Journal of Sustainability Perspectives

journal homepage: https://ejournal2.undip.ac.id/index.php/jsp/

Empowering Students as Sustainability Ambassadors: A Conceptual Framework for Higher Education

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Article Info

Received:
30 April 2025
Accepted:
29 September 2025
Published:
30 December 2025

DOI:
10.14710/jsp.2025.29855

Abstract. Universities have a crucial role in fostering sustainability awareness and solutions. This conceptual paper introduces a three-stage framework-Awareness, Action, and Advocacy-for empowering students as sustainability ambassadors. The Awareness stage focuses on building foundational knowledge through orientation programs, campus-wide campaigns, and interactive workshops. Action emphasizes hands-on engagement, from eco-clubs and recycling drives to collaborative green projects that cultivate leadership and problem-solving skills. The Advocacy stage involves peer education, institutional policy dialogue, and partnerships with local communities and organizations to extend the impact beyond the campus. The proposed framework aligns with global sustainability goals, including the UN Sustainable Development Goals (SDGs) and the UI GreenMetric World University Rankings criteria. It highlights the importance of administrative support, training, and recognition systems to sustain momentum and institutionalize these efforts. By systematically involving students in sustainability initiatives, universities can catalyze lasting cultural shifts, foster responsible citizenship, and create pathways for scalable, real-world impact. This paper contributes a strategic roadmap for higher education institutions seeking to harness student potential, address environmental and social challenges, and build a generation of skilled sustainability leaders.

Keywords:

Action, Advocacy, Awareness, Higher education, Student engagement, Sustainability, Sustainable development goals, UI GreenMetric

1. Introduction

Sustainability has become increasingly significant in higher education, reflecting the global recognition of universities as essential drivers of societal transformation. As primary incubators for future leaders, researchers, and policymakers, universities are tasked with embedding sustainability principles across teaching, research, operations, governance, and

community interactions [1–3]. This holistic approach positions universities as microcosms for societal change, ideal for pioneering innovative solutions and disseminating sustainable practices to wider communities [4,5].

However, integrating sustainability into universities is inherently complex, often dominated by top-down strategies. While necessary, these traditional methods might overlook the influential role students can play at the grassroots level [2]. Students represent a powerful force capable of reinforcing or surpassing official sustainability initiatives when effectively mobilized. By actively engaging students as sustainability ambassadors, universities can bridge a critical gap in sustainability strategies, enhancing the effectiveness and persistence of these initiatives [6].

Recent literature underscores the transformative potential of student-driven sustainability actions. Student empowerment through roles as sustainability ambassadors fosters more meaningful and enduring changes. Students engage deeply through hands-on projects, peer mentoring, and collaborations with faculty, adopting a "living laboratory" approach where campuses become testing grounds for sustainable innovations [7,8]. This grassroots approach resonates deeply with students' values, translating abstract sustainability goals into tangible actions, enhancing leadership development, and instilling a sense of responsibility and ownership often missing in hierarchical models [9].

Moreover, global frameworks and rankings, such as UI GreenMetric, increasingly acknowledge the importance of active student participation in sustainability efforts. Students can significantly contribute to achieving sustainability benchmarks by organizing events, raising awareness, and implementing real-time solutions, thus informing more inclusive and adaptable administrative strategies [10,11].

This paper proposes a conceptual framework that emphasizes student engagement in university sustainability initiatives through three stages: awareness, action, and advocacy. It aims to highlight the significant role students play in aligning higher education institutions with global sustainability agendas, particularly the United Nations Sustainable Development Goals [6]. The framework is intentionally broad and adaptable, suitable for diverse institutional contexts and resource capacities, and serves as a strategic complement to existing administrative sustainability policies [12].

2. Theoretical Approach

The global attention to sustainability in higher education arises from an overarching commitment to addressing critical issues like climate change, resource depletion, and social inequities [1,3]. Universities, recognized as key actors in shaping societal priorities, increasingly adopt measurable benchmarks and frameworks to guide their sustainability initiatives, notably the United Nations Sustainable Development Goals (SDGs) and the UI GreenMetric World University Rankings [2,6,10]. Both frameworks emphasize measurable outcomes, continuous improvement, and active participation, highlighting student involvement as essential for sustainable institutional transformation [8].

The UN SDGs, established in 2015, consist of seventeen goals addressing environmental, social, and economic dimensions, requiring universities to integrate sustainability across teaching, research, and operational practices [6,8]. Universities adopting the SDGs are encouraged to develop innovative pedagogical methods and interdisciplinary collaboration, positioning students centrally within their sustainability strategies. Actively engaged students bridge academic learning with community practices, enhancing the effectiveness and outreach of sustainability initiatives [8,13].

In parallel, ranking systems such as UI GreenMetric have emerged to benchmark universities' sustainability performance through quantifiable metrics across infrastructure, energy use, waste management, water usage, transportation, and educational outreach [10]. Such rankings implicitly acknowledge that genuine sustainability requires community-wide involvement, especially student engagement. Hence, student-driven activities, outreach programs, and participatory governance significantly enhance institutional performance on these metrics, fostering a sustainable campus culture that blends administrative strategies with student enthusiasm and initiative [10,12].

Theoretical perspectives further support the critical role of students in sustainability outcomes, particularly through peer-to-peer learning models. Rooted in social learning theory, peer education leverages shared values and experiences to effectively disseminate sustainable practices within student communities [14]. This approach promotes deep learning and sustained behavioural change through mutual reinforcement, observation, and imitation, making students powerful catalysts for institutional sustainability initiatives [14,15].

Additionally, student involvement theory underlines the importance of active student participation in sustainability projects, correlating student engagement with enhanced commitment and leadership skills development [16,17]. Practical involvement in sustainability challenges, such as reducing waste or designing eco-friendly initiatives, deepens students' environmental stewardship and cultivates critical leadership skills relevant to professional and civic roles [16,18].

Incorporating students into shared governance structures further accelerates cultural transformation, aligning sustainability strategies with inclusive and socially relevant priorities [19]. Through participatory decision-making platforms, students actively shape sustainability policies, fostering a collaborative model where sustainability efforts are collectively owned and continuously refined [19,20].

3. Conceptual Frameworks

The conceptual framework for student engagement in sustainability within higher education can be articulated through a three-stage model consisting of Awareness, Action, and Advocacy. This model reflects an educational approach that transitions students from passive recipients of information to active participants and ultimately influential sustainability ambassadors. Each stage builds upon the previous, fostering individual understanding, collective engagement, and societal impact [21,22]. This progression is illustrated in Figure 1, depicting a cyclical model in which Awareness fosters Action, transitions into Advocacy, and is continually refined through feedback.

Awareness is the foundational stage, crucial for establishing students' basic understanding of sustainability issues such as climate change and resource depletion. Effective awareness programs include curricular integration, campus-wide orientation sessions, extracurricular workshops, and digital campaigns [23]. While formal courses introduce sustainability topics academically, they can be supplemented with co-curricular activities to encourage deeper reflection and relevance. Orientation sessions often highlight immediate, practical actions students can adopt, such as waste reduction and energy-saving habits, setting the stage for sustained involvement [24]. Digital platforms, including social media, play a vital role by efficiently disseminating information, balancing urgency with optimism to inspire collective purpose rather than apathy or eco-fatigue [25].

Figure 1. A cyclical progression in which Awareness fosters Action, transitions to Advocacy, and is refined by a Feedback

Interactive workshops further enrich the awareness stage by combining theoretical instruction with experiential activities. These sessions cover specific topics like climate science or sustainable consumption and include practical exercises that develop problem-solving and communication skills. Experiential learning, such as green campus tours highlighting eco-friendly infrastructure, transforms sustainability from abstract concepts into lived experiences [26]. The primary objective of this stage is to instill fundamental environmental literacy and initial enthusiasm, preparing students for more active roles in subsequent stages [27].

The Action stage builds directly on awareness, involving students in tangible sustainability initiatives. This stage emphasizes experiential learning, reinforcing values and developing competencies such as leadership and teamwork. Activities typically include participating in eco-clubs, organizing recycling drives, and engaging in campus greening projects, fostering a community-oriented approach to environmental stewardship [18]. Through these projects, students apply classroom knowledge to practical challenges, contributing to campus-wide sustainability efforts and gaining essential life skills [28].

Project-based learning exemplifies action-oriented education, with students conducting waste audits or proposing energy-saving measures. These real-world tasks enable learners to experience sustainability as an iterative process involving testing, reflection, and refinement, contributing directly to institutional improvements [29]. Consistent engagement, such as maintaining campus gardens or regular waste management activities, fosters traditions that ensure sustainability practices persist and expand across student cohorts [30].

Despite these strengths, the Action stage faces challenges such as limited resources and high student turnover. Effective action requires consistent institutional support, structured knowledge transfer processes, and collaboration between students, faculty, and administrative staff. These conditions help sustain momentum and create opportunities for initiatives to scale, transitioning smoothly into broader advocacy efforts [31].

Advocacy represents the final, advanced stage of the framework, transitioning students from campus-specific actions to influencing institutional policies and broader societal norms.

At this level, students act as sustainability ambassadors, equipped to engage in policy dialogue, mobilize communities, and advocate for systemic change. Their roles may include peer education, involvement in institutional governance, and collaboration with external community or industry partners, significantly expanding their influence [32].

Peer-to-peer education allows student ambassadors to disseminate their insights effectively, fostering a sustainable culture campus-wide. Ambassadors leverage formal presentations, workshops, and digital platforms to educate peers, deepening their expertise while promoting broad student engagement [33]. Advocacy also encompasses collaborative initiatives with local organizations, expanding the reach of student-led projects beyond campus and providing valuable real-world experience in stakeholder engagement and public relations [34].

Institutional advocacy involves students holding formal roles within governance bodies, advocating for sustainability policies, such as carbon neutrality goals or sustainability-focused curricula. Student participation in decision-making enriches institutional dialogue with fresh perspectives and urgency, driving more inclusive and comprehensive sustainability strategies [35]. Digital advocacy campaigns further amplify these efforts, utilizing social media to raise awareness and mobilize community support, effectively influencing institutional policies like fossil fuel divestment or climate emergency declarations [36].

Table 1. Three-stage framework with typical activities, resources, and outcomes

Stage	Typical Activities	Key Resources	Potential Outcomes
Awareness	Orientation workshops, sustainability seminars, social media campaigns	Faculty/staff trainers, basic funding for materials, digital platforms	Increased environmental literacy, initial student interest, baseline behaviour changes
Action	Eco-clubs, waste sorting drives, small-scale campus greening projects	Student volunteers, collaborations with facilities management, modest budgets for supplies	Hands-on leadership development, noticeable waste/energy reductions, community-building
Advocacy	Peer-to-peer trainings, policy dialogues, partnerships with local NGOs	Administrative support, networking opportunities, external/community contacts	Institutional policy influence, broader societal impact, long-term cultural shifts

This three-stage framework not only delineates a clear pathway for student empowerment but also highlights the importance of integrating theoretical knowledge with practical applications. Each stage reinforces the others, creating a robust system where foundational literacy supports hands-on action, which in turn informs and strengthens advocacy efforts. The cyclical nature of this model ensures ongoing feedback and refinement, enhancing the sustainability impact at institutional and societal levels. By situating students at the core of sustainability strategies, universities can effectively cultivate a generation of informed, committed, and influential sustainability leaders [21,22]. Table 1 summarizes the key activities, required resources, and anticipated outcomes for each stage, providing a

concise reference for practical implementation.

4. Aligning with Sustainable Development Goals

Empowering students as sustainability ambassadors aligns significantly with the ethos of the United Nations Sustainable Development Goals (SDGs), particularly SDG 4 on Quality Education. This goal emphasizes transformative educational experiences that equip learners with critical thinking skills, ethical leadership, and the capacity to promote sustainable development [8]. Higher education institutions that prioritize student-centered sustainability foster environments where learning transcends traditional classroom boundaries, leading students to deeply internalize sustainability values and apply them effectively in real-world scenarios. This approach represents a shift from passive knowledge acquisition to active, meaningful participation, shaping institutional culture and benefiting communities [37].

Student engagement in sustainability initiatives also aligns with several interconnected SDGs, highlighting the holistic nature of sustainable development. For example, SDG 11 (Sustainable Cities and Communities) encourages universities to partner with local communities, driving initiatives such as waste reduction programs, green infrastructure, and urban renewal projects. By actively collaborating with municipalities, students help bridge theoretical academic knowledge with practical urban revitalization efforts, fostering community-focused solutions and cultivating civic-minded graduates [11].

Similarly, student-led initiatives significantly support SDG 12 (Responsible Consumption and Production). Activities such as campus reuse programs, thrift shops, and refill stations championed by student ambassadors emphasize the importance of individual and institutional responsibility. These projects not only reduce environmental impacts but also educate peers and encourage a culture of sustainability within and beyond the campus. When such practices become widespread, their cumulative effect significantly reduces consumption patterns, promoting broader sustainable behavioural shifts [38].

Furthermore, students contribute meaningfully to SDG 13 (Climate Action) through advocacy and awareness efforts. Universities traditionally address climate issues through infrastructure improvements, but student-led campaigns add a vital layer of cultural and behavioral transformation. Students often organize climate awareness events, participate in reforestation activities, and advocate for ambitious climate neutrality goals. Such grassroots activism frequently prompts broader institutional changes, linking student-driven initiatives to systematic policy decisions and institutional commitments towards climate action [35].

The interconnected impact of student ambassadors extends to broader institutional and societal contexts, further aligning with SDG 17 (Partnerships for the Goals). By engaging in peer-to-peer education and community partnerships, students disseminate sustainable practices widely, influencing diverse social groups and establishing new behavioral norms. These external collaborations enable students to work with various stakeholders, addressing challenges such as waste management or ecological restoration collectively. This approach positions the university as a living laboratory, effectively blending institutional objectives with community interests, and enhancing sustainability efforts on a larger scale [39]. The alignment between student engagement stages (Awareness, Action, and Advocacy) and selected SDGs (4, 11, 12, 13, and 17) is visually represented in Figure 2 using a radar chart.

Moreover, robust student engagement contributes positively to institutional reputation and visibility, particularly through mechanisms like the UI GreenMetric World University Rankings. Such rankings evaluate sustainability performance across education, waste management, and energy use, all areas strengthened by student-led initiatives. High rankings

can attract socially responsible students and further investments in sustainability, creating a positive reinforcement loop. This cycle amplifies the role of student ambassadors, whose grassroots efforts can scale into significant institutional policy changes, reflecting broader national and global sustainability priorities [40].

Overall, aligning student empowerment with the SDGs creates a dynamic interplay of education, advocacy, and structural change. It demonstrates the powerful potential of universities to nurture influential sustainability leaders, actively contributing towards global sustainable development.

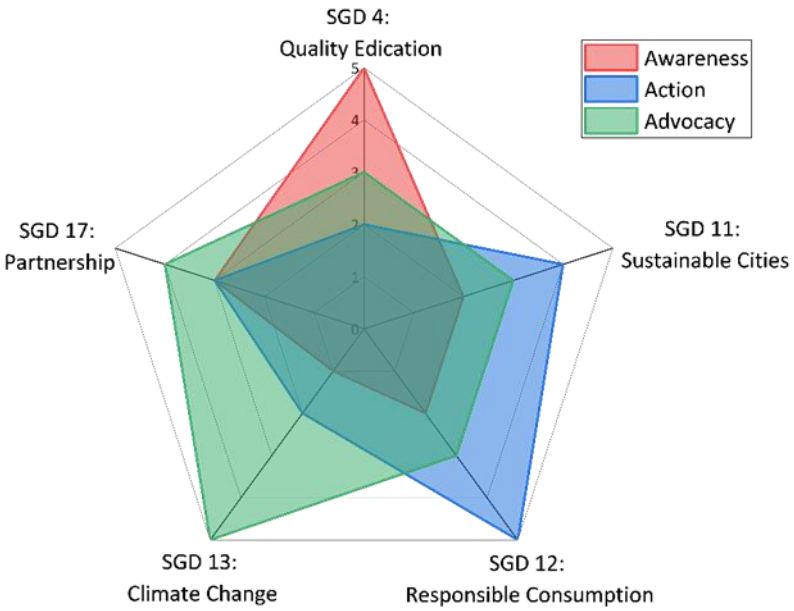

Figure 2. Radar chart illustrating how Awareness, Action, and Advocacy align with SDGs 4, 11, 12, 13, and 17.

5. Potential Impact and Benefits

Empowering students as sustainability ambassadors has far-reaching benefits, significantly enhancing students' personal and professional development. Engaging in sustainability initiatives requires students to exercise critical skills such as organization, communication, negotiation, and leadership competencies highly valuable across diverse career paths [30]. For example, coordinating recycling programs or leading student environmental organizations cultivates project management expertise and negotiation capabilities. These practical experiences reinforce developmental theories suggesting that meaningful extracurricular engagement fosters self-efficacy, critical thinking, and collaborative problem-solving [16]. Furthermore, students assuming leadership roles in sustainability initiatives frequently report a heightened sense of responsibility and ownership over their educational environment, strengthening their capacity for future civic and professional engagement [13].

At the institutional level, student-driven sustainability initiatives significantly reinforce universities' overarching sustainability cultures, providing essential grassroots support to complement top-down administrative policies. Research underscores that student participation enhances the effectiveness of sustainability strategies, as student input often provides valuable insights directly related to daily campus life, bridging the gap between

policy formulation and practical implementation [41]. For instance, student-managed recycling initiatives adapted specifically to campus housing conditions can substantially improve waste reduction policies. These practical enhancements help institutions perform better in recognized sustainability rankings, such as the UI GreenMetric World University Rankings, which emphasize active student engagement and educational outreach as key evaluation criteria [40]. Such achievements further position the university as an attractive institution committed to progressive governance and continual improvement, drawing interest from potential students, faculty, and research partnerships [42]. A detailed step-by-step process illustrating how student-led sustainability initiatives typically evolve from initial proposal and implementation to eventual scale-up—is presented in Figure 3.

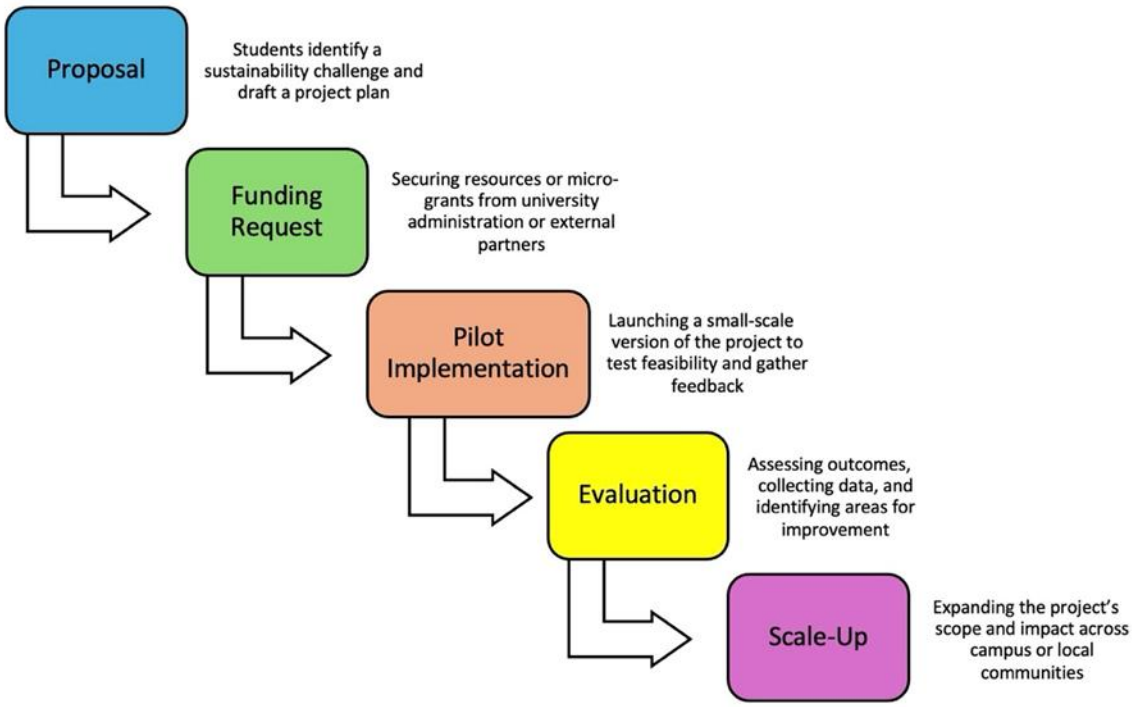

Figure 2. Step-by-step flowchart of a student-led sustainability project, from proposal to scale-up

The societal impact of student ambassadors extends significantly beyond campus boundaries, benefiting local communities and broader society. Students' involvement in outreach initiatives, collaborations with non-governmental organizations (NGOs), and partnerships with local businesses facilitates the dissemination of sustainable practices. Community-oriented projects like neighbourhood clean-ups, urban agriculture initiatives, or educational workshops translate academic insights into tangible improvements in community settings [43]. These cooperative efforts not only enhance environmental outcomes but also foster robust, trust-based relationships between universities and local communities. Such partnerships exemplify the inclusive stakeholder engagement emphasized in international frameworks, notably the UN Sustainable Development Goals, promoting civic responsibility and multicultural collaboration essential for addressing global sustainability challenges [35,44].

Moreover, successful student-led sustainability projects often serve as replicable models for other universities and community organizations, amplifying their broader societal influence. Universities documenting and sharing these successful initiatives through

conferences, academic publications, or online platforms enable peer institutions to learn and adapt similar strategies effectively. This dissemination promotes a network effect, where each successful case becomes a blueprint for others to build upon and scale. Consequently, universities recognized as hubs of innovative sustainability practices attract further investment, enhancing their capacity for continuous improvement and expanded impact [45]. Additionally, students who graduate with sustainability experience often continue advocating for sustainable practices within their professional careers, extending their impact into broader societal contexts and professional spheres [46].

In sum, investing in student-led sustainability initiatives generates a multidimensional impact that benefits students, universities, and society at large. Students mature into adept, socially responsible leaders capable of driving substantial change [43]. Universities gain from enriched sustainability cultures, improved operational effectiveness, and enhanced reputational standing in sustainability assessments [45]. Society broadly benefits from the scalable transfer of sustainable practices, contributing to wider cultural shifts toward sustainable living [46]. This comprehensive, student-centred approach exemplifies how sustainability efforts are most effective when implemented as inclusive, collaborative processes actively supported at all educational levels, creating a powerful convergence of educational, institutional, and societal advancement [42].

While student ambassadors hold significant potential for driving sustainability initiatives, several challenges must be addressed to ensure the effectiveness and longevity of their efforts. A crucial challenge is securing robust administrative support. Institutional leadership, including senior executives and department heads, plays a pivotal role in legitimizing student-led sustainability initiatives by providing access to necessary resources, such as facilities, data, and funding streams [2]. Without this top-level backing, students often face bureaucratic hurdles and insufficient cooperation from faculty or staff. Administrative endorsement can streamline processes, foster cross-departmental collaboration, and align student initiatives with the university's broader strategic goals, ensuring that sustainability is not treated as peripheral but central to institutional priorities [35].

Another key consideration involves continuity and knowledge transfer. Given the inherently transient nature of student populations, there is a significant risk that the departure of student leaders can result in a loss of momentum and institutional memory for ongoing projects [47]. Effective documentation, such as digital repositories, project reports, or structured mentorship programs, can mitigate this risk by preserving valuable insights, best practices, and lessons learned. Institutions can further enhance continuity by embedding student ambassador roles within permanent governance structures like sustainability committees or advisory boards, ensuring successive cohorts build upon established groundwork rather than starting anew each year [13].

Adequate funding and resource allocation present additional barriers to student-led sustainability initiatives. Although many activities can be carried out cost-effectively through volunteerism and community partnerships, ambitious projects often necessitate more substantial investments in infrastructure, specialized training, or research tools [46]. Budget constraints may prevent promising initiatives from progressing, underscoring the importance of establishing dedicated financial mechanisms. Institutions can respond by creating targeted sustainability funds or micro-grants to enable pilot projects and proof-of-concept experiments, allowing students to demonstrate viability before pursuing larger external grants [30]. Collaborating strategically with external stakeholders such as local businesses, non-governmental organizations, and municipal governments can further expand resource

availability, enhancing both the scope and impact of student-driven projects [48].

Institutionalizing student involvement in sustainability also requires managing the balance between bottom-up creativity and top-down structured oversight. While administrative policies and resources provide necessary frameworks, it is ultimately the students' enthusiasm, innovation, and commitment that sustain engagement and drive continuous improvement [42]. Institutions must thus create supportive environments where student ideas are valued and actively encouraged, but also strategically guided to align with broader sustainability objectives. Establishing clear channels for communication and collaboration between students and administrators can help achieve this balance, reducing organizational inertia and promoting agile responsiveness to emerging sustainability challenges [49].

Finally, evaluating and demonstrating impact remains a critical challenge. Effective sustainability initiatives require robust mechanisms to monitor, measure, and communicate their outcomes. Developing clear, accessible metrics and regular reporting processes allows students and administrators alike to assess progress, celebrate successes, and identify areas for improvement [50]. Transparent evaluation practices not only enhance accountability but also strengthen the institutional narrative around sustainability, boosting reputation, attracting prospective students and staff, and facilitating further investment in sustainability initiatives.

Table 2. Key challenges, their implications, and suggested mitigations

Challenge	Implication	Suggested Mitigations
Administrative Support	Lacks legitimacy, access, or financial backing	Official endorsement from leaders; dedicated committees; alignment with strategic goals
Continuity	Lost knowledge, stalled projects, inconsistent progress	Clear documentation; transitional leadership roles; integration in governance
Funding & Resources	Projects stall without adequate budgets or materials	"Green funds" or micro-grants; NGO/business partnerships; small, dedicated budgets

By proactively addressing these challenges, securing administrative support, ensuring continuity and resource availability, balancing structured oversight with student-led innovation, and establishing clear impact evaluation mechanisms, universities can significantly enhance the efficacy and sustainability of student-led environmental initiatives. These measures not only amplify students' contributions to sustainability but also embed environmental stewardship as a foundational component of institutional culture and strategic development. Table 2 provides a concise summary of the primary challenges faced by student ambassadors, outlining their implications and offering practical strategies for mitigation.

6. Conclusions

The conceptual framework outlined throughout this paper encompassing the stages of Awareness, Action, and Advocacy illustrates how universities can tap into the vast potential of their student populations to advance campus sustainability. By beginning with Awareness, institutions ensure that students develop a foundational understanding of environmental

issues, informed by both curricular and co-curricular learning opportunities. This foundational knowledge sets the stage for Action, wherein students transition from passive observers to active participants, engaging in concrete initiatives such as waste reduction programs, campus greening efforts, or broader community outreach. The transformative journey culminates in Advocacy, as students become empowered change agents capable of influencing institutional policies, bridging relationships with local stakeholders, and championing sustainability on regional or even global platforms. Though each phase serves distinct purposes, their interconnectedness underscores a holistic process of capacity-building and collective mobilization that can yield enduring cultural shifts in higher education.

Universities that adopt or adapt this model stand to benefit from increased student engagement, enriched experiential learning, and a more robust positioning in recognized sustainability rankings such as UI GreenMetric. More importantly, integrating student leadership into institutional sustainability planning can further align higher education practices with the United Nations Sustainable Development Goals, thereby fulfilling a broader societal mandate. This approach also ensures that emerging professionals, equipped with both theoretical insights and hands-on competencies, can extend their influence beyond the campus, catalyzing positive environmental and social outcomes in future workplaces and communities. Yet, the framework's true strength lies in its adaptability: universities of varying sizes and resource capacities can tailor each stage to match their unique contexts, from low-cost awareness campaigns to community-driven advocacy projects that address local priorities.

The potential for impact remains considerable, yet it also prompts avenues for further inquiry. Future research could focus on refining evaluation metrics to measure the extent and depth of student-led interventions across different institutional cultures. Comparative case analyses might illuminate which specific strategies or support mechanisms produce the most enduring improvements in sustainability performance, informing best practices that can be shared across institutions. Long-term outcome tracking, moreover, could examine whether students who have actively participated in such programs continue to demonstrate heightened environmental stewardship, civic engagement, or professional advocacy in their post-graduate lives. These lines of investigation would not only strengthen the empirical basis for student-centered approaches but also provide a clearer understanding of how to optimize the interplay between top-down policy frameworks and bottom-up student innovation.

By situating students as key drivers of sustainability initiatives, universities can fulfill their educational mission while contributing to broader societal goals. The three-stage model offers a structured yet flexible roadmap for cultivating environmental literacy, encouraging hands-on problem-solving, and forging leadership pipelines that extend far beyond campus borders. Institutions that choose to implement this conceptual framework will likely find that the benefits reverberate at every level, from enriched learning outcomes for individual students to measurable progress toward fulfilling international sustainability commitments.

Acknowledgment

The author would like to thank the Deanship of Scientific Research at Shaqra University for supporting this work.

Conflict of Interest

The author declares that there is no conflict of interest regarding the publication of this paper.

Authors Contribution

H.A. completed all aspects of this work, including the conceptualization, literature review, framework development, analysis, and writing of the manuscript. The author reviewed and approved the final version

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