

Review article

The science, technology and society approach to managing internationalization



El enfoque ciencia, tecnología y sociedad para la gestión de la internacionalización

A abordagem ciência, tecnologia e sociedade para a gestão da internacionalização

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ABSTRACT

The science, technology, and society approach is crucial for managing the internationalization of the Bachelor of Education in Pedagogy and Psychology program in Cuba. Through a methodology based on theoretical systematization, document analysis, and literature review, the objective of grounding the science, technology, and society approach in the management of internationalization within the comprehensive education of students in the program was achieved. The results highlighted the development of global competencies, access to up-to-date information through technology, the

strengthening of research through international cooperation networks, and curricular innovation with multicultural perspectives. The integration of the international dimension prepares future professionals to respond effectively to educational challenges in diverse and globalized contexts.

Keywords: science; technology; society; internationalization; pedagogy-psychology.

RESUMEN

El enfoque ciencia, tecnología y sociedad es determinante para la gestión de la internacionalización de la carrera Licenciatura en Educación Pedagogía-Psicología en Cuba. A través de una metodología basada en la sistematización teórica, el análisis documental y la revisión bibliográfica, se cumplió con el objetivo de fundamentar el enfoque ciencia, tecnología y sociedad para la gestión de la internacionalización, en la formación integral de los estudiantes de la carrera. Los resultados destacaron el desarrollo de competencias globales, el acceso a información actualizada mediante tecnologías, el fortalecimiento de la investigación mediante redes de cooperación internacional y la innovación curricular con perspectivas multiculturales. La integración de la dimensión internacional prepara a los futuros profesionales para responder de manera efectiva a los desafíos educativos en contextos diversos y globalizados.

Palabras clave: ciencia; tecnología; sociedad; internacionalización; pedagogía-psicología.

RESUMO

A abordagem ciência, tecnologia e sociedade é crucial para a gestão da internacionalização do programa de Licenciatura em Pedagogia e Psicologia em Cuba. Por meio de uma metodologia baseada na sistematização teórica, análise documental e revisão bibliográfica, alcançou-se o objetivo de fundamentar a abordagem ciência, tecnologia e sociedade na gestão da internacionalização na formação integral dos estudantes do programa. Os resultados destacaram o desenvolvimento de competências globais, o acesso à informação atualizada por meio da tecnologia, o fortalecimento da pesquisa através de redes de cooperação internacional e a inovação curricular com perspectivas multiculturais. A integração da dimensão internacional prepara os futuros profissionais para responderem eficazmente aos desafios educacionais em contextos diversos e globalizados.

Palavras-chave: ciência; tecnologia, sociedade; internacionalização; pedagogia-psicologia.

INTRODUCTION

In a world of constant scientific and technological development and evolution, dominated by neoliberal globalization, the Republic of Cuba attaches great importance to the progress of science and technology for innovation in service to the people and society, as an essential pillar of government management, with a direct impact on the management of university processes.

Both concepts are the result of social processes that have developed throughout human history, and therefore cannot be analyzed separately today; science cannot be done without a broad combination of technological resources. This is confirmed in Núñez (2016): "Contemporary science, as we have seen, is increasingly oriented towards practical objects, towards fostering technological development and with it innovation..." (p. 19).

It is, therefore, a necessity for scientific and technological development, an in-depth analysis and study of its advantages and disadvantages, its impact and its interrelationships with society, aspects that demonstrate the relevance of the science, technology and society (STS) approach; that is, the determining interrelationship between these concepts for Cuba and for the world.

The STS approach aims to "understand the social aspects of scientific and technological phenomena, both in terms of their social determinants and their social and environmental consequences" (Núñez, 2016, p. 6). It involves making a more conscious and responsible use of scientific knowledge and information, truly applying it to the characteristics of the society in which we live, as well as understanding its influence and interrelation with the world.

One of the ideal scenarios for the materialization of STS studies is higher education, which, through its university-society link, requires that the university institution open itself to its context of action and truly insert itself into the community, committed to the search for solutions to social problems, as well as ways to improve its conditions.

Cuban universities are committed to being key institutions in the production, dissemination and use of knowledge, information relevant to development, as well as the necessary and appropriate management of science and technology activity (Borot *et al.*, 2023). It is, therefore, a requirement

of all professionals working in higher education institutions to carry out relevant research in relation to social development, responding to research projects of each area and institution.

Among the key areas for managing the STS approach at the University of Pinar del Río is the internationalization of the different careers studied there, since it is essential to provide students with a global perspective on human problems and skills to meet the growing demands of a constantly evolving and developing world.

Specifically, for the Bachelor of Education in Pedagogy and Psychology program, this is a cross-cutting theme in the initial training of its students, allowing them to incorporate international knowledge and practices to address global educational challenges. It offers opportunities to improve academic quality and research, train competent professionals capable of navigating changing environments, and respond to global and local challenges such as the use of new technologies and the needs of society at large.

From the perspective of the professional model for the Bachelor of Education in Pedagogy and Psychology, the characterization of the profession addresses the presence of international trends in the training profile of its students, analyzing their main areas of practice and the object of their work, in accordance with current demands (Avila *et al.*, 2021). This training is currently being driven by the influence of results obtained from the research projects: "Management for the Improvement of the Training Processes of the Bachelor of Pedagogy and Psychology" and "Governance and Management of University Processes for Sustainable Development at the University of Pinar del Río."

The growing demands and advancements surrounding the involvement and relevance of science and technology in internationalization, both globally and nationally, are a social reality. Therefore, the Science, Technology, and Society (STS) Agenda aims to address the challenges of science and technology management, specifically regarding its implications for the internationalization of the Bachelor's Degree in Education (Pedagogy-Psychology). This agenda recognizes the lack of awareness among management, academic administrators, faculty, and students regarding the relationship and relevance of these elements to ensuring a comprehensive education that meets current scientific and political demands.

The general objective of this article is to establish the STS approach for the management of the internationalization of the Bachelor's Degree in Education Pedagogy-Psychology.

DEVELOPMENT

Theoretical foundations

University research in Cuba has great potential for integration into Research, Development, and Innovation (R&D&I) systems at the territorial, national, and international levels. Internationalization is recognized within these areas as a key aspect, as it can enrich production systems, provide access to up-to-date information, improve training processes, and attract investment and research development in the diverse fields that Cuban society requires.

Educational management is a discipline that evolves as a result of the application of management theory to the educational context. It begins with the premise that management as a process has been present throughout human history, and that with the development of science itself, its conceptualization is necessary due to its demonstrated importance in people's lives, as it responds to social, commercial, and scientific-technological norms and dynamics.

Accordingly, management in educational institutions is considered to be a planned and organized process that leads to improving the educational process in these institutions, "oriented towards the optimization of internal processes and projects (...), with the objective of perfecting the pedagogical, managerial, community and administrative procedures that are mobilized in it" (Rico, 2016, p. 70).

According to Rodríguez *et al.* (2020), management is the process of coordinating and administering resources to achieve specific objectives of a university institution. It includes activities such as planning, organization, direction, and control, encompassing the institutional, administrative, pedagogical, and community dimensions.

In the Cuban context, internationalization is a growing and evolving process from which universities cannot be detached. It has a positive impact on educational quality, improves academic results, incorporates global dimensions, fosters international cooperation, and develops distinctive competencies in students (Labrada & Valiente, 2021).

This process is influenced by the country's educational and foreign policies, which seek to balance integration into global trends with the defense of national identity and the principles of sovereignty and internationalism. To this end, Villavicencio (2019) points out:

In the pursuit of higher quality through international contributions, the Cuban Ministry of Higher Education (MES in Spanish) established an internationalization strategy in 2003. Based on this strategy, a set of specific initiatives were developed to support the international ties of Cuban higher education institutions (HEIs), foster academic networks, collaborative doctoral programs, postdoctoral fellowships, research projects with leading institutions, and the development of a program for international scholarship recipients. All these actions have been aimed at ensuring that international cooperation has a greater impact on raising the quality of core processes and, consequently, on the achievement of excellence by HEIs (p. 11).

Regarding the definition of internationalization, national and international authors such as Knight (2008), Marshall (2014), Gacel-Ávila (2019), and Dafouz (2025) have offered their considerations. Knight (2008) defines internationalization as "the process of integrating an international, intercultural dimension into the purpose, functions, and strategies of higher education" (p. 30).

This definition, adapted to our reality, allows us to address the purpose of internationalization in the country's universities, which is aimed at training professionals who are increasingly committed to their national identity and more competent in international contexts. In this regard, UNESCO (2022) points out that internationalization is becoming a key tool for social development; however, it is necessary to be aware that this process involves not only changes in the education system, but also social, cultural, and economic changes that directly affect society.

The more science and technology are unified with the management of internationalization, the greater the possibilities of integrating scientific and research development among the diverse countries of the world, fostering cooperation and the establishment of joint research projects that allow integration into R&D& I policy.

The internationalization of the Bachelor's Degree in Education Pedagogy-Psychology in Cuba

The internationalization of the Bachelor's Degree in Education with a focus on Pedagogy and Psychology in Cuba reflects national educational policies aimed at improving the quality and relevance of higher education. The program's curriculum has evolved to include more comprehensive pathways, emphasizing educational guidance, psycho-pedagogical counseling, and the identification of educational challenges.

In 2003, a new version of the program was designed to address the emerging training needs of teachers and social workers. In 2007, the reopening of the Pedagogy-Psychology program as a daytime course was approved as one of the measures taken by the Ministry of Higher Education (MES in Spanish) to strengthen preventative work. It began in the 2008-2009 academic year with a pool of high school graduates, and subsequently went through several curricula until the current "Plan E," which is characterized by the increasing integration of an international approach. This involves incorporating global dimensions based on knowledge, literature, international practices, projects, and research networks to address educational challenges worldwide (MES, 2016).

From its professional model, it highlights the characterization of the profession, the correspondence of the training profile with international trends:

The international study of the current practice of professionals, both in training and in practice in the specialty of Pedagogy-Psychology, denotes as part of their main functions, educational guidance in the different contexts of action, psychopedagogical advice to the various agents that intervene in the process, as ways for the prevention of situations, taking into account the educational diversity that is found in the human beings who interact in the different contexts of action, all of which is projected as a prospective reality for this professional (MES, 2016, p. 4).

Another important element to highlight is the implementation of curricular strategies that are articulated with the components of training: academic, work-related, research, and outreach. This includes working with strategies for career guidance, computer skills, the environment, health and sexuality, legal training, economic training, native language, and English language (Valdés *et al.*, 2017).

The current context of training in the career is determined by the influence of research projects, which aim to specifically solve the problem related to how to perfect the conception, design and execution of the training processes of the Bachelor of Pedagogy and Psychology in Pinar del Río.

Specifically, there is the problem of insufficient theoretical and practical knowledge for managing scientific results and exchanging psychopedagogical information, particularly regarding the presentation of results, their implementation in practice, and their generalization, as well as the methods and means for exchanging experiences. To address this, the internationalization of the degree program is a key action within the project's strategy, fulfilling one of its specific objectives

related to the development of research and scientific exchanges concerning the training of graduates in Pedagogy and Psychology with various national and international institutions.

The need for a science, technology and society approach in the internationalization of the Bachelor of Education Pedagogy-Psychology degree in Cuba

Science and technology in the internationalization of the degree program allow for the training of professionals with intercultural and global competencies, capable of addressing educational challenges in diverse contexts. This is essential for graduates in Pedagogy-Psychology to perform effectively in an increasingly globalized and multicultural world (Ochoa-Nápoles *et al.*, 2022).

Including international dimensions in education enriches students' perspectives, enabling them to understand and apply educational theories and practices from diverse cultural and socioeconomic contexts. This contributes to improving the quality of education and developing skills for solving local problems with a global perspective.

Following Villavicencio's criteria (2023), it is recognized that the STS approach to internationalization fosters collaboration with foreign educational institutions, which can facilitate the exchange of ideas, student and faculty mobility, the development of joint research projects, and access to scholarships. This is crucial for raising the academic quality and international visibility of Cuban universities.

Flexibility in curriculum design allows the study plan to be adapted to the current and future needs of the global job market. This includes the incorporation of optional and elective courses that address international topics, facilitating the training of more versatile and competitive professionals.

The STS approach to the internationalization of the Bachelor of Education Pedagogy-Psychology degree in Cuba is necessary because it allows for the comprehensive training of professionals with global competencies to face the growing diversity of demands of society, and thus address educational challenges in diverse contexts; it fosters research and international cooperation, promotes flexibility and curricular adaptation, as well as the possibility of greater access to and visibility of scientific results.

Benefits of science and technology in the internationalization of the Bachelor of Education degree in Pedagogy-Psychology

Among the main profits to deal with, global competence stands out, since it prepares students to guarantee their successful performance in any work context, since it fosters, from all components of training, the appropriation of all the necessary skills to face the demands of an increasingly heterogeneous world, and more demanding and in need of guidance in the diversity of existing areas and problems (Rentería-Vera *et al.*, 2022).

This aspect is clearly explained by Betancur and Farfán (2015) in the following statement:

Within the framework of curriculum internationalization, international competencies refer to the skills, knowledge, and attitudes that students acquire during their education to face—as future professionals—the international arena. These qualities give students a global perspective and foster a commitment to society and to being global citizens, developing professional skills addressed in both national and international dimensions (p. 15).

Access to information and virtual learning facilitates, through the use of technology, the promotion of cultural and scientific interaction. This allows for greater knowledge exchange, technology transfer, and research. Through Information and Communication Technologies (ICTs) and artificial intelligence, students gain a global vision and broad perspectives on their subject of study, related to their field of practice (Leguízamo-Suárez *et al.*, 2025). This aspect, according to Villavicencio (2023), "contributes, as never before, to the universal dissemination of knowledge generated in universities and research centers" (p. 14).

The intercultural skills and the development of cultural awareness develop in students an awareness of their own local and national culture, as well as that of other nations of the world, such as the appreciation of languages, their idiosyncrasies, their customs, fostering respect and social responsibility for the identity of each country (Álvarez & Mendoza, 2025).

Learning foreign languages is a key aspect of the benefits provided, as it allows the diverse university student body, both local, national and international, the possibility of communicating with each other, as well as access to a greater amount of scientifically valuable information that is crucial for their training, seen within the curricular strategies of the career itself.

English is among the most widely used languages of science, making its learning an essential requirement for any student's academic training. It is one of the most spoken languages in the world and boasts one of the simplest learning systems, characterized by its conciseness, clarity, and directness in the handling and transmission of information. These advantages are readily utilized by the research community, as they provide a common language that fosters greater scientific development in general, as well as the exchange, access, and dissemination of scientific knowledge (Torres-Cabrera *et al.*, 2023).

The global approach to topics allows them to be addressed globally and to consider diverse cultural and scientific-technological perspectives in the analysis of the territorial problems of each university, thus guaranteeing other approaches, perspectives and possibilities of treatment and solution based on the real conditions available in each context, enriching the framework of the Bachelor of Education Pedagogy-Psychology, by facing the demands of society (UN, 2015 & Alonso-Becerra *et al.*, 2021).

The improvement in academic quality is seen from the exchange of ideas and the updating of content, the cooperation and collaboration between researchers and the adoption of best educational practices, which enables the transfer of learning and methodologies, raising the standards of academic quality of higher education institutes and, precisely, those of the career, ratified by the category of Excellence by the National Accreditation Board (Rodríguez *et al.*, 2024; Sánchez *et al.*, 2025; Valenzuela, 2024).

Strengthening research is made possible by access to more information, participation and collaboration with researchers on issues in other countries, and participation in international research networks, boosting knowledge production and innovation with nations such as Spain, Angola, and Mexico. This idea is corroborated by Villavicencio (2023) who states:

In this regard, the need to internationalize research is highlighted, understood as the expression of the international dimension in each country's science policies, as well as in the activities carried out by researchers, managers, and decision-makers in science, technology, and innovation policies. It is a dynamic process in which, based on R&D&I results, the aim is to enhance the quality of science, promote academic mobility, and broaden international visibility, where cooperation established between different countries through the creation of networks in an increasingly globalized world is crucial (p. 14).

Curricular innovation is promoted by the incorporation of new perspectives, experiences and methodologies in teaching, research and curriculum design, viewed from other angles, enriching the educational experience and preparing graduates in Pedagogy-Psychology for the challenges of the current world (Beneitone, 2022; Rey & Corrales, 2022).

The promotion of international understanding and solidarity is fostered by respect for diversity, tolerance and intercultural understanding, contributing to building a more peaceful and supportive world, in which the will to contribute to addressing common problems, support and selfless help is expressed, enabling well-being, peace and respect among nations (Valenzuela, 2024).

The development of cooperation networks contributes to establishing collaboration among institutions, professors, and students, a process facilitated by advances in Information and Communication Technologies. Among the main networks in which the program is represented is the Ibero-American Network of Pedagogy (REDIPE). Alpízar *et al.* (2023) state in this regard that:

The growing internationalization of higher education has catalyzed the creation of university associations, rectors' conferences, academic and scientific networks, and other collaborative spaces that add value to cooperation and, consequently, to its effectiveness and impact. Links between actors from different regions and countries allow for the optimization of resources through the generation of new capacities, programs, and innovative scientific research projects, based on common interests and with multi-purpose impacts (p. 112).

The greatest visibility, reach, and transfer of results and innovations are achieved through the program's ongoing scientific work and its dissemination in all relevant forums related to its areas of knowledge, the pursuit of opportunities to promote exchange and collaboration, and a constant focus on enriching the curriculum. The program aims to train highly qualified professionals who can respond to societal demands and are committed to the principles of their socialist nation.

It is crucial to highlight all the benefits that science and technology bring to the development of the internationalization of the Bachelor's Degree in Education Pedagogy-Psychology; as it allows us to be part of global dynamics and make a local scientific contribution to the development of more science and technology.

Current limitations in the science-technology-internationalization relationship in the Bachelor's Degree in Education Pedagogy-Psychology

Based on the analysis and theoretical systematization carried out, with respect to the current limitations in the internationalization of the career, in relation to science and technology, by authors such as Ochoa-Nápoles *et al.* (2022), Escribano *et al.* (2022), Linch (2023) and Mentges and Costa (2023), the following elements are noted:

1. A lack of financial and technological resources can hinder the effective implementation of internationalization programs. This includes difficulties with student and faculty mobility, as well as access to advanced online learning technologies.
2. Communications infrastructure and internet connectivity may be limited in some areas of the country, making virtual collaboration and access to international educational resources difficult.
3. The ongoing training and professional development of faculty in internationalization is crucial. However, there are limitations regarding the availability of training programs that specifically address this topic.
4. Although efforts are made to incorporate international bibliography and resources, the availability of these materials may be limited due to economic and political restrictions.
5. Internationalization requires effective integration with the global context, which can be challenging due to the particularities of the Cuban education system and external constraints.
6. Rigidity in curriculum designs can hinder the incorporation of international content and approaches, limiting the ability to adapt to new global trends.
7. Although Cuba has maintained an active position in international cooperation, political and economic restrictions can affect collaboration with certain countries, limiting opportunities for exchange and collaboration.

In summary, the current limitations in the relationship between science and technology for the management of internationalization in Cuba include limited resources, insufficient infrastructure, the need for teacher training, restricted access to international literature, integration with the global context, curricular flexibility, and international collaboration.

CONCLUSIONS

Managing internationalization in higher education is crucial for training competent and committed professionals capable of addressing contemporary educational challenges and contributing to the social development of the global context. Science and technology should be seen as pillars that enhance this process, ensuring a quality education that responds to the demands of an increasingly globalized world.

In the Bachelor of Education (Pedagogy-Psychology) program in Cuba, this is an essential process for preparing students for the challenges of a globalized and constantly evolving world. Through the STS (Science, Technology, and Society) approach, the program seeks to integrate knowledge and practices that respond to current social needs, promoting a comprehensive education that develops intercultural and global competencies, collaboration and innovation in the educational field, as well as fostering research and the exchange of experiences between national and international institutions. However, it is crucial to address existing limitations, such as a lack of resources and staff training, to ensure the effective implementation of internationalization tailored to the country's specific conditions.

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Conflict of interest

Authors declare no conflict of interests.

Authors' contribution

The authors participated in the design and writing of the article, in the search and analysis of the information contained in the consulted bibliography.



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