



Educational innovation in technological training in football through project-based learning: impact on student entrepreneurship

Innovación educativa en la formación tecnológica en fútbol mediante aprendizaje basado en proyectos: impacto en el emprendimiento estudiantil

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Abstract

Introduction: Technological education in football technical management requires active methodologies that promote entrepreneurship and adapt to the demands of a constantly changing sports industry.

Objective: Analyze the impact of project-based learning on the development of entrepreneurial competencies in students of the Higher Technological Institute of Football of Guayaquil.

Methodology: Case study with a mixed approach (qualitative-quantitative) over six academic semesters. The population consisted of 120 students from the Higher Technology in Technical Football Management program. The information was obtained thru a documentary review of academic projects, content analysis of business models, and observation of the training process, applying methodological triangulation to strengthen the validity of the findings.

Results: It was observed that 20% of the students developed projects with entrepreneurial potential, with football academies (30%), extracurricular sports programs (23%), and personalized training services (20%) standing out. The initiatives demonstrated skills related to innovation, strategic planning, leadership, and sports management.

Discussion: The results corroborate that project work fosters the transfer of knowledge to real-life situations, consolidating entrepreneurial training and expanding the professional opportunities of future trainers.

Conclusions: Project-Based Learning stands out as an ideal pedagogical strategy to promote sports entrepreneurship and strengthen educational innovation in technological training in football.

Keywords: Project-based learning; educational innovation; technological education; entrepreneurship; professional training.

Resumen

Introducción: La educación tecnológica en gerencia técnica del fútbol precisa de metodologías activas que fomenten el emprendimiento y que se ajusten a las exigencias de una industria deportiva que cambia constantemente.

Objetivo: Analizar el impacto del aprendizaje basado en proyectos en el desarrollo de competencias emprendedoras en estudiantes del Instituto Superior Tecnológico de Fútbol de Guayaquil.

Metodología: Estudio de caso con enfoque mixto (cualitativo-cuantitativo), a lo largo de seis semestres académicos. La población estuvo integrada por 120 estudiantes de la carrera de Tecnología Superior en Dirección Técnica de Fútbol. La información se obtuvo mediante revisión documental de los proyectos académicos, análisis de contenido de los modelos de negocio y observación del proceso formativo, aplicando triangulación metodológica para afianzar la validez de los hallazgos.

Resultados: Se pudo apreciar que el 20 % de los estudiantes desarrolló proyectos con potencial emprendedor, sobresaliendo las academias de fútbol (30 %), los programas deportivos extracurriculares (23 %) y los servicios de entrenamiento personalizado (20 %). Las iniciativas demostraron habilidades relacionadas con la innovación, la planificación estratégica, el liderazgo y la gestión deportiva.

Discusión: Los resultados corroboran que el trabajo con proyectos propicia la transferencia de conocimientos a situaciones reales, consolidando la formación emprendedora y ampliando las posibilidades profesionales de los futuros entrenadores.

Conclusiones: El Aprendizaje basado en Proyecto se erige como estrategia pedagógica idónea para fomentar el emprendimiento deportivo y robustecer la innovación educativa en la formación tecnológica en fútbol.

Palabras clave: Aprendizaje basado en proyectos; innovación educativa; educación tecnológica; emprendimiento; formación profesional.

Introduction

Higher education must transform to include active methods that enable students to acquire professional skills appropriate for facing the challenges of the knowledge economy, digitalization, and innovation. With this objective, project-based learning (PBL) has established itself as one of the most efficient pedagogical strategies to foster collaboration, critical thinking, real problem-solving, and the practical implementation of knowledge, which allows for the combination of academic training with the requirements of the work environment (Bell, 2010; Krajcik & Blumenfeld, 2006). PBL, unlike traditional methods that focus on content transmission, places the student as the main character in the educational process and allows them to generate knowledge thru the design, development, and evaluation of projects with a real impact. This simultaneously helps to strengthen technical, social, and entrepreneurial skills.

Moreover, scientific evidence shows that active methods, focused on solving problems, make learning deeper and more lasting. From this perspective, problem-based learning is a theoretical precursor to PBL because it fosters research, self-regulation, and complex reasoning in concrete situations, which produces relevant learning and optimizes the transfer of knowledge to work contexts (Hmelo-Silver, 2004). The implementation of PBL has been driven by these qualities at various levels of education, especially in technology and university programs, which aim to strengthen employability and innovation.

Simultaneously, business education has taken on a strategic role in higher education institutions in response to the demands of the contemporary job market. Entrepreneurship is not limited to the creation of businesses; it also includes acquiring skills to identify opportunities, establish innovative solutions, take calculated risks, and generate social and economic value. Nabi et al. (2017), after conducting a systematic review, determine that entrepreneurship education programs generate beneficial impacts on the intention to undertake, on acquiring knowledge related to the business field, and on developing skills to start new businesses, particularly when carried out thru experiential methodologies such as project-based learning.

In the sports field, these competencies acquire special importance due to the increased professionalization of the sector and the variety of services associated with training, sports management, performance evaluation, technological innovations, and community development. According to Coalter (2013), sport is no longer considered solely a competitive activity, but also a means for social, educational, and economic development. On the other hand, Jones & Jones (2014) indicate that training in sports management and business is essential to respond to the new employment opportunities provided by the sports industry.

One of the scenarios where this transformation is most noticeable is football. The application of digital technologies, artificial intelligence, robotics, data analysis, and applied engineering is significantly transforming the processes of preparation, instruction, and management in the sports field. According to the most recent studies, AI tools, such as FC-RAG, optimize the decision-making process of coaches thru multimodal mechanisms for the creation and retrieval of knowledge (Wang et al., 2026). Likewise, the development of humanoid robots for sports research (Mohammadi et al., 2024), the creation of robotic assistants for football training based on computer vision (Tan, 2021), and educational robotics competitions inspired by football, such as Very Small Size Soccer (VSSS), demonstrate the potential of the union between innovation, engineering, and technological education to strengthen educational processes (Vázquez-Hurtado & Rodríguez-Padilla, 2022).

The incorporation of these technologies also aligns with the principles of innovation and educational sustainability promoted by the 2030 Agenda. Toward the solution of real problems, the approach of technological education promotes the development of sustainable solutions, fosters innovation, and strengthens the necessary capacities to face contemporary economic and social challenges (Ma, 2024). According to Ferulano (2021), educational innovation, from a sociocultural perspective, also means identifying local environments, promoting inclusion, and establishing pedagogical models that fit the particularities of each educational community.

Several studies demonstrate that, in the field of sports training, high-quality educational processes have a direct impact on the professional progress of future coaches and sports managers. Gutiérrez et al. (2020) argue that football, thru experiential methodologies, is an effective pedagogical resource for teaching administration, leadership, strategic planning, and business management. According to Ostrowska (2021), quality sports education strengthens students' practical and organizational competencies. These results support the use of football as a means to learn in an interdisciplinary manner, enabling the combination of sports, administrative, and business knowledge.

Technological training in football coaching in Ecuador faces specific challenges, stemming from the increasing professionalization of the sports industry and the need to expand job opportunities for future coaches. There are numerous students who enter these programs and come from backgrounds as semi-professional or professional football players, who, despite having extensive practical experience, need to strengthen skills such as project development, innovation, entrepreneurship, sports management,

and strategic planning to meet the current demands of the sector. In this context, the Higher Technological Institute of Football in Guayaquil offers a technological program that focuses on training football coaches. The curriculum includes subjects such as Sports Project Formulation and Sports Administration. In the latter, project-based learning is used as a strategy to connect the educational process with the real challenges of the football world.

The application of project-based learning in these subjects has allowed students to generate proposals related to the creation of football academies, extracurricular sports programs, individualized training services, training schools, sports consulting, and community projects. In this way, the integration of technical and administrative knowledge with skills such as leadership, innovation, and creativity is encouraged. These experiences are real learning contexts that foster the development of business skills and strengthen the professional training of future coaches.

However, despite the reported progress in entrepreneurial education, educational innovation, and sports training, scientific studies continue to show that project-based learning has a limited effect on the development of business skills within technological programs focused on technical leadership in football. Most of the research is conducted in the general university field or in administration and engineering programs, and there are few studies carried out in institutions that focus solely on the technological training of human talent for football, especially in Latin America. This disparity highlights the importance of producing empirical knowledge that facilitates the understanding of how active methodologies contribute to strengthening sports entrepreneurship in such entities.

In this context, the current research is being conducted at the Higher Technological Institute of Football in Guayaquil. This institution is the first in Ecuador to offer specialized technological training for football coaches. The purpose of the study is to analyze how project-based learning influences the development of business skills in its students. The research question that arises from this context is as follows: What is the impact of project-based learning on the development of entrepreneurial skills in technology students specializing in football technical management at the Higher Technological Institute of Football of Guayaquil?

According to the question, the main purpose of the research is to examine how project-based learning influences the development of entrepreneurial skills in students who are being technologically trained in football technical management at the Higher Technological Institute of Football of Guayaquil. Specifically, it aims to determine the types of sports projects that students undertake, examine how PBL relates to sports initiatives, and evaluate how these actions affect their professional growth. The findings will provide scientific evidence of the effectiveness of active methodologies in sports technology education and will offer information to consolidate curricular models focused on educational innovation, entrepreneurship, and the sustainability of the football sector.

Method

Design

The study was conducted using a mixed methodology (quantitative-qualitative), as the phenomenon under study required combining numerical data obtained from the characterization of the projects carried out by the students and qualitative evidence derived from the scrutiny of the training process and the interpretation of the educational experiences generated in the use of PBL. The combination of the two methods made it possible to better understand the effect that this active methodology has on the training of skills for entrepreneurship in the technological education of football technical directors, as it helped to triangulate the information and reinforce the validity of the results.

From a methodological perspective, it is an educational case study because it thoroughly analyzed a pedagogical experience that took place in a specific institutional context, represented by the Higher Technological Institute of Football of Guayaquil. This design made it possible to analyze, in a specific context, the relationship between project-based learning, professional training, and the development of entrepreneurial skills within the framework of a technological program focused on football technical

management. The study focused on describing and interpreting, as it aimed not only to identify the traits of the projects carried out by the students but also to understand how the methodology used helped acquire skills related to innovation, entrepreneurship, and sports management.

The research was conducted over six consecutive semesters in the subjects of Sports Project Formulation and Sports Administration, which are part of the academic program of Higher Technology in Technical Football Management. During this time, a uniform academic planning was maintained, with the same learning outcomes, evaluation criteria, and teaching methods. This ensured that the information collected among the different evaluated cohorts was comparable. The sports projects developed by the students as an integrative result of the pedagogical process constituted the unit of analysis. These projects served as the primary test to evaluate the progress of entrepreneurial skills that emerged as a result of the application of project-based learning.

Variables

The research analyzed the connection between two essential variables. Project-based learning was considered the independent variable, which is understood as an active teaching methodology that fosters the creation of knowledge thru the planning, execution, and evaluation of projects aimed at solving authentic problems in the professional environment. This variable was analyzed based on three key dimensions. The initial dimension was related to project planning, which encompassed the students' ability to identify the needs of the sports environment, set objectives, coordinate activities, schedule resources, and develop feasible proposals. The second dimension was related to the progress of the project, in which the incorporation of the knowledge obtained during the training, the use of tools for sports management, teamwork, problem-solving, and the creation of business models were analyzed. Finally, the third dimension referred to how to apply the proposals in the sports field, considering how relevant they are, the degree of innovation they have, whether they are feasible to implement, and what their possible effect on the football environment would be.

The progress of entrepreneurial competencies, defined as the accumulation of attitudes, knowledge, and skills that enable students to detect opportunities, suggest innovative solutions, and turn ideas into sustainable projects in the sports field, was the dependent variable. Four dimensions were considered for their analysis. The first focused on identifying opportunities, analyzing the ability to detect needs in the sports sector that have the potential to transform into business projects. The second dimension was related to innovation, analyzing the originality, creativity, and distinction of the proposals presented. In the third dimension, the administration of sports projects was addressed, examining factors related to resource organization, the establishment of business models, strategic planning, and the sustainability of the initiatives. Finally, the fourth dimension focused on professional development, addressing transversal skills such as leadership, teamwork, effective communication, strategic thinking, and the ability to implement entrepreneurial initiatives in professional practice.

Participants

It was composed of 120 students from the Higher Technology in Football Technical Management program at the Higher Technological Institute of Football in Guayaquil, who took the courses Sports Project Formulation and Sports Administration over six consecutive semesters. Each cohort consisted of approximately 20 students, which allowed for an uninterrupted examination of the implementation of project-based learning over a period equivalent to three academic years.

A census sampling was employed, which included all the students enrolled during the study period, because they all were part of the same pedagogical methodology and carried out sports projects under similar academic conditions. This decision regarding the methodology enabled a complete representation of the examined phenomenon and avoided biases that could arise from the sample selection processes.

The participants had certain characteristics in the academic and professional fields. A significant portion came from careers as professional or semi-professional footballers, which provided them with practical experience in the sport; however, they required training in sports management, administration, project

formulation, strategic planning, and entrepreneurship. This context made the group a significant set to examine the impact of project-based learning on the improvement of entrepreneurial skills aimed at creating new job opportunities in the football industry.

Procedure

The research consisted of four phases. The first two focused on analyzing the educational experience that took place over six consecutive academic semesters, in the subjects of Sports Project Formulation and Sports Administration within the Higher Technology program in Technical Football Management, offered by the Higher Technological Institute of Football Guayaquil. During this period, the business models created by the students as academic products, the sports projects they designed themselves, and the observations of the teaching-learning process were collected. Later, the information was structured thru content analysis matrices and document review, with the aim of finding patterns linked to innovation, entrepreneurship, and the implementation of project-based learning within the sports field.

With the aim of strengthening entrepreneurial skills in students of technological training in football technical management, a methodological proposal based on PBL was established, based on the results. The proposal was conceived to be executed in an academic semester of 16 weeks, which is the standard training duration of the Higher Technological Institute of Football of Guayaquil. It consists of five stages, distributed over sixteen in-person sessions that take place once a week and last four academic hours each. This adds up to a total of 64 hours in the classroom, in addition to approximately 32 additional hours for independent work, which includes research, project design, and business model creation. The proposal includes a total of 96 hours of academic work.

Sessions 1 and 2, which correspond to the first two weeks, are dedicated to diagnosis and contextualization so that students can identify needs and opportunities in the context of football. The activities include: analysis of the local sports environment, visits to successful company cases, technical visits or study of sports scenarios, interviews with sector participants (coaches, clubs, football schools, and managers), detection of problems that can be transformed into business opportunities. At this stage, each group chooses a problem and presents a diagnostic sheet with the foundations of their project.

The phase of formulating the sports project takes place between the third and sixth weeks. During this period, the students create work teams, define the problem, determine the objectives, specify the population that will benefit, and develop the value proposition of the venture. They also design the business model using tools like the Business Model Canvas, analyze the potential market, identify competitors, estimate human and financial resources, and propose initial sustainability strategies. At the end of this phase, the teams will present a draft project to receive feedback from the professor.

The design and consolidation phase of the sports venture, which is the central axis of the methodological proposal, takes place between sessions seven and twelve, that is, between the seventh and twelfth week. In these sessions, the students create the operational and strategic plan, establish management indicators, project a basic financial analysis, develop sports marketing strategies, and create a schedule for implementation. Simultaneously, they participate in ongoing tutorials, present their partial progress, and modify their proposals based on the feedback they receive from professors and peers. The expected product is the completed sports entrepreneurship plan, which includes all its technical and management elements.

The fourth phase of the training, which takes place between weeks 13 and 15, focuses on evaluating and socializing the projects. Each team presents their proposal to an academic jury, which is composed of professors and invited experts from the sports field. The evaluation is based on criteria such as technical feasibility, leadership, economic sustainability, creativity, relevance, social impact, feasibility of implementation in the field of football, and management capacity. The students present the revised business model and the final project report, in addition to the oral presentation.

Finally, in week 16, the stage of reflection, evaluation, and professional planning is addressed. During this session, the students critically examine the learning process, identify the skills acquired throughout the project, and think about concrete opportunities to turn the proposal into a sports venture.

Additionally, they develop an individual improvement plan and receive feedback from the teacher regarding the strengths and areas for improvement of each initiative.

It is important to highlight that the proposed methodology was created based on the examination of the educational experience carried out at the Higher Technological Institute of Football in Guayaquil over six consecutive semesters, including the findings obtained thru content analysis, document review, and academic observation. Therefore, the present study did not carry out either the implementation or the experimental evaluation of the proposal; instead, it is established as a model of educational innovation, based on the data collected and aimed at future applications and validation processes in technological educational programs for football technical management.

Instruments

The data were collected using three instruments that were specifically designed to meet the purposes of the research. The first was a document review matrix, used to organize the information that the students had included in the sports projects. This matrix enabled the documentation of variables related to the suggested entrepreneurship class, the target audience, the goals, innovation, viability, sustainability, the expected impact, and the characteristics of the business model.

The second tool was a content analysis based on the business models that had been developed in the courses. With this instrument, categories related to value creation, leadership, innovation, entrepreneurship, economic sustainability, strategic planning, and the potential for implementing the proposals were identified.

An academic observation guide was the third instrument. The researcher implemented it throughout the training process with the purpose of documenting elements related to student participation, their collaboration, how they solved problems, their creativity, autonomy, leadership, and how they put what they learned into practice. The simultaneous use of these tools facilitated a holistic understanding of the studied phenomenon and strengthened the reliability of the results thru the convergence of various informational sources.

Data analysis

A tactic of merging qualitative and quantitative information was employed to examine the data. A descriptive analysis of the sports projects developed by the students was carried out in the quantitative component, classifying them by type and computing absolute frequencies and percentages to determine the distribution of the various entrepreneurial initiatives that emerged during the six academic semesters. The results were grouped into tables and graphs, which helped identify the trends related to the types of ventures undertaken and the most interesting professional fields.

A content analysis of academic projects, business patterns, and observation records was conducted in the qualitative component, using a method of coding, categorization, and interpretation of the information. The process enabled the detection of patterns associated with innovation, leadership, sports management, inventiveness, entrepreneurial skills, and the transfer of learning to real-world scenarios in the workplace.

With the aim of strengthening the methodological rigor of the analysis, a triangulation procedure was applied, combining data obtained from academic projects, business models, and systematic observation of the educational process. By comparing these three sources of information, it was possible to verify the findings obtained thru different data collection techniques. This allowed the results regarding the effect of project-based learning on the progress of entrepreneurial skills of the students at the Higher Technological Institute of Football of Guayaquil to be more credible, consistent, and interpretable.

Results

The analysis of the projects developed by the students over six academic semesters allowed for the identification of significant trends related to the development of entrepreneurial initiatives within the sports field.

Table 1. Characteristics of the Analyzed Population

INDICATOR	VALUE
Semesters analyzed	6
Average number of students per semester	20
Total students analyzed	120
Courses analyzed	Sports Administration / Sports Project Development
Teaching methodology	Project-Based Learning

Note. Data corresponding to the analyzed population. Source: Authors' own elaboration.

During the study period, approximately 120 students were analyzed, distributed in cohorts of around 20 students per semester, who developed sports projects as part of the courses Sports Management and Sports Project Formulation. The projects were designed under the project-based learning approach, which allowed students to apply the knowledge acquired in real contexts of the sports sector. The results show that a significant percentage of students directed their proposals toward the creation of entrepreneurial initiatives linked to sports.

Table 2. Sports Entrepreneurship Projects Developed by Cohort

COHORT	NUMBER OF STUDENTS	ENTREPRENEURIAL PROJECTS	PERCENTAGE
Semester 1	20	3	15%
Semester 2	20	4	20%
Semester 3	20	5	25%
Semester 4	20	3	15%
Semester 5	20	4	20%
Semester 6	20	5	25%

Note. Entrepreneurial projects identified during the study period. Source: Authors' own elaboration.

The data shows that between three and five students per cohort developed entrepreneurial initiatives, which represents between 15% and 25% of the student body. This demonstrates that the implementation of project-based learning contributes to the development of proposals oriented toward sports entrepreneurship.

Table 3. Types of Sports Entrepreneurship Projects

TYPE OF PROJECT	FREQUENCY	PERCENTAGE
Football Academies	9	30%
Extracurricular Sports Programs in Schools	7	23%
Personalized Training Services	6	20%
Specialized Goalkeeper Training Schools	4	13%
Community Sports Projects	4	13%

Note. Classification of entrepreneurial projects developed during the study period. Source: Authors' own elaboration.

The most frequent projects correspond to formative football academies, followed by extracurricular programs in private educational institutions. These results show that students identify professional development opportunities within the field of sports training. Likewise, there is a growing interest in the development of specialized services such as personalized training and specific training schools for archers.

Table 4. Contexts for the Implementation of Sports Projects

IMPLEMENTATION CONTEXT	TYPE OF INITIATIVE
Private Schools	Extracurricular Sports Programs
Residential Communities	Youth Sports Development Schools
Sports Centers	Football Academies
Individual Training	Personalized Sports Training Services
Municipal Governments	Community Sports Schools

Note. Contexts in which sports entrepreneurship initiatives were implemented. Source: Authors' own elaboration.

The results show that students identify opportunities in various social and educational spaces, which demonstrates the ability of the educational process to connect higher education with real needs in the environment.

Representative Cases of Sports Entrepreneurship

In addition to the quantitative analysis, representative cases were identified that illustrate the impact of project-based learning on the development of entrepreneurial initiatives.

Case 1 – Football Academy - Roberto Myna

A student developed a project aimed at creating a football academy for young talents. The project included market analysis, business model design, and planning of training programs for youth categories. Subsequently, the student began the process of implementing their project in the real environment.

Case 2 – Organizational Redesign of a Women's Football School

Another academic project focused on the organizational redesign of a women's football school run by an institute graduate. The proposal included the restructuring of the training model, the strengthening of administrative management, and the planning of new student recruitment strategies.

Case 3 – Community project of sports schools in Esmeraldas

A student from the province of Esmeraldas designed a project aimed at the implementation of municipal football schools. The main objective of the project was to promote sports practice among the youth of the community and contribute to social development thru sports.

General interpretation of the results

The results obtained show that project-based learning promotes the generation of entrepreneurial initiatives among students in technological training in football technical management. The presence of projects oriented toward sports academies, extracurricular programs, and community projects demonstrates that students are able to identify opportunities in the sports market and design proposals that can become real ventures.

Likewise, the results indicate that technological training in the sports field can significantly contribute to the diversification of professional opportunities for future coaches, expanding their job market beyond the management of competitive teams.

Discussion

The findings show that project-based learning is an effective pedagogical tactic for promoting the development of entrepreneurial skills in students who are being technologically trained in football technical management. The fact that students have been able to apply what they learned during their training in the creation of proposals aimed at solving real needs in the sports field is demonstrated in the diversity of initiatives identified, including mainly football academies, community projects, extracurricular sports programs, and individualized training services. These results are consistent with what Thomas (2000) proposes about project-based learning: meaningful learning is achieved thru solving real problems, which makes it possible to combine knowledge, skills, and attitudes in professional environments. Similarly, Prince (2004) determines that active methodologies foster student engagement, participation, and learning when they make the student the main actor in their own learning process.

The fact that projects with entrepreneurial possibilities were found in all the studied groups demonstrates that project-based learning promotes the acquisition of skills related to recognizing opportunities and creating innovative proposals in the sports field. Although the rate of students who engage in entrepreneurship fluctuated between 15% and 25% for each cohort, the stability observed over the six semesters demonstrates that this method continuously fosters a culture of entrepreneurship and innovation. The assertions of Neck and Greene (2011), who state that entrepreneurial education should focus on educational experiences thru which students build knowledge via experimentation, reflection, and facing real challenges, instead of transmitting theoretical content, are supported by these results. Following the same line, the Organization for Economic Cooperation and Development (OECD, 2019) indicates that it is the obligation of higher education to generate entrepreneurial skills thru methodologies that stimulate critical reasoning, creativity, and the ability to turn ideas into projects with economic and social repercussions.

Most extracurricular sports programs and football academies show that students consider these spaces as feasible opportunities for their professional integration. This behavior is consistent with the characteristics of the analyzed population, which is mostly composed of semi-professional footballers

or former football players who are directly familiar with the needs of the sports environment. In this way, project-based learning enabled this practical experience to be transformed into organized entrepreneurship proposals, which strengthened the ability to create sustainable business models. These findings are consistent with those of Ratten (2011), who argues that sports entrepreneurship is a specialized field where management, innovation, and sports knowledge converge to create new possibilities for economic and social progress. From this perspective, the training of coaches must go beyond the traditional view that is limited to sports training and include skills related to management, innovation, and entrepreneurship in the sports field.

The diversity of contexts in which the students planned to implement their projects is another important aspect. The projects directed at urban developments, municipalities, sports centers, communities, and educational institutions demonstrate that those involved gained a broad perspective of the sports ecosystem and were able to adjust their proposals to different social realities. This result corroborated that PBL promotes learning processes in specific contexts, where knowledge is generated from the study of real problems and interaction with the environment, as suggested by Savery (2006). These findings are in line with UNESCO's (2021) approach to promoting education for sustainable development through methods that enhance students' ability to create innovative solutions to environmental, economic, and social challenges.

The significant cases examined demonstrate that several projects went beyond the academic context and began to be applied in real situations, which shows the potential that project-based learning has to connect education with the productive environment. The creation of a football academy, the restructuring of a women's school, and the design of a community program for municipal schools are examples of how academic work can be transformed into viable projects that can be implemented. These results are consistent with those of Quyen et al. (2025), who argue that contemporary education should progress from paradigms focused on the acquisition of knowledge to experiences that emphasize innovation, practical use, and sustainability. Likewise, Sorici et al. (2023) found that interdisciplinary projects significantly contribute to the acquisition of entrepreneurial skills because they enable students to combine knowledge from various disciplines to solve complex problems.

The findings also show that project-based learning boosted students' motivation and dedication throughout the entire educational process. The development of projects around specific professional interests helped participants actively take ownership of their learning process, which strengthened autonomy, creativity, and decision-making power. These findings are consistent with those of Zhang et al. (2024), who discovered that involvement in innovative projects increases intrinsic motivation and strengthens students' commitment throughout the learning process. Likewise, Zen et al. (2022) found that academic performance improves with the project-based learning methodology, as long as student participation increases and their commitment to educational activities is strengthened.

The collected data also supports the need to combine technological innovation with entrepreneurial education in sports training programs. Kang and Lee (2020) assert that technological training must foster innovation skills through methodological approaches that incorporate strategic thinking, problem-solving, and creativity. Following this same line, Liu et al. (2026) verified that the fusion of project-based learning with innovative pedagogical methods significantly contributes to fostering entrepreneurial skills that are in line with the Sustainable Development Goals. The findings of this study support this perspective, as they demonstrate that project-based learning is an appropriate method to link technical training in football management with the promotion of entrepreneurial skills, which increases employability opportunities and the creation of sustainable initiatives in the sports field.

It is important to consider certain methodological restrictions, even though the results suggest that project-based learning contributes to the improvement of entrepreneurial skills. The research was conducted only at the Higher Technological Institute of Football in Guayaquil, which may imply that the characteristics of the training model and the population are different from those of other higher educational institutions. The analyzed data were obtained from academic projects, business models, and observation records, without subsequent follow-up that would allow determining how many of the proposed initiatives transformed into firmly established companies. Similarly, the methodology proposed in the study was based on the findings; however, it was not implemented nor subjected to an

empirical validation method that would allow for the evaluation of its effectiveness in fostering entrepreneurial competencies.

In this regard, future studies should be conducted to implement and experimentally validate the proposed methodology in various university and technological training programs related to sports, in order to compare its results with other active methods. Moreover, it is essential to conduct longitudinal studies to evaluate the viability of the entrepreneurial projects that students develop at the end of their training, as well as to examine how emerging technologies, artificial intelligence, learning analytics, and digital tools influence the strengthening of sports entrepreneurship. These lines of research will help strengthen educational innovation models that can meet the emerging demands of the sports sector and intensify the comprehensive education of future football professionals from the perspective of sustainability, innovation, and social value creation.

Conclusions

At the Higher Technological Institute of Football in Guayaquil, the project-based educational method proved to be an effective tactic for reinforcing entrepreneurial skills in students pursuing a degree in Higher Technology in Football Technical Management. The implementation of projects related to specific problems in the sports field made it possible to apply knowledge about sports management, strategic planning, innovation, and entrepreneurship in practice. This contributed to a more adequate training directed toward the current demands of the sector.

The students' projects focused mainly on football academies, sports programs outside of school hours, individualized training services, goalkeeper schools, and community projects. This variety demonstrates the students' ability to identify business opportunities, develop viable proposals, and meet specific needs in the sports field thru solutions that can be applied.

The findings confirm that project-based learning strengthens the professional training of future technical leaders, as it enhances skills related to problem-solving, leadership, group collaboration, business model creation, and creativity. Thru the execution of projects, the students were able to surpass theoretical instruction, which enabled them to develop initiatives aimed at generating social and economic value within the framework of the sports ecosystem.

Technological training in football coaching can significantly increase students' job opportunities by fostering a professional perspective that goes beyond sports training and includes management, innovation, and entrepreneurship as fundamental components of the exit profile. This experience demonstrates the above. In this regard, project-based learning is a method that helps prepare professionals to face the challenges of a constantly changing sports industry.

A methodological proposal based on project-based learning is the contribution of this research. Its purpose is to strengthen entrepreneurship in the technological training of football and provides a model to create educational experiences focused on generating sustainable and innovative proposals. Although this proposal was not implemented during the study, its structure makes it possible to establish the foundations for future pedagogical interventions in technological higher education institutions.

Finally, the findings provide evidence of the ability of project-based learning to promote educational innovation in sports technology training and strengthen pedagogical models focused on the establishment of ventures with social, educational, and economic repercussions. To optimize the development of entrepreneurial skills in future professionals in the sports field, it is recommended to validate the methodological proposal thru experimental and longitudinal research, apply this proposal in other higher education programs linked to sports, and incorporate emerging technologies and artificial intelligence.

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Conflict of interest

The authors declare no conflict of interest.

Author's contributions

Author 1: conceptualization, research, and project management.

Author 2: writing and project management.

Author 3: writing and project management,

Author 4: review, validation, and editing.

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