ISSN: 1815-7696 | RNPS: 2057 | Mendive. Journal on Education. Vol. 24, e4156
Santana Hernández, M. A.; Rodríguez Peñate, M.; de la Torre Blanco, E. de J. "Comprehensive teacher training for scientific culture".
https://mendive.upr.edu.cu/index.php/MendiveUPR/article/view/4156

2026

Original article

Comprehensive teacher training for scientific culture

Formación docente integral para la cultura científica

Formação abrangente de professores para a cultura científica

Marcos Antonio Santana Hernández[1] 0000-0002-2927-684X santanahernandez340@gmail.com

Marisela Rodríguez Peñate[1] 0000-0001-7091-9264 mariselarpw@gmail.com

Edmundo de Jesús de la Torre Blanco[1] 0000-0002-8702-8086 edmundodltorres@ucpejv.edu.cu

[1] University of Pedagogical Sciences "Enrique José Varona". Cuba.

Received: 11/02/2025

Accepted: 13/01/2026

ABSTRACT

Scientific literacy is a crucial component of the comprehensive general culture promoted in Cuba within the socialist social project, thus justifying the need for comprehensive teacher training. The objective of this study was to contribute to the foundations of university-level pedagogical training that prepares scientifically literate and socially committed teachers, encompassing undergraduate, vocational, and postgraduate levels. The research was framed within a qualitative paradigm, using dialectical materialism as the general method of knowledge, along with theoretical methods of analysis and synthesis, historical-logical analysis, and systematization to construct the essential foundations that link scientific literacy with professional training. The results demonstrate the importance of training teachers capable of understanding their reality with a critical and transformative spirit, who use science, technology, and innovation to contribute to the development of a prosperous and sustainable socialism. Finally, it is concluded that comprehensiveness in

pedagogical training is indispensable to guarantee not only scientific competencies but also an ethical and social commitment that promotes well-being, quality of life, and happiness in Cuban society.

Keywords: scientific culture; sustainable development; teacher training.

RESUMEN

La cultura científica constituye un componente crucial de la cultura general integral promovida en Cuba dentro del proyecto social socialista, lo que fundamenta la necesidad de una formación docente integral. El objetivo de este estudio fue contribuir a los fundamentos para la formación pedagógica universitaria que prepare docentes cultos científicamente y comprometidos socialmente, abarcando pregrado, preparación para el empleo y postgrado. La investigación se enmarcó en un paradigma cualitativo, utilizando la dialéctica materialista como método general del conocimiento, junto con métodos teóricos de análisis y síntesis, histórico-lógico y sistematización para construir los fundamentos esenciales que vinculan la cultura científica con la formación profesional. Los resultados evidencian la importancia de formar docentes capaces de comprender su realidad con espíritu crítico y transformador, que utilicen la ciencia, tecnología e innovación para aportar al desarrollo de un socialismo próspero y sostenible. Finalmente, se concluye que la integralidad en la formación pedagógica es indispensable para garantizar no solo competencias científicas, sino también un compromiso ético-social que promueva el bienestar, la calidad de vida y la felicidad en la sociedad cubana.

Palabras clave: cultura científica; desarrollo sostenible; formación docente.

RESUMO

O letramento científico é um componente crucial da cultura geral abrangente promovida em Cuba dentro do projeto social socialista, justificando, assim, a necessidade de uma formação docente integral. O objetivo deste estudo foi contribuir para os fundamentos da formação pedagógica em nível universitário que prepare professores letrados cientificamente e socialmente comprometidos, abrangendo os níveis de graduação, profissional e pós-graduação. A pesquisa foi enquadrada em um paradigma qualitativo, utilizando o materialismo dialético como método geral de conhecimento, juntamente com métodos teóricos de análise e síntese, análise histórico-lógica e sistematização para

construir os fundamentos essenciais que vinculam o letramento científico à formação profissional. Os resultados demonstram a importância de formar professores capazes de compreender sua realidade com um espírito crítico e transformador, que utilizem a ciência, a tecnologia e a inovação para contribuir para o desenvolvimento de um socialismo próspero e sustentável. Finalmente, conclui-se que a integralidade na formação pedagógica é indispensável para garantir não apenas competências científicas, mas também um compromisso ético e social que promova o bem-estar, a qualidade de vida e a felicidade na sociedade cubana.

Palavras-chave: cultura científica; desenvolvimento sustentável; formação docente.

INTRODUCTION

The article presented is linked to the research project "Pedagogical integrality in the continuous training of education professionals", a project of the Center for Educational Studies of the Enrique José Varona University of Pedagogical Sciences, associated with the Sectorial Program of the Ministry of Higher Education "Higher Education and Sustainable Development".

Scientific culture is an essential component of the comprehensive general culture that is promoted in Cuba through the system of influences associated with education (institutionalized or not), with the purpose of having citizens committed to the socialist social project that is being built and defended, bearers of knowledge, values and ways of acting that correspond to the demands of their historical time.

By highlighting the subject's connection to culture, the dialectical-materialist conception of culture is identified, which is expressed as the set of material and spiritual achievements that demonstrate multifaceted human activity. This encompasses the body of knowledge, skills, procedures, modes of action, and results obtained in the process of human transformation of objective reality. However, it also involves the process of creation and appropriation, which leads to the issues of inheritance, continuity and rupture, enrichment and improvement, and development (Huepa Mosquera *et al.,* 2023).

In light of Marxism-Leninism, the terms culture and identity are assumed to be the set of material and spiritual values, as well as the procedures for creating, applying, transmitting and achieving them by society in literature, art, the experience of the production of goods, scientific knowledge,

technology, the organization of social life, education, health and other services (Fernández Mijares *et al.,* 2021).

Culture, from a philosophical perspective, according to the criteria of Rodríguez Rodríguez *et al.* (2019):

> It is also the sum of all types of transformative activity of man and society. It is a historically determined level of the development of society, of man's creative forces and capacities, expressed in the modes of organization of life and f people´s activity, as well as in the material and spiritual values created by it. A distinction is made between material and spiritual culture. The former includes all material goods and the means of their production, while the latter includes all knowledge, all forms of social consciousness: philosophy, science, morality, art, etc. (p. 34).

Thus, it encompasses a process of creation and socialization of the entire cultural heritage that is transmitted across generations and is crucial in the formation of individual, professional, and collective identities. Therefore, culture, viewed as identity, attitude, sensitivity, socialization, creation, and cultivation, in conjunction with the individual who carries that culture, enables their harmonious development and is essential to wholeness as a quality of personality. This quality is particularly significant for education professionals, who are responsible not only for transmitting culture to individuals of different generations as part of their profession, but also for their holistic development.

In Cuba, the struggle for the preservation and development of this heritage takes on special characteristics and is closely linked to the aims of education. Therefore, when addressing the concept and significance of culture, it is necessary to do so from a broad and integrative perspective, one that expresses the capacity of individuals in society to orient themselves and act in the face of new and complex realities. It is a multidimensional and complex phenomenon encompassing different manifestations; thus, one can speak of political, historical, economic, legal, moral, artistic, aesthetic, energy, environmental, scientific, and labor culture, among others. The goal of achieving a comprehensive general culture that prepares citizens for life is to understand and develop this knowledge in their citizens.

This is not, of course, a fragmented view of culture, considering only the aforementioned manifestations, but rather its interrelation in the intellectual and affective realms, as the foundation

of values, attitudes, behaviors, and individuals' modes of action within their social context. It has been a constant priority of the Revolution's leadership to achieve widespread access to a comprehensive general culture for all citizens, a goal to which various factors, structures, and educational influence agencies contribute. As part of the holistic development of new generations, this has been the focus of attention for the national education system and the professionals who work within it.

This comprehensive general culture is achieved through the development of all its manifestations, including scientific culture. Now, although learning science as part of education became widespread from the second half of the 19th century onwards, scientific culture, as a component of general culture, acquired particular importance, especially after the Second World War, largely due to the growing role of science and technology in the contemporary world.

When considering science as an intrinsic part of culture, the combination of the terms "culture" and "scientific" has been used in various ways. The resulting category is complex and is often associated with the dissemination and democratization of science. There is a perceived lack of consensus on what this represents, and there is no unanimity on whether scientific culture is an appropriate end in itself, much less whether it should be primarily an educational goal (Shamos, 1988). Furthermore, the different sectors involved in this category (teachers, educational administrators, scientists, industry representatives, students, politicians, among others) express very different conceptions of its meaning (Champagne *et al.,* 1989).

Another position understands the term in a more generic sense; that is, as the body of knowledge that can be considered sufficient to understand, analyze, and apply the scientific information presented, both in the media and in typical work contexts. The problem with this interpretation lies in the imprecise definition of the nature of such knowledge and in the reduction of scientific literacy to the processing and use of information; hence its ambiguity.

This understanding is linked to the idea of scientific culture as the integration of information about science, technology, and innovation received by society or a given sector of it; that is, elements that are part of social perception, such as knowledge about disciplines in the exact, natural, and social sciences, as well as technology. This perception is necessary for individuals and society as a whole to identify, understand, and explain concepts and actions related to these topics, and to act accordingly in life.

From a more moderate and simplified view of the concept, science communicators and journalists argue that scientific literacy contains the knowledge needed to understand public issues. It is a combination of facts, vocabulary, concepts, history, and philosophy. It is not the domain of experts, but rather something more general used in political discourse. The point is that doing science is not the same as using it, and scientific literacy is only related to the latter.

The above aligns with the contributions made by researchers at the Enrique José Varona University of Pedagogical Sciences regarding holistic education, which expresses the harmonious development of human faculties in the affective, intellectual, and executive domains, and guarantees the individual's connection to the culture, contradictions, and aspirations of a particular era and country. Holistic development allows for the full enjoyment of the spiritual values created by humanity, paves the way for identification with these values, and conditions the capacity of individuals to understand their world, assume a critical stance toward it, and be useful within it (del Pino Calderón, 2011).

Hence the necessary relationship that must exist—though it is not always evident—between scientific culture and the comprehensive education of new generations, and particularly of teachers, as professionals entrusted with this social responsibility. This implies that they assimilate and understand their reality with a critical and transformative spirit. This relationship and its implications for the performance of these professionals are the subject of this work, which aims to contribute to the foundations of university-level pedagogical training that prepares scientifically knowledgeable and socially committed teachers, encompassing undergraduate, vocational, and postgraduate levels.

MATERIALS AND METHODS

The research is predominantly qualitative and considers dialectical materialism as the general method of knowledge, within a systemic integration that allowed for the configuration of the essential foundations supporting the development of scientific culture in its relation to the comprehensive training of education professionals. Theoretical methods such as analysis and synthesis were employed in the study of theoretical and methodological aspects. The historical-logical method and systematization enabled the identification of prevailing criteria regarding the topic in question during this initial exploratory stage of the research.

In the empirical phase, documentary analysis was used to review previous research, including the integrative foundations that underpin pedagogical wholeness and regulatory documents. Techniques

and instruments such as interviews with university students and faculty were applied, serving as a basis for evaluating scientific literacy in their holistic education. Furthermore, observation proved valuable, allowing for the identification of essential elements that contribute to comprehensive and ongoing training.

To apply the described instruments, a population was selected consisting of six majors at the Enrique José Varona University of Pedagogical Sciences: Mathematics, Spanish-Literature, Marxism-Leninism and History, Economics, Pedagogy-Psychology, and Primary Education. The sample consisted of the official enrollment records of third-year students in these majors.

The first result achieved was the understanding of scientific culture as a consequence of science education, which implies the shared commitment of different social agents who contribute to its formation and development, particularly educational institutions and education professionals. However, in the current social context, the authors of this work shared the view that aspiring to a scientifically cultured school will depend on networking for the exchange of knowledge established both within the institution and from it to the outside world.

Integration scientific literacy is a determining factor in scientific culture because it combats obsolescence as science advances. Therefore, it was concluded that the need for a lasting relationship between science and education is largely ensured through ongoing teacher training. Scientific literacy is a component of the educator's professional culture and is revealed in one of their functions, which is associated with continuous professional development.

However, this updating is achieved mostly through self-management, self-awareness, and self-determination of the needs for improvement for successful performance, and not only through a predetermined postgraduate training system, where the teacher is a passive recipient of knowledge.

Another conclusive element of this research is that education professionals, given the significance of their social role as educators, must possess the necessary general knowledge and, as part of this, the scientific literacy required for the profession. If they are not scientifically literate, they cannot develop the scientific literacy of their students.

It was necessary to delve into the necessary relationship between the science associated with the specialty and its didactic transposition in the discipline or subject it explains; in this sense, it was revealed in the investigative process that a developmental teaching-learning process should be

promoted that stimulates in students the interest in scientific knowledge and their identification with the use of science in order to improve humanity.

At the same time, it was concluded that, based on their mastery of educational sciences and the methodology of educational scientific research, teachers must be able to identify, confront, and seek solutions to problems in the school environment (school-family-community) or in society that affect their educational work, as well as propose innovative actions that contribute to the improvement of that work, in accordance with the development of science and technology in the contemporary world.

Their preparation in this area begins during initial training, but the concept of comprehensive and continuous professional development is deepened in subsequent stages of the process; that is, in job preparation and postgraduate training, the design of which must respond to the real needs of teachers, scientifically diagnosed. This means a strengthening of their scientific literacy and translates into improved performance, thus achieving, based on the diagnosis of students' needs and characteristics, their comprehensive development and attention to the family and social environment in this educational endeavor.

How can we achieve the holistic development of the education professional's personality based on these socio-professional parameters and needs, and their own holistic development as a person?

To achieve this, it is necessary to develop basic skills in him, among which investigative and informational skills stand out, which allow him to discern, select, organize, store, process, analyze and synthesize relevant information, make decisions in the search for solutions to social, technological and environmental problems, using scientific procedures.

However, it has been observed in practice that the functions of the education professional (teaching-methodological, educational guidance, research and professional development) are underused in the exercise of the profession, especially the latter; because science is not always used to solve the daily professional problems they face, including their students' learning problems. the contradictions between the science that explains it as a teaching discipline and the reality that is experienced, as well as those presented by methodological work, which frequently does not aim towards scientifically grounded solutions.

The above affects not only professional performance, but also the teacher's self-esteem, social recognition; in short, their very identity with the teaching profession.

It is therefore important to consider how knowledge is used in continuing education, including the educator's scientific training and the motivations and incentives that stimulate and strengthen it, along with activities related to science, innovation, and educational technology. This contributes to the consolidation of the teacher's role in their professional pedagogical practice. All of this is conceived as part of the foundations of pedagogical integration in holistic education, which guarantees the assimilation and understanding of reality with a critical and transformative spirit.

The job preparation stage, currently underused, should be used to strengthen the initial training received through the necessary coordination between the university and the employing educational institution. This would ensure that graduates are not seen merely as a workforce to guarantee teacher coverage, but as professionals who require ongoing support and guidance in their performance. They should have sufficient time to enrich their scientific knowledge and develop that of their students by planning and implementing activities that stimulate their interest in science and its application for the benefit of society. They should also have time to deepen and update their professional knowledge and skills through self-improvement and the various types and forms of methodological work, designed and developed from a scientific perspective, in accordance with the needs of the school and its teachers.

In particular, it is necessary to make better use of the potential of scientific-methodological work to update teachers in accordance with contemporary scientific-technical development, both in the field of education and in other spheres, through conferences or lecture series given by recognized specialists, scientific workshops for reflection and debate on certain topics, the projection, observation and debate of audiovisual materials of scientific content, active participation, as authors and speakers, in different scientific events, among others, that contribute to the enrichment of that scientific culture as part of their general culture.

Likewise, at this stage, the graduate must be able to apply research methodology in the diagnosis and transformation of educational reality and its environment, in the detection and solution of problems that affect the students' learning and behavior, or that hinder the fulfillment of the mission of the school in its relationship with the family and the community.

As a stage of continuing education, job preparation confirms the quality of initial training and should provide a suitable environment for transitioning, at varying speeds, to postgraduate academic training. The various modalities of postgraduate studies enable higher levels of scientific literacy and,

consequently, improved professional performance in line with advances in science and technology. This, more than the previous stage, influences the possibility of involvement in research projects, whether or not they are associated with sectorial and national science, technology, and innovation programs, especially for teachers who obtain a Master's degree or a Doctorate in Education.

The country's scientific progress must impact educational development, and vice versa. This is only possible through the training of teachers who are capable of navigating an increasingly digital, interconnected, and computerized world; who can promote multi-stakeholder research projects in the community where the school is located; and who can cultivate in their students an innovative and creative spirit, enabling them to solve problems in their environment using scientific methods. This is achieved by having students complete progressively more complex research tasks, and by fostering a sense of purpose that contributes to local, national, and international scientific and technological development.

Furthermore, teachers' scientific literacy depends not only on their ability to use disruptive technologies, such as computer science and artificial intelligence, but also on their understanding of how these technologies work, their internal logic, and their formal structure, so they can see their applicability in society. This, of course, must be done with an ethical approach.

DISCUSSION

Undoubtedly, society must be scientifically literate to understand and participate in the search for appropriate solutions to social problems from scientific perspectives. This view often emphasizes that understanding technology is just as necessary as understanding science, since technology intervenes, even more directly, in many of the problems that concern people (Hickman, 1987).

The term scientific culture is also used to refer to the culture that resides within science professionals, the culture they need to ensure their consistent performance in solving problems, improving living conditions, and meeting growing social needs. This variant includes the category of scientific-research culture, which is defined as the set of meanings, expectations, and behaviors shared by professionals regarding science, technology, and innovation.

This category refers to the conceptual framework that guides professional work in the generation and application of new knowledge and technologies, aimed at solving problems within its field through

scientific methods. In other words, it is linked to the ability to investigate, argue, create, innovate, and manage scientific research processes (Gutiérrez Rojas *et al.,* 2018).

It is understood, then, that the essence of scientific-investigative culture lies in scientific intentionality, which, unlike the social apprehension of scientific culture, only occurs in professionals whose cultural identity is marked by the development of a scientific practice.

On the other hand, the Cuban authors Pérez and Bárzaga (2006) carried out a study of scientific culture, which appears in the paper presented at the IV Conference on Scientific Culture, developed by the Ministry of Science, Technology and Environment and Sci Dev Net-Brasil, where they referred to it as "the capacity, proper to a given society, to scientifically explain the origin, essence and behavior of the spiritual and material values it possessed, and to influence its subsequent transformation and development" (Pérez & Bárzaga, 2006, p. 8).

Pino (2007) also pointed out that scientific culture encompasses knowledge about the objects, phenomena, and processes related to science and technology, including the methods and skills necessary to understand, transform, produce, apply, and communicate them, from ethical perspectives and within a specific historical and social framework. This culture integrates achievements, interests, emotions, values, beliefs, and ways of acting that facilitate the harmonious interaction of human beings with nature and society. Furthermore, scientific culture manifests itself through a set of material and spiritual values that empower individuals to assume their social responsibility in the face of current scientific and technological advancements (Bello Rey & Núñez González, 2017).

As can be seen, this definition includes not only knowledge itself, but also its connection to science and technology. It delves into the humanistic approach determined by the need for responsible human action and highlights self-realization within the relationship between nature and society. Therefore, this definition is adopted in the present work, not only because it considers the development of scientific culture in accordance with scientific and technological advancements, but also because the author recognizes that scientific culture is a product of science education and, through this education, contributes to the students´ comprehensive development, which aligns with the current state of Cuban education and its ongoing improvement.

Science education, which could address both the questions posed by students and teachers, would be that which fosters in each student a desire to learn, to question, and to constantly challenge

assumptions. Scientific literacy for all must allow for the development of a creative spirit, both individually and collectively, to facilitate integration—not merely adaptive integration, but active integration that enables the continuous building of better societies. (Macedo, 2016).

The preceding statement reflects a convergence with Martí's conception of education, insofar as scientific culture, as a component of culture, is part of the human endeavor that must be instilled in every person, making them a summary of the living world up to the day they live, bringing them up to the level of their time and preparing them for life (Martí Pérez, 1991). It is no coincidence that the Apostle defended scientific education when he expressed ideas such as the following: "Let scientific teaching flow, like the sap of trees, from the roots to the top of public education…" (Martí Pérez, 1991).

Recent studies have delved into Martí's figure as a man with a comprehensive humanistic culture. The review conducted reveals a key manifestation of Martí's scientific culture: his constant inclination to study, assimilate, investigate, evaluate, disseminate, and apply the scientific knowledge of his time, as well as the methods of science itself. Furthermore, it considers that this orientation was the foundation of his complete culture, evidenced in the depth of his entire body of work, in his exemplary life, and in the enduring relevance of his ideas. From this, it can be inferred that his self-education played a significant role in the formation of Martí's scientific culture, a topic that has also been the subject of research.

A scientifically literate teacher must also participate in international debate through networks that exchange innovative experiences and best practices, thereby amplifying their voice in international science. Consequently, they must master and transmit to their students the fundamental elements of science communication. In doing so, they would be contributing to establishing revolutionary education based on solidarity and collaboration.

This teacher, possessing a scientific culture in tune with their time and the social reality in which they work, will be able to develop actions that enhance students' scientific literacy and the quality of the classes they teach. In these classes, they will guide students in completing increasingly complex research tasks, employing productive methods that foster their inquiry skills, curiosity, and the joy of learning. Scientific literacy is fostered not only in the classroom but also through activities such as: participation in student interest groups and scientific societies, visits to research centers associated with the natural and social sciences, exchanges with scientists invited to the school to

discuss important topics, and engagement with online spaces created on social media where scientific information is shared.

Developing a scientific culture requires exploring topics of interest that can help solve everyday problems. It also involves using educational and scientific programs broadcast on national television to discuss and analyze their impact on society; holding science fairs in educational or community institutions, where students become promoters of scientific culture; and participating in olympiads, competitions, and other student science events. These are not the only possible actions; others can be planned and implemented according to the conditions and resources of each educational institution.

University-level teacher training faces a significant challenge today: preparing scientifically literate educators for the future, in a society that relies on science, technology, and innovation to build a prosperous and sustainable socialism that ensures its members´ well-being, quality of life, and happiness. All of this unfolds amidst the heightened hostility of its historical adversary and within an international context marked by rapid scientific and technological development, sharp contradictions, and grave dangers that threaten the survival of humanity.

Hence, the continuity of comprehensive training in the stages of preparation for employment and postgraduate studies should prioritize, as part of the enrichment of general culture, the development of the knowledge, skills and values associated with the scientific culture required to fulfill their social responsibility as a competent professional, committed to human improvement, and an active subject in the systemic and systematic connection between the training process and educational institutions as laboratories for the generation of new scientific-educational knowledge.

REFERENCES

Bello Rey, M., & Núñez González, M. R. (2017). Concepción dirigida a la cultura científica de los Docentes de la Educación en la primera infancia. *Revista: Atlante*. https://www.eumed.net/rev/atlante/2017/09/cultura-cientifica-docentes.html

del Pino Calderón, J. L. (2011). Fundamentos martianos de la educación de la integralidad en el ser humano. *Revista Científico-Metodológica Varona*, *52*, 68-74. https://www.redalyc.org/pdf/3606/360635574011.pdf

Fernández Mijares, E., Rubio Vargas, I., Lima Peñalver, R., & Caro Lloret, A. (2021). *Relación dialéctica entre cultura, filosofía e identidad*. Editorial Redipe. https://editorial.redipe.org/index.php/1/catalog/download/142/249/4936?inline=1

Gutiérrez Rojas, I. R., Peralta Benítez, H., & Fuentes González, H. C. (2018). Cultura científica y cultura científico investigativa. *Revista Humanidades Medicas*, *18*(1), 8-19. https://humanidadesmedicas.sld.cu/index.php/hm/article/view/1179

Hickman, F. M. (1987). Science/Technology/Society: A Framework for Curriculum Reform in Secondary School Science and Social Studies. En *National Science Foundation* (p. 56). Social Science Education Consortium, Inc., Boulder, CO. https://files.eric.ed.gov/fulltext/ED288783.pdf

Huepa Mosquera, D. M., Sánchez Franco, M. de los Á., & Sánchez Peñalver, B. A. (2023). La formación y evolución de la identidad cultural cubana y el desempeño profesional pedagógico. *Revista Científico-Metodológica Varona*, *77*, 1-13. http://scielo.sld.cu/pdf/vrcm/n77/1992-8238-vrcm-77-e2149.pdf

Macedo, B. (2016). *Educación científica* [Post]. Foro Abierto de Ciencias de América Latina y el Caribe, Montevideo. https://unesdoc.unesco.org/ark:/48223/pf0000246427

Martí Pérez, J. (1991). *José Martí. Obras completas* (Centro de Estudios Martianos, Vol. 8). Editorial de Ciencias Sociales. https://sos-de-fra-1.exo.io/patria-libros/books/42-Editorial-Ciencias-sociales_27-tomos/Jose-Marti-Obras-completas-1991_26-tomos/Vol08.pdf

Rodríguez Rodríguez, E. R., Benítez Víctores, O., & Noa Rodríguez, R. (2019). Diccionario de Ciencias Sociales y Humanística. En *Diccionario de Ciencias Sociales y Humanística* (Vol. 1). Editorial de Ciencias Sociales.

Shamos, M. (1988). The lesson every child need not learn. *The Science*, *28*(4), 14-20. https://doi.org/10.1002/j.2326-1951.1988.tb03029.x

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.