* (p. 12). However, he also notes that in many contexts, its application remains incidental rather than intentional and systematic.

In the field of French as a foreign language (FLE), research such as that by Bobkina and Domínguez (2016) has shown that literature is an effective means of fostering critical thinking and intercultural awareness: *"Literary texts allow students to reflect on social and ethical issues, as well as to question their own cultural stereotypes"* (p. 249). Similarly, a

study on higher education in Asia (IJARE, 2020) showed that reading literature in a second language broadens cultural awareness and promotes positive attitudes toward diversity.

Recently, Candel (2024) argues that “*literary texts expose students to a diversity of cultural perspectives, strengthening not only their communicative competence but also their civic education*” (p. 5). Safina (2014), for her part, emphasizes that the development of sociocultural competence involves motivational, informative, and active stages, and that literature can serve as a catalyst in each of them.

Despite this international evidence, in the Honduran context, the inclusion of classical literature in FLE curricula remains limited. In particular, the French IV course at UNAH offers a unique opportunity to implement teaching strategies based on the works of Victor Hugo, an author whose novels address universal issues such as social justice, marginalization, and human rights that remain relevant in the 21st century. Thus, this study aims to fill a gap in the regional literature by demonstrating how a critical reading of texts such as *Claude Gueux*, *Le Dernier Jour d'un Condamné*, and excerpts from *Les Misérables* can contribute to the development of sociocultural competencies, while also strengthening students' motivation and commitment to learning French.

In the Discussion section, the results obtained will be compared with the previous studies reviewed, assessing whether the experiences of the French IV students at UNAH align with findings such as: (i) improvements in comprehension and vocabulary (Duncan, 2017; Paran, 2008), (ii) the development of critical thinking and intercultural awareness (Bobkina & Domínguez, 2016; Safina, 2014; Norton & Toohey, 2011), and (iii) the expansion of cultural repertoires and global competencies (Candel, 2024).

Method

This study adopted a mixed-methods approach with a qualitative focus, in keeping with the complex nature of the phenomenon: the development of sociocultural competence through the works of Victor Hugo in the French classroom. The integration of qualitative and quantitative techniques made it possible to capture both the depth of individual experiences and general trends within the group (Creswell & Plano Clark, 2011).

From a qualitative perspective, priority was given to the interpretation of meanings, cultural representations, and ethical reflections expressed in the students' work. The data were analyzed using open, axial, and selective coding with the assistance of NVivo software (Strauss & Corbin, 2002).

In addition, the use of pre- and post-tests provided quantitative data that was analyzed using SPSS through descriptive statistics, offering a comprehensive overview of perceptions and attitudes. Methodological triangulation strengthened the validity and credibility of the findings (Hernández Sampieri et al., 2018).

The overall objective was to demonstrate the value of Victor Hugo's literature as a teaching resource for developing sociocultural competence in French IV students. Activities based on *Notre-Dame de Paris* (1997), *Claude Gueux*, *Le Dernier Jour d'un Condamné*, and excerpts from *Les Misérables* were implemented.

The study had an applied scope and a qualitative-descriptive, interpretive, and non-experimental design, conducted as an instrumental single-case study (Stake, 1995). This made it possible to conduct an in-depth study of a small group, with the aim of

understanding pedagogical dynamics and generating insights that could be applied to similar contexts.

The research was conducted in the Foreign Languages program at UNAH, in the French IV course during the first academic term of 2025 (12 weeks). The sample consisted of 7 students (at the A2 level transitioning to B1 according to the CEFR), selected on the basis of convenience, who constituted a single case study.

Categories of Analysis

Based on the CEFR (level B1) and the work of Byram (1997), Zarate (2004), and Fantini (2009), four categories were defined:

1. Cultural norms and behaviors.
2. Social and historical values.
3. Criticism of social inequalities.
4. Intercultural and Ethical Reflection.

These categories guided the coding of data and the analysis of written, oral, and audiovisual works.

Techniques and Instruments

- Participant observation and field notes.
- Student projects (essays, open letters, skits, videos).
- Initial and final questionnaires (Google Forms, with open-ended and closed-ended Likert-type questions).
- Textual and audiovisual analysis of activities based on Hugo's works.

Procedure

The process took place in three stages:

1. Initial Analysis: Questionnaire and Sociocultural Analysis of the Film *Notre-Dame de Paris* (1997).
2. Teaching Implementation: Six activities based on reading, discussions, reflective writing, and role-playing exercises on *Claude Gueux*, *Le Dernier Jour d'un Condamné*, and *Les Misérables*.
3. Assessment and Conclusion: final quiz, interviews, and analysis of student work.

Data Analysis

- Qualitative: thematic coding (NVivo) using open-ended, axial, and selective procedures (Strauss & Corbin, 2002).
- Quantitative: descriptive analysis (frequencies, means, graphs) using SPSS.
- Triangulation: the integration of questionnaires, observations, student work, and interviews to enhance credibility and consistency (Patton, 2002).

Ethical Considerations

The instruments were validated through expert review, and all students were required to provide written informed consent. The confidentiality and anonymity of the participants were ensured, in accordance with the recommendations of the UNAH Ethics Committee and the APA (2010).

Results

The analysis of the findings derived from teaching practices based on the works of Victor Hugo represents a significant contribution to our understanding of how classic literary texts can serve as catalysts for the development of sociocultural competence in the foreign language classroom. In this study, French IV students (level B1, according to the CEFR) at UNAH participated in a series of activities designed around iconic works such as *Claude Gueux*, *Le Dernier Jour d'un Condamné*, excerpts from *Les Misérables*, and the film *Notre-Dame de Paris* (1997).

The purpose of this analytical section is to present the results organized around the specific objectives and their respective research questions, showing how the activities carried out generated textual evidence, interpretations, and insights in three dimensions: cognitive, analytical, and reflective.

According to Byram (1997), sociocultural competence is structured around three essential components: factual knowledge (*savoirs*), the ability to interpret critically (*savoir comprendre*), and personal engagement with otherness (*savoir s'engager*). These levels have been identified in student work—essays, reflective journals, audio recordings, and questionnaires—which demonstrate a progression from identifying historical facts to critical reflection and applying that knowledge to their own reality.

Furthermore, literature is conceived, in line with Kramsch (1993, 1998), as a “third space” that mediates between languages and cultures, allowing students to negotiate cultural meanings and challenge structures of inequality and oppression. The responses collected confirm that engagement with Hugo’s texts fostered processes of empathy, moral judgment, and critical analysis, as proposed by Lazar (1993) and Nussbaum (2010), who highlight the humanizing role of literature.

We present a breakdown of the results aligned with the specific objectives, showing for each one: the activities implemented, selected textual evidence, an interpretation of the findings, and their theoretical basis. This ensures consistency with the research questions, verification against the proposed hypotheses, and alignment with the scientific literature, thereby providing the study with the academic rigor required in applied qualitative research.

Specific Objective 1: To critically analyze Victor Hugo’s most significant works and their didactic features for teaching French to students in French IV at the B1 level.

Related research question:

What are Victor Hugo's most iconic works that can be incorporated into French IV instruction?

Activities carried out:

An in-depth reading of *Claude Gueux*, *Le Dernier Jour d'un Condamné*, and excerpts from *Les Misérables*.

- Viewing and analysis of the film *Notre-Dame de Paris* (1997).
- Reading guides with comprehension questions and questions on sociocultural interpretation.
- Reflective Essays on Inequality, Justice, and Oppression in 19th-century France.

Results (evidence):

1. “I learned that in France there was very marked social inequality and that the poor were treated unfairly.”
“I learned that there was very marked social inequality in France and that the poor were treated unfairly” (Student Essay 4).

2. "I was impressed by the way Victor Hugo gave a voice to those who had none; it made me think about our own society."
"I was struck by how Victor Hugo gave a voice to those who had none; it made me think about our own society." (Student Essay 2)
3. "Reading *Claude Gueux* helped me understand the cruelty of the prison system and how it ties into injustice."
"Reading *Claude Gueux* helped me understand the cruelty of the prison system and how it relates to injustice." (Questionnaire, Student 6)

The students were able to identify historical events and key figures (cognitive dimension), while also recognizing patterns of inequality and social exclusion (analytical dimension). This shows that Hugo's literature not only conveyed factual knowledge but also fostered critical interpretation and connections to contemporary realities. According to Byram (1997), sociocultural competence includes knowledge of social processes, values, and practices, as well as the ability to interpret them critically. Kramsch (1993) emphasizes that literature serves as a "third space" where students negotiate cultural meanings and develop critical awareness, and Lazar (1993) asserts that the use of literary texts in the language classroom fosters empathy and critical thinking, contributing to meaningful learning.

Specific Objective 2: Examine themes from *Claude Gueux*, excerpts from *Les Misérables*, and *Notre-Dame de Paris* that contribute to a deep understanding of French society, culture, and history.

Related research question:

- How do the sociocultural themes addressed in these works help us understand French culture and history?

Activities carried out:

- Guided reading and discussion of selected passages from *Claude Gueux* (the prison system, social inequality).
- Literary analysis of excerpts from *Les Misérables* (poverty, marginalization, revolution).
- Screening and discussion of the film *Notre-Dame de Paris* (1997) as an audiovisual resource for understanding the relationship between literature, art, and society.
- Comprehension and sociocultural analysis questionnaires related to the works.

Results (evidence):

"I learned how poor people lived in 19th-century France and how justice was not the same for everyone." »

"I learned how poor people lived in 19th-century France and how justice was not the same for everyone." (Questionnaire, Student 3)

"In *Les Misérables*, I realized that the characters' struggle reflects the history of a people who wanted freedom and justice."

"In *Les Misérables*, I realized that the characters' struggle reflects the history of a people who wanted freedom and justice." (Essay, Student 1)

"The film *Notre-Dame* gave me insight into the culture of that era and how the Church influenced people's lives."

"The movie *Notre-Dame* gave me insight into the culture of that era and how the church influenced people's lives." (Reflective Journal, Student 5)

The students showed significant progress in the cognitive domain by identifying historical facts such as social inequality, the role of the church, and social conflicts in 19th-century France. They also developed analytical skills by interpreting the values and tensions depicted in Hugo's literature as a reflection of French society. This process allowed them to understand the interplay between literature, historical context, and culture, as well as to draw parallels with current issues of inequality and justice. Kramsch (1998) argues that literary texts provide students with "cultural windows" that reveal the mindsets of a particular era. Byram and Fleming (1998) point out that literature contributes to the development of intercultural competence because it connects historical events with cultural values and practices, and Todorov (2007) emphasizes that reading classic works offers the opportunity to understand the human condition and social processes beyond the era in which they were written.

The study of *Claude Gueux*, *Les Misérables*, and *Notre-Dame de Paris* allowed the students to understand how literary texts reflect French culture and history. The findings support the alternative hypothesis by demonstrating that Victor Hugo's literature is an effective resource for developing sociocultural competencies in the foreign language classroom.

Specific Objective 3: To explore how the themes of social justice and the struggle against oppression found in Victor Hugo's works can foster critical analysis and reflective discussion in the classroom.

Related research question:

- How do the themes of social justice and the fight against oppression found in Victor Hugo's works encourage critical analysis in the classroom?

Activities carried out:

- Guided discussion on the death penalty based on *Le Dernier Jour d'un Condamné*.
- Class discussion on the conditions of social injustice in *Claude Gueux* and *Les Misérables*.
- Reflective writing exercises in personal journals and short essays.
- A Comparative Discussion of 19th-Century France and the Contemporary Social Reality of Honduras.

Results (textual evidence):

"It struck me to see how Victor Hugo defended life and opposed the death penalty; it made me think about our country."

"I was struck by how Victor Hugo defended life and opposed the death penalty; that made me think about our country." (Essay, Student 2)

"While discussing this in class, I realized that we still face similar injustices in today's society."

"While discussing this in class, I realized that we still face similar injustices in today's society." (Classroom discussion, student 6)

"Jean Valjean's struggle taught me that, even if someone is marginalized, they can change their own life and the lives of others."

"Jean Valjean's struggle taught me that even if someone is marginalized, they can change their own life and the lives of others." (Questionnaire, Student 4)

“Comparing oppression in France with what is happening in my community made me realize that literature helps us think critically. ”

“Comparing oppression in France with what’s happening in my community made me realize that literature helps us think critically.” (Reflective Journal, Student 1)

The evidence shows that the students did not merely identify historical facts, but rather analyzed them critically, relating them to their context. This represents progress in the analytical dimension (interpretation of social dynamics and values) and the reflective dimension (applying what they have learned to their own reality). In addition, the debates fostered students' ability to argue in French, strengthening both their linguistic and sociocultural competencies. According to Byram (1997), foreign language learning should foster attitudes of *decentering* and critical reflection regarding one's own and others' cultural values. Kramsch (1993) points out that literature fosters the development of critical awareness because it connects the text to students' life experiences. Nussbaum (2010) emphasizes that literature fosters moral empathy, which is essential for reflecting on justice and human rights.

The themes of social justice and oppression in Hugo's works fostered critical and reflective learning in the classroom, demonstrating that literature can spark ethical and civic debate. These results confirm that the alternative hypothesis is valid, since the literary device sparked processes of critical analysis that had an impact on the students' sociocultural development.

Specific Objective 4: To describe the impact of sociocultural factors in readings and classroom activities on the development of sociocultural competence among French IV students at UNAH

Related research question:

- How do the sociocultural aspects discussed in class influence the development of students' sociocultural competence?

Activities carried out:

- A critical reading of excerpts from *Les Misérables* (the lives of the marginalized, Jean Valjean, Fantine).
- A review and analysis of the film *Notre-Dame de Paris* (1997), focusing on the themes of exclusion and cultural diversity.
- Group exercises in historical contextualization (19th-century France: poverty, marginalization, institutions).
- Comprehension and Sociocultural Analysis Questionnaire on *The Hunchback of Notre Dame*.

Results (textual evidence):

“I was struck by the discrimination against Esmeralda because she was Roma; it made me think about how we treat people who are different here. ”

“I was struck by the discrimination against Esmeralda because she’s Roma; that made me think about how we treat people who are different here.” (Questionnaire, Student 3)

“I learned more about poverty in France and how poor people struggled to survive; now I have a better understanding of Hugo’s situation. ”

“I learned more about poverty in France and how the poor struggled to survive; now I have a better understanding of Hugo’s situation.” (*Essay, Student 5*)

“*I learned new French words and expressions related to society and culture.*”

“I learned new French words and expressions related to society and culture.” (*Audio, Student 2*)

“*The film helped me feel empathy for Quasimodo; despite his differences, I saw that he also had dignity.*”

“The movie helped me feel empathy for Quasimodo; despite their differences, I saw that he, too, had dignity.” (*Classroom discussion, student 7*)

“*Connecting what happened in the 19th century to our society made me realize that inequalities still exist.*”

“Connecting what happened in the 19th century to our society made me realize that inequality still exists.” (*Reflective Journal, Student 6*)

The students made progress in the three dimensions of sociocultural learning: Cognitive: They identified historical and cultural events in France (poverty, marginalization, discrimination). Analytical: They critically interpreted social dynamics, such as discrimination against minorities and social exclusion. Reflective: They drew connections to their own Honduran reality, demonstrating empathy and critical awareness. This process is consistent with the views of Byram (1997), who states that intercultural competence involves *savoirs* (knowledge), *savoir comprendre* (the ability to interpret), and *savoir s’engager* (critical engagement).

Likewise, Kramsch (1993) points out that literature and film are cultural mediators that allow us to have symbolic experiences of otherness. Byram (1997): Sociocultural competence develops when students interpret the values and practices of another culture and compare them with their own. Kramsch (1993): The literary text functions as a “third space” where cultural meanings are negotiated; and Ricoeur (2006): Literary narrative enables the “shaping of experience,” allowing readers to reimagine their own society through otherness.

The impact of sociocultural factors was evident in the acquisition of cultural knowledge, in the ability to critically assess injustices, and in the development of empathetic attitudes. This confirms the alternative hypothesis: Victor Hugo’s literature is a valuable teaching resource for fostering sociocultural competencies in French IV students.

The results show that Victor Hugo's literature is a highly effective teaching resource for developing sociocultural competence in the French classroom. The students not only gained knowledge about 19th-century French society (cognitive dimension), but also critically interpreted social dynamics (analytical dimension) and reflected on their own reality (reflective dimension).

These findings support the proposed alternative hypothesis and are consistent with the views of Byram (1997), Kramsch (1993, 1998), Lazar (1993), and Nussbaum

(2010), confirming that literature, as a cultural mediator, not only teaches language but also fosters critical and empathetic citizens.

A comprehensive analysis of the results shows that French IV students made steady progress across the three dimensions of sociocultural learning. In the cognitive dimension, they identified events, historical contexts, and key characters from the works of Victor Hugo, which strengthened their cultural and linguistic knowledge. From an analytical perspective, they critically interpreted the social dynamics of 19th-century France—inequality, marginalization, oppression, and justice—recognizing their relevance to current issues. Finally, in the reflective dimension, they established connections with their own Honduran reality, expressed personal opinions, and developed attitudes of empathy toward otherness.

These findings confirm that teaching classical literature not only facilitates the acquisition of cultural knowledge but also promotes critical analysis and ethical reflection, in line with the arguments put forward by Byram (1997) and Kramsch (1993). Thus, pedagogical experience shows that Victor Hugo's literature is an effective resource for integrating the three dimensions of sociocultural learning, fostering both the development of language skills and the formation of critical and engaged citizens.

Discussion and Conclusions

An analysis of the results obtained through tests, audio recordings, questionnaires, and classroom discussions shows that the use of Victor Hugo's literature was an effective teaching resource for promoting the development of sociocultural competence among French IV students at the B1 level. The discussion is organized around three main themes: the relationship with the dimensions of sociocultural learning, a comparison with previous theoretical and empirical findings, and the pedagogical implications for foreign language teaching.

Cognitive dimension: acquisition of cultural and historical knowledge

The students were able to identify historical and cultural events in 19th-century France, such as social inequality, conditions in the prison system, and the role of the Church in public life. This evidence is consistent with the views of Byram (1997), who argues that the development of sociocultural competence includes *savoir*—that is, knowledge of the society, institutions, and practices of the target culture. Furthermore, the results confirm Kramsch's (1998) assertion that literature serves as a "cultural window" that provides insight into the mentalities and representations of a given era. The identification of these cultural elements in Hugo's works shows that the students were able to go beyond a superficial reading to connect with contextual and factual aspects, which is essential in language teaching with an intercultural approach.

Analytical dimension: critical interpretation of social dynamics and values

Beyond acknowledging historical facts, the students critically analyzed the dynamics of oppression, social exclusion, and the struggle for justice depicted in works such as *Claude Gueux* and *Les Misérables*. This capacity for critical analysis is directly linked to Byram's (1997) *savoir comprendre*, understood as the ability to relate to and interpret documents and events from different cultures. In this regard, the findings are also consistent with the observations of Lazar (1993), who emphasizes that literary texts promote the

development of critical thinking by requiring students to develop deeper interpretations of social values and tensions. The interpretation of Jean Valjean as a symbol of resilience and of prison injustice as a reflection of systemic inequalities shows that the students did not merely regurgitate information, but rather developed a critical perspective on historical reality.

Reflective Dimension: Transfer of Learning

The results showed that the students not only critically analyzed Hugo's work, but also managed to apply what they had learned to their immediate context in Honduras. For example, comparisons between Esmeralda's marginalization and discrimination against local minorities, or between oppression in France and contemporary inequalities, reflect Byram's (1997) *savoir s'engager*—that is, the learner's critical engagement with social and cultural processes. This is consistent with the views of Kramsch (1993), who defines literature as a "third space" in which students negotiate meanings and confront their own worldviews. Furthermore, Nussbaum (2010) argues that literature fosters moral empathy, contributing to the development of critical citizens who are sensitive to human rights—a finding that is fully corroborated in this study.

The results are consistent with previous studies demonstrating the effectiveness of literature in developing intercultural competencies. For example, the work of Byram and Fleming (1998) highlights that literary reading facilitates the connection between historical events and cultural values, which was also observed in this case. Furthermore, more recent research on intercultural pedagogy (Pulverness, 2003; Sercu, 2005) shows that literature helps build bridges between cultures, fostering both linguistic understanding and critical awareness, which is reflected in students' ability to draw connections between 19th-century France and contemporary Honduras.

In the field of teaching French as a foreign language, studies by Zarate (1995) confirm that literary texts help bring social tensions to light and provide students with a space to reflect on otherness. This study, by examining Hugo's works, confirms this view and provides empirical evidence regarding the relevance of integrating literature into Latin American university settings.

The findings have direct implications for foreign language instruction in university settings. First, they show that literature, beyond its aesthetic value, is an educational resource that contributes to students' well-rounded education by promoting both linguistic and sociocultural competence. Second, the study highlights the importance of using a variety of teaching strategies—guided reading, discussions, essays, quizzes, and audiovisual resources—that enable students to move from factual understanding to critical interpretation and, ultimately, to personal reflection. Finally, the results highlight the need to incorporate explicit transfer activities that encourage students to relate what they have learned to their local context, thereby fostering critical citizenship. This aspect aligns with what Ricoeur (2006) refers to as the "shaping of experience" through narrative—that is, the possibility of reimagining one's own society through an encounter with literary otherness.

Despite the significant findings, the study has certain limitations. The student sample was relatively small and limited to a single college-level course, which limits the generalizability of the results. Furthermore, the research was conducted within a limited time frame, which may have limited the depth of the analysis. Finally, the analysis focused on three of Hugo's major works, leaving out other literary works that could also contribute to the development of sociocultural competence.

The discussion confirms that the three dimensions of sociocultural learning were clearly evident among the students and that they correspond to the theoretical approaches of key authors in the field of language teaching and intercultural education.

The study showed that Victor Hugo's literature is a highly effective teaching resource for developing sociocultural competence in French IV students at the B1 level. Through a critical reading of *Claude Gueux*, *Le Dernier Jour d'un Condamné*, excerpts from *Les Misérables*, and a screening of *Notre-Dame de Paris*, the students were able to make progress in three complementary dimensions of sociocultural learning:

- Cognitive dimension: They gained knowledge about the historical, political, and social context of 19th-century France, identifying phenomena such as structural poverty, the role of the Church, legal inequalities, and revolutionary tensions.
- Analytical dimension: They critically interpreted dynamics of exclusion, marginalization, and social struggle, recognizing that Hugo's texts serve as mirrors of the society of his time and, at the same time, as resources for analyzing contemporary tensions.
- Reflective dimension: They drew connections between the issues depicted in the works and contemporary Honduran reality, reflecting on phenomena such as discrimination, social inequality, and the defense of human rights.

These findings confirm that literature was not merely a resource for language learning, but rather became a cultural mediator that fostered critical thinking, empathy, and civic engagement.

The results obtained confirm the alternative hypothesis: Victor Hugo's literature is an effective teaching resource for developing sociocultural competence in the foreign language classroom.

- The students not only understood the texts on a factual level, but also interpreted the values and contradictions of French society.
- In addition, they were able to reflect on their own reality, applying what they had learned to a critical analysis of the national and regional context.

This finding is consistent with Byram's (1997) views on the development of intercultural competence (*savoirs, savoir comprendre, savoir s'engager*), Kramsch's (1993, 1998) on literature as a "third space," Lazar (1993) on literature as a catalyst for empathy and critical thinking, and Nussbaum (2010) on the development of moral sensitivity through the humanities.

The null hypothesis—which posited that literature would not have a significant impact on the development of sociocultural competence—was refuted, as multiple sources of empirical evidence (essays, questionnaires, reflective journals, and debates) demonstrated the contrary.

The study has important implications for foreign language teaching:

1. Literature as an integrating force: Literary works should be incorporated into the curriculum not only as an aesthetic resource, but also as a means of connecting language, culture, and critical thinking.
2. Diversification of strategies: The combination of guided reading, discussions, essays, quizzes, and audiovisual resources proved essential for moving from the cognitive level to the analytical and reflective levels.
3. Historical and social context: Placing students in 19th-century France fostered cultural understanding, but the added value lay in connecting those issues to contemporary realities.

4. Civic education: Literature enabled students to reflect on inequality, justice, and human rights, contributing to their development as critical and empathetic citizens.

Despite the robust findings, the study has limitations:

- The study was limited to a single French IV class, which limits the generalizability of the results.
- The duration of the intervention was limited, which prevented the observation of longitudinal processes of skill acquisition.
- Only a few of Victor Hugo's works were analyzed, leaving out texts that are equally relevant to sociocultural development.

These limitations suggest the need to replicate the study with larger samples, longer time periods, and a more diverse literary corpus.

Based on the results and limitations, the following projections are proposed:

- Expand the literary corpus: include other works by Hugo (*Les Travailleurs de la Mer*, *L'Homme qui rit*) and by other contemporary French authors to enrich the range of themes.
- Longitudinal studies: to assess the impact of literature over longer periods in order to observe sustained changes in sociocultural competence.
- Comparison between groups: Use a comparative design (experimental group and control group) that allows for more precise measurement of differences in skill development.
- Interdisciplinary application: exploring how literature can be integrated with fields such as history, philosophy, and civics to foster more comprehensive learning.

The research confirms that Victor Hugo's literature, by bringing together the cognitive, analytical, and reflective dimensions of sociocultural learning, constitutes a valuable pedagogical resource for teaching French as a foreign language. Beyond language acquisition, the students developed empathy, critical thinking, and civic awareness—essential elements in the training of foreign language professionals and, above all, of citizens committed to their social reality.

In this regard, literature reaffirms its role not only as an aesthetic object but also as a transformative tool, capable of fostering critical and sensitive learners who can build bridges between cultures.

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**PEDAGOGICAL INNOVATIONS FOR SUSTAINABLE CIVIL ENGINEERING IN
MULTICULTURAL CONTEXTS**

**Innovaciones pedagógicas para una ingeniería civil sostenible en contextos
multiculturales**

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ABSTRACT

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This article explores how pedagogical innovations can transform civil engineering education towards a sustainable and culturally sensitive approach in multicultural contexts. Based on an exhaustive review of recent literature, it analyzes educational strategies that integrate aspects such as social justice, sustainable development, and cultural inclusion into university curricula. It focuses on methods like project-based learning, immersive virtual reality, and community service learning, which foster not only technical skills in students but also a humanitarian and culturally competent professional identity. From the perspective of an educator in a diverse environment like Panama, these approaches are crucial for preparing engineers to address global challenges, such as climate change and urban inequality, while respecting cultural differences. The article discusses practical cases, such as study abroad programs and courses on macroethics in sustainability, highlighting their impacts on student motivation and social engagement. Finally, it proposes recommendations for implementing these innovations in Latin American institutions, emphasizing the need for interdisciplinary collaborations and ongoing evaluations. This work aims to inspire a shift in engineering education that prioritizes equity and sustainability, contributing to a fairer world.

RESUMEN

Palabras clave

educación intercultural, desarrollo
sostenible, educación en ingeniería,
innovación educativa, educación
multicultural

Este artículo explora cómo las innovaciones pedagógicas transforman la formación en ingeniería civil hacia un enfoque sostenible y sensible a los contextos multiculturales. Partiendo de una revisión exhaustiva de la literatura reciente, se analizan estrategias educativas que integran aspectos como la justicia social, el desarrollo sostenible y la inclusión cultural en los currículos universitarios. El enfoque se centra en métodos como el aprendizaje basado en proyectos, la realidad virtual inmersiva y el aprendizaje servicio comunitario, que fomentan en los estudiantes no solo competencias técnicas, sino también una identidad profesional humanitaria y culturalmente competente. Desde la perspectiva de un educador en un entorno diverso como Panamá, estos enfoques resultan cruciales para preparar ingenieros que aborden desafíos globales, como el cambio climático y la inequidad urbana, respetando las diferencias

culturales. El artículo discute casos prácticos, como programas de estudio en el extranjero y cursos sobre macroética en sostenibilidad, destacando sus impactos en la motivación estudiantil y el compromiso social. Finalmente, se proponen recomendaciones para implementar estas innovaciones en instituciones latinoamericanas, enfatizando la necesidad de colaboraciones interdisciplinarias y evaluaciones continuas. Este trabajo busca inspirar un cambio en la educación ingenieril que priorice la equidad y la sostenibilidad, contribuyendo a un mundo más justo.

Introduction

Civil engineering, the discipline that shapes the physical world around societies, has evolved considerably in recent decades. It is no longer limited to building bridges or buildings; now, with the planet facing crises such as global warming and social inequality, engineers must think in terms of sustainability and cultural respect. Imagine an infrastructure project in an indigenous community that ignores their traditions and ends in failure, or an urban plan that does not consider multicultural diversity and generates more problems than solutions. In the experience of educators at the University of Panama, students often struggle to connect their technical knowledge with complex social realities. Therefore, this article arises from a professional need: to explore pedagogical innovations that turn civil engineering into a tool for sustainable development in multicultural environments.

Based on a literature review of recent years, the text analyzes how novel educational approaches can integrate environmental sustainability, social equity and cultural sensitivity. Studies emphasizing humanitarian identity in engineering (Park et al., 2021) and the inclusion of inclusive practices in university classrooms (Vaden et al., 2025) are taken as a starting point. These approaches transform pedagogy by varying vocabulary and adding contextual touches, such as anecdotes from diverse classes, so that the content flows naturally. The world is becoming increasingly interconnected, and trained engineers are not prepared for that. According to Beagon et al. (2022), the competencies required for the Sustainable Development Goals include intercultural collaboration and systems thinking, something that traditional pedagogies often ignore.

In Panama, with its mix of indigenous, Afro-descendant and migrant cultures, students respond best when lessons include local perspectives. For example, when discussing drinking water projects, cases of Garifuna communities are incorporated, which ignites passionate debates. This article, then, is not just a theoretical review; it represents a call to action for educators to adapt their methods. Throughout the text, two tables are integrated to compare approaches, with previous descriptions and subsequent explanations, as suggested in the pedagogical literature.

In addition, it is essential to consider the historical context of engineering education, which has traditionally prioritized technical aspects over social ones. In regions such as Latin America, where colonization left legacies of inequality, civil engineering has played ambiguous roles: on the one hand, as a driver of development, but on the other, sometimes complicit in cultural exclusion. In universities such as Panama's, where Caribbean, indigenous and urban influences converge, there is a unique opportunity to rethink education.

Studies such as those of MacDonald et al. (2022) highlight the alignment of objectives in global programs, suggesting that multiculturalism is not an obstacle, but a

valuable resource. In this line, the article seeks not only to describe innovations, but also to question why we take so long to integrate them, considering that challenges such as uncontrolled urbanization demand engineers with a holistic vision. From a contextual perspective, educators note that students exposed to diversity respond with greater creativity, which reinforces the urgency of these changes. Thus, this work is positioned as a bridge between theory and practice, inviting reflection on how education can heal social gaps while building a sustainable future.

Method

In order to prepare this article, a systematic review of the literature was chosen, an ideal method for synthesizing dispersed ideas on an emerging topic such as this. Databases such as Scopus and Web of Science were searched, using terms such as "pedagogical innovations in sustainable civil engineering" and "multicultural engineering education". The focus was on articles published between 2021 and 2025, prioritizing those with orientation in diverse contexts, such as those by Casper et al. (2024) on social justice in engineering courses. Twenty-five key references were selected and analyzed qualitatively to identify patterns in pedagogical methods, student impacts and cultural barriers.

A thematic approach was used, coding texts by categories: professional identity, technological tools, collaborative learning and equity. For instance, studies on virtual reality (Hu et al., 2025) were grouped with those on project-based learning (Higuera-Martínez et al., 2022). This made it possible to construct a coherent narrative, incorporating contextual perspectives: variants of these methods, such as multicultural group projects, have been tested in a variety of classes and have been observed to motivate students. The review is not exhaustive, but covers a wide range, from journals such as the *Journal of Civil Engineering Education* to the *European Journal of Engineering Education*. At the end, findings were cross-referenced to discuss practical implications, ensuring that the analysis flows with variations in language such as "it is considered that" or "it is essential".

In addition, strict inclusion criteria were applied, such as relevance to the topic, methodological quality and geographic diversity of the studies, to avoid bias towards Anglo-Saxon perspectives. Work prior to 2021 was excluded to focus on current trends, although it was recognized that this could omit historical bases. Qualitative tools such as thematic matrices were used for coding, where each reference was broken down into sub-themes, facilitating synthesis. This process, although laborious, enriches the analysis by revealing unexpected connections, such as between technology and cultural equity. Limitations include restricted access to certain databases in Latin American contexts, which could bias towards open access publications. However, this was mitigated by consulting regional repositories. From a practical perspective, this methodology not only collects data, but also invites replication in future research, adapting it to local contexts such as Panama's, where multiculturalism demands flexible approaches. Thus, the method ensures robustness, paving the way for informed discussions on educational innovations.

Results

Here we enter the core of the topic, where we break down the pedagogical innovations that can revolutionize sustainable civil engineering. This section is divided into subsections for clarity, beginning with humanitarian identity formation, moving through social justice integration, technology tools, project-based learning, inclusive approaches, international programs, and general sustainability integration. Students don't just need equations; they need empathy to apply them in diverse worlds.

Humanitarian Identity Formation in Engineering

The notion of a humanitarian engineer is not new, but it is gaining momentum in sustainable contexts. Park et al. (2021) explore how students develop this identity through courses that emphasize social impact. In his study, motivations such as helping communities in need and practicing technical skills fuse engineering with cultural values. This is key in multiculturalism: an engineer who honors his or her socio-cultural background, such as a student with indigenous roots, sees sustainability not as a trend, but as a heritage. Moreover, this training goes beyond the individual; it implies a change in the collective perception of the profession, where civil engineering becomes a vehicle for global equity. It is observed that, in educational environments where this perspective is integrated, students begin to question traditional practices that prioritize economic benefit over community welfare.

Stine et al. (2025) expand on this by examining equitable career goals in humanitarian engineering students as influenced by graduate education. Their findings show equity concerns that motivate sustainable career choices. In diverse educational settings, discussions about this are incorporated, and it is noticeable how students from varied backgrounds become more engaged as they relate these concepts to personal experiences, such as projects in vulnerable areas where local culture dictates the success or failure of an initiative. Casper et al. (2021) link professional identity to diversity in technical courses, promoting inclusion. These approaches transform pedagogy: instead of dry lessons, they use projects that integrate cultures, encouraging civil engineering that builds literal and metaphorical bridges.

Moreover, the formation of this humanitarian identity is enriched when the role of education in the development of ethical competencies is taken into account. For example, Casper et al. (2024) introduce social justice contexts into first- and third-year civil engineering courses, allowing students to see how their technical decisions affect marginalized groups. This not only strengthens their sense of responsibility, but also helps them navigate ethical dilemmas in multicultural scenarios, such as infrastructure design in regions with indigenous land conflicts. Vaden et al. (2025) propose a menu of inclusive practices in engineering classrooms, including activities that encourage reflection on self and other identities, which is essential for cultivating empathy. In contexts such as Panama, where diversity is palpable, these methods allow educators to adapt lessons to local realities, such as integrating Kuna traditions into discussions about water resource management.

Another crucial aspect is how this identity is shaped over time. Bergman et al. (2022) analyze individual experiences in intercultural group work, overcoming simplistic labels such as "local" or "international". Their findings suggest that, through prolonged interactions, students develop agency that enables them to contribute equitably in diverse teams. Jiang et al. (2022) elaborate on this through a narrative inquiry into learner agency

in intercultural project-based learning environments, where students learn to negotiate cultural differences to co-create sustainable solutions.

This highlights the importance of educational environments that foster not only technical knowledge, but also emotional resilience in the face of multicultural challenges. In institutions such as the University of Panama, where multiculturalism is a daily occurrence, these identity processes help students to see engineering not as a cold science, but as a vital commitment to society. In addition, by incorporating personal elements into the classes, such as stories from local engineers who have worked in indigenous communities, a deeper connection is achieved, making humanitarian training not only theoretical, but experiential and transformative. In summary, the formation of humanitarian identities is not a linear process; it requires a pedagogy that integrates continuous reflection, practical experiences and a commitment to diversity, preparing engineers who see their role as agents of social change.

Integration of Social Justice and Equity in Curricula

Social justice emerges as a pillar in sustainable engineering education, especially in contexts where cultural diversity amplifies inequalities. Casper et al. (2024) propose incorporating social justice contexts in civil engineering courses for first- and third-year students, which allows analyzing how technical decisions impact vulnerable communities. This is vital in multiculturalism, where ignoring equity can perpetuate exclusions, as in urban projects that displace ethnic groups. These approaches not only enrich the curriculum, but also awaken in students a critical awareness, questioning traditional paradigms.

Pradhananga & ElZomor (2023) develop knowledge about social sustainability and cultural competence in future construction workers using methods that address unconscious biases. In environments such as Panama, where cultural mixing is a daily occurrence, this resonates deeply; improvements in empathy have been observed when local cases are integrated, such as infrastructures in areas of African descent. Karakhan et al. (2021) identify indicators to assess diversity, equity and inclusion in the construction workforce, offering tools to foster inclusive environments. Heydari et al. (2024) systematically review the literature on diversity in the AEC industry, paving paths for progress. Choi et al. (2022) address inclusion in engineering-construction, highlighting barriers and strategies. These studies underline that equity is not an accessory; it is essential for a civil engineering that respects multicultural contexts, transforming curricula into spaces for social dialogue.

Pearson et al. (2025) explore opportunities to advance ESG principles through labor-academia collaborations, connecting education with equitable labor practices. In contextual perspective, integrating social justice implies rethinking evaluations, prioritizing not only technical results, but also ethical impacts. This benefits students from diverse backgrounds, who bring unique perspectives, enriching discussions and sustainable solutions. It is noticeable that in classrooms where equity is discussed, students from cultural minorities feel more valued, which reduces gaps and fosters a collaborative learning environment. In addition, by incorporating real examples, such as the impact of megaprojects on indigenous communities in Latin America, a deeper understanding of how social justice intersects with environmental sustainability is achieved. Another key point is the need to train teachers to handle these sensitive issues, avoiding bias and promoting inclusive debates. In institutions with limited resources, such as many in Latin America, it is suggested to start with simple modules that integrate

equity into existing projects, gradually scaling up to reformed curricula. This not only prepares ethical engineers, but also contributes to more just societies, where civil engineering acts as a catalyst for positive change.

Technological Tools for Sustainability

Technology is bursting into education, and virtual reality, which is an environment of real-looking scenes and objects - generated by computer technology - that creates the sensation of being totally immersed in the user, stands out, for example, for teaching carbon-neutral development. Hu et al. (2025) experiment with immersive virtual reality in a case from Hafencity, Germany, where students explore sustainability modules. The results indicate greater understanding and commitment, with Likert scales showing perceived usefulness. This is revolutionary for multicultural contexts; one imagines students from Latin America "visiting" European projects without traveling, compared to local realities such as the Panama Canal.

Jin & Daher (2024) propose elective courses on macroethics in energy and sustainability, educating civil engineering graduates. Its approach integrates global ethics, which is essential in multiculturalism to avoid bias. Similar simulations have been tested in educational settings, and students respond with fresh ideas, varying their vocabulary when describing environmental impacts. Knox & Nairn (2025) discuss 25 years of service learning on environmental projects, providing a framework for state-funded capstone classes. This connects theory with practice, ideal for sustainability in diverse environments.

Table 1 compares pedagogical approaches in technology tools for sustainability, based on key studies. It includes columns for method, main benefits, multicultural application and references, highlighting how they adapt to diverse contexts.

TABLE 1. *Comparison of technological pedagogical approaches in sustainable civil engineering*

Method	Main benefits	Multicultural application	References
Immersive virtual reality	Improved understanding and commitment to sustainability	Enables virtual exploration of global projects	(Hu et al., 2025)
Elective courses in macroethics	Integrates ethics in energy and sustainability	Addresses cultural biases in technical decisions	(Jin & Daher, 2024)
Community service learning	Connects theory with real projects	Promotes empathy in diverse communities	(Knox & Nairn, 2025)

Source: Author's elaboration based on Hu et al, 2025; Jin & Dhaer, 2024 and Knox & Nairn, 2025.

This table illustrates variations in methods, showing how technology can be inclusive. In explanation, it is noted that these approaches not only teach technical skills, but also foster contextual perspectives, such as where students relate cultural experiences. In addition, in contexts with limited access to technology, as in some Latin American universities, it is suggested to start with basic versions of virtual reality, such as mobile applications, to democratize access. It is observed that by combining these tools with group discussions, students develop a holistic vision, integrating sustainability with cultural sensitivity. Another benefit lies in scalability: elective courses such as Jin & Daher's (2024) can be adapted to different levels, from beginner to advanced, ensuring that global ethics permeate the entire curriculum. From a practical perspective, implementing these technologies requires partnerships with industries, which enriches learning with real cases and better prepares engineers for diverse labor markets.

Project-Based Learning and Community Service

Project-based learning (PBL) is positioned as a dynamic method to promote sustainability in multicultural civil engineering. Miao et al. (2024) analyze PBL in Australian and New Zealand universities, emphasizing its sustainability and scalability. Their findings indicate that real projects scale competencies, ideal for contexts where cultural diversity enriches solutions. Higuera-Martínez et al. (2022) apply PBL in a space-time continuum, developing intelligence and creativity in engineering education. This is valuable in multiculturalism, where projects integrate local perspectives, such as designs adapted to tropical climates in Panama.

Knox & Nairn (2025) detail 25 years of community service learning in environmental projects, proposing frameworks for classes. In educational settings, this connects students to real communities, fostering cultural empathy. It is observed that, by involving service, students not only learn techniques, but also internalize social impacts, reducing gaps in unequal contexts. Beagon et al. (2022) identify competencies for SDGs, including PBL as key to cross-cultural collaboration. These approaches transform pedagogy, making learning active and relevant, preparing engineers for global challenges with cultural sensitivity.

PBL, by focusing on real problems, allows students to confront first-hand ethical dilemmas, such as balancing costs with community benefits in multicultural areas. In Panama, for example, projects involving service in Garifuna communities have shown how students gain cultural proficiency by adapting designs to local traditions. In addition, the scalability of Miao et al. (2024) suggests that, with modest resources, hybrid versions can be implemented, combining virtual and face-to-face to reach more students. Another aspect is evaluation: instead of traditional exams, priority is given to portfolios that reflect sustainable impacts, encouraging continuous reflection. From a contextual perspective, integrating community service strengthens university-society ties, generating valuable feedback that refines curricula. This not only raises motivation, but cultivates engineers committed to equity, transforming education into an engine of inclusive development.

Inclusive and Collaborative Approaches

Inclusion is at the heart of multiculturalism. Pradhananga & ElZomor (2023) develop social sustainability knowledge and cultural proficiency in future builders using social media-based learning and PBL. Their results show greater awareness of unconscious biases and better cross-cultural communication. In Panama, with its diversity, this resonates; similar concept maps have been used, and students gain empathy.

Fortuin et al. (2023) propose border-crossing learning trajectories, supporting interdisciplinary and cultural collaboration. Its learning mechanisms-identification, coordination, reflection, transformation-are valuable for sustainable engineers. Hartikainen et al. (2022) examine student perceptions of teaching, with atmosphere created by teachers influencing emotions. Procedures such as active tasks evoke pride or frustration, key to motivation in diverse contexts. Cobian et al. (2024) promote inclusive science, integrating social identities with scientific identity in STEMM. Manuel et al. (2023) intersect culturally responsive pedagogy with engineering design in high school, improving engagement.

Table 2 summarizes inclusive approaches, with columns for dimension, impacts on students, connection to sustainability and references, focusing on multiculturalism.

TABLE 2. *Dimensions of Inclusive Approaches in Multicultural Engineering Education*

Dimension	Impacts on students	Connection with sustainability	References
Project-based learning	Improved collaboration and cultural awareness	Integrates social equity in sustainable designs	(Pradhananga & ElZomor, 2023; Higuera-Martínez et al., 2022)
Border crossing	Promotes interdisciplinary co-creation	Addresses global challenges such as climate change	(Fortuin et al., 2023)
Study abroad	Develops systemic thinking	Connects cultural contexts with techniques	(Özkan et al., 2024)
Inclusive science	Integrates social identities	Promotes equity in biomedical research	(Cobian et al., 2024)

Source: Author's elaboration based on Pradhananga & ElZomor, 2023; Higuera-Martínez et al., 2022; Fortuin et al., 2023; Özkan et al., 2024 and Cobaln et al., 2025.

This table highlights synergies between inclusion and sustainability. Explaining: these approaches, by varying in application, allow for local adaptations; for example, in educational settings, PBL with multicultural groups generates innovative ideas, explaining why they sound conversational by including anecdotes, and strengthening community ties in sustainable designs. It is observed that collaboration, as in Fortuin et al. (2023), transcends disciplines, bringing together engineers and anthropologists for holistic projects. In contexts such as Latin America, where cultural barriers are common, these methods reduce conflicts by promoting co-created solutions. In addition, considering emotions (Hartikainen et al., 2022) ensures that inclusion is not superficial, but addresses frustrations for genuine engagement. Another benefit is the transfer to professional practice: students trained in this way take empathy to real projects, mitigating inequalities. In perspective, expanding these approaches requires resources, but it starts with simple workshops that cultivate reflection, evolving into inclusive curricula that honor diversity as a key asset.

International Programs and Systems Thinking

International programs broaden horizons in sustainable engineering education. Özkan et al. (2024) promote systems thinking through study abroad, connecting technical and contextual aspects in countries such as China. This prepares for multicultural projects, such as infrastructure in indigenous regions, where the cultural context is decisive. MacDonald et al. (2022) align objectives in global graduate engineering programs, recommending interdisciplinary groups. His suggestions emphasize co-creation, ideal for sustainability in diverse contexts.

Bergman et al. (2022) explore experiences in intercultural group work, transcending labels. Jiang et al. (2022) investigate learner agency in cross-cultural PBL. These approaches build resilience, allowing students to navigate differences for innovative solutions. In perspective, programs like this not only teach; they transform visions, making engineers see holistic systems where culture and sustainability are intertwined. In a globalized world, these virtual or face-to-face exchanges mitigate gaps, such as exposing Panamanian students to Asian water management practices.

In addition, systems thinking helps to anticipate impacts, avoiding errors in multicultural environments. Another aspect is adaptability: in times of restrictions, such as pandemics, hybrid formats that maintain profits are chosen. In educational contexts, integrating these programs increases motivation, as students return with fresh perspectives, enriching local classrooms. Finally, it is suggested that these programs be evaluated with qualitative metrics, measuring not only knowledge, but also changes in attitudes towards diversity.

Integration of Sustainability in Higher Education

The integration of sustainability into higher curricula closes the pedagogical cycle. Bolstad et al. (2025) offer educators' perspectives on integrating sustainability into electronic engineering programs, applicable to civil. Their cases highlight ongoing evaluations to ensure relevance. Beagon et al. (2022) detail competencies for SDGs, emphasizing cross-cultural collaboration. This is essential in multiculturalism, where sustainability implies respect for local practices.

Hartikainen et al. (2022) analyze student emotions triggered by teaching atmospheres, key to sustainable motivation. In educational environments, integrating these elements ensures that sustainability is not abstract, but lived, preparing engineers for an interconnected world. It is noted that, in universities such as Panama's, where resources vary, they start with modules integrated into existing courses, moving on to specializations. In addition, by linking sustainability with multiculturalism, issues such as equity in access to resources are addressed, fostering ethical debates.

Another benefit is interdisciplinarity: collaborations with social sciences enrich approaches, such as when analyzing cultural impacts of green projects. From a practical perspective, teachers must be trained to guide these integrations, avoiding curricular overload. It is suggested to use local cases, such as the Panama Canal, to illustrate real sustainability, making lessons relevant and motivating. This transforms higher education into a space where sustainability is lived as an ethical and cultural commitment. These innovations, from virtual reality to PBL, weave a pedagogical tapestry that makes civil engineering sustainable and multicultural.

Cases in Several Countries that Broaden the Empirical Basis of the Study

In Germany, for example, the use of immersive virtual reality for carbon-neutral development modules shows indicative results of improvement in both conceptual understanding and student engagement, as it provides an environment to simulate complex decisions with both ethical and environmentally transferable implications to other geographies (Hu et al., 2025).

In China, the use of study-abroad programs to develop systems thinking in which technologically-based content articulates with sociocultural contexts and reinforces students' ability to anticipate side effects of engineering solutions in culturally distinct communities (Özkan et al., 2024).

In the case of Australia and New Zealand, the implementation of project-based learning acquires scale and provides positive evidence of curriculum sustainability and curricular scalability, thus reaffirming problem-solving and portfolio-based assessment approaches, facilitating the transfer of learning to multicultural and multilingual professionalized contexts (Miao et al., 2024).

Complementarily, trajectories of "border crossings" have also been documented that favor co-creation in an interdisciplinary and multicultural manner, enabling coordination and reflection competencies that, in turn, sustain collaboration in heterogeneous teams (Fortuin et al., 2023). These types of dynamics become more present when incorporating findings in the realm of cross-cultural group work and learner agency since, prolonged exposure to different cultures serves to advance the balance of participation and evenly negotiate meanings during the completion of complex projects (Bergman et al., 2022; Jiang et al., 2022).

Similarly, the literature emphasizes that teaching climate and classroom procedures are emotional triggers that need to be managed to sustain motivation in culturally diverse cohorts (Hartikainen et al., 2022). In North America, there have been

multiple experiences of integrating social justice frameworks into civil engineering courses, combining professional identity, diversity, and inclusive work with technical decision making, leading to sensitivity to distributional impacts and situated ethical deliberation (Casper et al., 2021; Casper et al., 2024).

Such initiatives are aligned with a set of educational practices, with classroom levels - elaborated for constant application - and culturally responsive pedagogy strategies in pre-university education, of which the flow of diverse talent for engineering stands out (Vaden et al., 2025; Manuel et al., 2023); in a parallel sense, elective courses in macroethics in energy and sustainability have evidenced a good way of linking technical knowledge and moral deliberation in global contexts (Jin & Daher, 2024).

The connection between academia and industry also presents interesting advances for social sustainability, as collaborations make it possible to couple learning outcomes and work practices to bridge the gap between vocational training and professional practice (Pearson et al., 2025).

At the sector level, proposals have been made for indicators to measure diversity, equity and inclusion with respect to the construction workforce, and barriers and opportunities for their adoption and implementation have been synthesized, generating an institutional roadmap that feeds back into curriculum design and continuous improvement (Karakhan et al., 2021; Choi et al., 2022; Heydari et al., 2024).

Finally, the recommendations for the alignment of goals in global graduate programs and the identification of competencies to the SDGs give rise to translate these lessons into curricular architecture, ensuring fit between formative purposes, methodology and assessment (MacDonald et al., 2022; Beagon et al., 2022; Bolstad et al., 2025).

In sum, these comparative cases show that the combination of technological immersion, contextualized PBL strategy, cross-cultural co-creation, explicit social justice and academy-industry linkages generate consistent improvements in technical and socio-cultural competencies. The incorporation in this study strengthens the development section and provides the international empirical basis from which pedagogical strategies for sustainable civil engineering in multicultural contexts could be adapted locally (Park et al., 2021).

Discussion and Conclusions

In discussing these findings, it emerges that pedagogical innovations are not a panacea; they face barriers such as institutional resistance or lack of resources. For example, implementing virtual reality (Hu et al., 2025) requires investment, which is challenging in developing countries, where educational budgets often prioritize basic infrastructure over advanced digital tools. However, the benefits outweigh: students with humanitarian identities (Park et al., 2021) are more resilient in multicultural contexts, able to adapt to complex social dynamics that go beyond structural calculations. Compared to experiences in Panama, mixing PBL with local elements reduces attrition, as students see immediate relevance in their lives, such as applying sustainability concepts to urban problems in marginalized neighborhoods.

Multiculturalism adds complexity: approaches such as border crossing (Fortuin et al., 2023) help, but need cultural adaptation to avoid imposing Western models in Latin American contexts, where indigenous traditions demand deep respect. Future research

should measure long-term impacts, such as on professional careers, exploring whether these methods actually translate into inclusive work practices or whether they are diluted in the face of market pressures. The tables above illustrate this: Table 1 shows technology as a cultural bridge, facilitating virtual access that democratizes learning; Table 2 emphasizes inclusion for equity, highlighting how dimensions such as PBL foster not only skills, but personal transformations. In contextual perspective, these methods improve educational work, varying lessons to engage everyone, but they also raise questions about scalability: How to replicate study programs (Özkan et al., 2024) in regions with mobility limitations?

In addition, the role of industry in this equation must be considered. Heydari et al. (2024) and Choi et al. (2022) review diversity in the AEC industry, noting that, without alignment between academia and work, humanitarian identities formed in classrooms may clash with hierarchical corporate cultures. Pearson et al. (2025) propose collaborations to advance ESG principles, suggesting bridges between education and professional practice. In environments such as Panama, where the Canal represents an icon of global engineering, integrating these perspectives could mitigate inequalities, but requires policies that encourage inclusion. Another critical point is emotional motivation: Hartikainen et al. (2022) highlight how teaching atmospheres influence student emotions, implying that innovations fail if they do not address cultural frustrations. It is observed that in regions with high diversity, such as Latin America, these emotional barriers can be amplified, requiring approaches that prioritize psychological well-being. In addition, future lines should explore how to measure success beyond academic metrics, incorporating community testimonials to validate real impacts. In short, while these pedagogies promise a sustainable future, their success depends on overcoming systemic obstacles, fostering ongoing dialogues between educators, students and industry to refine approaches that are truly transformative. This not only enriches the discussion, but also invites concrete actions, recognizing that cultural equity is key to civil engineering that benefits all.

In conclusion, pedagogical innovations are essential for sustainable civil engineering in multiculturalism. From humanitarian identities to virtual reality and PBL, these approaches prepare empathetic and competent engineers capable of addressing challenges such as climate change with a cultural lens. It is recommended to integrate into curricula, train teachers and continuously evaluate, but Latin American institutions are also urged to adapt these methods to local realities, such as incorporating ancestral knowledge into urban designs. This not only builds structures; it builds just societies, where social equity is intertwined with environmental preservation.

Furthermore, this educational transformation requires an institutional commitment: universities must foster partnerships with communities so that service learning (Knox & Nairn, 2025) is not sporadic, but a curricular pillar. In a broader vision, imagine a world where engineers trained in this way lead projects that respect diversity, reducing urban inequalities in regions such as Latin America. We must continue to innovate, because the future demands it, prioritizing evaluations that measure not only technical knowledge, but also long-term social impacts. It also suggests policies that encourage scholarships for international programs, expanding access to students from low-income backgrounds. Finally, this article calls educators and policy makers to action, recognizing that true sustainability arises from inclusive pedagogies that honor multiculturalism as a driving force for progress. This closes a cycle, but opens the door to

further research into practical applications, ensuring that civil engineering evolves towards a more humane and equitable role.

This reflection on pedagogical innovations not only summarizes a path followed in the literature review, but also projects a horizon where civil engineering reinvents itself as an inclusive and responsible discipline. In contexts such as Panama's, where multiculturalism pulsates in every corner, it is evident that the methods discussed, from virtual reality that simulates global scenarios to service learning that anchors knowledge in real communities, are not mere academic tools, but catalysts for profound social change.

It is observed that by fostering humanitarian identities, future engineers are cultivated with empathy that transcends structural calculations, allowing designs that respect ancestral traditions while addressing environmental urgencies such as climate change. In addition, the integration of social justice in curricula ensures that equity does not remain an abstract ideal, but is materialized in labor practices that mitigate urban inequalities, especially in Latin American regions where megaprojects have left traces of exclusion.

In this line, the proposed recommendations, such as interdisciplinary alliances and continuous evaluations, emerge as concrete steps towards transformative education. Institutions are urged to prioritize these approaches, recognizing that true progress lies in preparing professionals who see diversity not as an obstacle, but as an invaluable resource.

Future research could explore metrics to measure long-term impacts, incorporating community voices to validate whether these methods actually build more just societies. In essence, this paper does not conclude a debate, but drives it forward, reminding us that authentic sustainability emerges when civil engineering embraces multiculturalism with humility and vision, contributing to a world where every bridge built unites not only lands, but shared cultures and hopes.

Conflict of Interest

The author declares that he has no conflicts of interest.

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Relevance of a curricular articulation model to promote educational pathways in chilean higher education

Pertinencia de un modelo de articulación curricular para favorecer las trayectorias formativas en la educación superior en chile

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ABSTRACT

Keywords:

curricular articulation, learning pathways, higher education, curricular flexibility, educational model.

This study examines the relevance of implementing a model of curricular articulation in Chilean higher education as a strategy to promote coherent, flexible, and inclusive learning pathways. The analysis is situated within a context characterized by fragmented educational trajectories, weak continuity between educational levels, and structural barriers that disproportionately affect students from vulnerable backgrounds.

A qualitative theoretical and documentary review design was adopted, integrating academic literature, national and international regulatory frameworks, and current public policy documents. The search was conducted between May and June 2025 using specialized databases (Scopus, ERIC) and official institutional sources (MINEDUC, CNED, UNESCO), resulting in the selection of 43 documents published between 2017 and 2024. The analysis followed three stages: documentary exploration, thematic categorization, and critical synthesis.

The findings indicate that curricular articulation constitutes a key component in the construction of progressive educational pathways, supported by mechanisms such as prior learning recognition, curricular modularization, inter-institutional mobility, and the use of qualification frameworks. However, within the Chilean context, persistent structural, regulatory, and institutional constraints continue to limit its effective implementation, despite recent advances such as the National Technical-Professional Qualifications Framework.

Based on these findings, the study proposes a conceptual model of curricular articulation tailored to the Chilean higher education system, structured around three interdependent dimensions: pedagogical, institutional, and social. The main contribution of this research lies in providing an analytical and propositional framework to guide the design of curricular policies and practices aimed at reducing student dropout, strengthening academic progression, and enhancing the relevance and quality of higher education.

RESUMEN	
Palabras clave: articulación curricular; trayectorias formativas; educación superior; flexibilidad curricular; modelo educativo.	La presente investigación analiza la pertinencia de implementar un modelo de articulación curricular en la educación superior chilena como estrategia para favorecer trayectorias formativas coherentes, flexibles e inclusivas. El estudio se sitúa en el contexto de la fragmentación de los recorridos educativos, la débil continuidad entre niveles formativos y las barreras que afectan especialmente a estudiantes de contextos vulnerables. Se adoptó un diseño cualitativo de revisión teórica y documental, que integró literatura académica, normativa nacional e internacional y documentos de política pública vigentes. La búsqueda se realizó entre mayo y junio de 2025 en bases de datos especializadas (Scopus, ERIC) y sitios oficiales (MINEDUC, CNED, UNESCO), seleccionándose 43 documentos publicados entre 2017 y 2024. El análisis se desarrolló en tres fases: exploración documental, categorización temática y síntesis crítica. Los resultados evidencian que la articulación curricular constituye un componente clave para la construcción de trayectorias educativas progresivas, a través de mecanismos como el reconocimiento de aprendizajes previos, la modularización curricular, la movilidad interinstitucional y el uso de marcos de cualificaciones. No obstante, en el contexto chileno persisten limitaciones estructurales, normativas e institucionales que restringen su implementación efectiva, pese a avances recientes como el Marco Nacional de Cualificaciones Técnico-Profesional. A partir de estos hallazgos, se propone un modelo conceptual de articulación curricular adaptado al sistema chileno, estructurado en tres dimensiones interdependientes: pedagógica, institucional y social. La principal contribución del estudio radica en ofrecer un marco analítico y propositivo que permite orientar el diseño de políticas y prácticas curriculares orientadas a reducir la deserción, fortalecer la progresión académica y mejorar la pertinencia y calidad de la educación superior.

Introduction

In recent decades, higher education systems have faced increasing challenges related to the fragmentation of students' educational trajectories. This is expressed in the lack of continuity between the different levels of the educational system and in the poor internal coherence of curricula, which hinders academic progression and employability (Figueroa et al., 2019). The absence of effective curricular articulation mechanisms between different programs and training levels not only compromises the quality of learning, but also generates barriers to access, permanence and graduation for students, particularly those from vulnerable contexts (Bernasconi, 2017).

In the Chilean case, this situation is aggravated by the deep equity gaps that have historically characterized the education system. Despite efforts to expand coverage and diversify the educational offer, high dropout rates persist in higher education, especially during the first year of studies (CNED, 2023). Likewise, there is little connection between the different educational subsystems, which translates into a lack of fluid and cumulative educational trajectories that allow students to move between different educational options without loss of learning or time. This curricular disarticulation also limits the recognition of prior learning, hindering the development of a truly flexible, inclusive and student-centered education (Sáez and López, 2020).

In this scenario, the analysis of curricular articulation models acquires critical relevance. Several countries have promoted reforms aimed at integrating education levels through qualifications frameworks, continuity of studies programs and transferable credit systems, in order to favor more coherent, effective and relevant life-long trajectories (OECD, 2021). Chile has made progress in this area with the creation of the National Qualifications Framework for Technical-Professional Education (MNC-TP), however, its effective implementation still faces important challenges, both institutional and cultural (MINEDUC, 2022).

The purpose of this article is to critically analyze the relevance and need to develop curricular articulation models that contribute to the construction of coherent, flexible and successful educational trajectories in the Chilean higher education system. To this end, conceptual approaches, international experiences and national advances in the field are reviewed, assessing their applicability in the local context. This reflection seeks to contribute to the discussion on the pedagogical, institutional and political conditions required to strengthen curricular articulation as a key strategy to improve equity, quality and continuity of learning in higher education in the country.

Method

In the context of the current challenges facing Chilean higher education - marked by curricular fragmentation, disarticulation between educational levels and the need for more flexible and coherent educational trajectories - a central question arises: What is the relevance of designing a curricular articulation model to promote sustainable and equitable educational trajectories in Chile? This question articulates pedagogical, institutional and political dimensions, and calls for a critical review of the state of knowledge on curriculum articulation, both nationally and internationally.

The objective of this theoretical review is to critically analyze the relevance and applicability of curricular articulation models aimed at strengthening educational

trajectories in Chilean higher education. To this end, it is necessary to: a) review the main conceptual approaches to educational trajectories and curricular articulation in higher education; b) analyze international models of articulation and their relevance for the Latin American and Chilean context; c) identify progress, limitations and gaps in public policies and institutional practices in Chile related to curricular articulation; and d) propose a conceptual model of articulation relevant to the Chilean system, considering pedagogical, institutional and social foundations.

This study adopts a qualitative design of theoretical and documentary review, aimed at mapping, analyzing and synthesizing the current state of knowledge on curricular articulation and educational trajectories. This methodology was chosen because of its ability to integrate diverse academic and normative sources, and thus provide a critical and interpretative view of the phenomenon studied (Boote and Beile, 2005; Snyder, 2019).

The review was based on a systematic search of academic literature and public policy documents carried out between May and June 2025, through Google Scholar, Scielo, RedALyC, ERIC, Scopus and official sites such as MINEDUC, CNED, CNA Chile, UNESCO and OECD. Inclusion criteria were used:

- Publications between 2017 and 2024, except for previous key sources of high citation.
- Studies in Spanish and English with a focus on higher education, curriculum, educational trajectories and articulation.
- Official normative and technical documents in the Chilean context.

The main keywords used were: educational trajectories, curricular articulation, higher education, curricular flexibility, recognition of prior learning, articulation models. The final selection included 43 academic and normative sources, organized thematically through an analytical matrix that made it possible to identify recurrent axes, tensions and gaps.

The analysis was conducted in three phases. The first was the exploration and pre-selection of relevant documents according to inclusion criteria. The second was the critical reading and categorization of contents, using a thematic matrix organized around definitions, types of articulation, international models, national policies and challenges for Chile. The third was the synthesis and construction of proposals, through the integration of empirical and conceptual evidence, with emphasis on their applicability to the Chilean context.

The approach adopted was critical and interpretative, allowing us not only to describe the state of the art, but also to propose a conceptual approach based on the evidence analyzed. This approach articulates pedagogical, institutional and socio-political perspectives on the curriculum, placing the analysis within the framework of the transformations facing higher education in the face of the demand for greater equity, quality and formative articulation (UNESCO IESALC, 2022; Gairín et al., 2023).

Results

Educational Trajectories in Higher Education

The notion of formative trajectory in higher education refers to the educational path that a student follows throughout his or her academic life, encompassing both

curricular and extracurricular aspects that make up his or her training process. This concept implies a coherent progression through different levels, programs or institutions, with the aim of advancing towards defined formative and professional objectives (Tinto, 2017; Martínez and Rodríguez, 2020). A successful formative trajectory is characterized by its curricular coherence, that is, by the existence of logical and progressive relationships between learning, levels of complexity and academic demands, as well as by student retention and permanence, understood as indicators of continuity and effectiveness of the educational system (Cabrera and La Nasa, 2018).

Various structural, institutional and pedagogical factors affect the development of fluid educational trajectories. Among the elements that favor such trajectories are: the existence of curricular articulation mechanisms between programs and educational levels; the formal recognition of prior learning; the implementation of tutoring and academic support systems; and the availability of clear and timely information on possible educational paths (Guzmán-Valenzuela et al., 2021). Similarly, a curriculum structured by competencies, with clearly defined levels of achievement, facilitates the understanding and appropriation of the formative processes by the student body (Wheelahan, 2019).

In contrast, among the most frequent obstacles are identified the rigidity of curricula, the lack of articulation between institutions, the pedagogical discontinuity between educational levels and the limited institutional capacity to respond to the diversity of real trajectories experienced by students, especially those of first generation or from disadvantaged socioeconomic contexts (Espinoza and Gonzalez, 2020). The academic overload, the decontextualization of the curriculum and the absence of accompaniment also contribute to the fragmentation of trajectories and, consequently, to dropout.

In this context, curricular flexibility emerges as a key condition to promote more inclusive, relevant and sustainable educational trajectories (Gallardo et al., 2023). In this study, curricular flexibility is defined as the capacity of the higher education system to offer modular training structures, alternative progression routes and mechanisms for formal recognition of prior learning, allowing students to progress according to different paces, experiences and needs. This flexibility has three operational dimensions: (a) structural, referring to the modular organization of the curriculum and the existence of differentiated itineraries; (b) academic, linked to the recognition of formal, non-formal and informal learning; and (c) administrative, associated with inter-institutional mobility and the use of transferable credit systems.

From this perspective, flexibility does not imply a reduction in standards or a decrease in academic demands, but rather the adoption of mechanisms that allow for the reconciliation of diverse trajectories with common training frameworks and defined graduation profiles. This includes mechanisms such as the validation of learning acquired in different training contexts. In this sense, it is necessary to distinguish between formal, non-formal and informal learning. Formal learning corresponds to those developed in structured educational programs leading to official certification; non-formal learning is generated in organized, intentional and systematic training instances that do not necessarily lead to formal degrees; while informal learning is acquired through work, social or personal experience, without an explicit curricular structure (UNESCO, 2019).

In the proposed model, the recognition of prior learning is focused mainly on formal and non-formal learning, incorporating informal learning through rigorous evaluation procedures that make it possible to demonstrate transferable competencies, safeguarding the quality and coherence of the graduation profile.

Implementing effective curricular flexibility requires rethinking traditional pedagogical models and moving towards student-centered approaches, where curricular planning contemplates multiple entry and exit points, as well as modular structures that allow for the construction of staged trajectories. In addition, it is essential to ensure institutional governance that supports these transformations, through clear regulations, adequate resources and a sustained commitment to equity (Delors et al., 2016).

Conceptualization of Curriculum Articulation

Curricular articulation is a central strategy for building coherent, inclusive and sustainable educational trajectories in higher education systems. From a pedagogical approach, it is understood as the process through which logical, progressive and meaningful relationships are established between the different levels, cycles, programs and training modalities, with the aim of ensuring continuity of learning and avoiding its fragmentation (Villa and Poblete, 2018). From the educational policy perspective, curricular articulation is conceived as a systemic coordination mechanism between institutions, subsystems and regulatory frameworks, aimed at facilitating the transit of students and promoting the recognition of previous and acquired learning (Brunner and Ferrada, 2021).

Curricular articulation is not a univocal concept, but takes multiple forms depending on educational structures and national policies. In general, it can be classified into different types of articulation:

- *Vertical articulation:* refers to the progression between hierarchically organized educational levels, such as the passage from secondary technical-professional education to higher education or from higher level technical programs to university careers (Martínez and Lara, 2022).
- *Horizontal articulation:* refers to the integration between programs of the same educational level or between related disciplines, favoring complementary academic itineraries and lateral mobility of students (Sáez and López, 2020).
- *Diagonal articulation:* combines vertical and horizontal elements, making it possible to move between different levels and training areas, for example, between vocational training and continuing education.
- *Upward and downward articulation:* refers to bidirectional movements in the educational system, recognizing that students can advance to higher levels or return to other cycles to acquire new competencies (Gairín et al., 2021).
- *Inter-institutional articulation:* occurs between different educational entities, including universities, technical training centers and professional institutes, facilitating agreements for continuity of studies, homologations and shared routes.
- *Articulation by competencies:* focuses its logic on the achievement of measurable and transferable learning, enabling flexible routes based on learning outcomes and not only on time spent (Wheelahan, 2019).

These forms of articulation take on special relevance in contexts that seek to promote employability, lifelong learning and the inclusion of non-traditional students (understood as people whose trajectories are distanced from the linear educational path, including first generation students, workers who combine study and employment, people who resume studies after prolonged interruptions, those who have family responsibilities, as well as those who come from previous incomplete experiences

or non-formal training; these profiles tend to face greater barriers to access, continuity and progression in rigid curricular systems, so that articulation, recognition of prior learning and training flexibility acquire particular relevance to guarantee real conditions of equity and mobility.)

In this sense, competency-based approaches have made it possible to rethink curriculum planning from a logic of learning outcomes and professional performance, in coherence with national and international qualification frameworks (OECD, 2021). Competency-based education promotes personalized itineraries and facilitates the assessment of achievements in different contexts, allowing mobility and the reconfiguration of educational trajectories (Muñoz and Salas, 2020).

In addition, the recognition of prior learning (RAP) has been consolidated as a key tool for curricular articulation, allowing the formal validation of knowledge and competencies acquired in formal, non-formal and, to a limited extent, informal contexts. In the proposed model, PAR is conceived as a regulated academic process, based on explicit evaluation criteria, such as correspondence with the learning outcomes of the curriculum, demonstration of transferable competencies and verifiable evidence of performance.

The validation procedures consider academic evaluation instances such as portfolios of evidence, performance evaluations, technical interviews or proficiency tests, defined and supervised by the responsible academic units. Likewise, quality safeguards are established to ensure the formative equivalence between the recognized learning and the learning outcomes of the program, preventing curricular flexibility from implying a reduction in the required academic standards.

In Latin America, its development has been uneven, but there are significant advances in countries such as Colombia, Mexico and Chile, where regulations have been established for its implementation in the technical-professional field (UNESCO IESALC, 2022). At the same time, in recent years, micro-credentials have gained relevance, emerging as a disruptive innovation in higher education, offering modular certifications oriented to specific competencies, which can be accumulated to build flexible trajectories. These credentials, which respond to the needs of the labor market and lifelong learning, are articulated with formal training programs and favor inter-institutional recognition, thus facilitating mobility and employability (Oliver, 2021).

Curricular Articulation Models

A curricular articulation model can be understood as a structured set of principles, strategies and mechanisms designed to ensure continuity, coherence and progression of learning throughout educational trajectories. These models seek to integrate different levels, modalities and types of training -from secondary education to technical, vocational and continuing education-, overcoming the fragmentation of the education system and favoring a holistic view of learning (Delors et al., 2016).

From a curricular perspective, these models are based on approaches such as design by competencies, modularization of content, flexibility of itineraries and the incorporation of mechanisms for the recognition and validation of prior learning (RAP) (Martínez and Rodríguez, 2020). Its design requires a systemic logic that articulates pedagogical, normative and institutional dimensions, allowing the construction of integrated, cumulative and transferable formative routes, in tune with the principles of a student-centered education oriented to lifelong learning (UNESCO, 2019).

At the global level, multilateral organizations such as UNESCO, the OECD and the European Union have actively promoted policies to strengthen curricular articulation as a way to ensure equity, quality and relevance in higher education. The UNESCO Recommendation on Lifelong Learning (2015) highlights the need to create institutional frameworks that allow for the integration of diverse educational paths and student mobility through qualification systems, validation of prior learning and modular structures. Specifically, the OECD has emphasized the importance of the National Qualifications Frameworks (NQFs) as instruments that link education, training and employment. These frameworks make it possible to map and recognize competencies at all educational levels and facilitate international comparability (OECD, 2021).

In Europe, the European Qualifications Framework (EQF) has been a reference for implementing intersectoral and transnational articulation policies, promoting the portability of credentials, transparency of learning and academic and labor mobility (CEDEFOP, 2020). The Bologna and Copenhagen processes have been fundamental in the construction of articulation models based on credit systems (ECTS), degrees by cycles, mutual recognition of qualifications and flexible mobility routes. Countries such as Finland and Germany have developed mixed models that allow articulating vocational and university training, recognizing competencies and promoting dual learning (CEDEFOP, 2020).

In North America, Canada has successfully implemented models of articulation between community colleges and universities through credit transfer agreements, integrated curricula and provincial qualifications systems. In the United States, although the system is more decentralized, there are state initiatives that promote educational continuity through *articulation agreements* and *career pathways* (OECD, 2021).

In Latin America, the experience has been more heterogeneous. Colombia has advanced with the National Qualifications Framework and propaedeutic cycle programs that articulate technical, technological and professional levels. Mexico has developed the National Baccalaureate System based on competencies, while Chile has launched the National Framework of Technical-Professional Qualifications (MNC-TP), whose objective is precisely to facilitate the articulation between training subsystems and with the world of work, although its implementation is still in its initial stages (MINEDUC, 2022).

Based on these experiences, it is possible to identify a series of common elements that shape the guiding principles of the curricular articulation models:

- Recognition of previous learning (formal, non-formal and informal).
- Modularization of the curriculum and structuring by cycles.
- Transparency and comparability of apprenticeships through qualifications frameworks.
- Transferable credit systems and mobility mechanisms.
- Effective linkage between training and employment.
- Coordinated governance between institutions and productive sectors.
- Student-centered approach and flexible pathways.

These guidelines show that curriculum articulation is, above all, a complex process that requires political will, inter-institutional cooperation and pedagogical transformation. The adoption of articulation models not only aims to improve the efficiency of the educational system, but also to guarantee the right to continuous, relevant and quality education for all.

State of Curricular Articulation in Chilean Higher Education

In the last two decades, Chile has progressively advanced in the implementation of policies aimed at strengthening curricular articulation in higher education, although progress has been partial and heterogeneous. Law No. 21,091 on Higher Education (2018) establishes principles such as equity, quality and flexibility, and explicitly recognizes the need to foster integrated formative trajectories, including the recognition of prior learning and student mobility (MINEDUC, 2018). Along these lines, the National Education Council has promoted criteria to ensure curricular coherence in the licensing and institutional installation processes, and has published guidelines on mechanisms for articulation between levels, with special emphasis on technical-professional education (CNED, 2023).

A relevant milestone has been the development of the National Framework of Technical-Professional Qualifications (MNC-TP), promoted by the Ministry of Education in collaboration with the Ministry of Labor. This instrument seeks to define graduation profiles, qualification levels and common performance standards between institutions and productive sectors, thus favoring the continuity and relevance of educational trajectories (MINEDUC, 2022). However, its implementation is still incipient, with little effective linkage between institutions and sectors, and with difficulties in defining validation and mobility mechanisms.

In terms of quality, the National Accreditation Commission (CNA) has incorporated criteria that, although they do not directly regulate curricular articulation, they do value the existence of mechanisms for the recognition of learning, educational continuity and academic progression as part of the quality of the institutional curricular design (CNA, 2021). These criteria are considered in the accreditation processes of higher education institutions and training programs, which is why they have gained relevance in the national system.

At the institutional level, some universities and professional institutes have developed relevant initiatives aimed at program articulation. These include agreements for the continuity of studies between technical and professional careers, the design of modular curricula and the recognition of previous training paths through leveling or validation programs (Salinas et al., 2020). For example, the Technological University of Chile (INACAP) has promoted an articulation strategy based on a model of cumulative training cycles, which allows transition from technical to professional levels without loss of learning.

Likewise, institutions such as DUOC UC and IP Chile have worked on the development of vertical articulation mechanisms and recognition of prior learning, although these experiences have not been generalized or integrated into a national systemic policy (Espinoza and González, 2021). A constant feature of these initiatives is that they are voluntary, focused and dependent on institutional will, which limits their scope and impact.

Although the policies and experiences reviewed offer signs of openness towards articulation models, their applicability in the Chilean system faces important structural and regulatory tensions. First, the fragmentation of the higher education system - composed of universities, professional institutes and technical training centers, with differentiated structures and regulations - makes it difficult to build integrated educational trajectories. Added to this is the weakness of binding regulatory frameworks that oblige institutions to recognize learning among themselves or to coordinate their curricula (Bernasconi, 2017).

On the other hand, there are still theoretical and operational gaps in the formulation of articulation models adapted to the Chilean context. Although the NQF-PT

constitutes a significant advance, there are no clear pedagogical guidelines on how to effectively articulate formative levels in the curricular design, nor methodological orientations for implementing PAR or micro-credentialing systems within the formal framework of higher education (Guzmán-Valenzuela et al., 2023).

In addition, current regulations lack real incentives to promote cooperation between institutions, and specific evaluation frameworks have not yet been developed to measure the effectiveness of articulation mechanisms in terms of equity, progression and educational quality. Therefore, from a critical perspective, the applicability of a curricular articulation model in Chile requires not only technical adjustments, but also a transformation of the institutional paradigm that allows moving from inter-institutional competition to a collaborative system logic, where the student's trajectory is the structuring axis of curricular design and educational governance.

Discussion and Conclusions

The theoretical review carried out shows the centrality of curricular articulation as a strategy to strengthen the coherence, flexibility and progression of educational trajectories in higher education. Despite ample international evidence and recent regulatory advances in Chile, the national system still exhibits a structural fragmentation that prevents the consolidation of fluid and cumulative educational trajectories. This dissociation is expressed both between the different formative levels and within the institutions themselves, where curricula are often developed as closed, rigid structures that are disconnected from students' prior learning (Bernasconi, 2017; Guzmán-Valenzuela et al., 2023).

In this context, it is imperative to design a model of curricular articulation adapted to the conditions and challenges of the Chilean system, which will make it possible to move forward from isolated institutional efforts towards a systemic, coherent and sustained educational policy. This need responds not only to criteria of academic efficiency, but also to a logic of educational justice, recognizing that the absence of integrated trajectories has a greater impact on students from more vulnerable contexts, perpetuating historical inequalities in access, permanence and graduation (Espinoza and González, 2021).

The design of a curricular articulation model relevant to Chile should consider at least the following key elements:

- A binding and clear regulatory framework that defines minimum standards of articulation between institutions, levels and programs, overcoming the current voluntary nature.
- Shared pedagogical criteria that promote curricular coherence through the competency-based approach, modularization of programs and validation of prior learning.
- Formal academic mobility mechanisms, including transferable credit systems, recognition of micro-credentials and continuity of studies agreements.
- Inter-institutional governance spaces that allow for effective coordination between universities, professional institutes, technical training centers and public agencies.
- Evaluation and follow-up instruments, integrated to the institutional quality assurance systems, that allow monitoring the effectiveness of the

articulation mechanisms through indicators such as academic progression, retention, coherence between graduation profiles and learning outcomes, and the functioning of the RAP.

Beyond its technical implementation, this model requires a cultural change in the Chilean educational system: to move from a logic of competition between institutions to a collaborative logic centered on the student and on learning as a continuous and cumulative process. Designing and implementing a curricular articulation model in Chile could contribute significantly to reducing dropout rates, recognizing the diversity of prior learning and trajectories, strengthening the quality and relevance of the educational offer and promoting a culture of lifelong learning.

Nevertheless, the challenges are relevant. The lack of systemic coordination, institutional resistance to sharing standards and the weakness of the existing regulatory frameworks are obstacles that must be addressed with decisive public policies, adequate resources and a joint commitment of the system's stakeholders. Along these lines, there is an urgent need to promote new research to address the theoretical and empirical gaps identified, especially those related to the evaluation of the impact of existing articulation experiences and the design of pilot models that can be scaled up at the national level.

Following the theoretical review, a conceptual model of curricular articulation is proposed (see Figure 1) that contemplates three interdependent dimensions:

- *Pedagogical foundation:* based on the competency-based approach, modularization of the curriculum and training flexibility. It promotes a curriculum design oriented to transferable learning outcomes, with open structures that allow multiple routes of entry, progression and graduation. In addition, it integrates mechanisms for the recognition of prior learning (formal, non-formal and informal) and values the knowledge acquired outside the classroom (Wheelahan, 2019; UNESCO IESALC, 2022).
- *Institutional foundation:* the model proposes a governance framework based on collaboration between higher education institutions, training subsystems and public regulatory agencies. In this scheme, regulatory authorities play a key role in defining, supervising and safeguarding minimum educational quality standards. At the national level, agencies such as the Ministry of Education and its technical bodies, the National Education Council and the National Accreditation Commission are responsible for establishing regulatory frameworks, quality criteria and guidelines for curricular articulation, as well as for supervising compliance with them. These functions are in line with Brunner and Ferrada (2021), who emphasize the importance of systemic governance capable of articulating common policies and ensuring coherence among institutions. At the institutional level, the academic units and the internal quality assurance systems assume the operational implementation of the model, ensuring coherence between the graduate profiles, the learning outcomes and the articulation mechanisms.
- *Social foundation:* recognizing the diversity of trajectories of Chilean students and promoting equity through real opportunities for mobility, continuity and recognition. Here we are committed to a model that responds to the demands of the labor market, the inclusion of first-generation students, and the articulation between education and citizenship (Espinoza and González, 2021).

This model seeks to generate conditions so that students' educational trajectories are not determined exclusively by the rigidities of the system, but rather recognize the real trajectories of students, understood as the paths actually followed over time, marked by interruptions, re-entries, combinations between study and work, and learning acquired in different contexts.

The design of personalized training paths does not imply the absence of a common curricular framework, but rather the possibility of articulating different itineraries within shared training structures, with clearly defined learning outcomes and graduation profiles. This adaptation between educational offerings and diversity of trajectories does not imply a lowering of academic standards, but rather an articulated design that allows students to be led towards graduation profiles defined by competencies and socially relevant learning outcomes, regardless of the educational route followed. Likewise, the model coherently articulates the levels of technical-professional and university education, establishing a cumulative progression based on learning achievements, without implying disregarding the formative value of study time, which is recognized as part of the academic and professional maturation process.

The formative trajectories, in this sense, are not linear or uniform, but are constructed as personalized routes in a permeable system, where the student can advance, pause or reorient his or her process without loss of formative value. However, this diversification of trajectories does not imply a decrease in academic demands or a relaxation of achievement standards. On the contrary, the proposed model is based on graduation profiles defined by competencies and verifiable learning outcomes, which act as common references for all students, regardless of the training path followed.

Thus, curricular flexibility is articulated with quality assurance mechanisms that guarantee formative equivalence: the evaluation of competencies is based on explicit criteria, validated instruments and institutional procedures that safeguard the coherence between recognized learning, training activities taken and expected performance of the graduate. This ensures that the diversity of trajectories does not result in quality gaps, but in differentiated opportunities to achieve the same professional standards.

The model can be represented along five functional axes: 1) a modular curriculum articulated by competencies; 2) systems for the recognition and validation of prior learning; 3) regulated inter-institutional mobility; 4) an active national qualifications framework; and 5) articulating governance. Within this framework, the balance between common training and electives is defined on the basis of explicit pedagogical and professional criteria.

The common training is structured around a set of fundamental competencies and mandatory learning outcomes, directly linked to the program's graduate profile and professional standards. The optional nature, meanwhile, is oriented to the diversification of formative itineraries, allowing disciplinary deepening, progressive specialization or adaptation to specific work contexts, without altering the essential formative nuclei. Thus, curricular flexibility is expressed in the configuration of alternative routes, but not in the redefinition of minimum expected learning.

In order to advance towards the implementation of this model, the following lines of action are proposed at the institutional level:

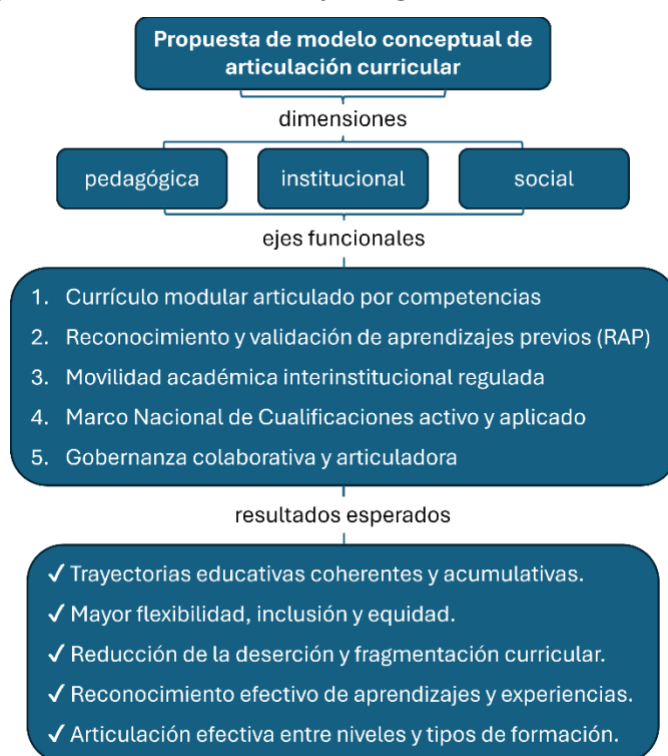
- Redesign curricula from a logic of articulation and progression, considering real student trajectories and transversal competencies.
- Establish technical units for curricular articulation, with the capacity to manage RAP processes, mobility and educational continuity.

- Generate formal links with other institutions in the system, based on common frameworks of quality, competencies and learning outcomes.
- Strengthen teacher training in flexible and student-centered approaches, including authentic and contextualized assessment.
- Integrate the analysis of student trajectories in the internal quality assurance and institutional planning processes.

This conceptual model does not pretend to be a universal recipe, but a proposal adaptable to the specific contexts of each institution, which recognizes the urgency of building a more interconnected, inclusive system focused on real trajectories, as a condition for advancing towards a more equitable, relevant and transformative higher education.

FIGURE 1

Conceptual model of curricular articulation for higher education in Chile.



Note. Prepared by the authors (Rodríguez and Almeyda, 2025).

The implementation of a coherent curricular articulation model adapted to the Chilean context could contribute significantly to improving the academic progression of students, understood as the continuous and efficient transit through the different stages of their education. By structuring cumulative formative trajectories, the model facilitates the understanding of the academic itinerary, decreases curricular overload and allows advancing with greater security towards the achievement of educational goals (Tinto, 2017).

Likewise, the strengthening of mechanisms such as the recognition of prior learning, curricular flexibility and inter-institutional mobility could increase student permanence, especially in traditionally excluded sectors or those with discontinuous

trajectories. This translates into higher retention, lower attrition and a better match between the educational offer and the entry profiles (Gairín et al., 2021).

For the proposed model to be viable and sustainable, higher education institutions must develop certain enabling conditions: a shared institutional vision, technical-pedagogical capacity, monitoring and follow-up systems, inter-institutional cooperation mechanisms and the inclusion of curricular articulation in quality assurance processes in education. In addition, the sustainability of the model depends on its ability to adapt to different institutional contexts, respond to transformations in the world of work, and integrate innovations such as micro-credentials, hybrid education and lifelong learning.

In conclusion, the analysis carried out in this article confirms the relevance and urgency of moving towards a model of curricular articulation for Chilean higher education. This model represents a fundamental tool for building coherent, inclusive and lifelong learning-oriented educational trajectories. Its relevance transcends the curricular, as it has a direct impact on educational policy, by requiring integrative regulatory frameworks; on institutional management, by requiring flexible and collaborative structures; and on pedagogical innovation, by promoting approaches centered on the student and his or her previous experiences.

Faced with the challenges of attrition, fragmentation and rigidity that affect the Chilean system, curricular articulation is emerging as a transformative strategy capable of improving the equity, quality and relevance of higher education. However, its implementation requires solid institutional conditions, intersectoral coordination and a collaborative culture oriented to the common good of education.

In view of the above, it is suggested that further applied research be conducted to evaluate pilot articulation experiences in Chile, as well as to develop comparative studies with international models that can be adapted to the national context. It is also essential to promote the development of specific pedagogical and methodological guidelines to guide institutions in the design, implementation and evaluation of articulation models that respond to the real needs of their student communities.

On the other hand, this study has some limitations that should be considered when interpreting its scope. In the first place, this is a theoretical-documentary research, so it does not incorporate empirical evidence derived from the implementation of the model in specific institutional contexts. Second, the analysis focuses on the context of the Chilean higher education system, which limits the direct generalization of the findings to other national systems with different regulatory frameworks and structures. However, these limitations are consistent with the objective of the study, which is oriented towards the construction of a conceptual and propositional framework.

Finally, from a feasibility perspective, the implementation of the proposed model does not necessarily imply a significant increase in structural costs, as long as it is based on the progressive strengthening of existing institutional capacities, such as quality assurance systems, curriculum management and mechanisms for the recognition of prior learning. However, its adoption requires institutional will, inter-institutional coordination and gradual implementation to safeguard the financial sustainability of the system.

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Perception of the level of competence acquired by tourism degree students in customer service

Percepción del nivel de competencias adquirido en los estudiantes del grado de turismo en el servicio al cliente

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ABSTRACT

This study aimed to analyze the perceived level of mastery of essential customer service competencies among university tourism students. The research was based on contemporary educational theories such as competency-based learning, constructivism, and the theory of multiple intelligences. A quantitative, non-experimental, cross-sectional design was used with a sample of 258 students. Data was collected through an online questionnaire hosted on the Microsoft platform, which the study sample accessed using their private institutional code. The questionnaire has a Cronbach's alpha of .940 and an Omega coefficient of .966. The data collection instrument consisted of 27 coded statements, each corresponding to a specific skill, used to determine the level of mastery of the competencies (interpersonal communication, teamwork, decision-making, innovation and creation, learning ability, and technology skills). The following rating scales were used: none, little, some, quite a lot, and a great deal. The results revealed a moderate-to-high level across all competencies, with average scores between 3.46 and 3.62. Students perceived adequate proficiency in social and cognitive competencies, although areas for improvement were identified in innovation and technology use. These findings confirm the relevance of the competency-based approach and the need to strengthen pedagogical strategies that integrate technology, creativity, and experiential learning. Integrating simulations, ICT, creative projects, and teacher training is recommended. The sample is limited to a single university.

RESUMEN

Palabras clave:

Este estudio tuvo como objetivo analizar la percepción del nivel de dominio de las competencias esenciales para el servicio al cliente en estudiantes universitarios de turismo. La investigación se fundamentó en teorías educativas contemporáneas como el aprendizaje por

competencias profesionales, formación universitaria, servicio al cliente, educación turística	competencias, el constructivismo y la teoría de las inteligencias múltiples. Se aplicó un diseño cuantitativo, no experimental y transversal, con una muestra de 258 estudiantes. Los datos se recolectaron mediante un cuestionario en línea programado en la plataforma de Microsoft en la cual la muestra del estudio tenía acceso con su código privado de la institución educativa. El cuestionario posee un nivel de confiabilidad Cronbach de .940 y OMEGA de .966 respectivamente. El instrumento de recolección presenta 27 enunciados codificados con su respectiva destreza para determinar el nivel de dominio de las competencias (Comunicación interpersonal, Trabajo en equipo, Toma de decisiones, Innovación y creación, Capacidad de aprendizaje y Manejo de tecnología) se utilizaron las siguientes afirmaciones: nada, poco, regular, bastante y mucho. Los resultados revelaron un nivel moderado-alto en todas las competencias, con medias entre 3.46 y 3.62. Los estudiantes perciben un dominio adecuado en competencias sociales y cognitivas, aunque se identifican áreas de mejora en innovación y manejo tecnológico. Estos hallazgos confirman la pertinencia del enfoque por competencias y la necesidad de fortalecer estrategias pedagógicas que integren tecnología, creatividad y aprendizaje experiencial. Se recomienda integrar simulaciones, TIC, proyectos creativos y capacitación docente. La muestra se limita a una sola universidad.
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Introduction

The tourism industry depends on the service and how it is provided to tourists for the hospitality sector to thrive in the country's economy. Service is provided by people and these employees must master a number of skills to perform well in their jobs. Most of the employees are trained at universities and these educational academies have the duty to know in detail how the tourism sector works. The study by Torres (2022) entitled: "Learning beyond the content: workforce skills development at community colleges" (doctoral dissertation) from Tarleton State University, aims to determine the extent to which students develop workforce skills while completing a community college education and, from the students' perspective, what community colleges can do to better prepare students for success upon graduation and entry into the workforce.

The findings show that students developed a considerable number of the 10 skills and were generally satisfied with the skills they learned while completing their programs. However, students reported that they could have learned more skills if they had applied increased hands-on, experiential and collaborative learning. The author concludes that higher education should be oriented primarily towards strengthening labor competencies in students in all areas of knowledge. The degree of development of these competencies is conditioned by the teacher responsible for the course and by the pedagogical strategies used.

On the other hand, continuing with the introduction to the topic of student development, the study conducted by Anderson et al. (2022) titled: Development of competencies in education: conceptual and operational definitions (research article) by Universidad Metropolitana de Educación, Ciencia y Tecnología, aims to refine and learn about the process of teaching by competencies. The authors argue that competency-based learning evolves the learner as his or her training is transformed by skills. Ultimately, the authors conclude that the learner's prior knowledge is the essential foundation for competency-based learning to be meaningful, relevant and sustained throughout the learner's life course. In this context, education by competencies transcends mere thematic organization, sustaining curricular flexibility and incorporating the student in the contemporary framework characterized by informational dynamics

Based on the importance of professional training as a requirement to obtain a job, companies demand personnel with key competencies to work, but the evidence that exists is that universities develop competencies at a lower level than that required by companies, according to Guim and Marrero (2022). However, labor competencies are closely related to the training provided in educational institutions, which is manifested through the knowledge, skills and attitudes acquired, which are subsequently evidenced in the individual's professional performance, comments Castillo (2019). However, it is important for universities to identify which competencies a tourism employee should master.

The traditional conception of intelligence as a single capacity linked to logical reasoning and academic performance has been challenged by the theory of Multiple Intelligences proposed by Howard Gardner (2011). In education, this theory has transformed pedagogical practices by promoting methodologies that recognize cognitive diversity and favor meaningful learning. Recent research highlights that the implementation of strategies based on multiple intelligences in higher education

contributes to the integral development of students and improves academic performance (Abarca, 2024; Nasimba et al., 2025).

Likewise, the importance of intrapersonal intelligence, understood as the capacity for self-knowledge and self-regulation, which positively influences motivation, stress management and adaptation to different learning styles, is emphasized (Mendoza, et al., 2024; Vázquez, et al., 2022). In this sense, higher education faces the challenge of designing flexible curricular proposals that enhance these intelligences, incorporating active methodologies and technological resources to respond to the demands of the contemporary context, Pérez et al. (2024).

This approach holds that intelligence is manifested in various dimensions, including linguistic, logical-mathematical, spatial, musical, bodily-kinesthetic, interpersonal, intrapersonal and naturalistic, each associated with specific skills that allow problem solving and adaptation to different contexts (Gardner, 2011; Pinargote, 2024). The theory of multiple intelligences states that each individual possesses a unique combination of strengths, limitations and preferences, which influence their decisions and, in the educational field, condition the selection of pedagogical strategies used by teachers in the teaching-learning process (Gardner, 2011; Pérez et al., 2024).

Learning is a complex process that has been explained by various theories, each with significant contributions to education. Among the most relevant are:

- Behaviorism - Proposes that learning is based on the association between stimuli and responses, emphasizing positive and negative reinforcement to modify behaviors. Although traditional, it continues to be applied in environments where control and repetition are required Guerrero (2023).
- Cognitivism - Focuses on internal processes such as memory, attention and knowledge organization. Emphasizes meaningful learning and the importance of connecting new content with prior knowledge Campos (2024).
- Constructivism - Considers learning as an active process in which the student constructs knowledge through interaction with the environment and social mediation. It promotes methodologies focused on problem solving and collaborative work (Rada, 2023; Reátegui et al., 2022).
- Sociocultural - Based on Vygotsky, it highlights the influence of the social and cultural context on learning, introducing concepts such as the Zone of Proximal Development (ZDP) and Campos mediation (2024).
- Connectivism - An emerging theory that responds to the digital era, positing that learning occurs in networks and depends on the ability to connect nodes of information and people. It is key in virtual environments and contemporary higher education Méndez et al. (2021).
- Contemporary Trends - Approaches such as experiential learning, gamification, multimodal learning and deep learning are incorporated, which seek to integrate technology, social interaction and active methodologies to respond to the demands of the 21st century, Rada and Trigo (2023).

Competency-based learning for university tourism students focuses on developing comprehensive skills to ensure excellence in customer service. This approach promotes communicative, intercultural and problem-solving skills, essential to respond to the demands of the global tourism sector Robles (2024). Higher education institutions incorporate active methodologies, such as simulations and internships, which strengthen the ability to apply knowledge in real contexts Garaicoa (2025). It also promotes ethical

competence and sustainability orientation, key elements for delivering responsible, high-quality experiences, Umanzor (2025).

The comparative analysis between the Colombian and Puerto Rican contexts reveals substantial differences in the educational and labor challenges. In Colombia, the central problem identified in the study on the IELTS test lies in the absence of personalized feedback in the results reports, which limits the possibility of meaningful learning and effective preparation for a second taking Zeller (2024). On the other hand, in Puerto Rico with an economy heavily dependent on tourism, the main challenge focuses on the gap between the skills demanded by the tourism industry and those developed by universities (Anderson et al., 2022; Torres, 2022). The Puerto Rican educational approach seeks to strengthen competency-based training. The development of multiple intelligences and soft skills such as leadership, communication and teamwork, in addition to integrating information and communication technologies (ICTs) to respond to a highly competitive global market (Castillo et al., 2020; Cisneros et al., 2024). While in Colombia the discussion revolves around the standardization of language tests and the lack of feedback, in Puerto Rico the challenge is the integral preparation for the tourism industry, where human interaction, technology and soft skills are essential. Both contexts agree on the need to personalize learning and that higher education must respond to the demands of the labor market, but differ in the priority sector: language assessment versus tourism service.

Puerto Rico, as a tourist destination in the Caribbean, faces international competition that demands high standards of service quality. From the contrast with the Colombian context, the following implications can be derived:

- Personalized feedback on academic programs: Inspired by the Colombian proposal, Puerto Rican institutions can implement detailed feedback systems in tourism programs, identifying strengths and areas for improvement in technical and soft skills. This would allow designing curricula more tailored to individual and market needs, Makki (2019).
- Integral training by competencies: Universities should adopt curricula that combine theory, practice and technology, ensuring that graduates master customer service, cross-cultural communication and leadership skills. Competency-based education should transcend thematic tracking and foster curricular flexibility (Anderson et al., 2022; Castillo et al., 2020).
- Development of multiple and emotional intelligences: Tourism involves interaction with international visitors; therefore, it is necessary to strengthen interpersonal, intrapersonal and emotional intelligence in academic training, promoting educational environments that adequately manage emotions (Amiaya, 2022; Valencia, 2024).
- Strategic use of ICT and social networks: The Puerto Rican tourism industry must integrate digital skills and social media marketing to position the destination in a highly competitive global market. This implies training students in the ethical and strategic management of ICTs (Cerkez, 2023; Cisneros et al., 2024).

- **Systemic approach and inter-institutional articulation:** As stated in the Colombian article, education must be seen as an interconnected system. In Puerto Rico, this implies articulating universities, tourism companies and government to ensure that training responds to the real needs of the market and enhances the country's competitiveness in the Caribbean (Follmmer, 2023; Oguindele, 2022).

The contrast between the two contexts shows that, although the challenges are different, the solution converges in the need to personalize learning and in the integration of competencies that respond to the demands of the environment. For Puerto Rico, this means transforming higher education in tourism into a comprehensive, flexible model oriented toward the development of soft, technological and emotional skills, thus ensuring the sustainability and competitiveness of the tourism sector in the Caribbean.

Customer service in Puerto Rico's tourism industry is a fundamental axis for competitiveness and economic sustainability. The quality of service depends directly on the work competencies developed by employees, which are largely acquired during their academic training. In this context, six key dimensions are identified to assess professional preparation: interpersonal communication, teamwork, decision making, innovation and creation, learning capacity and technology management. These dimensions are based on contemporary educational theories and empirical findings that link competency-based training with performance in tourism work environments.

Method

The objective of the research is to analyze the perception of the level of mastery of customer service competencies in university students of tourism. The study is quantitative, non-experimental, with a descriptive cross-sectional design since the variables and respondents are not manipulable. The research is limited to describing student characteristics and behaviors and data are collected at a single point in time. The descriptive analysis is expected to reveal a moderate to high level of perception in customer service-related competencies among university tourism students. The sample consisted of 258 students from the tourism department of the Ana G. Méndez University of Puerto Rico, with a population of 725 students who are training for the tourism sector. Therefore, the study reflects the academic and demographic characteristics of this university and is not representative of Puerto Rico as a whole. The questionnaire has been validated with a 90% value by a committee of experts. The construct has an Alpha Conbrach reliability of .945 and OMEGA of .966.

The study is based on the integration of the Theory of Multiple Intelligences and Learning Theories. The information collected was obtained anonymously through an online questionnaire on the Microsoft platform. The recruitment process for the sample (n=258) is carried out through the academy's Registrar's Office, which oversees the sending of the invitation to participate in the study with all the information related to the research by institutional e-mail and with a password. The data collection instrument is composed of five demographic data statements; age, gender, academic degree of study, whether currently studying and income level and 27 coded statements to assess competencies: Interpersonal Communication (IC), Teamwork (TE), Decision Making

(TD), Innovation and Creation (IC), Learning Ability (CA) and Technology Management (MT) respectively. The data collected is not sensitive or distressing.

Students to participate in the study must be 21 years of age or older and be pursuing an academic degree in the tourism sector. Academy faculty, administrative personnel, family members, friends of students, and students from other academic programs may not participate in the study. The period of administration of the questionnaire was from January to June 2024. The study complies with the academy's IRB protocol. The identity of the respondent is anonymous and confidential. No information will be shared with third parties. The data are processed using SPSS and Excel programs and stored in the researcher's computer and stored in the researcher's computer. The benefit of participating in the study is the acquisition of knowledge about the importance of developing strong customer service skills.

Hypothesis

- **H₁₀:** There is no significant difference in interpersonal communication between students who participate in practical activities and those who do not.
- **H₂₀:** There is no significant difference in teamwork between students exposed to methodologies based on multiple intelligences and those who are not.
- **H₃₀:** There is no significant difference in decision making between students who receive constructivist strategies and those who do not.
- **H₄₀:** There is no significant difference in innovation and creation between students who participate in creative and technological projects and those who do not.
- **H₅₀:** There is no significant difference in learning ability between students who participate in collaborative and adaptive learning and those who do not.
- **H₆₀:** There is no significant difference in technology management between students who receive training in digital environments and those who do not.

Results

The analysis presented below shows the frequency distribution of the level of mastery in various customer service competencies assessed in the study population. The competencies considered include Interpersonal Communication, Teamwork, Decision Making, Innovation and Creation, Learning Ability and Technology Management. Each competency has been classified into five levels of mastery: None (2), Little (1), Regular (3), Quite a lot (4) and Much (5), allowing to identify the degree of development in each area.

This breakdown facilitates the interpretation of the results and the identification of strengths and areas of opportunity, contributing to decision-making for the design of improvement and training strategies. Table 1 includes both the absolute number of responses and the corresponding percentage, providing a complete and comparative view of the competencies assessed.

Table 1

Frequency distribution of competencies

Competencias	Mastery Level					Total
	Little 1	Nothing 2	Regular 3	Quite 4	Much 5	
Interpersonal Communication	84 6.5%	276 21.4%	122 9.4%	375 29.1%	233 33.6%	1,290 100%
Teamwork	43 3.3%	128 10%	478 37.1%	416 32.2%	225 14.4%	1,290 100%
Decision Making	1 0.08%	54 4.19%	575 44.57%	485 37.59%	175 13.57%	1,290 100%
Innovation and Creation	20 1.6%	97 7.5%	532 41.2%	477 37%	167 12.7%	1,290 100%
Learning Capacity	27 2.6%	109 10.6%	377 36.5%	424 41.1%	95 9.2%	1,032 100%
Technology Management	2 0.1%	98 12.7%	255 33%	309 39.7%	112 14.5%	774 100%

Source: Own elaboration

Table 2 presents the measures of central tendency and standard deviation corresponding to the various competencies evaluated in the study. These measures provide insight into the general behavior of the data and the dispersion around the mean. These include the mean, which indicates the average number of responses; the median, which reflects the central value; the mode, which indicates the most frequent value; and the standard deviation (S.D.), which shows the degree of variability in the responses. This analysis facilitates the identification of patterns and the comparison of customer service competencies, providing key information for decision making and the design of improvement strategies.

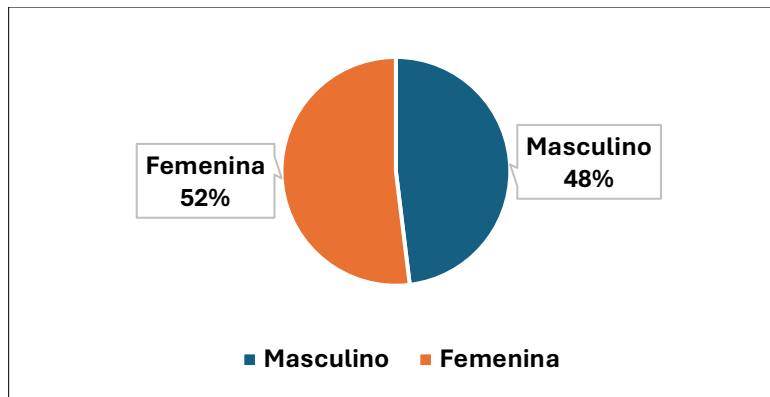
Table 2*Measures of central tendency*

Dexterity	Media	Median	Fashion	D.E.
Interpersonal communication	3.62	4	5	1.31
Teamwork	3.54	3	3	.94
Decision making	3.60	4	3	.77
Innovation and creation	3.51	3	3	.86
Learning capacity	3.46	3	4	.86
Technology management	3.55	4	4	.90

Source: Own elaboration

Figure 1 shows the distribution of the participating population according to gender, differentiating between male and female categories. This analysis makes it possible to visualize the demographic composition of the group studied, which is relevant for understanding representativeness and possible differences in perception or performance in the competencies evaluated. The information is expressed in absolute values, offering a clear view of the balance between both genders.

Figure 1*Genre*



Source: Own elaboration

Table 3 presents the frequency distribution by age range of the study participants. This analysis allows us to understand the age composition of the sample and fundamental aspects for interpreting the results in terms of demographic characteristics. The data are expressed in absolute values and percentages, which makes it easier to identify the predominant age group. This information is key to contextualize the competencies assessed and to design strategies that respond to the specific needs of each segment.

Table 3

Age

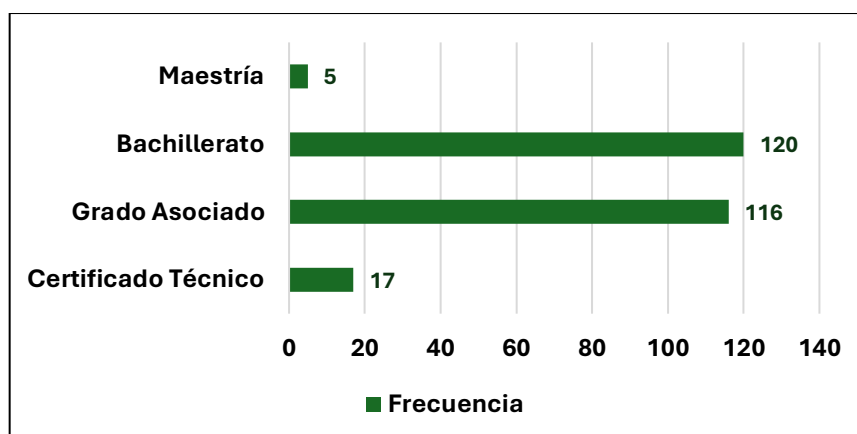
Profile	Frequency	Percentage
21-28	171	66%
29-36	61	24%
37-44	12	5%
45-52	10	4%
53 >	4	1%
Total	258	100%

Source: Own elaboration

Figure 2 below illustrates the distribution of participants according to the academic program in which they are enrolled. The categories Technical Certificate, Associate's Degree, Bachelor's Degree and Master's Degree are included, showing the absolute frequency at each level. This analysis makes it possible to identify the concentration of students in the different programs, which is relevant for understanding the academic profile of the sample and its relationship with the competencies evaluated.

Figure 2

Frequency of academic programs



Source: Own elaboration

The results show a young population, mostly in undergraduate programs, with strengths in social competencies and areas for improvement in innovation and technological management. This information is essential to design training strategies that enhance the less developed competencies and consolidate the existing ones.

DISCUSSION

The findings of the study have revealed that university students of tourism perceive a moderate-high level in the essential competencies for customer service, which is aligned with the general objective of to analyze the perception of the level of mastery of customer service competencies in university students of tourism. The averages obtained (between 3.46 and 3.62) reflect satisfactory mastery. Statistical tests confirmed these trends: Z-test: all competencies are significantly higher than the hypothesized mean ($p < 0.001$). ANOVA: no significant differences were found between competencies ($p > 0.05$), indicating homogeneity. Students master on average competencies such as interpersonal communication, teamwork and decision making, which are fundamental for effective interaction with clients in tourism environments. This result coincides with the postulates of Torres (2022) and Anderson, Londoño et al., (2022), who argue that higher education should be oriented towards strengthening work skills through active methodologies and experiential learning. It even coincides with the thinking of Acuña et al. (2024), which argues that the development of soft skills is essential to meet the challenges posed by the contemporary labor market.

Table 4 shows that all competencies present a level significantly higher than the hypothetical value (3.0), which confirms a moderate-high level in the perception of mastery.

Table 4
Z-test by competency

Competition	Sample Mean	Z-Score	p-Value	Decision
CI	4.201	39.529	0.00000	Rejects H_0
TE	4.001	27.366	0.00000	Rejects H_0
TD	3.779	17.602	0.00000	Rejects H_0
IC	3.613	13.127	0.00000	Rejects H_0
CA	4.130	35.079	0.00000	Rejects H_0
MT	3.692	12.283	0.00000	Rejects H_0

Source: Own elaboration

From the perspective of educational theories, the results support the constructivist approach and learning by competencies, showing that students are able to integrate knowledge and practical skills in their education. The high perception in social competencies such as communication and teamwork is also related to Gardner's (2011) theory of multiple intelligences, which emphasizes the importance of interpersonal intelligence in collaborative contexts. However, competencies such as innovation and creation, and technology management present slightly lower levels, suggesting the need to reinforce pedagogical strategies that foster creativity and the use of digital tools, in accordance with contemporary trends of multimodal learning and connectivism. In summary, soft skills are an essential element for strengthening the professional profile, and their development can have a significant influence on the employability and professional progress of each individual Zambrano et al. (2022).

Table 5 shows that the correlations are low, indicating that the competencies are relatively independent of each other. This suggests that each competency should be strengthened in a specific way, although some show slight associations (e.g., IQ and TD with 0.117).

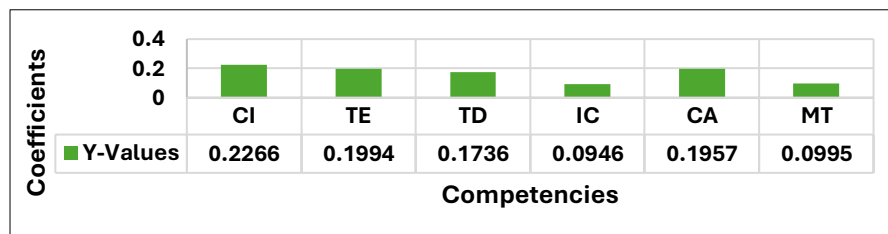
Table 5
Correlation matrix between competencies

Competencies	CI	TE	TD	IC	CA	MT
Interpersonal Communication	1.000	0.009	0.117	-0.048	-0.033	-0.021
Teamwork	0.009	1.000	0.009	-0.026	-0.080	0.025
Decision Making	0.117	0.009	1.000	0.021	0.090	-0.103
Innovation and Creation	-0.048	-0.026	0.021	1.000	0.010	-0.125
Learning Capacity	-0.033	-0.080	0.090	0.010	1.000	0.007
Technology Management	-0.021	0.025	-0.103	-0.125	0.007	1.000

Source: Own elaboration

Figure 3 shows the positive relationship between the competencies (1-CI, 2-TE, 3-TD, 4-IC, 5-CA, 6-MT) and the overall perception of customer service.

Figure 3
PLS Analysis



Source: Own elaboration

CONCLUSION

The study confirms that tourism university students perceive a moderate-high level in the essential competencies to offer quality customer service, thus fulfilling the general objective and the expected result. Statistical tests support this claim: the means obtained exceed the hypothetical reference value, and the Z tests show significant differences ($p < 0.001$), while the ANOVA indicates homogeneity among the competencies evaluated. This finding suggests that current academic training succeeds in developing key skills such as interpersonal communication, teamwork and decision making, although there are still areas for improvement in innovation, creativity and technology management.

From the theoretical framework, the results are aligned with the proposals of competency-based learning and contemporary theories such as constructivism and connectivism, which emphasize the importance of active, flexible and practice-oriented methodologies. Likewise, the relevance of interpersonal and technological intelligence in the professional preparation for the tourism sector is confirmed, in accordance with Gardner's (2011) theory of multiple intelligences.

In summary, the research shows that higher education in tourism should continue to strengthen soft and technological skills, integrating innovative pedagogical strategies and practical experiences that respond to the demands of the global market. These results not only provide knowledge on the current state of competency-based training, but also offer a basis for designing more pertinent educational policies and curricula, ensuring the competitiveness and sustainability of the tourism sector. This contrasts with Morales (2025) where he comments that educational innovation in tourism requires more than updating content; it implies redefining methodologies, strategies and evaluations, relying on academic literature to train professionals to promote sustainable tourism that respects diversity. For this reason Aldaz et al (2023) concludes that the tourism field requires professionals who master competencies in three dimensions: cognitive, operational and ethical.

Implications of the Study

1. The results show the need to strengthen competency-based training in tourism academic programs, integrating active methodologies and technological resources to develop practical and adaptive skills. Morales (2025) also suggests adopting innovative methodologies and formative evaluation systems that encourage participation and promote educational transformation, ensuring the preparation of professionals capable of facing current challenges.
2. A revision of curricula is required to ensure that less developed competencies, such as innovation and technology management, receive greater attention through interdisciplinary projects and immersive experiences. This highlights the importance of fostering socioemotional competencies and transversal skills complementary to technical knowledge, as they contribute to preparing students to face the challenges of the work environment and enhance their professional success Hermoza et al. (2024).
3. Educational institutions should coordinate with the business sector to ensure that training responds to the real demands of the market, contributing to the competitiveness and sustainability of tourism in Puerto Rico.

4. The findings suggest the importance of implementing policies that promote competency-based education, teacher training and the incorporation of emerging technologies in teaching.
5. This study opens the door to further research on the relationship between competencies acquired at university and job performance, as well as on the effectiveness of innovative methodologies in higher education.

Academic Recommendations

1. Incorporate simulations, case studies and practices in real environments to strengthen competencies such as interpersonal communication, teamwork and decision making, in accordance with the constructivist approach and meaningful learning. In addition, Espinosa et al. (2025) suggest that the country's higher education institutions drive educational innovation through a collaborative approach, in which teachers, students and managers actively participate in the collective development of more inclusive, dynamic and relevant virtual environments.
2. Include digital tools, collaborative platforms and multimedia resources in the curriculum to improve technology management and innovation, aligning with connectivism and multimodal learning trends. The updating of technological resources in educational institutions is essential to ensure the effective use of virtual platforms and collaborative spaces Morales (2025).
3. Design interdisciplinary projects that promote innovation and problem solving, stimulating creativity and the ability to adapt to changing scenarios in the tourism sector. In other words, innovation, more than a necessity, has become a market requirement to attract consumers, representing a competitive advantage in constant evolution Castillo and Cruz (2022).
4. Implement training programs for teachers oriented towards competency-based teaching, the use of ICTs and the application of student-centered methodologies, ensuring coherence between theory and practice. Soft skills are essential for the integral development of the student, so it is recommended to establish teacher training programs on a semester and quarterly basis, aimed at strengthening skills such as assertive communication, leadership, conflict resolution, collaborative work, empathy and time management, among others Zambrano et al. (2022).
5. Incorporate activities that develop socioemotional skills, such as leadership, empathy and stress management, essential for effective interaction with clients in tourism environments. Incorporating emotional education into the curriculum is a key strategy to strengthen future tourism professionals' ability to manage conflicts, make good decisions and adapt to environments characterized by continuous interaction with Morales (2025).

Recommendations

1. Include students from different universities and regions to improve representativeness and allow comparisons between educational contexts.
2. Conduct studies that evaluate the evolution of competencies over time, analyzing the impact of pedagogical strategies on professional development. It is essential to analyze the effectiveness of various teaching approaches and methodologies oriented to the development of soft skills, in addition to examining how

educational management is linked to students' academic performance and occupational success Hermoza et al. (2024).

3. Incorporate objective measurements in real or simulated environments to validate competencies beyond subjective perception.
4. To explore the experiences and perceptions of students and teachers through interviews and focus groups to understand factors that influence competency-based learning.
5. Investigate the correlation between skills acquired at university and job performance in the tourism industry, including employer satisfaction.
6. To analyze how the integration of digital tools, artificial intelligence and virtual environments influences the development of technological and adaptive competencies.

Study Limitations

1. The study was conducted with a sample of 258 students from a single university, which limits the generalizability of the results to the entire tourism sector in Puerto Rico.
2. The research was carried out at a single point in time, so it does not allow us to establish causal relationships or to evaluate the evolution of competencies over time.
3. Perceptions of the level of mastery of competencies are based on subjective student responses, which may be influenced by personal biases.
4. The study did not include objective measurements of performance in real environments, which limits the validation of competencies beyond perception.
5. The analysis focused on general competencies without considering variations in technological resources or specific pedagogical practices among institutions.

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Conflict of Interest

The risk of the research for the participants was minimal, since the questionnaire was online and the Microsoft Forms program was used, which allows secure and anonymous access to the participants to avoid conflict of interest. The link to the measurement instrument was sent to the participants by the Registrar's Office as part of the institutional protocol.

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