

Research

Strategies for engaging students in sustainability initiatives and fostering a sense of ownership and responsibility towards sustainable development

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Abstract

This study investigated successful strategies for engaging students in sustainable initiatives and encouraging a sense of accountability and ownership for sustainable development. Using a qualitative study methodology, eighty-three (83) administrators and lecturers from ten (10) Ugandan higher institutions participated in in-depth interviews. The data revealed eight major themes: awareness and education, practical engagement and hands-on activities, integration into the curriculum, student leadership and ownership, community and collaboration, recognition and reward, personal relevance and connection, and long-term impact and legacy. These results are consistent with international best practices in sustainability education, highlighting the necessity of an all-encompassing strategy incorporating knowledge dissemination with practical experience and active student involvement. Nonetheless, by offering context-specific insights pertinent to developing nations like Uganda, where such strategies have not received enough attention, our study attempts to address the literature gap. The findings highlight the importance of institutional support and offer practical suggestions for university administrators, educators, and policymakers who want to increase student involvement in sustainability projects. This study adds to the expanding body of information on sustainability education and provides a useful framework for using higher education to promote a sustainable future.

Article Highlights

- A key strategy for making sure that sustainability ideas become established in the educational system is to incorporate sustainability into the curriculum
- Systems of rewards and recognition inspire students and reaffirm the importance of their contributions.
- Making sustainability personally relevant to students increases their engagement and commitment.

Keywords Sustainability · Education · Student · Engagement · Higher education

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1 Introduction

Sustainability refers to the processes and systems that enable the preservation and regeneration of resources, allowing for the fulfilment of present needs without compromising the ability of future generations to meet their own needs [1–3]. It encompasses the integration of environmental, social, and economic dimensions to ensure long-term stability and health of both human and ecological systems [4, 5]. Using resources wisely, cutting waste, and protecting ecosystems are all parts of environmental sustainability [1]. Promoting social justice, equity, and well-being is the main goal of social sustainability [1]. The goal of economic sustainability is to maintain long-term economic viability without destroying the environment or depleting resources [1].

Sustainability has emerged as a critical topic in modern education, especially in higher education institutions that are so important in moulding the next generation of sustainability agents and leaders. Universities are becoming more acknowledged as vital players in advancing sustainable development as global issues including social injustice, resource depletion, and climate change worsen [6–8]. However encouraging a true feeling of ownership and responsibility in students and getting them involved in sustainability projects is still a difficult task, especially in underdeveloped nations like Uganda due to several factors. First, limited financial resources and infrastructure constrain the ability of educational institutions to provide comprehensive sustainability programs [9]. Second, the immediate economic needs of many students and their families often take precedence over long-term environmental concerns [9]. Third, there is a lack of awareness and understanding of sustainability issues among the general population, which can diminish the perceived importance of such initiatives [10]. Lastly, cultural attitudes and practices may sometimes conflict with sustainability goals, making it challenging to implement and sustain these projects [11].

Universities in Uganda are beginning to integrate sustainability into their educational frameworks through various initiatives. For example, Makerere University has established a Centre for Climate Change Research and Innovations, which focuses on research and training in climate resilience and sustainability [12]. Additionally, the university's Green University Initiative promotes campus-wide sustainability practices, such as waste management and energy conservation [12]. Kampala International University has also incorporated sustainability into its curriculum by offering courses on environmental science and sustainable development, and by engaging students in community-based sustainability projects [13]. However little study has been done on the best ways to get students involved in these initiatives [12, 13].

It is critical to comprehend the most effective ways to inspire and include students in sustainability projects, considering Uganda's distinct socioeconomic and cultural background characterized by its diverse ethnic composition, with over 50 different ethnic groups, each with unique traditions and languages [14]. The country faces significant economic challenges, including high levels of poverty and unemployment, particularly among the youth [15]. Additionally, Uganda's education system struggles with limited resources and infrastructure, impacting the quality and reach of education [14]. These factors contribute to a unique context in which sustainability education must be tailored to address local needs and cultural nuances effectively. By examining the viewpoints of administrators and lecturers from Ten Ugandan Universities, this study attempts to fill the gap.

The primary objective of this study was to identify and analyze strategies that effectively engage students in sustainability initiatives, fostering a sense of ownership and responsibility towards sustainable development. To achieve this objective, the study sought to answer the following research question: "What strategies are effective in engaging students in sustainability initiatives and fostering a sense of ownership and responsibility towards sustainable development?"

2 Literature review

Universities play a critical role in shaping societal norms and behaviours through education, research, and community engagement [16–18]. Universities are important stakeholders in the promotion of education, training and development of their human resources, by offering programs focused on sustainability, they help raise awareness and equip students with the skills needed to tackle the challenges of sustainable development [19, 20]. Sustainability education has been framed in various ways, including the development of competencies, fostering professional identity, and promoting agency among students [21–23]. Successful implementation strategies often involve inter- and transdisciplinary pedagogies that integrate sustainability across curricula and engage students in real-world problem-solving [24–26].

Raising awareness and educating students about sustainability issues are foundational steps towards fostering sustainable behaviours. UNESCO highlights that to produce knowledgeable global citizens, education institutions must incorporate sustainability [10]. According to research by Wiek and Redman [27], anticipatory skills and systems thinking are two sustainability competencies that are critical to the success of sustainability education. For educational programs on sustainability to be effective in developing nations like Uganda, where environmental challenges are severe [28], they must take into account local environmental issues.

For students to internalize sustainability concepts, experiential learning through real-world involvement and hands-on activities is essential. According to Ngo and Chase [29], direct experiences are crucial for learning. Research indicates that hands-on activities, such as campus sustainability audits and neighbourhood clean-ups, greatly improve student engagement and retention of sustainability concepts [30, 31]. Programs such as the “Green Schools” project have been effectively implemented in Uganda, producing significant results in terms of community involvement and student engagement [32].

Ensuring that sustainability is viewed as a fundamental aspect of education involves including it in the curriculum for a variety of courses. Tasdemir and Gazo [33] argue that to promote holistic thinking and problem-solving abilities, sustainability should be integrated into all academic fields. But Žalėnienė and Pereira [10] point out that there is a lack of systematic integration, especially in underdeveloped nations where there may be a shortage of resources and teacher preparation [9]. Comprehensive curricular integration is beneficial, as shown by successful models from Sweden and Australia [34, 35].

Fostering student leadership in sustainability initiatives is key to developing a sense of ownership and responsibility. Hamann et al. [36] emphasize how important it is to include students in decision-making since it strengthens their commitment to sustainability objectives. Initiatives in Uganda that provide students with the authority to head environmental clubs have demonstrated positive outcomes [32]. This is consistent with research from industrialized nations, where student-led initiatives have greatly enhanced educational institutions’ use of sustainable practices [37].

Collaboration with local communities is essential for the success of sustainability initiatives. Participation from the community increases the significance and impact of educational initiatives [38]. Community-based sustainability initiatives in Uganda have successfully addressed regional environmental issues and promoted a feeling of shared accountability [39]. This is in line with international research showing that community involvement is essential to environmental education programs’ success [40].

Systems of rewards and recognition inspire students and reaffirm the importance of their contributions. According to Ryan and Deci’s [41] research on intrinsic and extrinsic motivation, rewarding students for their contributions can greatly increase their commitment to and perseverance in sustainability projects. Both in established and developing environments, programs that openly recognize and honour students’ accomplishments in sustainability have proven successful [42].

Making sustainability personally relevant to students increases their engagement and commitment. According to Sidiropoulos [43], students are more likely to adopt sustainable behaviours when they can observe how their actions affect their local environment.

Focusing on the long-term impact and legacy of sustainability initiatives encourages students to think beyond immediate outcomes. Long-lasting initiatives like school gardens and renewable energy installations can have a significant and long-lasting influence on the attitudes and actions of students [37, 44]. Initiatives in Uganda that prioritize community development and long-term environmental stewardship have demonstrated the ability to bring about long-lasting change [45].

While significant progress has been made in integrating sustainability into education globally, gaps remain, particularly in the context of developing countries like Uganda. The existing literature highlights the need for tailored approaches that consider local environmental, social, and economic contexts. This study attempts to address these gaps by proposing a comprehensive educational strategy that incorporates local relevance, practical engagement, and community collaboration.

3 Methodology

3.1 Research Design

This study’s research design was qualitative, including semi-structured interviews where the interviewer uses a pre-determined set of questions or topics but allows flexibility to explore responses in more depth and adapt the conversation as

needed. Although semi-structured interviews follow a specific structure to ensure consistency across interviews, they also allow for the exploration of unexpected themes and the development of a deeper understanding of the participants' perspectives. In this study, the interviews were designed with a specific structure to address key research questions and themes related to sustainability education. This included a set of core questions aimed at uncovering insights about participants' experiences and opinions. However, the semi-structured format allowed the interviewer to probe further based on participants' responses, enabling the exploration of emerging topics and deeper understanding.

To enable a thorough examination of participants' experiences, viewpoints, and behaviours regarding strategies for engaging students in sustainability initiatives and fostering a sense of ownership and responsibility towards sustainable development, interviews were used as the main means of data gathering.

3.2 Participants

83 administrators and lecturers from 10 Ugandan Universities took part in this study. The Universities were chosen due to their leading roles in higher education in Uganda and their ongoing efforts to integrate sustainability into their curricula and campus operations. Some of the selected universities have significant influence and resources to pioneer sustainability initiatives while others are known for their strong emphasis on technical and vocational education, providing a different perspective on how sustainability can be integrated into more practice-oriented and community-based educational frameworks. The selection of these universities allows for a comprehensive understanding of how different types of institutions in Uganda are approaching sustainability education.

The participants were chosen according to their roles and responsibilities in carrying out sustainability projects at their colleges. Data saturation, or the point at which no new themes or information are emerging from the data, was used to establish the sample size. Data saturation was reached after 83 participants were interviewed, suggesting that an adequate sample size had been established.

3.3 Demographic

There were 83 participants in the study. There were 32 (38.55%) administrators and 51 (61.45%) lecturers. The majority of the participants 38 (45.79%) were PhD degree holders, 32 (38.55%) were master's degree holders, and 13 (15.66%) were bachelor's degree holders. The majority of the participants 25 (30.12%) have working experience of 16 years and above, 21 (25.30%) have working experience of 11 years to 15 years, 22 (26.51%) have working experience of 5 years to 10 years, and 15 (18.07%) have working experience of less than 5 years.

3.4 Data collection

Semi-structured interviews were used to gather data from each participant. The in-person interviews took place for about 30 to 45 min. The purpose of the interviews was to extract in-depth information about the approaches taken to involve students in sustainability projects and foster a sense of accountability and ownership for sustainable development. The framing of open-ended questions was designed to encourage participants to reflect on their experiences and provide rich, descriptive data.

3.5 Data analysis

The analysis of interview data was conducted using NVivo 12, a software program designed for qualitative data analysis. The iterative process followed for data analysis included familiarization with the data, coding of transcripts, identification of themes, and the creation of a final report.

The coding process was carried out by a team of researchers rather than a single individual. This approach helped ensure a more balanced interpretation of the data and minimized individual biases. The coding was both theory-led and grounded. Initially, a set of pre-determined codes based on the theoretical framework of sustainability education and the research questions guided the coding. As the analysis progressed, additional codes emerged from the data, reflecting the grounded nature of the approach. This combination allowed for a structured yet flexible analysis. Codes were grouped into broader themes. These groupings were iteratively refined as the analysis proceeded, ensuring that they accurately represented the data. For example, themes such as "awareness and education" or "practical engagement" were developed based on both theoretical expectations and the specific insights gathered from the interviews.

To enhance the reliability of the coding, three researchers were involved in reviewing and discussing the codes and themes. This collaborative process helped to ensure consistency and validity in the interpretation of the data.

3.6 Trustworthiness

To ensure the trustworthiness and credibility of the study findings, robust strategies were employed. These included peer debriefing, member checking, and reflexivity. Peer debriefing involved discussing the study with colleagues to gain different perspectives and insights. Member checking was conducted by sharing the findings with participants to confirm the accuracy and validity of the data. Reflexivity was practised by the researcher to acknowledge and mitigate any biases that may have influenced the study.

3.7 Ethical considerations

Ethical guidelines were followed throughout the research process. Informed consent was obtained from all participants, and their anonymity and confidentiality were ensured throughout the study.

4 Results

To maintain the confidentiality of names each participant in the study was assigned a database number referred to as P1 to P83. When the findings reference a participant's comments, the database number (P1 to P83) is recorded in parentheses.

4.1 Awareness and education

Participants consistently highlighted that awareness and education in sustainability are crucial for fostering long-term engagement. Awareness and education form the bedrock of any sustainability initiative aimed at students. By establishing a foundational understanding of sustainability, students become more receptive to engaging in and taking ownership of related activities (P9, P11, P26, P28). Effective awareness and education strategies encompass introducing basic concepts, demonstrating relevance, and presenting global perspectives. "We must start by educating students on the basics of sustainability. Without this foundational knowledge, it's hard to engage them in more complex initiatives" (P1). Another participant confirms this, emphasizing that "awareness is the first stage." When students understand the consequences of their choices, they are more likely to make sustainable decisions (P4). Incorporating global viewpoints and practical examples further enhances understanding. "Students must be exposed to the global viewpoint. It helps students realize that sustainability is an issue that affects everyone when they learn about it globally" (P17). Additionally, making sustainability concepts tangible through field trips and practical experiences can deepen students' appreciation. "Sustainability concepts can be brought to life and made tangible through field trips to nature reserves, recycling facilities, and sustainable businesses" (P23).

4.2 Practical engagement and hands-on activities

Participants underscored the importance of experiential learning in fostering a connection to sustainability. Hands-on activities and practical engagement are essential for translating theoretical knowledge into real-world applications (P31, P35, P39, P40, P47, P58). These activities not only make learning more engaging but also help students see the tangible impact of their actions on sustainability. "Students learn best by doing. When they participate in recycling projects or community cleanups, they see firsthand the difference they can make" (P22). Hands-on activities such as gardening clean-ups, tree planting, recycling programs, sustainable farming projects, and building sustainable models provide practical experience and reinforce learning. "Hands-on activities like gardening or building sustainable models help students understand the practical applications of sustainability" (P28). Further, engaging students in local and global environmental initiatives can enhance their understanding of broader ecological issues. "Students who take part in wildlife conservation initiatives gain a greater understanding of biodiversity and the need to preserve it" (P46). Practical experiences such as these not only educate but also inspire students to act.

4.3 Integration into curriculum

Participants emphasized how integrating sustainability into the curriculum can help normalize the concepts and make them a regular part of students' education. This holistic approach helps students understand sustainability as a multifaceted issue that intersects with various aspects of their education (P42, P43, P50, P57, P59, P63). Integrating sustainability into the curriculum across various disciplines ensures that all students, regardless of their field of study, are exposed to sustainability principles. This can be achieved by embedding sustainability topics into existing courses or developing dedicated sustainability courses. "When sustainability topics are woven into the curriculum, they become a natural part of what students learn every day" (P32). Additionally, incorporating sustainability across various subjects can highlight its relevance in diverse contexts. "We need to integrate sustainability into all subjects, not just science. That way, students see it as a multifaceted issue that affects every part of life" (P35). Subjects such as literature, history, and economics provide unique opportunities to explore sustainability from different angles. For example, "Students learn how cultures may change for the better by seeing case studies on sustainable practices in history classes" (P38). By embedding sustainability into multiple disciplines, students gain a comprehensive understanding of its importance and applications.

4.4 Student leadership and ownership

Participants emphasized that student leadership can significantly enhance engagement and commitment to sustainability projects. When students take charge of projects, they are more likely to invest time and effort into making them successful (P16, P19, P28, P34, P39, P40, P41). Encouraging student leadership in sustainability initiatives empowers students and fosters a deep sense of responsibility and ownership. "Giving students leadership roles in sustainability initiatives empowers them and gives them a sense of responsibility" (P12). This sense of ownership often translates into a more passionate and dedicated approach to sustainability efforts. "Students are more dedicated to seeing a project through to completion and take it more seriously when they are in charge of it" (P13). Student-led projects not only encourage responsibility but also foster creativity and innovation. "Student-led projects frequently contribute new, creative ideas that improve the school's overall sustainability activities" (P38). Additionally, leadership roles in sustainability initiatives help students develop valuable skills such as problem-solving and project management, preparing them for future challenges.

4.5 Community and collaboration

Participants highlighted the benefits of collaboration in creating impactful sustainability initiatives. Community and collaboration are integral to strengthening sustainability initiatives. Engaging students in collaborative projects not only amplifies the impact of these initiatives but also fosters a sense of community and shared purpose. Collaboration with various stakeholders, including local organizations, businesses, and families, provides students with practical experiences and reinforces their understanding of sustainability. "Collaboration with local organizations can provide students with real-world perspectives and resources" (P1). Another participant confirmed this by emphasizing the importance of community involvement: "Working together on sustainability projects builds a sense of community and shared purpose among students" (P3). Engaging with local businesses and government organizations offers students valuable real-world experience. "Collaborating on sustainability projects with nearby businesses provides students with real-world experience and strengthens neighbourhood ties" (P6). Additionally, involving families and community members fosters a supportive network for students' learning. As one participant observed, "Involving families and parents in school sustainability initiatives fosters a network of support for student's learning" (P13). Moreover, partnerships with environmental NGOs and local farms enhance students' practical knowledge and community connection. "Students can learn about sustainable agriculture and food systems through collaborative sustainability projects involving local farms and schools" (P30). Such collaborations not only enrich students' learning experiences but also strengthen the relationship between schools and their communities.

4.6 Recognition and reward

Participants stressed that recognition can significantly enhance students' motivation and sense of accomplishment. Acknowledging students' efforts through various forms of recognition can reinforce their commitment and encourage ongoing participation. "Acknowledgement, in the form of prizes or public remarks, makes students feel important and promotes continued involvement" (P2). Publicly recognizing achievements, even small ones, helps maintain momentum. As noted by another participant, "Honoring accomplishments, no matter how small, maintains the momentum and lets students know that their efforts are valued" (P5). Different forms of recognition, such as awards or eco-badges, can boost students' self-esteem and passion for sustainability. "Giving awards or eco-badges to students in recognition of their hard work increases their self-esteem and passion for sustainability" (P7). Additionally, highlighting student-led projects in school newsletters or on social media can inspire others and acknowledge their achievements. "Publicly highlighting student-led sustainability projects on social media or in school newsletters encourages others and recognizes their accomplishments" (P9). Establishing a "green honor roll" or creating annual sustainability awards can further motivate students and emphasize the importance of their contributions. "Encouraging others to get interested in sustainability projects can be accomplished by designating a 'green honour roll' for students who actively participate" (P18). Such initiatives not only reward individual efforts but also promote a culture of sustainability within the school.

4.7 Personal relevance and connection

Participants emphasized the importance of connecting sustainability to students' personal lives and interests. Making sustainability personally relevant to students is key to increasing their engagement and commitment. When students see how sustainability issues impact their lives and align with their interests, they are more likely to become actively involved. "Students become more engaged and interested in sustainability when they see how it impacts their own lives and futures" (P55). Linking sustainability projects to students' individual passions can enhance their relevance. As one participant explained, "Making the connection between students' particular interests and passions and sustainability projects increases the concept's relevance and engagement" (P57). Connecting sustainability to immediate personal concerns, such as health and well-being, can also increase engagement. "Students take sustainability more seriously when they see how it directly affects their health and well-being" (P61). Engaging students in community-based projects offers them hands-on experience and the opportunity to see the real-world impact of sustainability efforts. By participating in these projects, students can witness firsthand how their actions contribute to the well-being of their community and the environment. This experiential learning fosters a sense of responsibility and a deeper emotional connection to sustainability practices. As one participant highlighted "Getting students involved in community-based projects helps them develop a personal connection to sustainability" (P72). Moreover, allowing students to choose projects that align with their interests and providing visible outcomes from their efforts further strengthens their connection and dedication. "Students learn the long-term significance of their activities through discussing how present environmental practices will affect future generations" (P81). Observing tangible results, such as a flourishing garden or reduced waste, also reinforces their commitment. "Students' connection and dedication are strengthened when they can observe the observable outcomes of their sustainability activities" (P82).

4.8 Long-term impact and legacy

Participants emphasized the importance of helping students see the long-term effects of their actions. Understanding the long-term impact and legacy of sustainability initiatives helps students appreciate the broader implications of their actions (P10, P13, P24, P30, P33). Focusing on long-term outcomes encourages students to consider the enduring effects of their efforts on the environment and future generations. "Assisting students in seeing the consequences of their actions down the road helps them feel responsible" (P3). Teaching students about the enduring benefits of sustainability initiatives, such as habitat creation or tree planting, underscores their significance. "Highlighting the long-term advantages of sustainability initiatives, such as establishing wildlife habitats or planting trees, accentuates their significance" (P21). Moreover, understanding the historical context of sustainability can enhance students' appreciation of its long-term impact. "Students have an understanding of how actions taken now might affect the globe for future generations when they study historical instances

of sustainability” (P13). By exploring concepts like ecological footprints and the contributions of environmentalists, students can better grasp the importance of their efforts and feel a sense of purpose. “Students gain an understanding of the long-term effects of their daily decisions on the environment by investigating the idea of ecological footprints” (P27). Encouraging students to set and pursue significant, impactful goals helps them recognize the potential of their contributions to create a lasting positive legacy. “The inclusion of long-term objectives in sustainability education motivates students to establish and pursue significant, impactful goals” (P26).

5 Discussion

The integration of sustainability initiatives into educational frameworks is increasingly recognized as essential for fostering a sense of ownership and responsibility among students. Initiatives aimed at promoting sustainability must start with awareness and education. The importance of awareness and education in getting students involved in sustainability projects became clear. The significance of establishing a solid foundation of knowledge regarding sustainability challenges was stressed by academics and administrators in our study. This result is consistent with other research showing that education has a critical role in helping students develop an awareness of the environment [10, 19, 24]. Although this strategy has worked well in a variety of situations, it is especially important in places like Uganda where environmental problems like deforestation and water scarcity are major concerns [28].

Engaging in practical activities where shown to be beneficial and to foster a deeper understanding of sustainability. This is consistent with previous research highlighting the value of hands-on learning in developing a strong, intimate bond with sustainability [29, 30, 32].

A key strategy for making sure that sustainability ideas become established in the educational system is to incorporate sustainability into the curriculum. This result is consistent to earlier studies’ recommendations to integrate sustainability into a range of subject areas to give students a comprehensive understanding of sustainability [20, 33, 34]. Including sustainability subjects in a variety of courses promotes multidisciplinary approaches to environmental problem-solving and aids in the normalization of sustainable practices. However, there is still a gap in the systematic application of these ideas in developing nations [10]. As demonstrated by effective models from nations like Sweden and Australia, closing this gap calls for focused legislation as well as expenditures in curriculum development and teacher preparation [34, 35].

Encouraging students to assume leadership positions and cultivating a feeling of responsibility were deemed essential for maintaining involvement in environmental initiatives. This strategy is consistent with previous research, where student-led initiatives have improved school sustainability policies significantly [32, 36, 37]. In addition, enhancing sustainability efforts through collaboration with external partners and within the university community was determined to be a crucial strategy. This is consistent with previous research demonstrating that community involvement is essential to the viability and success of environmental education initiatives [38–40].

Systems of rewards and recognition inspire students and reaffirm the importance of their contributions. Studies indicating that students’ morale and participation can be greatly enhanced by being acknowledged for their accomplishments through rewards, diplomas, or public recognition lend support to this subject [41, 42]. Students are encouraged to actively participate in and perform well in sustainability projects through reward schemes. The implementation of such systems in Uganda has the potential to augment student engagement and involvement in sustainability initiatives.

Making sustainability personally relevant to students increases their engagement and commitment. This result is in line with earlier studies’ findings which indicate that students are more likely to adopt sustainable habits when they understand how their actions directly affect their immediate environment [5, 43]. In Uganda, making connections between sustainability education and regional concerns like agriculture and water conservation might help make these ideas more relatable and accessible for students. In addition, students’ feelings of purpose and vision can be instilled by stressing the sustainability projects’ long-term impact and legacy. Research suggests a stronger commitment to sustainability can be fostered by focusing on long-term results, which lends credence to this strategy [37, 44, 45]. Students are more likely to engage in ongoing efforts towards sustainable development when they realise that their actions have a bigger legacy.

6 Conclusion

Engaging students in sustainability initiatives through education is essential for fostering a sense of ownership and responsibility towards sustainable development. By focusing on the themes of Awareness and Education, Practical Engagement and Hands-on Activities, Integration into Curriculum, Student Leadership and Ownership, Community

and Collaboration, Recognition and Reward, Personal Relevance and Connection, and Long-term Impact and Legacy, we can create a comprehensive strategy to effectively involve students in meaningful sustainability efforts. Students will not only learn about sustainability but will also develop the skills, attitudes, and sense of responsibility needed to contribute to sustainable development. This holistic educational approach ensures that sustainability becomes a core value and practice in their lives, both during their education and beyond.

7 Implications of the study

The findings from this study on engaging students in sustainability initiatives through education provide several actionable implications for practices within educational institutions, particularly in the context of developing countries like Uganda. These implications can guide administrators, educators, and policymakers in effectively integrating sustainability into educational frameworks and fostering a culture of environmental responsibility among students.

i. Enhanced Curriculum Integration

Integrating sustainability into all academic fields not just environmental science, should be a top priority for educational establishments. This approach guarantees that every student, irrespective of their academic discipline, acquires a fundamental comprehension of sustainability concepts and their implementation. Case studies, sustainability problems, and multidisciplinary projects that demonstrate the applicability of sustainability in diverse situations can be incorporated into courses. This holistic integration helps students see sustainability as a fundamental aspect of their education and future careers.

ii. Promotion of Experiential Learning

Integrating practical engagement and hands-on activities is crucial to helping students internalize sustainability concepts. Institutions of higher learning ought to create curricula that incorporate fieldwork, internships, and community-based initiatives. Through these experiences, students can put their theoretical knowledge to use in solving practical issues, which deepens their understanding and dedication to sustainable practices. For instance, students can take part in renewable energy installations, sustainable agriculture programs, or local environmental conservation projects.

iii. Support for Student Leadership

Academic institutions have to proactively foster and encourage student leadership in sustainable projects. This can be accomplished by setting up forums where student-run sustainability groups, councils, or committees with the freedom to plan and carry out projects. Giving students access to leadership development training and tools can enable them to take charge of sustainability projects, encouraging student participation and creativity.

iv. Community Collaboration

Effective collaboration with local communities is essential to the accomplishment of sustainability projects. Universities ought to collaborate with regional businesses, government agencies, and groups to jointly develop and carry out sustainability initiatives. These partnerships can give students access to priceless tools, knowledge, and authentic work environments. Community involvement also makes sustainability initiatives more impactful and sustainable by ensuring that they meet local needs and are culturally appropriate.

xxii. Recognition and Incentives

Putting in place systems of recognition and rewards can greatly encourage students to participate in sustainability projects. Academic institutions have the authority to institute prizes, grants, or diplomas for exceptional achievements towards sustainability. Acknowledging and applauding accomplishments not only inspires people but also increases consciousness and establishes a standard for others to strive for. Fostering a culture of acknowledgement can help sustainability initiatives thrive in a competitive and positive atmosphere.

vi. Resource Allocation and Infrastructure Development

Investing in the necessary resources and infrastructure is vital for supporting sustainability education. Universities should allocate funds for sustainability projects, research, and the development of green campus facilities. This includes setting up recycling programs, energy-efficient buildings, and sustainable transportation options. Ensuring that the

physical infrastructure of the campus aligns with sustainability principles provides a living laboratory for students and demonstrates the institution's commitment to sustainability.

vii. Long-Term Vision and Planning

A long-term vision for sustainability education should be adopted by institutions and included in their strategic planning and policies. This vision must incorporate quantifiable objectives, frequent evaluations, and methods for ongoing progress. University ethos can be infused with sustainability to leave a lasting legacy that affects the next generations of students and the community at large.

By implementing these practices, educational institutions in developing countries can enhance the effectiveness of sustainability education, foster a sense of ownership and responsibility among students, and contribute to sustainable development goals on a broader scale.

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Declarations

Competing interests The authors declare no competing interests.

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Appendix

Interview Guide

1. How do you engage students in sustainability initiatives at your university?
2. Can you describe a successful sustainability initiative that has been implemented?
3. What challenges have you encountered in engaging students in sustainability?
4. How do you foster a sense of ownership and responsibility towards sustainable development among students?
5. What strategies have you found to be most effective in promoting sustainability education?
6. How do you collaborate with students and other stakeholders to promote sustainability on campus?
7. Can you provide examples of how sustainability has been integrated into the curriculum?
8. How do you assess the impact of sustainability initiatives on students' attitudes and behaviours?

References

1. Hajian M, Kashani SJ. Evolution of the concept of sustainability: from Brundtland report to sustainable development goals. In: Hussain CM, Velasco-Muñoz JF, editors. Sustainable resource management. Amsterdam: Elsevier; 2021. p. 1–24. <https://doi.org/10.1016/B978-0-12-824342-8.00018-3>.
2. Kumar A, Trivedi A, Nandeha N, MP N. Sustainable agriculture development and optimum utilization of natural resources: striking a balance. *J Sci Res Rep.* 2024;30(5):477–86. <https://doi.org/10.9734/jsrr/2024/v30i51964>.

3. Thiele LP. Sustainability. Hoboken: John Wiley & Sons; 2024.
4. Halawa E. Sustainable energy: concept and definition in the context of the energy transition—a critical review. *Sustainability*. 2024;16(4):1523. <https://doi.org/10.3390/su16041523>.
5. Davim JP, Leal Filho W, editors. Challenges in higher education for sustainability. Volume 1. Cham: Springer International Publishing; 2016.
6. Brenton J, Slawinski N. Collaborating for community regeneration: facilitating partnerships in, through, and for place. *J Bus Ethics*. 2023;184(4):815–34. <https://doi.org/10.1007/s10551-023-05365-5>.
7. Ketlhoilwe MJ, Silo N, Velepini K. Enhancing the roles and responsibilities of higher education institutions in implementing the sustainable development goals. In: Nhamo G, Mjimba V, editors. Sustainable development goals and institutions of higher education. Berlin: Springer; 2020. p. 121–30. https://doi.org/10.1007/978-3-030-26157-3_10.
8. Moganadas SR, Nun SH, Subramaniam S, Bahaman AS. Perspectives of academic staff concerning the sustainable development dimensions of a Malaysian higher education institution. *Environ Dev Sustain*. 2022. <https://doi.org/10.1007/s10668-021-02014-7>.
9. Heng K, Hamid M, Khan A. Factors influencing academics' research engagement and productivity: a developing countries perspective. *Issues Educational Res*. 2020;30(3):965–87.
10. Žalėnienė I, Pereira P. Higher education for sustainability: a global perspective. *Geogr Sustain*. 2021;2(2):99–106.
11. Pascual U, Balvanera P, Anderson CB, Chaplin-Kramer R, Christie M, González-Jiménez D, Martin A, et al. Diverse values of nature for sustainability. *Nature*. 2023;620(7975):813–23.
12. Ssekamatte D. The role of the university and institutional support for climate change education interventions at two African universities. *High Educ*. 2023;85(1):187–201.
13. Favour Ali U. Integrating Sustainable Development Goals (SDGs) into the Ugandan education system: enhancing academic performance and future success.
14. Gyagenda A. Culture and educational policy in Uganda. *Interdiscip J Educ*. 2024;7(1):56–70.
15. Egessa A, Nyanzi JB, Muwanga J. Determinants of youth unemployment in Uganda: the role of gender, education, residence, and age. *IZA J Labor Policy*. 2021;11(1).
16. Brundiens K, Barth M, Cebrián G, Cohen M, Diaz L, Doucette-Remington S, Zint M. Key competencies in sustainability in higher education—toward an agreed-upon reference framework. *Sustain Sci*. 2021;16:13–29. <https://doi.org/10.1007/s11625-020-00838-2>.
17. Wals AE, Mathie RG. It takes a whole school. *Am Sci*. 2022;110(4):244–7.
18. Lozano R, Barreiro-Gen M. Developing sustainability competences through pedagogical approaches: experiences from international case studies. Berlin: Springer Nature; 2021.
19. Machado CF, Davim JP. Higher education for sustainability: a bibliometric approach—what, where and who is doing research in this subject? *Sustainability*. 2022;14(8):4482. <https://doi.org/10.3390/su14084482>.
20. Machado CF, Davim JP. Sustainability in the modernization of higher education: curricular transformation and sustainable campus—a literature review. *Sustainability*. 2023;15(11):8615. <https://doi.org/10.3390/su15118615>.
21. Rieckmann M. Developing and assessing sustainability competences in the context of education for sustainable development. In: Education for sustainable development in primary and secondary schools: pedagogical and practical approaches for teachers. Cham: Springer International Publishing; 2022. p. 191–203. https://doi.org/10.1007/978-3-031-09112-4_14.
22. Wamsler C. Education for sustainability: fostering a more conscious society and transformation towards sustainability. *Int J Sustain High Educ*. 2020;21(1):112–30.
23. Lotz-Sisitka H, Schudel I, Di Wilmot ZS, O'Donoghue R, Chikunda C. 4. Transformative learning for teacher educators: making sense of education for sustainable development (ESD) policy emphasis on transformative education. 2022.
24. Leal Filho W, Frankenberger F, Salvia AL, Azeiteiro U, Alves F, Castro P, vila LV. A framework for the implementation of the sustainable development goals in university programmes. *J Clean Prod*. 2021;299:126915. <https://doi.org/10.1016/j.jclepro.2021.126915>.
25. Barth M, Kater-Wettstädt L. Implementing education for sustainable development in the German school system: implications for teacher education. In: Lee JC-K, Ehmke T, editors. Quality in teacher education and professional development. Milton Park: Routledge; 2021. p. 157–75.
26. Weiss M, Barth M, von Wehrden H. The patterns of curriculum change processes that embed sustainability in higher education institutions. *Sustain Sci*. 2021;16(5):1579–93. <https://doi.org/10.1007/s11625-021-00984-1>.
27. Wiek A, Redman A. What do key competencies in sustainability offer and how to use them. In: Vare P, Lousselet N, Rieckmann M, editors. Competences in education for sustainable development: critical perspectives. Cham: Springer International Publishing; 2022. p. 27–34. https://doi.org/10.1007/978-3-030-91055-6_4.
28. Auma S, Badr N. Assessment of the impacts of climate change on livestock water sources and livestock production: case study, Karamoja region of Uganda. *World Water Policy*. 2022;8(2):180–200.
29. Ngo TT, Chase B. Students' attitude toward sustainability and humanitarian engineering education using project-based and international field learning pedagogies. *Int J Sustain High Educ*. 2021;22(2):254–73.
30. Anwar G, Abdullah NN. Inspiring future entrepreneurs: the effect of experiential learning on the entrepreneurial intention at higher education. *Int J Engl Lit Soc Sci*. 2021;6.
31. Rodríguez Aboytes JG, Barth M. Transformative learning in the field of sustainability: a systematic literature review (1999–2019). *Int J Sustain High Educ*. 2020;21(5):993–1013.
32. Andreou N. Towards a generation of sustainability leaders: eco-schools as a global green schools movement for transformative education. In: Gough A, Lee JCK, Tsang EPK, editors. Green schools globally: stories of impact on education for sustainable development. Cham: Springer; 2020. p. 31–45.
33. Tasdemir C, Gazo R. Integrating sustainability into higher education curriculum through a transdisciplinary perspective. *J Clean Prod*. 2020;265:121759.
34. Argento D, Einarson D, Mårtensson L, Persson C, Wendin K, Westergren A. Integrating sustainability in higher education: a Swedish case. *Int J Sustain High Educ*. 2020;21(6):1131–50.
35. Arefin MA, Nabi MN, Sadeque S, Gudimetla P. Incorporating sustainability in engineering curriculum: a study of the Australian universities. *Int J Sustain High Educ*. 2021;22(3):576–98.

36. Hamann KR, Holz JR, Reese G. Coaching for a sustainability transition: empowering student-led sustainability initiatives by developing skills, group identification, and efficacy beliefs. *Front Psychol.* 2021;12:623972.
37. Vare P. Exploring the impacts of student-led sustainability projects with secondary school students and teachers. *Sustainability.* 2021;13(5):2790.
38. Zizka L, McGunagle DM, Clark PJ. Sustainability in science, technology, engineering and mathematics (STEM) programs: authentic engagement through a community-based approach. *J Clean Prod.* 2021;279:123715.
39. Oates L, Kasaija P, Sseviiri H, Sudmant A, Ersoy A, Van Bueren E. Pluralizing the urban waste economy: insights from community-based enterprises in Ahmedabad (India) and Kampala (Uganda). *Environ Urban.* 2023;35(2):411–32.
40. Oe H, Yamaoka Y, Ochiai H. A qualitative assessment of community learning initiatives for environmental awareness and behaviour change: applying UNESCO education for sustainable development (ESD) framework. *Int J Environ Res Public Health.* 2022;19(6):3528.
41. Ryan RM, Deci EL. Intrinsic and extrinsic motivation from a self-determination theory perspective: definitions, theory, practices, and future directions. *Contemp Educ Psychol.* 2020;61:101860.
42. Bliven A, Jungbauer M. The impact of student recognition of excellence to student outcome in a competency-based educational model. *J Competency-Based Educ.* 2021;6(4):195–205.
43. Sidiropoulos E. The influence of higher education on student learning and agency for sustainability transition. *Sustainability.* 2022;14(5):3098.
44. Nolan K. Biodiversity education and sustainability consciousness: a study on the effect of biodiversity education on the sustainability consciousness of Irish Primary School Students. 2020.
45. Waaswa A, Satognon F. Development and the environment: overview of the development planning process in agricultural sector, in Uganda. *J Sustain Dev.* 2020;13(6):1.

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