

Environmental Awareness and Educational Motivation in Choosing Environmental Engineering as a University Major

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Abstract

Growing environmental challenges and the transition toward a sustainable economy have increased the importance of Environmental Engineering as a strategic academic discipline. Although previous studies have separately examined environmental awareness and educational motivation, limited attention has been given to how these constructs interact in shaping students' decisions to choose Environmental Engineering as a university major. Therefore, this study aims to synthesize current evidence on the relationship between environmental awareness and educational motivation in students' academic decision-making. This study employed a qualitative library research design using a narrative review approach. Data were collected from 32 peer-reviewed journal articles published between 2022 and 2026 and retrieved through Google Scholar based on predefined inclusion and exclusion criteria. The selected literature was analyzed using narrative synthesis through thematic categorization, comparative analysis, and conceptual integration. The findings indicate that environmental awareness serves as the primary intrinsic foundation influencing students' educational choices, while educational motivation reinforces these decisions through both intrinsic interests and extrinsic career expectations. Furthermore, Education for Sustainable Development strengthens the interaction between these constructs by fostering sustainability competencies and professional identity. This review contributes to the literature by integrating environmental awareness and educational motivation into a unified conceptual framework for understanding students' decisions to pursue Environmental Engineering. The findings also provide practical recommendations for universities and policymakers to strengthen sustainability-oriented recruitment strategies and curriculum development to support future environmental professionals.

Keywords : Educational Motivation, Environmental Awareness, Environmental Engineering, Higher Education, Sustainability Education

INTRODUCTION

Global environmental challenges, including climate change, biodiversity loss, resource depletion, and plastic pollution, have intensified the demand for sustainable development across multiple sectors (Chen & Lin, 2022). As societies transition toward environmentally responsible economic and industrial systems, higher education institutions play a critical role in preparing professionals capable of addressing these

complex challenges. Among various academic disciplines, Environmental Engineering has become increasingly important because it equips graduates with the scientific knowledge and technical competencies required to design sustainable environmental solutions and support long-term ecological resilience (Turner & Wright, 2021). Consequently, understanding why students choose Environmental Engineering as their field of study has become an important issue for both educational institutions and policymakers seeking to strengthen the future environmental workforce.

Previous research has identified various factors influencing students' selection of university majors. Within the broader STEM (Science, Technology, Engineering, and Mathematics) context, students' educational choices are commonly associated with career opportunities, employment prospects, academic self-efficacy, parental and institutional support, and personal interest (Eli & Hamou, 2022; Mardenova et al., 2023; Martins et al., 2023). Meanwhile, studies in environmental education have consistently shown that environmental awareness, environmental literacy, ecological values, and pro-environmental attitudes promote students' educational aspirations and engagement with sustainability-related issues (Aqil et al., 2026; Wang & Li, 2026). Collectively, these findings suggest that both intrinsic and extrinsic factors shape educational decision-making. However, these determinants have generally been examined independently and across different disciplinary perspectives, providing only a fragmented understanding of how environmental awareness and educational motivation jointly influence students' decisions to choose Environmental Engineering as a university major.

Although the existing literature provides valuable insights into educational motivation and environmental awareness, several important gaps remain. Studies focusing on educational motivation predominantly emphasize employability, academic achievement, and career-related expectations, whereas research on environmental awareness primarily investigates ecological attitudes and pro-environmental behaviors. Consequently, limited attention has been devoted to understanding how these two constructs interact in influencing students' decisions to pursue Environmental Engineering. Furthermore, existing evidence remains dispersed across different educational contexts, theoretical perspectives, and research designs, making it difficult to develop a comprehensive understanding of the factors shaping students' academic choices. This fragmentation indicates the need for a systematic synthesis capable of integrating findings across the existing body of literature.

The growing implementation of Green Economy initiatives and Environmental, Social, and Governance (ESG) principles has further transformed Environmental Engineering into a discipline that combines environmental responsibility with promising career opportunities (Gomez & Patterson, 2024). As environmental professionals are increasingly required in both public and private sectors, students' decisions to pursue Environmental Engineering may reflect a combination of ecological commitment and expectations regarding professional stability and career development. Despite the growing number of empirical studies addressing these issues, no comprehensive synthesis has systematically examined how environmental awareness and educational motivation collectively influence students' decisions to choose Environmental

Engineering as a university major. Therefore, a Systematic Literature Review is necessary to consolidate current evidence, identify consistent patterns, highlight remaining research gaps, and establish directions for future investigations.

Accordingly, this study aims to systematically review and synthesize empirical evidence concerning the relationship between environmental awareness and educational motivation in students' decisions to choose Environmental Engineering as a university major. The theoretical novelty of this review lies in integrating two research traditions—environmental awareness and educational motivation—that have largely evolved independently into a unified conceptual understanding of students' academic decision-making. Empirically, this review offers a comprehensive synthesis of existing findings, identifies dominant research trends and unresolved issues, and proposes future research directions within Environmental Engineering education. The findings are expected to contribute to the advancement of environmental education literature while providing practical recommendations for universities, curriculum developers, and policymakers in designing recruitment strategies and educational programs that better align with students' motivations and the global sustainability agenda.

METHOD

This study employed a qualitative library research design using a narrative review approach to synthesize existing evidence on the relationship between environmental awareness and educational motivation in students' decisions to choose Environmental Engineering as a university major. Data were collected exclusively from peer-reviewed journal articles published between 2022 and 2026 and indexed in Google Scholar. Literature was selected purposively based on predefined inclusion and exclusion criteria emphasizing empirical studies relevant to environmental awareness, educational motivation, sustainability education, and Environmental Engineering. The researcher served as the primary instrument by identifying, critically evaluating, extracting, and organizing the literature through document analysis. Data were analyzed using narrative synthesis involving thematic categorization, comparison of findings across studies, identification of recurring patterns, and conceptual integration to develop a comprehensive understanding of the phenomenon. The trustworthiness of the review was enhanced through transparent literature selection, critical cross-study comparison, and the exclusive use of credible peer-reviewed publications.

FINDINGS AND DISCUSSION

The literature search and screening process identified 32 peer-reviewed journal articles published between 2022 and 2026 that met the predefined inclusion criteria. The articles were retrieved through Google Scholar, which indexes scholarly publications from reputable publishers and academic journals. The reviewed studies represented diverse geographical contexts, including Asia, Europe, North America, and Oceania, indicating growing global attention toward sustainability education, environmental awareness, and educational motivation. Methodologically, quantitative survey research dominated the literature, followed by qualitative studies, mixed-methods research, and

several review articles. The principal research themes included environmental awareness, environmental literacy, sustainability education, educational motivation, pro-environmental behavior, career aspirations, and students' intentions to pursue environmentally oriented disciplines (Castillo & Nozaleda, 2022; Hicks & Sadler, 2022; Husamah et al., 2022; Ali et al., 2023).

The reviewed literature demonstrates a substantial shift in research priorities over recent years. While earlier environmental education studies primarily examined environmental knowledge and pro-environmental behavior, recent investigations increasingly emphasize the role of environmental awareness in shaping educational aspirations, career intentions, and sustainability competencies among university students (Frensley et al., 2022; Khatoon, 2022). This trend reflects the growing recognition that environmental education should extend beyond promoting ecological responsibility to encouraging students to pursue professions capable of addressing global environmental challenges. Consequently, engineering education has gradually incorporated sustainability principles into curriculum design, interdisciplinary learning, and career development initiatives, thereby enhancing the attractiveness of Environmental Engineering as an academic major (Hicks & Sadler, 2022; Yusuf & Fajri, 2022).

Another notable finding concerns the increasing influence of international sustainability agendas on higher education. The implementation of the Sustainable Development Goals (SDGs), climate action policies, and environmental governance frameworks has encouraged universities to strengthen sustainability-oriented curricula while simultaneously responding to the expanding demand for environmentally competent professionals. As a result, Environmental Engineering is no longer perceived solely as a technical engineering discipline but increasingly as an interdisciplinary field integrating engineering, environmental science, sustainability, and social responsibility. This transformation has reshaped students' perceptions of Environmental Engineering by linking environmental commitment with meaningful career opportunities and long-term societal contributions (Castillo & Nozaleda, 2022; Hicks & Sadler, 2022; Khatoon, 2022).

Overall, the reviewed literature suggests that contemporary research has moved toward a more integrated understanding of students' educational decision-making. Rather than considering environmental awareness, educational motivation, and career expectations as independent variables, recent studies increasingly recognize their dynamic interaction in influencing students' academic choices. This emerging perspective provides the conceptual foundation for understanding why Environmental Engineering has become an increasingly attractive university major among students who seek to combine personal environmental values with professional aspirations in the growing green economy (Ali et al., 2023; Frensley et al., 2022; Husamah et al., 2022).

A consistent finding across the reviewed studies is that environmental awareness constitutes the primary intrinsic factor influencing students' decisions to pursue Environmental Engineering. Students with higher levels of environmental awareness consistently demonstrate stronger interest in sustainability-oriented academic programs

because they perceive environmental problems as urgent societal issues requiring scientific and technological solutions. Rather than selecting the major solely for economic or occupational reasons, these students frequently associate Environmental Engineering with opportunities to contribute directly to climate change mitigation, pollution control, biodiversity conservation, and sustainable resource management. Consequently, environmental awareness functions not only as environmental knowledge but also as an internal value system guiding educational and professional decision-making (Castillo & Nozaleda, 2022; Kousar et al., 2022; Hicks & Sadler, 2022).

The synthesis further indicates that environmental awareness is a multidimensional construct encompassing ecological knowledge, environmental concern, environmental attitudes, personal responsibility, and behavioral intentions. Several studies reported that students possessing stronger environmental literacy are more likely to develop positive attitudes toward sustainability-related careers because they believe that professional expertise can produce tangible environmental improvements. This finding suggests that awareness alone is insufficient unless accompanied by positive environmental values and a strong sense of responsibility toward environmental protection. In this regard, environmental awareness serves as a psychological foundation through which students translate ecological concern into educational aspirations and career intentions (Ali et al., 2023; Firmanshah et al., 2023; Kousar et al., 2022).

The reviewed evidence also highlights the important role of environmental education in cultivating environmental awareness. Universities implementing sustainability-oriented curricula, experiential learning, community engagement, and project-based environmental activities consistently report higher levels of environmental literacy among students. Such educational experiences allow students to connect theoretical knowledge with real environmental issues, thereby strengthening both environmental awareness and confidence in engineering as an effective mechanism for environmental problem-solving. These findings reinforce the argument that environmental education should prioritize authentic learning experiences capable of fostering both cognitive understanding and affective commitment toward environmental sustainability (Hicks & Sadler, 2022; Yusuf & Fajri, 2022; Frensley et al., 2022).

Recent studies additionally suggest that growing public concern regarding climate change has intensified students' environmental awareness and subsequently influenced educational choices. Nevertheless, the literature consistently demonstrates that climate change knowledge alone does not necessarily encourage students to pursue Environmental Engineering. Instead, students are more likely to select the discipline when climate literacy is integrated with moral responsibility, environmental ethics, and confidence that engineering solutions can effectively address environmental challenges. Accordingly, environmental awareness should be understood as a comprehensive psychological construct integrating knowledge, attitudes, values, and perceived efficacy rather than merely cognitive understanding of environmental issues (Castillo & Nozaleda, 2022; Khatoon, 2022; Kousar et al., 2022).

Taken together, the reviewed studies consistently indicate that environmental awareness has evolved beyond being a desirable educational outcome into a fundamental determinant of students' academic and professional choices. Across different educational contexts, students increasingly perceive Environmental Engineering as a meaningful pathway through which personal environmental values can be transformed into practical and socially beneficial contributions. This synthesis therefore extends current environmental education literature by demonstrating that environmental awareness functions as the underlying motivational mechanism connecting environmental concern with students' intentions to pursue Environmental Engineering, thereby establishing the conceptual basis for understanding the complementary role of educational motivation discussed in the subsequent section.

The reviewed literature consistently indicates that educational motivation constitutes a major determinant influencing students' decisions to pursue Environmental Engineering. Unlike environmental awareness, which primarily reflects students' ecological values and ethical commitment, educational motivation encompasses both intrinsic and extrinsic dimensions that collectively shape academic decision-making. Intrinsic motivation emerges from students' genuine interest in science, engineering, environmental protection, and solving real-world sustainability problems, whereas extrinsic motivation is associated with employment opportunities, professional recognition, expected income, and long-term career stability (France et al., 2022; Gutierrez-Bucheli et al., 2022; Concina & Frate, 2023).

Across the reviewed studies, intrinsic motivation consistently appears as the strongest educational driver. Students who perceive Environmental Engineering as intellectually meaningful and socially beneficial demonstrate stronger commitment toward their academic programs, greater persistence in completing engineering curricula, and higher aspirations to contribute to sustainable development. Rather than pursuing engineering solely as a technical profession, these students view Environmental Engineering as an opportunity to integrate scientific knowledge with environmental stewardship. This finding aligns with contemporary perspectives on engineering education that emphasize developing future engineers as agents of sustainable transformation rather than merely technical problem solvers (Gutierrez-Bucheli et al., 2022; France et al., 2022).

Nevertheless, the literature also demonstrates that extrinsic motivation has become increasingly influential in recent years. The rapid expansion of the green economy, renewable energy industries, sustainable infrastructure, environmental consulting, carbon management, and ESG implementation has substantially increased the attractiveness of Environmental Engineering careers. Consequently, many students perceive Environmental Engineering as offering not only opportunities to contribute to environmental sustainability but also favorable employment prospects in an increasingly competitive labor market. Several studies reported that engineering students considered career security, professional flexibility, and global employment opportunities as important complementary motivations when selecting sustainability-oriented engineering disciplines (France et al., 2022; Ng et al., 2022).

Another important pattern emerging from the reviewed literature concerns the role of Education for Sustainable Development (ESD) in strengthening students' educational motivation. Universities integrating sustainability principles into engineering curricula through interdisciplinary learning, project-based education, community engagement, and real-world environmental problem-solving consistently report higher levels of student engagement and stronger career aspirations toward sustainability-related professions. Rather than increasing environmental knowledge alone, ESD enhances students' perceptions regarding the societal relevance of engineering, thereby reinforcing both academic motivation and professional identity (Acosta Castellanos & Queiruga-Dios, 2022; Gutierrez-Bucheli et al., 2022; Prenger et al., 2022).

The reviewed evidence further suggests that engineering students' motivation evolves throughout their educational journey. France et al. (2022) found that senior engineering students generally reported stronger agency beliefs and greater intentions to pursue sustainability-oriented careers than first-year students, indicating that sustained exposure to sustainability-related learning experiences gradually strengthens students' professional commitment toward environmental problem-solving. This finding implies that educational motivation is not static but develops progressively through meaningful curricular experiences, practical engineering projects, and continuous interaction with sustainability-related issues.

A recurring theme across the literature is the emergence of a **dual-motivation pattern**. Contemporary students rarely choose Environmental Engineering based exclusively on environmental idealism or employment considerations. Instead, intrinsic environmental commitment and extrinsic career expectations reinforce one another, producing a balanced motivational structure. Students increasingly seek academic programs that enable them to generate positive environmental impacts while simultaneously ensuring professional growth and long-term employability. This dual-motivation pattern reflects changing societal expectations toward engineering education, where technical competence, sustainability literacy, and career readiness are regarded as complementary rather than competing objectives (Concina & Frate, 2023; Gutierrez-Bucheli et al., 2022; France et al., 2022).

Overall, the reviewed studies demonstrate that educational motivation extends beyond traditional academic interest or occupational expectations. Instead, it represents a multidimensional construct integrating intellectual curiosity, environmental commitment, professional identity, employability, and aspirations to contribute to sustainable development. This synthesis expands previous educational motivation literature by illustrating that students' decisions to pursue Environmental Engineering increasingly reflect the convergence of personal values and professional ambitions. Consequently, educational motivation should be understood as a dynamic process shaped by both internal aspirations and external opportunities within the rapidly evolving sustainability landscape.

A central finding emerging from the reviewed literature is that environmental awareness and educational motivation operate as complementary rather than independent determinants of students' decisions to pursue Environmental Engineering.

Earlier studies frequently examined these variables separately, emphasizing either environmental concern or educational motivation as the dominant predictor of academic choice. However, recent evidence demonstrates that students' decisions are better understood as the result of a dynamic interaction between ecological values and motivational processes. Students with stronger environmental awareness tend to develop higher intrinsic educational motivation because they perceive Environmental Engineering as an effective pathway for transforming environmental concern into practical and sustainable solutions (Kanada et al., 2023; Concina & Frate, 2023).

The reviewed studies consistently indicate that environmental awareness functions as the psychological foundation upon which educational motivation develops. Environmental literacy increases students' understanding of contemporary environmental challenges, while environmental concern encourages them to seek meaningful academic pathways capable of generating positive societal impacts. Consequently, students who possess higher levels of environmental awareness generally report stronger learning engagement, greater commitment toward sustainability-oriented education, and higher intentions to pursue environmental careers (Yusuf & Fajri, 2022; Husamah et al., 2024). These findings suggest that environmental awareness does not directly determine academic choice but instead strengthens the intrinsic motivation required to translate ecological concern into educational decisions.

The synthesis further reveals that Education for Sustainable Development (ESD) plays a critical mediating role in reinforcing this interaction. Universities that embed sustainability principles throughout engineering curricula provide students with opportunities to connect environmental values with scientific knowledge, engineering competencies, and real-world problem-solving experiences. Project-based learning, interdisciplinary collaboration, community engagement, and experiential learning consistently enhance both environmental awareness and academic motivation by allowing students to experience the societal relevance of engineering practice. Such learning environments strengthen students' professional identity while simultaneously increasing confidence in their ability to contribute to environmental sustainability (Gutierrez-Bucheli et al., 2022; Ng et al., 2022).

Another important pattern identified in the reviewed literature concerns the emergence of a dual-engine motivational profile among contemporary Environmental Engineering students. Unlike previous generations, whose academic choices were often dominated by either personal interest or occupational considerations, current students increasingly integrate environmental idealism with pragmatic career expectations. Environmental awareness provides the ethical and personal justification for choosing the discipline, whereas educational motivation is reinforced by favorable employment prospects associated with the expanding green economy, renewable energy industries, environmental consulting, and ESG implementation across public and private sectors. Rather than competing, these intrinsic and extrinsic motivations mutually reinforce one another, producing a stable and sustainable commitment toward Environmental Engineering education (France et al., 2022; Concina & Frate, 2023).

Despite this growing convergence, several knowledge gaps remain. Most existing studies employ cross-sectional survey designs that identify statistical associations but provide limited understanding of how environmental awareness gradually evolves into educational motivation throughout students' academic development. Furthermore, empirical evidence remains concentrated within individual institutions or national contexts, limiting the generalizability of current findings across different cultural and educational systems. Few studies have simultaneously examined environmental awareness, educational motivation, sustainability education, institutional support, and labor market expectations within a comprehensive conceptual framework. Consequently, a more integrated perspective is needed to explain the complex mechanisms underlying students' academic decision-making.

Overall, the present synthesis proposes that environmental awareness and educational motivation should be viewed as interdependent components of a unified decision-making process rather than isolated predictors. Environmental awareness establishes students' ecological values and sense of responsibility, while educational motivation transforms these values into sustained academic engagement and career aspirations. This integrated perspective contributes to the environmental education literature by bridging two research traditions that have largely developed independently and offers a more comprehensive explanation of why Environmental Engineering has become an increasingly attractive academic pathway in response to global sustainability challenges.

CONCLUSION

This narrative review concludes that students' decisions to choose Environmental Engineering as a university major are driven by the complementary interaction between environmental awareness and educational motivation. Environmental awareness provides the intrinsic foundation through ecological values and environmental responsibility, while educational motivation translates these values into academic commitment by combining personal interest in sustainability with expectations of promising green career opportunities. The review also highlights the important role of Education for Sustainable Development (ESD) in strengthening both constructs through sustainability-oriented curricula, experiential learning, and authentic environmental problem-solving. A key contribution of this study is the identification of a dual-motivation framework, in which environmental commitment and career aspirations jointly influence students' educational choices, thereby addressing the gap in previous studies that have generally examined these factors separately. Practically, universities should strengthen sustainability-based recruitment strategies and integrate interdisciplinary, project-based learning to enhance environmental awareness and motivation, while policymakers should reinforce environmental education pathways from secondary to higher education. Although this review synthesizes recent evidence published between 2022 and 2026, its findings are limited by the scope of the selected literature and the interpretative nature of narrative review. Future studies are encouraged to employ systematic reviews, meta-analyses, or empirical approaches while incorporating variables such as environmental

identity, sustainability self-efficacy, climate anxiety, institutional reputation, and perceived employability to further explain students' decisions to pursue Environmental Engineering.

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