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STUDENT ENVIRONMENTAL CULTURE AS A CORNERSTONE OF SUSTAINABILITY IN HIGHER EDUCATION



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CULTURE AS A CORNERSTONE OF SUSTAINABILITY IN HIGHER EDUCATION

LA CULTURA AMBIENTAL ESTUDIANTIL COMO EJE DE LA SOSTENIBILIDAD EN LA EDUCACIÓN SUPERIOR

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ABSTRACT

This article analyzes the environmental culture of higher education students and its impact on university sustainability, highlighting the importance of educational, institutional, and behavioral factors in developing a strong ecological awareness. The main objective is to examine how student environmental culture influences sustainability within universities, considering the interaction between environmental education, institutional policies, and academic practices. The methodology employed is based on a qualitative literature review approach, analyzing recent scientific literature published between 2019 and 2025. Empirical and theoretical studies were compiled from various academic databases, applying selection criteria focused on research related to higher education, sustainability, and pro-environmental behavior. The information was analyzed using thematic categories that allowed for the identification of common patterns, conceptual relationships, and research gaps in the field. The results of the analysis demonstrate that environmental culture among students depends not only on formal education but also on institutional commitment and practical learning experiences. It was found that the cross-cutting integration of sustainability into the curriculum, along with active learning methodologies and coherent university policies, significantly strengthens pro-environmental behavior. Furthermore, it was concluded that sustainability in higher education requires a comprehensive approach that integrates the pedagogical, organizational, and social dimensions to achieve a lasting impact on student development.

Keywords:

Environmental culture, sustainability, higher education, pro-environmental behavior, environmental education, universities.

RESUMEN

El presente artículo analiza la cultura ambiental en los estudiantes de educación superior y su impacto en la sostenibilidad universitaria, destacando la importancia de los factores educativos, institucionales y conductuales en la formación de una conciencia ecológica sólida. El objetivo principal es examinar cómo la cultura ambiental estudiantil influye en la sostenibilidad dentro de las universidades, considerando la interacción entre la educación ambiental, las políticas institucionales y las prácticas académicas. La metodología utilizada se basa en un enfoque cualitativo de revisión bibliográfica, mediante el análisis de literatura científica reciente publicada entre 2019 y 2025. Se recopilaron estudios empíricos y teóricos de diversas bases de datos académicas, aplicando criterios de selección orientados a investigaciones relacionadas con educación superior, sostenibilidad y comportamiento proambiental. La información fue analizada mediante categorías temáticas que permitieron identificar patrones comunes, relaciones conceptuales y vacíos de investigación en el campo estudiado. Los resultados del análisis evidencian que la cultura ambiental en los estudiantes no depende únicamente de la educación formal, sino también del compromiso institucional y de las experiencias prácticas de aprendizaje. Se identificó que la integración transversal de la sostenibilidad en el currículo, junto con metodologías activas y políticas universitarias coherentes, fortalece significativamente el comportamiento proambiental. Asimismo, se concluye que la sostenibilidad en la educación superior requiere un enfoque integral que articule la dimensión pedagógica, organizacional y social para lograr un impacto duradero en la formación estudiantil.

Palabras clave:

Cultura ambiental, sostenibilidad, educación superior, comportamiento proambiental, educación ambiental, universidades.

INTRODUCTION

In recent decades, sustainability has become a fundamental pillar of higher education worldwide, due to the rise in environmental problems such as climate change, pollution, biodiversity loss, and the depletion of natural resources. In this context, universities have ceased to be merely spaces for the transmission of knowledge and have become key players in the formation of environmentally responsible citizens committed to sustainable development. Within this process, environmental awareness among students acquires significant relevance, as it directly influences the adoption of sustainable behaviors and the development of a strong ecological conscience.

Environmental culture can be defined as the set of knowledge, values, attitudes, and practices that people develop in relation to the care and protection of the environment. In higher education, this culture is formed through the interaction between educational processes, institutional policies, and experiences within the university environment. Therefore, higher education institutions play a crucial role in promoting environmental values, as they not only train professionals but also citizens capable of making responsible decisions in the face of current environmental challenges.

Various international organizations have highlighted the importance of education for sustainable development as a strategic pillar for addressing the global environmental crisis. In this regard, the United Nations Educational, Scientific and Cultural Organization (2020) emphasizes that education for sustainable development is fundamental to empowering individuals with the knowledge, skills, values, and attitudes that enable them to contribute to a more sustainable future. This approach promotes the integration of sustainability at all educational levels, especially in higher education, where future leaders and professionals are trained.

Several recent studies have demonstrated the importance of environmental education in transforming student behavior. Chen et al. (2025) highlights those institutional practices and environmental policies have a direct impact on transforming students' environmentally responsible behavior. According to these authors, universities that incorporate environmental education strategies into their academic and administrative plans significantly strengthen environmentally conscious behavior among their students. This demonstrates that institutional commitment is essential for developing a strong environmental culture.

Similarly, Hou et al. (2025) indicate that environmental education has a positive effect on the sustainable behavior of university students. Their research demonstrates that students who receive environmental training are more willing to participate in sustainable practices such as recycling, energy conservation, and protecting the natural environment. Furthermore, these authors highlight that

teaching methodologies based on experience and active participation further promote the development of responsible attitudes toward the environment. This suggests that environmental education should be not only theoretical but also practical and experiential.

On the other hand, sustainability in higher education depends not only on the individual behavior of students but also on the institutional structure in which they develop. Basheer et al. (2025) explain that evaluating sustainability in higher education institutions involves analyzing multiple indicators, the perceptions of stakeholders, and various implementation challenges. Among the main problems identified are the lack of standardized evaluation tools, the limited participation of educational stakeholders, and the insufficient integration of sustainability into institutional management. These factors hinder the consolidation of an effective environmental culture within universities.

Along these same lines, Abo-Khalil (2024) argues that integrating sustainability into higher education represents both a challenge and an opportunity for universities globally. While structural, economic, and pedagogical barriers exist, opportunities also arise for educational innovation, strengthened research, and greater engagement with society. This author emphasizes that higher education institutions have a responsibility to lead the transformation toward sustainability by incorporating these principles into their strategic plans, curricula, and management models.

Furthermore, a focus on sustainability within universities also influences their institutional performance. Rotondo et al. (2025) found that a sustainable orientation has a positive impact on the performance of higher education institutions, especially when long-term strategies are implemented. This indicates that sustainability is not only an educational objective but also a factor that contributes to improving the efficiency, reputation, and competitiveness of universities. Consequently, promoting an environmental culture among students also contributes to institutional strengthening.

Overall, the scientific evidence suggests that environmental awareness among students is a complex phenomenon dependent on multiple interrelated factors, including environmental education, institutional policies, and the organizational commitment of universities. While environmental education plays a fundamental role in shaping sustainable attitudes and behaviors, its effectiveness largely depends on the institutional context in which it is implemented. Therefore, a comprehensive approach is needed that combines teaching, institutional management, and active student participation.

Despite advances in research on sustainability in higher education, significant gaps remain in our understanding of how environmental awareness is formed and maintained among students. Many studies focus on analyzing sustainable behavior or institutional policies in isolation, without

considering the dynamic relationship between these two elements. Therefore, it is necessary to delve deeper into how student environmental awareness influences institutional sustainability and vice versa, as well as to identify effective strategies for strengthening this relationship in different educational contexts.

In this sense, the objective of this article is to analyze the environmental culture in higher education students and its influence on university sustainability, identifying the educational, institutional, and behavioral factors that contribute to its development and strengthening in the current academic context.

METHODOLOGY

This study was conducted using a qualitative-analytical literature review approach, aimed at examining the environmental culture of higher education students and its relationship to university sustainability. This approach allows for the analysis, interpretation, and synthesis of scientific evidence from recent research on environmental education, institutional sustainability, and pro-environmental behavior in university contexts.

The methodological strategy was based on the systematic compilation of academic literature published between 2019 and 2025, prioritizing scientific articles indexed in recognized international databases. Empirical studies, theoretical reviews, and institutional analyses related to education for sustainable development, student environmental culture, sustainable university practices, and ecological behavior were selected.

The selection of sources was carried out using inclusion and exclusion criteria. Research directly addressing the relationship between higher education and sustainability was included, as well as studies focused on the environmental behavior of university students. Duplicate works, studies without full access, or those not directly related to the phenomenon analyzed were excluded.

Subsequently, a thematic analysis of the information was conducted, identifying key categories such as environmental education, student perception, institutional practices, sustainable behavior, curricular integration, and university organizational culture. This process allowed for the structured organization of the information and the establishment of conceptual relationships between the different theoretical and empirical contributions.

The information was interpreted critically, with the aim of identifying patterns, convergences and gaps in knowledge in the reviewed literature, which allowed for the construction of a comprehensive view of the phenomenon studied.

DEVELOPMENT

Strengthening environmental culture in higher education cannot be understood solely as incorporating ecological

content into the curriculum, but rather as a complex process of cognitive, ethical, and institutional transformation. In this sense, the university becomes a space where thought patterns are shaped that directly influence how students interpret their relationship with the natural environment. Environmental culture, therefore, is not an automatic outcome of teaching, but a progressive construction that depends on the coherence between institutional discourse, educational practices, and everyday experiences on campus.

A key aspect of this process is how institutions translate sustainability into concrete educational experiences. Recent evidence suggests that when sustainability is integrated as a cross-cutting theme rather than an isolated subject, students develop a greater capacity for critical reflection on their habits and decisions (Chen et al., 2025). However, this integration is not always effective, as many universities still maintain a separation between theoretical training and the practical application of environmental principles. This gap hinders the development of a strong environmental culture because knowledge is not sufficiently linked to action.

From a behavioral perspective, environmental learning depends not only on the information received but also on the contexts in which certain behaviors are reinforced. Hou et al. (2025) demonstrate that sustainable practices tend to become established when students actively participate in ecological activities, suggesting that experiential learning has a more lasting impact than traditional instruction. However, this type of participation is often contingent on the availability of institutional resources and the existence of a university culture that values sustainability as part of its identity. In the absence of these elements, environmental initiatives tend to be isolated and do not generate structural changes in student behavior.

On the other hand, the analysis of sustainability in higher education reveals that its implementation faces tensions between the normative and the operational. Basheer et al. (2025) point out that, although many institutions have adopted sustainability indicators, their practical application is limited by a lack of coordination among the various university stakeholders. This highlights a problem of institutional governance, in which sustainability is incorporated more as an external requirement than as an internal organizing principle. Consequently, students' environmental awareness is influenced by institutional environments that do not always reflect coherence between what is taught and what is practiced.

Adding to this scenario is the challenge of institutional transformation, as outlined by Abo-Khalil (2024), who emphasizes that integrating sustainability into higher education entails profound structural changes that affect how universities teach, conduct research, and engage with society. This process is neither linear nor immediate, as it requires modifying both academic structures and internal

cultural dynamics. In this sense, a student environmental culture cannot fully develop if the institution does not make a sustained and visible commitment to sustainability at all levels of its operations.

Furthermore, the relationship between environmental culture and institutional performance introduces a strategic dimension that extends beyond student education. Rotondo et al. (2025) argue that a focus on sustainability contributes to the organizational performance of educational institutions, suggesting a feedback loop between environmental culture and institutional efficiency. This implies that educating environmentally conscious students not only generates social and ecological benefits but also impacts universities' ability to adapt to increasingly demanding global contexts in terms of environmental responsibility.

In this context, the United Nations Educational, Scientific and Cultural Organization (2020) offers a normative and structural perspective, noting that education for sustainable development should be geared towards transforming educational systems as a whole, promoting competencies that enable students to act in contexts of environmental uncertainty. This approach broadens the understanding of environmental culture, positioning it not only as a set of individual values but also as a collective competence that must be developed through comprehensive educational processes. However, the implementation of this vision faces practical limitations, especially in institutions where sustainability is not yet part of the core strategy.

A critical element in fostering an environmental culture is institutional coherence. When universities promote sustainable discourse without backing it up with concrete actions, a dissonance arises that undermines the credibility of the educational process. This lack of coherence can weaken the internalization of environmental values among students, who tend to perceive sustainability as an academic requirement rather than an ethical commitment. In contrast, institutions that integrate sustainability into their infrastructure, internal policies, and student life create a more consistent and effective learning environment.

It is important to recognize that environmental awareness among students is not a homogeneous phenomenon, but rather is mediated by factors such as socioeconomic context, academic discipline, and prior exposure to environmental education. These variables influence how students interpret and adopt sustainable practices, suggesting the need for differentiated pedagogical approaches. In this sense, building a strong environmental awareness requires not only educational interventions, but also flexible institutional strategies that acknowledge the diversity of student experiences.

First, Abowardah et al. (2024) analyze students' perceptions of sustainable development in higher education in Saudi Arabia, highlighting that the understanding of

sustainability is not homogeneous among students but is strongly influenced by institutional, cultural, and academic factors. The authors demonstrate that, although there is a generally positive awareness of sustainability, this does not always translate into concrete actions due to the lack of systematic integration of the topic into educational programs. In this sense, their study suggests that student perception is an important starting point, but insufficient if it is not accompanied by institutional strategies that reinforce environmental practices. Therefore, they emphasize the need to strengthen the connection between knowledge, attitude, and action within the university context.

Complementarily, Qi et al. (2023) delves deeper into the factors influencing sustainable development literacy among engineering students in China, using the university impact model. Their findings demonstrate that variables such as the institutional environment, teaching quality, and exposure to environmental content have a direct effect on students' level of sustainable literacy. Furthermore, the authors highlight those academic disciplines also influence environmental awareness, which is higher in programs that integrate technical and environmental components. Consequently, this study provides a structural view of the phenomenon, demonstrating that environmental culture depends not only on the student but also on the educational ecosystem, thus reinforcing the importance of cross-curricular sustainability education.

Similarly, Abdullahi et al. (2024) examined the impact of education for sustainable development on the behavior of university students in Somalia, finding that exposure to specific sustainability education programs leads to positive changes in environmental behavior. The authors demonstrated that students who receive sustainability training were more willing to participate in pro-environmental actions, confirming the direct relationship between education and behavior. However, they also noted that the effectiveness of these programs depends on the continuity and depth of their implementation. In this sense, their contribution reinforces the idea that environmental education must be systematic and not fragmented to achieve sustainable behavioral changes over time.

On the other hand, Obrecht et al. (2022) analyze the integration of environmental sustainability into higher education from the perspective of training future professionals and leaders. Their study highlights that, although many universities have incorporated sustainability into their institutional discourse, shortcomings remain in its actual implementation within curricula. The authors emphasize the importance of developing environmental competencies in students as part of their professional training, since they will be responsible for decision-making in the future. Consequently, this study offers a critical perspective on the existing gap between institutional intention and educational practice, which limits the development of a robust environmental culture.

Along these same lines, Fernández et al. (2020) explored the relationship between students' ecological footprint and their connection to nature, finding a significant correlation between environmental awareness and sustainable lifestyles. The authors highlight those students with a stronger emotional connection to the natural environment tend to adopt more responsible behaviors, suggesting that the affective dimension is key in the formation of an environmental culture. This contribution is relevant because it broadens the understanding of the phenomenon beyond the cognitive realm, incorporating emotional and attitudinal factors as determining elements of sustainable behavior.

Similarly, Alkhalidy (2025) analyzes the impact of higher education institutions on sustainable development, concluding that universities play a strategic role in promoting sustainability at the social and community levels. The study demonstrates that these institutions not only influence academic training but also the transformation of social values related to the environment. In this regard, the author emphasizes that universities act as agents of social change, reinforcing the importance of their institutional commitment to sustainability as a cross-cutting theme.

Anyan et al. (2025) examine sustainability practices in higher education institutions, identifying significant progress in the implementation of environmental initiatives, but also limitations in their continuity and systematization. The authors point out that many universities develop sustainability projects in isolation, without structural integration into their institutional policies. This finding provides a critical perspective on the need to consolidate sustainability as part of the university's organizational culture, beyond isolated or symbolic actions.

In contrast, Boca & Săracli (2019) focus on the role of environmental education in students' perceptions of sustainability, demonstrating that formal education has a significant impact on the development of pro-environmental attitudes. However, they also highlight that the level of environmental awareness varies according to the student's prior educational experience and sociocultural context. Therefore, their study provides evidence of the importance of early and ongoing education in the formation of environmental values.

Furthermore, Alsharif & Ofori-Darko (2024) analyze the relationship between university curricula and orientation towards environmental sustainability, finding significant differences between academic disciplines. The authors conclude that students in technical and scientific fields show a greater inclination towards sustainability compared to other fields. This finding suggests that the curriculum structure directly influences the development of environmental awareness, supporting the need to integrate environmental content into all academic disciplines.

Regarding institutional integration, Ankareddy et al. (2025) review the practices and challenges of incorporating sustainability into universities, identifying one of the main obstacles as the lack of coherence between institutional policies and their practical application. The authors highlight that, although there is a growing interest in sustainability, its implementation still faces structural and organizational limitations. Consequently, their contribution reinforces the need for stronger university governance in environmental matters.

Complementarily, Qi et al. (2025) propose a model that links sustainability education, institutional support, and students' pro-environmental behavior, highlighting that educational influence is more effective when mediated by institutional commitment. This study provides evidence that sustainability is not a linear process, but rather a phenomenon mediated by multiple interdependent variables, which complicates its analysis and implementation in higher education.

Similarly, Leal Filho et al. (2025) evaluate the impacts of sustainability education in higher education institutions, concluding that this type of training has positive effects on students' environmental awareness in both the short and long term. The authors emphasize that the impacts are more significant when sustainability is taught in a cross-curricular and practical manner, reinforcing the importance of active learning methodologies in the educational process.

From a broader perspective, Barnett- Itzhaki et al. (2025) propose a holistic approach to sustainability in higher education, integrating social, economic, educational, and mobility dimensions. This approach allows us to understand sustainability as a complex system that requires the articulation of multiple institutional and social factors. Consequently, their contribution broadens the conceptual framework of the study by incorporating a multidimensional view of sustainable development.

Finally, Gupta et al. (2024); and Putri et al. (2025) agree that educational interventions, such as environmental education and green campus programs, have a direct impact on students' ecological behavior. These studies reinforce the idea that practical institutional strategies, such as environmental projects and student engagement activities, are fundamental for consolidating sustainable habits. Similarly, Ásványi & Gedeon (2025) highlight that project-based learning strengthens sustainability awareness in both the short and long term, demonstrating the importance of active methodologies in university environmental education.

The reviewed literature reveals that environmental culture in higher education is constructed through the interaction between student perceptions, institutional structure, and the pedagogical strategies implemented by universities. Generally speaking, the studies agree that students

demonstrate a favorable attitude toward sustainability, although this does not always translate into consistent behavior due to the lack of deep integration of the environmental approach into educational systems.

Furthermore, it is evident that students' level of environmental knowledge and commitment is conditioned by multiple factors, including the type of academic program, the quality of the training received, and the institutional environment. Scientific and technical disciplines tend to foster greater sensitivity to environmental issues, suggesting that the academic curriculum significantly influences the development of ecological awareness.

On the other hand, it is highlighted that environmental education and institutional strategies have a direct impact on students' sustainable behavior. However, this impact is more effective when there is coherence between university policies and their practical application, which implies that institutions must assume an active and systematic role in promoting sustainability.

Similarly, it has been identified that learning based on experiences, projects, and practical activities contributes more effectively to the development of sustainable habits than traditional approaches focused solely on theory. This highlights the importance of active methodologies that allow students to become directly involved in real-world environmental processes.

Furthermore, studies show that sustainability in higher education should not be understood in isolation, but rather as a complex system that integrates social, economic, educational, and organizational dimensions. In this sense, the university not only educates students, but also acts as an agent of social change with the capacity to influence broader communities.

It is also observed that there are significant challenges in implementing sustainability, especially regarding the lack of institutional coordination, the fragmentation of initiatives, and the absence of comprehensive long-term strategies. These factors limit the consolidation of a strong environmental culture within universities.

Evidence suggests that developing an effective environmental culture requires a combination of formal education, institutional commitment, practical experiences, and active student participation. Only by integrating these elements is it possible to achieve a real and lasting impact on sustainable behavior within higher education.

CONCLUSIONS

The analysis conducted allows us to conclude that environmental awareness among higher education students is not a spontaneous phenomenon, but rather the result of a complex interaction between academic training, the institutional context, and practical learning experiences. The reviewed evidence demonstrates that sustainability in higher education requires a systemic approach that

transcends theoretical teaching and is structurally integrated into universities.

First, it is concluded that environmental education has a significant impact on shaping sustainable attitudes and behaviors in students. However, this impact is only consolidated when there is coherence between academic content, institutional policies, and daily practices within the university environment. A lack of integration reduces the effectiveness of educational programs and limits the development of a strong environmental culture.

Secondly, it is evident that the role of higher education institutions is crucial in building sustainability. Universities not only transmit knowledge but also shape values, norms, and behaviors that directly influence students' environmental awareness. Therefore, sustainability must be understood as a cross-cutting theme in university management, not as an isolated initiative.

Furthermore, it is concluded that active learning methodologies, such as environmental projects, hands-on experiences, and sustainable campus programs, have a greater impact on the internalization of ecological values than traditional approaches focused exclusively on theory. This finding reinforces the need to transform pedagogical models toward more participatory and experiential approaches.

Similarly, it is identified that student environmental culture is influenced by structural factors such as the academic program, the level of exposure to environmental education, and institutional commitment. This demonstrates that not all students develop the same level of environmental awareness, which requires differentiated strategies adapted to diverse educational contexts.

Sustainability in higher education must be understood as a dynamic, multidimensional, and continuous process that requires the integration of education, institutional management, and student participation. Only through this integration will it be possible to consolidate a genuine environmental culture capable of generating long-term sustainable changes both in academia and in society at large.

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Conflicts of Interest:

The author declares no conflicts of interest.

Author Contributions:

Farshid Hadi: Conceptualization, data curation, formal analysis, investigation, methodology, supervision, validation, visualization, original draft writing, and writing, review, and editing.

Ethical statement:

The study was based on the analysis of documentary sources and publicly available data, and therefore did not involve the direct participation of human subjects. No personally identifiable information was handled.