



A Comprehensive Study: Assessing the Environmental Literacy Profile in Higher Education for Sustainable Development

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Abstract. The primary aim of this study was to evaluate the comprehension and engagement of higher education students with development issues, particularly focusing on environmental literacy. Environmental literacy encompasses an individual's knowledge, awareness, and capacity to address concerns through practical actions. As higher education shapes future leaders and professionals crucial to sustainable development, assessing students' literacy levels and identifying influential factors becomes imperative. To accomplish this, our research utilized a combination of surveys and qualitative interviews with students from diverse disciplines. Surveys gauged students' knowledge, attitudes, values, and behaviors regarding development, while interviews provided insights into their perspectives and experiences. Analysis of the gathered data aimed to delineate the environmental literacy profile within educational institutions, with a specific emphasis on sustainable development. Through this investigation, we aimed to uncover factors facilitating or impeding students' engagement in sustainable practices. Moreover, we sought to discuss the implications of our findings for curriculum development and teaching methodologies employed by educators, as well as institutional policies.

Keywords: Environmental Literacy, Higher Education, Sustainable Development.

1 Introduction

The importance of issues and sustainable development has grown significantly on a scale. To ensure a future individuals must have an understanding of environmental challenges and the ability to make well-informed decisions while taking sustainable actions [1]-[4]. Higher education institutions play a role, in preparing students to become leaders, professionals, and active contributors towards sustainable development [5], [6]. Environmental literacy, which encompasses knowledge, awareness, and the capacity to comprehend and address concerns is an element of sustainable development [7], [8]. It involves not knowledge, about the environment but also a broader understanding of

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how human activities are interconnected with ecological systems. Through literacy individuals gain the power to critically analyze problems assess potential solutions and actively engage in sustainable practices.

Understanding the level of knowledge, attitudes, values and behaviors, among students in education is crucial for assessing their environmental literacy [9]–[11]. By gaining insights into this aspect educators and institutions can identify areas where knowledge gaps exist and develop targeted interventions to improve students understanding and involvement in practices [1], [2], [12]. This study aims to address the existing research gap by conducting an assessment of the environmental literacy profile within education institutions particularly focusing on sustainable development. Through an examination of students' environmental knowledge, attitudes, values and behaviors this research intends to provide insights into the strengths and weaknesses of approaches, to environmental education.

The outcomes of this research will not just add to the existing knowledge. Also offer insights, into educational practices, curriculum development and institutional policies. By understanding the factors that impact students' environmental knowledge educators can customize their teaching approaches and design cross-disciplinary curricula that incorporate principles of development [13]–[15]. Furthermore recognizing the barriers and facilitators affecting students' involvement in practices will enable institutions to create supportive learning environments and provide hands-on experiences well as active participation in sustainability initiatives. Through promoting awareness and sustainable development, in education, we can nurture a generation of environmentally conscious individuals who are prepared to address complex environmental issues and contribute to a more sustainable and resilient future.

To put it simply this study seeks to evaluate how well students, in educational institutions comprehend and engage with issues in relation to sustainable development. By examining their existing level of literacy and investigating the factors that impact their understanding and involvement this research aims to offer insights for improving environmental education at the higher education level. Ultimately it aims to foster practices, among leaders and professionals.

2 Literature Review

The literature review gives a look, at the research and scholarly works concerning environmental literacy, in higher education for sustainable development. It delves into ideas, theories and discoveries that contribute to our comprehension of environmental literacy profiles and how higher education institutions promote practices among students.

2.1 Environmental Literacy and Sustainable Development

Environmental literacy refers to the understanding, beliefs, principles and actions that enable individuals to comprehend and tackle issues. It goes beyond knowledge by encompassing a comprehensive grasp of how social, economic and ecological systems are interconnected. On the hand sustainable development emphasizes integrating social and

economic factors to fulfill present needs while safeguarding the ability of future generations to meet their own needs [16].

Clarifying these terms' meanings and how they relate to one another is crucial when writing about the ideas of "Environmental Literacy" and "Sustainable Development," as well as when referencing them in other writing. The term "environmental literacy" describes the level to which people have a fundamental grasp of the environment and its processes, recognize how human behavior affects the environment, and are able to make wise decisions on environmental issues [17]–[20]. Contrarily, sustainable development is the guiding principle for achieving human development objectives while concurrently preserving the capacity of natural systems to supply the natural resources and ecosystem services that are essential to the economy and society. A crucial area of study and focus is the confluence of these ideas [21]. Environmental literacy is required for long-term development. Individuals and society must understand and consider the long-term environmental consequences of their choices in order to achieve sustainable development.

They require an environmental literacy foundation in order to make judgments that are not only helpful in the near term, but also long term [22], [23]. As a result, environmental education and environmental literacy play an important role in accomplishing sustainable development goals. In addition, the roles that governments, educational institutions, and social groups play in fostering environmental literacy as a tool for sustainable development would be noteworthy areas to investigate in the literature. These roles are manifested through policy formulation, curriculum design, and community-based efforts, in that order [24]. Dive into case studies where environmental literacy initiatives have resulted in advances to sustainable development, and investigate their techniques and impacts to bring considerable value to the literature. Finally, taking into account the problems of enhancing environmental literacy and attaining sustainable development, as well as suggesting prospective solutions, is a vital aspect to cover.

2.2 Environmental Literacy Profiles in Higher Education

The profiles of literacy, in education are found to differ among students showing variations in their knowledge, attitudes, values and behaviors towards the environment [25]. While some students showcase a grasp of literacy others may have gaps or misconceptions in their understanding [26]. The development of these profiles is influenced by factors such as the field of study previous exposure, to education and personal values.

Exploring the topic of "Environmental Literacy Profiles in Higher Education" means analyzing higher education students' grasp of environmental issues and how such education molds them to face ecological problems. Environmental literacy in higher education refers to the development of students' knowledge, abilities, and attitudes that enable them to understand and respond to environmental challenges. It aims to improve students' ability to participate in democratic decision-making on environmental concerns, taking into account the interconnection of social, economic, and ecological systems [9]–[11]. Analyzing students' environmental literacy could be divided into three parts: cognitive (knowledge), affective (attitudes/values), and behavioral (actions/behaviors).

These elements combine to form a complete picture of a student's environmental literacy profile. An analysis of environmental literacy in various academic areas may be of interest as well [1], [2]. Comparisons across disciplines can illustrate how different topic areas contribute to environmental literacy while also revealing interdisciplinary and disciplinary gaps in knowledge, attitudes, and actions. This can aid in the development of curricula to ensure that all students, regardless of major, learn a baseline degree of environmental literacy [12]. Furthermore, the incorporation of environmental literacy into higher education curricula could be an important subject to investigate in this literature. Investigating pedagogical practices that effectively promote environmental literacy, such as project-based learning, field visits, and experiential learning opportunities, could contribute to the conversation [3], [4], [7]. Finally, assessing the problems associated with improving environmental literacy in higher education and offering measures for development would have practical consequences for institutions seeking to deepen their commitment to environmental education. Consider elements like as curriculum development, faculty training, student participation, and policy provisions.

2.3 Impact of Environmental Education in Higher Education

Promoting literacy and sustainable development, in education presents various challenges. These challenges encompass divisions, a lack of faculty expertise, time limitations and the necessity for dedication and cooperation [15], [27]. Nevertheless, there are also chances, for innovation and enhancement. These opportunities include incorporating sustainability throughout the curriculum establishing centers and initiatives focused on sustainability well as fostering interdisciplinary collaborations [18], [19]. There are obstacles when it comes to promoting awareness and sustainable development in higher education. These challenges encompass divisions, a lack of knowledge, among faculty members, limited time availability and the necessity for institutional dedication and cooperation. Nonetheless, there are also chances, for innovation and enhancement. For agency incorporating sustainability into the curriculum and establishing centers and initiatives focused on sustainability. Nurturing collaborations.

To enhance literacy, in education it is recommended to adopt certain best practices and strategies [28], [29]. These include integrating topics into the curriculum fostering collaboration providing faculty development programs engaging with the community and establishing partnerships with external stakeholders [27]. By implementing these approaches students can have an transformative experience that equips them to tackle complex environmental challenges and contribute to sustainable development [26]. The literature review emphasizes the significance of literacy in education for promoting sustainable development. It highlights the importance of going beyond knowledge acquisition and encouraging students to engage in thinking develop values and adopt sustainable behaviors. By understanding the factors that shape literacy profiles and following practices higher education institutions can play a crucial role, in preparing students with the necessary knowledge, skills and motivation to create a more sustainable future.

3 Method

For this study we will use a combination of surveys and interviews to gather information. We will invite a group of students, from fields to take part. The surveys will help us understand the students' knowledge, attitudes, values and behaviors towards development. The interviews will give us insights into their thoughts, experiences and suggestions, for enhancing environmental education and promoting sustainable practices.

3.1 Research Design

We will use a research design that combines both surveys and qualitative interviews in this study. This approach will enable us to gain an understanding of the environmental literacy profile, in education institutions.

3.2 Participant Selection

A group of students, from fields will be carefully chosen from universities and colleges. The size of the group will be determined using methods to guarantee that the findings are representative and can be applied broadly.

3.3 Quantitative Survey

We will create a survey to evaluate the knowledge, attitudes, values and behaviors of students regarding development. This survey will include established scales and questions that assess aspects of environmental literacy. The questions may touch upon principles considerations related to the environment sustainable habits and awareness of global environmental issues. The survey will be conducted either online or, in person based on factors.

3.4 Qualitative Interviews

We will conduct interviews to get an understanding of what students think and feel about environmental literacy and sustainable development. We want to hear their experiences and suggestions. To maintain consistency we will use a structured interview guide but we'll also give participants the freedom to express their thoughts. We'll record the interviews. Transcribe them for analysis purposes.

3.5 Data Analysis

The quantitative survey data will be analyzed using appropriate statistical techniques, such as descriptive statistics, correlation analysis, and inferential statistics. These analyses will provide an overview of students' environmental literacy levels and identify any significant relationships or differences among variables. Qualitative data from the

interviews will be thematically analyzed to identify recurring patterns, themes, and unique insights related to environmental literacy and sustainable development.

The researchers will analyze both qualitative data to gain a comprehensive understanding of the level of environmental knowledge, in higher education institutions. They will examine where the quantitative and qualitative findings align or differ which will enable an interpretation and discussion of the results. Throughout the research process we will strictly adhere to guidelines and protocols. We will ensure that participants provide consent guaranteeing their involvement and keeping their responses confidential. The study will fully comply with guidelines and the requirements of the institutional review board to safeguard the rights and well-being of all participants. It is crucial to recognize the constraints of this study. These could encompass factors such as how the sample represents the population biases that might arise from individuals self-reporting in surveys and how applicable the findings are, to situations. Being aware of these limitations will shape how we interpret and discuss the results.

The research findings will add to what we know by giving us an understanding of how environmentally aware higher education institutions are. These results will help shape practices, curriculum development and institutional policies that focus on improving education and supporting sustainable development. Based on these findings recommendations will be provided to guide initiatives, in promoting literacy and sustainability, in higher education. The research findings will contribute to our existing knowledge by providing insights into the level of consciousness, among education institutions. These results will assist in shaping practices, curriculum development and institutional policies that prioritize enhancing education and fostering development. With these findings in hand, we will provide recommendations to guide initiatives aimed at promoting literacy and sustainability, within the realm of education.

4 Results and Discussion

In this study, 58.6% (85) of the respondents were students from UIN Walisongo Semarang, while 25.5% (Universitas Negeri Semarang), and 15.9% were students from Universitas Muhammadiyah Semarang. Complete analysis results are presented in Table 1.

Table 1. T-test on the level of environmental awareness in the concept of sustainable development based on school locations

Respondent	n	Mean	Std Dev	Df	t	Sig. P
Universitas Negeri Semarang	85	3.88	0.44	338	3.93	0.000
UIN Walisongo Semarang	37	3.64	0.46			
Universitas Muhammadiyah Semarang	23	3.69	0.46			

The T-test showed that there was a significant difference between the UIN Walisongo Semarang (mean=3.93, SD=0.44) as compared to Universitas Negeri Semarang school students (mean=3.64, SD=0.46). UIN Walisongo Semarang has a “higher”

level of environmental awareness of the concept of sustainable development. It is also possible to spread awareness of environmental sustainability by creating various implementation programs that are aimed at all higher education students.

4.1 Quantitative Survey Findings

Based on the survey findings it appears that students, in education institutions possess an understanding of environmental matters. Students demonstrate a good understanding of basic ecological principles but exhibit some gaps in knowledge regarding specific environmental issues and sustainable practices. Environmental Attitudes: The majority of students express positive attitudes towards environmental sustainability and acknowledge the importance of addressing environmental challenges. However, there is variability in the depth of their attitudes and the extent to which they translate into action.

Environmental Values: The survey reveals that students place a high value on environmental conservation, ecological integrity, and social responsibility. Many students recognize the intrinsic value of nature and the need for intergenerational equity in environmental decision-making. Environmental Behaviors: The findings indicate a range of environmental behaviors among students. While some students actively engage in sustainable practices such as recycling, energy conservation, and sustainable consumption, others demonstrate a lack of consistent environmentally friendly behaviors.

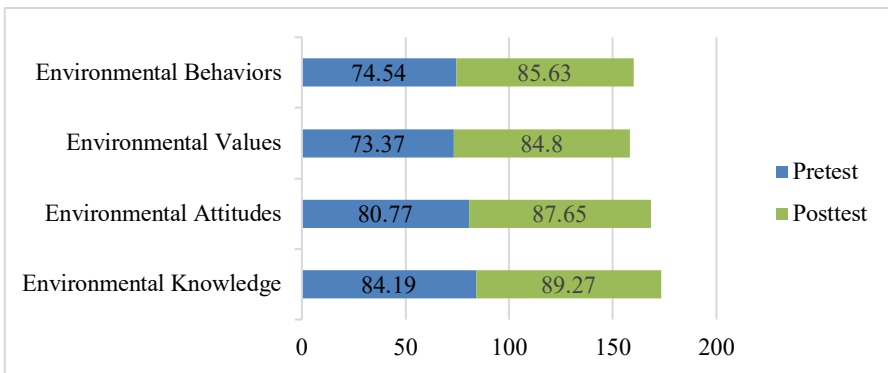


Fig.1. Environmental Literacy Level in Higher Education

Fig.1. explains that the environmental knowledge aspect has the largest proportion, namely 84.19 at the pretest in the good category, while at the posttest there is an increase in N-gain of 0.32 in the moderate category. These results underline that environmental knowledge forms the basis for understanding and navigating environmental issues. When learners have an in-depth grasp of environmental concepts and relationships, they are more likely to understand the impact of human activities on the environment, thereby making more informed decisions and showing responsible environmental behaviour. This highlights the importance of higher education institutions incorporating extensive environmental content into their curricula and

using effective teaching strategies to promote understanding. Knowledge builds a foundation for skills like critical thinking and problem-solving in environmental contexts. However, it's important to balance this knowledge-centric approach with other aspects of environmental literacy such as attitudes, skills, and behaviour, as they all play a crucial role in forming a well-rounded, environmentally literate individual.

The next comparison group is the environmental literacy profile between male and female students, as shown in Figure 2 below.

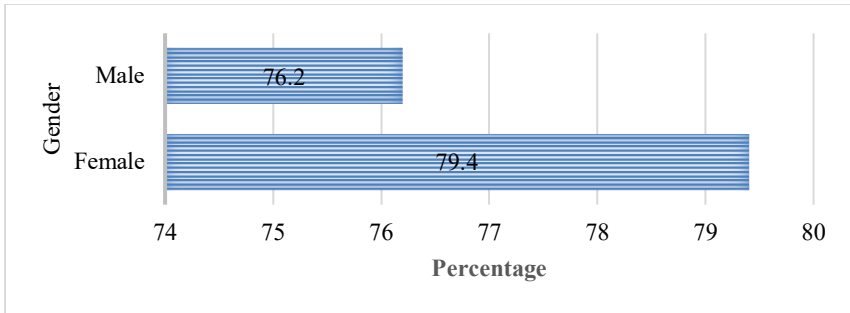


Fig. 2. Comparison of environmental literacy by gender

Male students had a percentage of awareness of 76.2% and female students had a percentage of awareness of 79.4%. This explains that the environmental literacy profile of female students is higher than that of male students. Gender differences are certainly the cause of physiological differences and affect psychological differences in learning, attitudes and behavior. So there are significant differences between cognitive abilities, attitudes and behavior. By implementing the recommendations and addressing the identified challenges, higher education institutions can play a pivotal role in nurturing environmentally literate graduates. These graduates will be equipped with the knowledge, skills, and motivation to address complex environmental challenges, contribute to sustainable development, and become catalysts for change in their personal and professional lives. In conclusion, enhancing environmental literacy in higher education for sustainable development is a pressing and ongoing endeavor. Through comprehensive curriculum integration, interdisciplinary collaboration, and engagement with external stakeholders, higher education institutions can foster environmentally literate graduates who possess the necessary knowledge, attitudes, values, and behaviors to create a more sustainable future. By empowering students to become environmentally responsible and proactive, higher education can contribute significantly to global efforts in tackling environmental issues and promoting sustainable development.

4.2 Qualitative Interview Findings

Motivations and Barriers: The interviews highlight various motivations and barriers influencing students' engagement with environmental issues. Motivations include per-

sonal experiences, environmental ethics, and a desire to make a positive impact. Barriers can arise due, to factors such as time, lack of awareness and a perceived mismatch between personal actions and the larger systemic challenges. When it comes to perceptions of Environmental Education students have differing opinions regarding its effectiveness in education institutions. While some believe that the current curriculum adequately addresses issues others argue for the need for interdisciplinary and practical learning opportunities. To improve education participants suggest recommendations. These include integrating sustainability into all disciplines providing world problem solving experiences encouraging student engagement through activities and establishing stronger partnerships, with community organizations and industry.

4.3 Integration and Discussion

The combined quantitative and qualitative findings give us an understanding of the environmental knowledge level, within education institutions. The results show that students have a grasp of concepts and hold positive attitudes but there is still room for improvement in translating this knowledge into consistent sustainable actions. The study emphasizes the importance of addressing barriers like time constraints and the perception that individual actions may not make a difference against systemic challenges. It underscores the need for an interdisciplinary approach to education focusing on critical thinking problem solving skills and active involvement.

Based on these findings recommendations are put forth to enhance education in education institutions. These include revising curricula to include sustainability courses offering hands on learning experiences and fostering collaborations with partners to bridge the gap between theory and real world practice [30]. The outcomes of this study contribute to the conversation about literacy and sustainable development in higher education. They offer guidance to educators, institutions and policymakers as they work towards promoting literacy empowering students as agents of change and advancing progress, towards a sustainable future [9], [10]. The results of this research offer information, about the level of awareness in colleges and universities [1]. It reveals the situation regarding students understanding, beliefs, values and actions towards development. The analysis of these findings delves into the impact, on teaching methods curriculum design and institutional policies to encourage awareness and sustainable behaviors among students.

Developing an understanding of the environment; The fact that students possess a level of environmental knowledge suggests that there is a need to reinforce their foundational understanding of ecological principles and specific environmental matters. To achieve this it would be beneficial to introduce interdisciplinary courses that cover environmental topics. Additionally integrating case studies and real life examples can greatly enhance their grasp of how environmental knowledge's applied in situations. Promoting a Positive Outlook, on the Environment; Most of the students involved in this research displayed perspectives when it comes to sustainability. Nonetheless it is crucial to nurture these outlooks and instill a sense of accountability for taking care of our environment. Educational initiatives centered around the environment can concentrate on inspiring students. Forging connections with environmental concerns through

hands on learning experiences, field excursions and encounters, with environmental advocates and role models.

There seems to be a difference, between what students believe in terms of values and how they actually behave [28]. This indicates that there is a need for specific actions to encourage behavior. Higher education institutions can play a role in bridging this gap by implementing initiatives such, as campus sustainability programs [18]. These programs can give students the chance to turn their values into actions like participating in energy conservation campaigns waste reduction efforts and community engagement projects. Improving the Teaching Methods of Environmental Education; The qualitative results emphasize the significance of captivating teaching methods, in education [31]. By incorporating learning opportunities activities that promote problem solving and collaborative projects we can enhance students' comprehension of development and provide them with useful skills. Employing approaches that integrate viewpoints and foster critical thinking can empower students to tackle intricate environmental issues more effectively.

Overcoming Obstacles and Building Stronger Relationships; The research identifies time limitations and a perceived mismatch, between actions and broader challenges as obstacles, to adopting behaviors. Overcoming these obstacles necessitates an endeavor involving universities, students and outside collaborators [18]–[20]. Developing partnerships with organizations, businesses and government agencies can offer students chances to apply their knowledge practically and drive systemic transformations that promote sustainable development [32], [33]. Ongoing Evaluation and Enhancements; The results emphasize the significance of assessing and enhancing environmental education programs in education. Regularly evaluating students understanding of issues and gathering feedback, from stakeholders can help shape curriculum updates and ensure that educational efforts stay up to date impactful and adaptive, to evolving challenges.

To sum up this study emphasizes the importance of knowledge, in education for promoting sustainable development. By acknowledging the areas that need improvement and putting into action the suggested measures, colleges and universities can significantly contribute to producing graduates who possess an understanding of issues and are capable of making positive contributions towards a sustainable future. It is crucial to enhance teaching methods related to education and establish strong collaborations in order to create impactful educational experiences that empower students to become catalysts, for change both personally and professionally.

Several factors have been found to impact the knowledge of college students. These factors encompass aspects like the curriculum and teaching methods extracurricular activities, sustainability initiatives, on campus, faculty involvement and supportive institutional policies. Successful environmental education programs blend disciplines hands on learning experiences and critical thinking to promote a comprehension and active participation.

The discuss over "Factors Influencing Environmental Literacy in Higher Education" entails an examination of the various factors that influence the development of environmental awareness and responsibility among university students [14], [15]. To begin,

the content and organization of the curriculum have a considerable impact on environmental literacy. This includes taking into account multidisciplinary approaches, incorporating sustainability themes into various courses, and utilizing active learning strategies such as problem-solving and project-based work on environmental problems. Second, the commitment and capacity of professors to impart environmental knowledge and values are critical variables. The attitudes of professors toward the environment, their degree of competency in environmental education, and their use of innovative pedagogical techniques all have an impact on student learning. Another thing that contributes is peer influence.

Students can learn from and encourage one another, which leads to a better understanding of and motivation for beneficial environmental actions [34], [35]. Collaboration on initiatives and debates about environmental issues can pique people's attention and drive them to action. Environmental literacy is also influenced by school policies and infrastructure. Universities that promote environmental responsibility by adopting sustainability activities on campus, providing resources for environmental learning, and exhibiting institutional commitment to sustainability can inspire students to become more environmentally aware. Lastly, personal attributes such as students' attitudes, beliefs, and background knowledge can influence the level of engagement and understanding of environmental issues. Understanding these individual characteristics and tailoring learning interventions to cater to diverse student needs can be useful for higher education institutions. By understanding these factors, higher education institutions could refine their approaches, strategies, and curricula to better equip students with environmental literacy that is essential in our rapidly changing global landscape.

5 Conclusion

Environmental literacy plays a role, in education when it comes to promoting sustainable development. This study aimed to evaluate the level of literacy among students in education institutions and find ways to enhance their understanding and involvement in sustainable practices. The findings provide insights into students' current knowledge, attitudes, values and behaviors regarding development. They also offer suggestions for approaches, curriculum design and institutional policies. The study results indicate a level of knowledge among students highlighting specific areas that can be improved. Overall students possess attitudes towards sustainability and value the preservation of ecosystems; however there is a need to bridge the gap, between these values and actual behaviors. This highlights the significance of nurturing skills and translating knowledge into actions that promote sustainability.

This research emphasizes the importance of approaches, in education by integrating sustainability principles across different areas of study. It highlights the value of hands on learning that connects students to world environmental problems. Additionally the study acknowledges the significance of partnerships with organizations and industries to provide opportunities for students and address systemic environmental issues. The study also identifies challenges such as time limitations, disciplinary boundaries and

expertise gaps, among faculty members, which require efforts and institutional commitment to overcome. Recommendations include updating curricula supporting faculty development programs establishing sustainability focused centers and enhancing community involvement.

By implementing the recommendations and addressing the identified challenges, higher education institutions can play a pivotal role in nurturing environmentally literate graduates. These graduates will be equipped with the knowledge, skills, and motivation to address complex environmental challenges, contribute to sustainable development, and become catalysts for change in their personal and professional lives. In conclusion, enhancing environmental literacy in higher education for sustainable development is a pressing and ongoing endeavor. Through comprehensive curriculum integration, interdisciplinary collaboration, and engagement with external stakeholders, higher education institutions can foster environmentally literate graduates who possess the necessary knowledge, attitudes, values, and behaviors to create a more sustainable future. By empowering students to become environmentally responsible and proactive, higher education can contribute significantly to global efforts in tackling environmental issues and promoting sustainable development.

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