

# PODIUM

Journal of Science and Technology in Physical Culture

EDITORIAL LIBERCIENCIA

Volume 18  
Issue 2

2023

University of Pinar del Río "Hermanos Saíz Montes de Oca"



*Translated from the original in spanish*

Original article

## *Challenge-based learning: A view from higher education*

*Aprendizaje basado en retos: una mirada desde la educación superior*

*Aprendizagem baseada em desafios: um olhar desde o ensino superior*

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*Received: 2023-02-17.*

*Approved: 2023-03-20.*

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### ABSTRACT

The objective of this research was to analyze how learning based on challenges provides, to the teachers of the Pedagogy of Physical Activity and Sport, greater possibilities of developing professional skills in their students. The qualitative method under the design of



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the grounded theory was used, a non-probabilistic sample where 25 university professors were selected, the in-depth interview technique was applied and a question guide as an instrument, validated through the judgment of five experts. The results found were determined in four stages: open, axial, selective coding and the conditional matrix; the latter allowed to have a theoretical approach by reporting that learning based on challenges enables the acquisition of professional skills. As conclusions, it was stated that challenge-based learning allows teachers to generate positive effects on their students on school performance and develops, better than other methodologies, professional skills during university education to solve new global challenges.

**Keywords:** Learning, professional skills, teaching, methodology.

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## RESUMEN

El objetivo de esta investigación fue analizar cómo el aprendizaje basado en retos proporciona, a los docentes de la Carrera de Pedagogía de la Actividad Física y Deporte, mayores posibilidades de desarrollo de competencias profesionales en sus estudiantes. Se utilizó el método cualitativo bajo diseño de la teoría fundamentada, una muestra no probabilística donde se seleccionaron 25 docentes universitarios, se aplicó la técnica de la entrevista en profundidad y como instrumento una guía de preguntas, validado a través del juicio de cinco expertos. Los resultados encontrados se determinaron en cuatro etapas: codificaciones abiertas, axiales, selectivas y la matriz condicional; esta última permitió tener una aproximación teórica al relatar que el aprendizaje basado en retos posibilita la adquisición de competencias profesionales. Como conclusiones, se planteó que el aprendizaje basado en retos le permite al docente generar en sus estudiantes efectos positivos sobre el rendimiento escolar y desarrolla, mejor que otras metodologías, las competencias profesionales durante la formación universitaria para dar solución a los nuevos desafíos globales.

**Palabras clave:** Aprendizaje, competencias profesionales, enseñanza, metodología.

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## RESUMO

O objetivo desta pesquisa foi analisar como a aprendizagem baseada em desafios proporciona, aos professores da Pedagogia da Atividade Física e do Esporte, maiores possibilidades de desenvolver habilidades profissionais em seus alunos. Foi utilizado o método qualitativo sob o delineamento da teoria fundamentada, uma amostra não probabilística onde foram selecionados 25 professores universitários, foi aplicada a técnica de entrevista em profundidade e um guia de perguntas como instrumento, validado por meio do julgamento de cinco especialistas. Os resultados encontrados foram determinados em quatro etapas: codificação aberta, axial, seletiva e matriz condicional; este último nos permitiu uma abordagem teórica ao relatar que a aprendizagem baseada em desafios possibilita a aquisição de competências profissionais. Como conclusões, afirmou-se que a aprendizagem baseada em desafios permite que os professores gerem efeitos positivos em seus alunos no desempenho escolar e desenvolvam, melhor do que outras metodologias, habilidades profissionais durante a educação universitária para resolver novos desafios globais.

**Palavras chave:** Aprendizagem, habilidades profissionais, ensino, metodologia.

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## INTRODUCTION

Higher educational institutions have a great social responsibility, because they must guarantee the training of future professionals who will bring great changes and innovations, this implies ensuring that the knowledge acquired by students is significant, develop research and critical skills, achieve autonomy in learning and lead the actions undertaken.

Crespí and García (2021) add to this idea, comprehensive training that is close to the current labor reality, through the development of generic and technical skills, while Posso *et al.* (2020) consider that it should be, through different student-centered methodologies. It is recognized that teaching methodologies must be active and contextualized by teachers, in correspondence with learning needs.



Ortega *et al.* (2021) state that active methodologies facilitate the development of cognitive and social skills. Meanwhile, Posso *et al.* (2022) comment that skills are strengthened with classroom activities in cooperative and collaborative groups and different degrees of research and academic complexity, according to the level at which they are applied; in this sense, Gil (2018) asserts that only in this way will the student become the true actor of his own knowledge and performance.

In order to comply with a student-centered approach, teachers must favor the construction of understanding, supported by the research of social problems and the labor reality. This argument was taken up by Freire (2008) when he said "Teaching is not transferring knowledge, but creating the possibilities for its own production or construction" (p. 47). Therefore, it is necessary to generate a training process based on active and flexible methodologies that allow participation and creation.

It is considered that the methodologies allow learning through inquiry to discover the truth, develop critical, reflective, creative, logical, divergent and convergent thinking. Moreno *et al.* (2019) and Jiménez *et al.* (2020) agree that with the development of skills, students have a more active role in society, as professionals who contribute to the resolution of problems that arise from their work environment, and are generators of new knowledge in tune with the demands of his academic training.

Based on the references mentioned, it can be said that teachers have a real challenge to structure a methodology according to the learning needs of students that allow the development of different professional skills. Silva and Maturana (2017) argue that the methodological design is planned to promote student participation, where the contents are significant over time and deep in complexity. In this context, previous knowledge and experiences are combined with new ones, in connection with professional practice and in a learning environment close to reality.

It is then understood that university professors must be aligned, from the new teaching roles as guides, facilitators, tutors or counselors of the professional training process, according to the output profile determined in the design of the Career. Astudillo and Chévez (2021) affirm "The role is more of a facilitator than of an educator and trainer, since these roles that



form the integrity of the student are left aside" (p. 148). This confirms the importance of the teacher having these qualities and selecting the best methodology to obtain better learning results (Posso, *et al.*, 2021).

Among the variety of existing active methodologies that can be applied in higher education, challenge-based learning is a good option, because it allows the student to participate in a challenge that involves them in the search for solutions to real, problems contextualized to the workplace (Posso, 2022). For these reasons, the objective of the research is to analyze how challenge-based learning provides higher education teachers with greater possibilities of teaching professional skills.

In short, challenge-based learning, aimed at acquiring knowledge for professional training, allows learning to become relevant and essential for job performance and for social skills in harmony with innovation and research.

## *MATERIALS AND METHODS*

The method used for this research was qualitative, with a grounded theory design and selected with the intention of explaining the objective of this study, through inductive interpretative procedures on a contextualized phenomenon that generates new knowledge from the data collected with this it is understood how challenge-based learning conceives better teaching possibilities in the training of future professionals.

The sample is non-probabilistic for convenience, in which 25 teachers from the Physical Activity and Sport Pedagogy Career belonging to five Ecuadorian universities were selected due to the degree of closeness of the researchers, they were taken into account as selection criteria, the availability of time for the collection of information, the application of the learning methodology based on challenges in the classes, having at least three years of university teaching experience and teaching undergraduate courses.



The technique used was the in-depth interview and its instrument was a question guide, focused on issues such as the microcurricular application of learning based on challenges from experiences, alignment with the contents, spaces, temporality, learning resources and appreciations in the learning outcomes. It was important to analyze from the role of the teacher and delve into whether or not the methodology enables the teaching of professional skills.

The content of the instrument was validated through the judgment of five experts on its clarity, coherence and relevance the degree of agreement of the experts was valued over 0.8 in each item. The information was collected from January to February 2022, through the Zoom platform; before the interview, each participant was informed of the objective of the research, the determined duration was between 40 to 50 minutes, consent was requested to record the interview, anonymity and confidentiality were guaranteed.

## ***RESULTS AND DISCUSSION***

The data analysis was based on the proposal of Strauss and Corbin (2002). Different results were achieved by stages such as open, axial, selective coding and the conditional matrix, detailed individually below.

It began with open coding, the data obtained in the interview were manually recorded, the main phrases and keywords exposed were taken into account, and the preliminary codes were determined, such as the role of the teacher in teaching challenge-based learning, the alignment of curricular contents, the complexity in the design of the essential question and the challenge, the generation of learning environments, the learning time, the learning expectations, the link with the real problem and the achievements obtained.

Based on open coding, axial coding was proposed, in which the systematic categories were established and related to the subcategories through the steps established in the methodology (Table 1).



*Table 1. - Axial coding*

Systematic categories	Subcategories
Teacher requirements in teaching challenge-based learning	List of active methodologies Availability of time to plan Creativity in the microcurricular design Learning facilitator Feedback to learning
Actions for the design of the methodology	Theme selection Creation of questions aligned to the topic Challenge approach Research process Challenge solution
Implementation of solutions in real environments	Validations Publications
Duration of the learning process	Monthly process Bimonthly process
Learning motivation actions	Intrinsic motivation Extrinsic motivation
Achievements obtained professional skills	Make the best decisions Solve professional field problems Ability to innovate Capacity for teamwork Learning autonomy

Next, the selective coding was carried out in which all the saturated categories were related, a central category was established that was carried out towards the refinement of the theorization; this is how it was important for the teacher to have previously worked with active methodologies for the implementation of challenge-based learning. However, the microcurricular planning required a lot of time and had the difficulty of relating the themes of syllables with the steps established in the methodology, mainly the generation of questions and the challenge.

The advantages obtained with the application of this methodology such as the acquisition of research skills, teamwork, the development of motivation, critical thinking, the ability to identify and build solution alternatives; as well as, its viability and impact were greater in relation to other active methodologies, which allowed students to develop professional skills.





Finally, a conditional matrix was established that allowed a theoretical approach that explained the objective of the research and revealed that learning based on challenges enabled teachers to develop professional skills in students and that they build research bases to be able to insert themselves in the proposed designs, which guaranteed improvements in academic performance. The foregoing is conducted from the external motivation of the teacher and their peers, with processes of accompaniment and feedback in each of the steps established so that academic progress can be verified.

The teacher preparation in the contextualization of the processes of the methodology was vital to intention the results and adapt them to the learning needs, from a vision where the student is the center, making it possible to direct the process in an integral way and select the tools suitable didactics for answering the essential question.

#### *Challenge-based learning as a methodological alternative*

Challenge-based learning is a teaching methodology in which the student is the center of learning because they participate in the solution of a real problem, it is based on the acquisition of knowledge in an experiential way where experience of learning in a real situation is actively and directly involved; Gaskins *et al.* (2015) and Zamora *et al.* (2017) state that learning should not be generated in the classroom, but in scenarios where the problem has arisen or, at least, in simulated environments.

The basic structure of challenge-based learning is inductive, because specific problems are presented for students to solve, so it automatically becomes interdisciplinary, by involving knowledge from different areas for its solution and it becomes a challenge because it requires students to investigate, from the perspective of classroom learning and in real situations.

In this way, learning based on challenges generates critical thinking in students, forges new ways of understanding from interaction in real problematic situations and they are producers of their own knowledge, directed by teachers who must plan the challenges and learning environments. learning, with the mission of motivating them to obtain academic achievements.



Active methodologies direct students to be more competent and globalized and to visualize the solution of the different problems presented in their daily lives. Therefore, the teacher must guide the learning structure, based on a question that promotes the challenge, linked to the problematized curricular theme and aligned with reality, in order to develop deep knowledge, where students establish questions that guide them. to create activities and find different solutions.

Challenge-based learning itself is an option to achieve the learning objectives established in the exit profiles of the students, it offers different teaching and learning advantages adjusted to reality in a local, regional, national or international context, in that knowledge is linked with the practice itself and the development of different established elements (Figure 1).

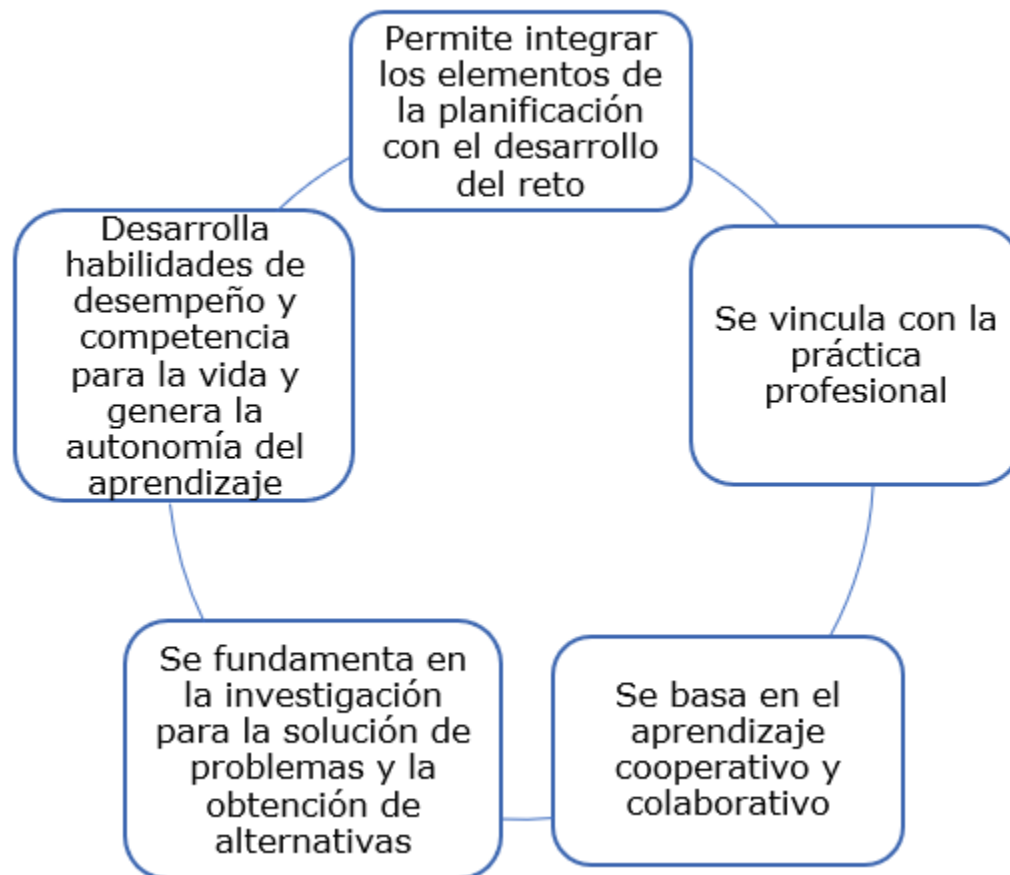


Fig. 1. - Elements of learning based on challenges. Adapted from Martinez (2020)



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### *Professional based learning*

In Ecuador, the Higher Education Quality Assurance Council [CACES] (2018) is in charge of regulating that higher educational institutions comply with quality standards on the so-called "(...) substantive teaching-learning processes" (p. 30), aligned to international standards such as the recommendations issued by the European Parliament and Council (2006), to focus on meeting quality standards in teaching programs designed by higher educational institutions.

But universities and technological institutes are the only ones to establish their educational programs and the teaching models to follow, due to the principle of autonomy and self-governance. Barreto (2015) mentions that the Ecuadorian state recognizes university autonomy in academics, management and administration, but always subject to evaluation and accreditation by CACES.

In this same line, higher educational institutions define the objectives and teaching methodologies depending on the curricular designs created, which flexibility and contextualization are the responsibility of teachers; as it is, to bring students closer to learning autonomy, through innovation and research that responds to social changes.

This is how university professors continually seek the best teaching methodology that is in accordance with the professional demands that the globalized society requests (Rodríguez and Naranjo, 2016). In this sense, challenge-based learning emerges as an alternative to achieve educational quality by transforming experiences and guaranteeing learning results. This methodology seeks those students in a challenging environment, created by the teacher, can get involved in solving real problems that arise during their work practice.

Consequently, it is pointed out that the methodology allows learning to be in two ways; the first, the fulfillment of the syllabus of the subject and the second, learning through professional experiences by solving problems that arise from them. Rodríguez *et al.* (2017) and Delgado *et al.* (2018) go deeper by saying that learning based on challenges is an option to connect the learning received at the university with the application of these in solving



problems within their work environment, taking advantage of research skills and acquired critical thinking, in the training process.

This favors the development, in university students, of cooperative and collaborative skills for efficient teamwork from activities in the productive sector, technical service, consulting and education. Consequently, challenge-based learning can be applied in different areas of knowledge, which have arisen according to the demands of today's society, mainly in the areas of humanities, social sciences, health sciences, engineering, among others.

With the orientation of the methodology, the acquisition of concrete knowledge that is of direct benefit to society must be achieved. Mandeville *et al.* (2017) mention that this specific learning must be integrated into the professional world, from an approach to the Bologna plan to improve higher education, in order to provide competitive professionals who, contribute to the progress and improvement of the quality of life of all citizens of the world.

Challenge-based learning applied in higher education ensures that students achieve the expected learning outcomes, Félix *et al.* (2019) mention that this methodology applied in several higher educational institutions has generated successful teaching processes, due to its advantages of comprehensive learning, where not only the topics established in the syllabus are addressed, but also the acquisition of knowledge from a hidden curriculum; so it can be applied in different university careers belonging to different areas of knowledge.

One of the results of learning based on challenges is visualized from the study carried out by Portuguese and Gómez (2020) in which they indicate an increase in learning of 12%, highlighting the involvement of research and deepening for the solution of planned challenges that generated this percentage; it fully coincides with what Kohn (2020) pointed out when he said that the challenges for solving real problems encourage students to solve them and continue their training process.

Another determinant was the definition of research activities that guide learning, for which specific timed objectives are proposed for each activity, aimed at the development of students' cognitive and social abilities in a sense of pedagogical responsibility (Agüero, *et al.*, 2019).



However, the teacher must create learning environments where confidence and motivation are consistent with positive interactions. Thus, the solutions are validated from the viability and impact and lead to real practice, with the linking of action plans according to the professional profile oriented in the training studies career (Gaskings, *et al.*, 2015).

Students, meanwhile, delve into research to solve problems and, consequently, establish an alternative of several solutions from their point of view, based on theory and experience (Ngai *et al.*, 2020) and demonstrate the development of skills to apply the knowledge acquired in academic training to society, to respond professionally to global challenges.

### CONCLUSIONS

What was found in this research allowed an analysis of how learning based on challenges is a methodology that allows the teaching of professional skills, where the teacher must fulfill different roles for its application such as mastery of active methodologies, dedication in planning, creativity and initiative in designing the ideal question and challenge, the ability to establish and align the methodology with themes chosen according to their importance and transcendence in work practice; in addition, a student-centered vision that facilitates the development of learning, through research structures and alternative solutions.

Certainly, challenge-based learning is a methodology that can be applied to university students to acquire professional skills, which generates positive effects on school performance; but without a doubt, the teacher's accompaniment and the motivation in each step allows the performance and the contribution of solutions to global challenges on different social problems, always supported with cognition and the autonomy of learning.



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**Conflict of interests:**

The authors declare not to have any interest conflicts.



**Authors' contribution:**

The authors have participated in the writing of the work and analysis of the documents



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