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# Components Of The Formation Of Ecological Culture Of Undergraduates In Higher Education Institutions

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**Abstract:** The study examines the theoretical and methodological foundations for the development of ecological culture among undergraduate students in higher education. It identifies the structural components, pedagogical conditions, and value orientations necessary for the formation of ecological consciousness, responsibility, and sustainable behavior within the university environment. The research emphasizes the integration of ecological education into the curriculum, extracurricular activities, and campus culture as key mechanisms for shaping environmentally literate and socially responsible graduates. Through analysis of contemporary educational approaches and environmental pedagogy, the paper defines cognitive, emotional-value, behavioral, and activity-based components as interrelated elements of ecological culture formation. The findings are expected to contribute to the enhancement of educational policy and curriculum design in the field of environmental education.

**Keywords:** Components, ecological culture, higher education, students, structural components, pedagogical conditions, value orientations.

**Introduction:** The urgency of this research is determined by the growing global ecological crisis, which demands a shift in human consciousness and behavior toward sustainability. Higher education institutions play a crucial role in preparing a new generation capable of making environmentally responsible decisions. However, the current level of ecological awareness among undergraduates often remains insufficient due to fragmented educational practices and the lack of an integrated approach to ecological culture formation. In this context, studying the components and mechanisms of ecological culture development within universities is of high scientific and practical significance. The research addresses the need to modernize educational processes, promote interdisciplinary ecological competencies, and cultivate ecological values as an integral part of professional training for future specialists.

Ultimately, the development of ecological culture among undergraduates is not limited to educational content but extends to shaping a holistic worldview that aligns with the principles of sustainability, ethical coexistence, and global responsibility. By cultivating these components, higher education can contribute meaningfully to the emergence of a generation capable of addressing the pressing ecological challenges of the 21st century.

## LITERATURE REVIEW

The rapid intensification of environmental problems has increased expectations that higher education institutions (HEIs) will contribute not only knowledge but also the formation of an ecological culture among students. Ecological culture is commonly conceptualized as a multidimensional construct including environmental knowledge, values/attitudes, practical skills, and pro-environmental behavioral dispositions that together enable individuals to make sustainable decisions and act responsibly toward the environment. Empirical and conceptual studies in educational research and sustainability studies stress HEIs' dual role: transmitting disciplinary knowledge and shaping dispositions and institutional practices that support sustainability.

Several frameworks have been proposed to capture the construct. Broadly, ecological culture is understood as an integrated system of (a) cognitive components (environmental knowledge and systems thinking), (b) affective components (values, attitudes, eco-

aesthetics), (c) behavioral/operational competencies (skills, habits, practices), and (d) institutional and socio-cultural conditions (campus policies, curriculum, campus culture). Models that emphasize ecological education as sociocultural transformation highlight that individual knowledge and values interact with institutional drivers and community practices to produce sustained behavioral change [2]; [3].

The following component taxonomy recurs across empirical and conceptual studies and provides a practical scaffold for designing HEI interventions.

Cognitive (knowledge and systems understanding). Environmental knowledge includes factual knowledge (ecology, pollution, climate science), conceptual understanding (ecosystem interdependence, carrying capacity), and systems thinking (feedbacks, trade-offs). Studies show that targeted ecological education increases students' environmental literacy and supports pro-environmental intentions when combined with reflective pedagogies.

Affective (values, attitudes, and eco-identity). Values and attitudes—including care for nature, responsibility, and perceived self-efficacy—mediate whether knowledge translates into action. Research finds that interventions cultivating environmental values (e.g., place-based learning, reflective activities) increase students' willingness to behave sustainably [4].

Behavioral and skills component (practical competencies). This includes procedural skills (waste sorting, energy audits), research and critical appraisal abilities, and civic competences (participation, advocacy). Practice-oriented learning—service learning, campus sustainability projects, labs and fieldwork—are repeatedly reported as effective means for converting values and knowledge into habitual behaviors.

Normative-institutional component (policies, campus ecology, and governance). An institution's policies, infrastructure (e.g., recycling systems, energy management), and governance models condition students' opportunities and incentives for pro-environmental behavior. Literature on the "ecological university" frames HEIs themselves as socio-ecological systems whose structures must align with sustainability goals to foster a culture of care.

Pedagogical and curricular integration. Integration can be disciplinary (environmental modules within majors), interdisciplinary (sustainability across curricula), and co-curricular (clubs, campaigns). Mixed-method studies indicate that curriculum integration plus experiential activities (e.g., projects, fieldwork) produce stronger and more persistent changes than isolated lectures.

Contextual and socio-cultural influences. Students' family background, local environmental problems (e.g., air quality), and national culture modulate how institutional interventions are received. Studies of HEIs across contexts show variable effects, suggesting that locally adapted designs are essential.

Empirical evidence on formation processes. Recent empirical studies (surveys, quasi-experimental designs, case studies) report positive effects of ecological education on sustainable behavior and attitudes when educational interventions combine: (1) knowledge provision, (2) values reflection, (3) hands-on practice, and (4) enabling campus infrastructure. For example, large-sample analyses show that increased exposure to ecological education correlates with higher probability of sustainable behaviors, and that mediators such as economic/social value perceptions and local pollution exposure can strengthen or attenuate effects [5].

Pedagogical implications and intervention strategies. Drawing on the component taxonomy, higher education institutions should consider multi-level interventions:

Curricular: mainstream environmental content across disciplines; teach systems thinking and problem-solving.

Experiential: embed service learning, field projects, and campus-based sustainability labs to build skills and habits.

Affective: use reflective practices, storytelling, and place-based pedagogy to nurture environmental values and identity.

Institutional: model sustainability via campus operations, governance, and student participation in decision making.

Assessment: develop competency-based evaluation that tracks knowledge, attitudes, and behavioral change over time.

Gaps and directions for future research. Despite progress, the literature shows gaps worth addressing:

Longitudinal evidence: relatively few long-term studies track whether undergraduate ecological culture persists into later life.

Causal mechanisms: more mixed-methods and experimental designs are needed to isolate causal pathways (knowledge → values → behavior).

Context sensitivity: comparative research across cultural and institutional contexts to identify which component mixes work where.

Assessment instruments: standard validated measures of "ecological culture" are still emerging; harmonization would improve cross-study

comparability.

Equity and inclusion: more work is needed on how ecological culture formation interacts with socio-economic background and on inclusive pedagogies.

The literature converges on a systems view: formation of undergraduates' ecological culture is a multi-component process that requires aligned efforts at the curricular, pedagogical, and institutional levels. Programs that combine cognitive learning, affective engagement, skills training, and enabling campus environments show the greatest promise. Future research that provides longitudinal, comparative, and causal evidence will strengthen the field's ability to design effective, context-sensitive interventions.

## DISCUSSION

From an anthropological standpoint, culture may be understood as a constellation of values, meanings, and attitudes that individuals and social groups possess and transmit across generations. As an integral aspect of social life, culture also encompasses the sharing of knowledge and skills that foster a sense of belonging and social cohesion. However, culture is not static; it evolves over time as values shift, new ideas emerge, and modes of production transform. For this reason, culture is conceived as a dynamic phenomenon, continuously adapting to lived realities and requiring processes of transformation and adjustment [9].

In this context, environmental and climate culture is associated with a system of values and beliefs shaped by collective experiences and the specific realities of a society or social group. Sociocultural dimensions related to the environment and climate must thus evolve toward a transformation in consciousness and mentality concerning the interrelations among society, land, and existence (Grinberg, 2006). Nonetheless, comprehension of climatic and environmental phenomena often depends less on the absence of information than on the cultural roots and cognitive frameworks of individuals [7]. The significance of culture, therefore, lies in how people perceive, value, and learn about the Earth, its climate, environment, and societies.

The integration of climate change into education is aligned with Objective 13 of the Sustainable Development Goals (Agenda 2030) — Climate Action — which calls for enhancing education, awareness, and institutional capacity in relation to climate change mitigation, adaptation, impact reduction, and early warning systems [8]. Meira-Cartea, Gutiérrez-Pérez, Arto-Blanco, and Escoz-Roldán note that university-level climate literacy often focuses on understanding the physical causes and processes of climate change, while its consequences and actionable responses receive less attention [7]. Consequently, there remains a paucity of studies addressing the incorporation and development of educational initiatives and research on climate education within higher education institutions.

## CONCLUSION

Higher education institutions face the pressing challenge of fostering awareness and contributing to the reconstruction of a global environmental and climate culture, thereby helping the planet confront its limits in terms of pollution, rising temperatures, and water scarcity through scientific engagement. However, both scientific and non-scientific forms of knowledge are necessary to generate new understandings from multiple perspectives and shared responsibilities, promoting epistemic plurality and greater certainty in addressing emerging realities. Science alone cannot resolve the complex environmental and socio-ecological crises of the contemporary world. Thus, new ontological and epistemological approaches—such as critical pedagogy, participatory inquiry, and transdisciplinary research—are essential for advancing sustainability and climate action through collaborative knowledge production [7].

The formation of ecological culture among undergraduates in higher education institutions represents a complex and multidimensional process that integrates cognitive, value-based, behavioral, and social components. At its core, ecological culture entails not only the acquisition of environmental knowledge but also the internalization of ecological values, the development of responsible attitudes toward nature, and the ability to act consciously in favor of environmental sustainability. Higher education plays a decisive role in shaping these dimensions by providing students with opportunities for scientific understanding, ethical reflection, and practical engagement with ecological issues.

The cognitive component involves the systematic development of environmental literacy—understanding the principles of ecology, sustainability, and human–nature interdependence. The axiological (value) component fosters the moral and ethical foundation necessary for forming pro-environmental worldviews. The behavioral component is reflected in students' readiness to translate ecological awareness into concrete actions and lifestyle choices that contribute to sustainable development. Finally, the social and communicative components emphasize collaboration, collective responsibility, and the integration of ecological practices within the academic and broader community.

To ensure the effective formation of ecological culture,

higher education institutions must adopt interdisciplinary and participatory pedagogical strategies that combine scientific knowledge with experiential learning, critical thinking, and civic engagement. Creating an institutional environment that embodies sustainability principles—through campus initiatives, curriculum design, and community partnerships—can reinforce students' ecological consciousness and empower them as active agents of environmental transformation.

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