

EcoFriends: Multicultural Service-Learning Communication for SDG 15: Life on Land

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ABSTRACT

Environmental degradation and biodiversity loss require higher education to adopt pedagogical models that connect sustainability learning with real-world practice. This study proposes the EcoFriends Multicultural Service-Learning Model as a design-based conceptual framework for operationalizing Sustainable Development Goal 15 (Life on Land) in higher education. Developed through literature synthesis, model construction, theoretical benchmarking, and replicability guidelines, EcoFriends integrates four components: knowledge integration, campus-based environmental action, community engagement, and multicultural reflection and collaboration. The model contributes by (1) explicitly aligning service-learning with biodiversity-focused SDG 15 priorities, (2) operationalizing intercultural pedagogy through structured multicultural collaboration and reflection, and (3) framing sustainability education as a communicative and civic engagement process linking students, universities, and community partners. As a conceptual contribution, EcoFriends is modular, adaptable, and resource-efficient, offering practical guidance for institutions seeking to localize SDG 15 through inclusive and practice-oriented education.

KEYWORDS

service-learning; multicultural education; SDG 15; sustainability education; higher education

INTRODUCTION

Environmental degradation, biodiversity loss, and ecosystem fragmentation represent urgent global challenges that threaten planetary resilience and human well-being. The United Nations' Sustainable Development Goal (SDG) 15, Life on Land, emphasizes the protection, restoration, and sustainable use of terrestrial ecosystems as a global priority (United Nations, 2023). Higher education institutions are increasingly expected to contribute to these goals by embedding sustainability principles into curricula and by fostering student engagement that connects academic learning with concrete environmental action.

Educational research has progressively shifted from transmissive models of instruction toward experiential and participatory pedagogies. Service-learning has been widely recognized as an approach that links classroom knowledge with community needs, thereby enhancing civic responsibility, critical reflection, and problem-solving capacity. In sustainability education, service-learning has been shown to strengthen students' environmental attitudes and pro-environmental behaviors while aligning

academic practices with global policy frameworks such as the SDGs (Diez-Ojeda et al., 2025; Vance-Chalcraft et al., 2022).

At the same time, scholarships on intercultural and multicultural education highlight the pedagogical value of cultural diversity in addressing complex socio-ecological issues. Intercultural approaches emphasize dialogue, plurality, and equitable participation, enabling diverse cultural knowledge systems to inform sustainability practices (Hajisoteriou et al., 2023; UNESCO, 2006). In increasingly internationalized higher education contexts, multicultural classrooms provide opportunities to transform diversity into a learning resource rather than a peripheral characteristic.

However, despite these advancements, three critical limitations remain in existing scholarship and practice. First, while sustainability-focused service-learning is widely documented, many initiatives address environmental issues broadly, without explicit alignment with biodiversity conservation or the specific targets of SDG 15. Biodiversity protection and terrestrial ecosystem resilience, central to SDG 15, often remain peripheral rather than structurally embedded components of service-learning design. Second, although multicultural education literature emphasizes inclusivity and equity, the ecological knowledge and culturally grounded sustainability perspectives of international and migrant students remain underutilized in sustainability programs. Third, existing models rarely provide an integrated pedagogical framework that systematically combines biodiversity-focused sustainability, structured multicultural collaboration, and communication-based civic engagement within a single, replicable design.

To address this gap, this study proposes the EcoFriends Multicultural Service-Learning Model for SDG 15 implementation in higher education. Unlike general sustainability-oriented service-learning frameworks, the EcoFriends model explicitly centers biodiversity conservation and terrestrial ecosystems as core curricular and experiential components. Furthermore, it operationalizes intercultural education principles through structured multicultural reflection and collaboration rather than treating diversity as a contextual variable. Finally, the model conceptualizes sustainability education as a communicative process and a form of civic engagement that connects students, universities, and community stakeholders in co-constructing ecological responsibility.

Accordingly, the purpose of this study is to design and theoretically validate a structured multicultural service-learning framework that operationalizes SDG 15 in higher education. The EcoFriends model consists of four interlinked components—knowledge integration, campus-based environmental action, community engagement, and multicultural reflection and collaboration—which collectively translate biodiversity-focused sustainability into pedagogical practice.

In doing so, the EcoFriends model makes a threefold contribution. First, it advances sustainability-oriented service-learning by aligning pedagogical practice directly with SDG 15 targets and biodiversity-focused action. Second, it translates multicultural and intercultural theory into structured pedagogical design, positioning cultural diversity as an epistemic and civic resource in ecological problem-solving. Third,

it contributes to the scholarship on higher education communication by framing sustainability education as a participatory communicative practice that fosters dialogue, collaboration, and civic responsibility. Through this integrated approach, the study seeks to provide a theoretically grounded, structurally adaptable framework for universities aiming to localize global sustainability agendas in inclusive, practice-oriented ways.

METHOD

This study adopts a design-based conceptual methodology to develop and present the EcoFriends Multicultural Service-Learning Model for SDG 15 implementation in higher education. Unlike empirical field experiments that evaluate specific case studies, this research emphasizes the development of a general pedagogical framework adaptable across diverse institutions. A conceptual design-based approach is particularly appropriate for this study because the primary objective is not to evaluate the effectiveness of a single program within a specific institutional context, but to construct a transferable and theoretically grounded educational model. Empirical case studies, while valuable, often produce context-dependent findings that limit generalizability. In contrast, a design-based conceptual methodology allows for the systematic integration of interdisciplinary theoretical insights and the formulation of structured components that can be adapted and empirically tested across diverse higher education settings. The methodological process consists of four interconnected stages: literature synthesis and theoretical grounding; model construction and design; theoretical validation and benchmarking; and replicability and application guidelines. Each stage is elaborated in detail to ensure transparency and to provide a clear roadmap for replication by subsequent researchers and practitioners.

The first stage involved an extensive literature review across three intersecting domains: service-learning and sustainability education, university social responsibility, and multicultural and intercultural pedagogy. The synthesis aimed to identify existing best practices, conceptual gaps, and guiding principles relevant to biodiversity-focused sustainability education. In the domain of service-learning and sustainability education, prior studies have demonstrated that service-learning effectively connects classroom learning with authentic community needs, fostering civic responsibility, critical reflection, and sustainability-oriented behaviors (Vance-Chalcraft et al., 2022; Diez-Ojeda et al., 2025). Empirical research further indicates that ecological service-learning enhances students' environmental responsibility and sustainability attitudes (Vance-Chalcraft et al., 2022). Universities adopting the "living laboratory" approach have also highlighted the role of campuses as experimental grounds for sustainability pedagogy, where academic courses, student projects, and institutional strategies are intentionally aligned (Withycombe Keeler et al., 2024).

The concept of university social responsibility (USR) further informed the methodological grounding of this study. Research on USR emphasizes the expanding role of higher education institutions in linking academic activities with local community needs

and broader sustainability agendas, thereby offering structural mechanisms to sustain student engagement (Coelho et al., 2021). Systematic reviews of sustainability-oriented service-learning similarly reveal both the growing importance of this pedagogical approach and the fragmentation of existing models, underscoring the need for more integrated frameworks (Rodríguez-Zurita et al., 2025).

The third literature domain focused on multicultural and intercultural pedagogy. Previous research highlights that intercultural education promotes plurality, inclusivity, and equitable participation, enabling diverse cultural knowledge systems to contribute meaningfully to sustainability practices (Hajisoteriou et al., 2023; UNESCO, 2006). UNESCO's intercultural education guidelines and subsequent empirical studies further demonstrate that integrating intercultural approaches into sustainability education fosters mutual understanding, equity, and culturally responsive learning environments (UNESCO, 2006; Kalogerogianni et al., 2025). Multicultural service-learning has been empirically linked to enhanced cultural awareness and intercultural competence, while participation in culturally diverse settings has been shown to increase student engagement and motivation (Smith, 2011; Abacioğlu et al., 2023).

The synthesis of these strands revealed both opportunities and limitations. While service-learning has been widely documented as effective in sustainability contexts, relatively few models explicitly focus on biodiversity and SDG 15. Likewise, although intercultural pedagogy is widely recognized as a foundation for inclusive education, concrete frameworks for integrating it with sustainability education remain underdeveloped. These gaps guided the construction of the EcoFriends model.

The second methodological stage involved systematically developing the EcoFriends Multicultural Service-Learning Model. Drawing on the literature synthesis, the model was designed around four interlinked components: knowledge integration, campus-based environmental action, community engagement, and multicultural reflection and collaboration. Sustainability concepts, biodiversity science, and SDG 15 targets are embedded into academic curricula through lectures, reading assignments, and reflective discussions. The design is informed by learning design principles that emphasize constructive alignment among content, intended learning outcomes, and assessment methods (Chirenje & Sibanda, 2025).

Campus-based environmental action constitutes the second component, in which students participate in hands-on sustainability projects such as biodiversity monitoring, campus greening initiatives, waste reduction campaigns, and upcycling workshops. These activities are deliberately structured to reinforce classroom learning and to connect theory with practice. Prior research demonstrates that ecological service-learning improves student environmental responsibility and fosters deeper learning when academic content and practical engagement are explicitly aligned (Vance-Chalcraft et al., 2022; Reames et al., 2020).

The third component focuses on community engagement through partnerships with municipalities, non-governmental organizations, and local community groups. Community stakeholders function not only as beneficiaries but also as co-creators of sustainability initiatives, ensuring that academic work addresses real-world ecological

challenges. This approach aligns with research emphasizing the importance of multi-stakeholder participation in sustainability education and university social responsibility (United Nations, 2023; Coelho et al., 2021).

Multicultural reflection and collaboration constitute the fourth component of the model. Students from diverse cultural backgrounds work in mixed teams to design, implement, and evaluate sustainability projects. Structured reflection sessions encourage students to articulate how their culturally grounded ecological knowledge informs sustainability practices. Empirical studies indicate that multicultural service-learning strengthens intercultural awareness, empathy, and inclusivity, while also bridging the gap between research and practice in linguistically and culturally diverse higher education settings (Smith, 2011; Duarte et al., 2024; Abacıoğlu et al., 2023).

The third methodological stage involved theoretical validation and benchmarking of the EcoFriends model. Each model component was aligned with specific SDG 15 targets, including the conservation of terrestrial ecosystems and the reduction of biodiversity loss (United Nations, 2023). Consistency with UNESCO's Education for Sustainable Development Goals: Learning Objectives was ensured by evaluating the model against internationally recognized sustainability education standards (UNESCO, 2017). Comparative analysis with existing sustainability-service-learning frameworks further highlighted EcoFriends' distinctive integration of multicultural reflection with biodiversity-focused action (Withycombe Keeler et al., 2024; Reames et al., 2020). Potential constraints and enabling factors, such as resource limitations, faculty readiness, and sustaining student motivation, were also identified, reflecting concerns raised in prior research (Diez-Ojeda et al., 2025; Rodríguez-Zurita et al., 2025). This stage focuses primarily on conceptual coherence and external benchmarking against internationally recognized sustainability education standards.

The final stage emphasized replicability and application guidelines. In contrast to the previous validation stage, this final stage translates the theoretically validated components into implementation-ready procedures and evaluation indicators that can guide practical application. Detailed process descriptions, suggested timelines, reflection prompts, and partnership strategies were developed to support adaptation across institutional contexts. The model's modular design allows institutions with limited resources to implement selected components while gradually scaling up. Proposed evaluation metrics include changes in student environmental attitudes, evidence of intercultural competence, tangible ecological outcomes such as waste reduction and biodiversity monitoring, and feedback from community partners. Future empirical studies may operationalize these metrics through mixed-method designs combining pre-post surveys, behavioral indicators, ecological performance data, and qualitative reflection analysis. Pilot implementations across multiple institutions could compare variations in student learning outcomes, intercultural collaboration dynamics, and measurable biodiversity-related impacts. Such empirical validation would enable refinement of the model and contribute to the development of comparative sustainability-service-learning research across cultural and institutional contexts. These guidelines align with recent recommendations that emphasize replicability and

simplicity as key features of innovative sustainability education models (Chirenje & Sibanda, 2025; Rodríguez-Zurita et al., 2025).

As a conceptual design-based study, this research does not provide empirical outcome data from direct implementation of the EcoFriends model. While theoretical validation and benchmarking strengthen its internal coherence, practical effectiveness remains to be verified through longitudinal and cross-institutional studies. Additionally, contextual variables such as institutional resources, faculty readiness, and student diversity may influence implementation outcomes. These limitations highlight the need for future empirical research to assess adaptability and impact in varied higher education environments.

RESULT AND DISCUSSION

The primary result of this study is the EcoFriends Multicultural Service-Learning Model itself, which provides a structured framework for operationalizing SDG 15 in higher education. In this conceptual study, the findings are presented in terms of key design features and representative outcomes for each model component. In conceptual design-based research, results are expressed as validated structural components and operational linkages rather than statistical findings. The EcoFriends model itself, therefore, constitutes the principal outcome of the study.

The first key finding concerns knowledge integration. The model demonstrates how biodiversity conservation and SDG 15 content can be embedded into academic curricula as core learning components rather than optional additions. This integration enhances the perceived relevance of sustainability education and encourages deeper student engagement.

The second finding relates to campus-based environmental action. The model outlines student-led activities, including biodiversity monitoring, campus greening, waste reduction, and upcycling initiatives. These activities function as living laboratories, allowing students to apply theoretical knowledge to tangible ecological challenges within their immediate environment (Reames et al., 2020; Withycombe Keeler et al., 2024).

The third finding highlights the role of community engagement. The EcoFriends framework formalizes partnerships with local governments, NGOs, and community organizations, positioning students as co-creators of sustainability initiatives. This structure extends the impact of service-learning beyond the campus and aligns higher education with principles of university social responsibility.

The fourth and most distinctive finding involves multicultural reflection and collaboration. By requiring intercultural team composition and structured reflection, the model leverages students' diverse cultural backgrounds as assets in sustainability practice. This component operationalizes intercultural education principles and demonstrates how cultural diversity can enrich ecological problem-solving (Abacioğlu et al., 2023; Smith, 2011). Multicultural collaboration enhances sustainability learning in several interrelated ways. First, communicative interaction among culturally diverse

students encourages the negotiation of ecological meanings and the comparison of locally grounded environmental knowledge systems. Such dialogic processes deepen critical reflection and expand students' understanding of biodiversity beyond a single cultural framework. Second, culturally situated ecological practices—such as traditional land stewardship, conservation ethics, or community-based sustainability initiatives—introduce alternative epistemologies that enrich problem-solving approaches. Third, intercultural teamwork fosters civic empathy and shared responsibility, reinforcing the social dimension of sustainability education. Through these mechanisms, multicultural engagement functions not merely as a contextual feature but as a pedagogical catalyst for transformative sustainability learning.

From a communication perspective, the EcoFriends model can be interpreted through frameworks of participatory communication and environmental communication. Participatory communication theory emphasizes dialogue, co-creation, and collective problem-solving as mechanisms for social change, all of which are embedded in the model's community engagement and multicultural collaboration components. Environmental communication scholarship further highlights the role of discourse, framing, and stakeholder interaction in shaping ecological awareness and action. By structuring sustainability education as an interactive and dialogic process, EcoFriends situates biodiversity conservation not only as a scientific issue but also as a communicative and civic practice.

Across all four components, communication functions as a cross-cutting mechanism that enables participation, coordinates stakeholder engagement, and shapes shared meanings around biodiversity stewardship. Taken together, these findings indicate that the EcoFriends model advances existing service-learning and sustainability education literature by explicitly focusing on biodiversity, integrating multicultural pedagogy, and emphasizing structural adaptability.

The model is designed to be adaptable across diverse cultural, institutional, and resource contexts. While its core principles remain consistent, implementation strategies may vary depending on institutional capacity, faculty expertise, and local ecological priorities. Universities with limited resources may begin with curriculum integration and structured reflection activities, gradually expanding toward community partnerships and biodiversity monitoring initiatives as capacity develops. This scalability enhances the model's practical relevance for institutions operating under different structural conditions.

Within the EcoFriends framework, certain components are essential for maintaining conceptual coherence, particularly the explicit alignment with SDG 15 targets and the structured integration of multicultural reflection. These elements ensure that biodiversity conservation and intercultural collaboration function as foundational pillars rather than peripheral activities. Other components, such as the scale of campus-based environmental action or the extent of external partnerships, may be flexibly adjusted based on institutional resources and regional ecological priorities. This balance between structural integrity and contextual flexibility strengthens the model's adaptability across diverse institutional contexts.

While the structural alignment with SDG 15 targets strengthens the model's theoretical coherence, its effectiveness as a pedagogical intervention ultimately depends on empirical validation across diverse institutional contexts. To enhance clarity and facilitate replication, the four core components of the EcoFriends model, knowledge integration, campus-based environmental action, community engagement, and multicultural reflection, can be summarized in a structured visual framework that illustrates their interrelationships and alignment with SDG 15 targets. Such a schematic representation underscores the model's modularity and highlights how communicative interaction operates across all components as a unifying principle.

CONCLUSION

The purpose of this study was to design and present the EcoFriends Multicultural Service-Learning Model as a conceptual framework for operationalizing Sustainable Development Goal 15 (Life on Land) within higher education. Building on insights from service-learning, sustainability education, and multicultural and intercultural pedagogy, the model integrates knowledge-based instruction, campus- and community-based engagement, and multicultural collaboration into a coherent and adaptable structure. Through this integration, EcoFriends offers higher education institutions a practical pathway for embedding biodiversity-focused sustainability education into curricula and student learning experiences.

The primary contribution of this study is threefold. First, at a conceptual and theoretical level, the EcoFriends model extends existing service-learning literature by explicitly foregrounding biodiversity conservation and terrestrial ecosystems, areas that have often remained peripheral in sustainability-oriented service-learning initiatives. By aligning service-learning practices directly with SDG 15, the model clarifies how global sustainability agendas can be meaningfully localized within higher education contexts. Second, at the pedagogical level, the model operationalizes principles of multicultural and intercultural education by structurally embedding multicultural reflection and collaboration into sustainability practice. In doing so, it moves beyond viewing cultural diversity as a contextual condition and instead positions it as a pedagogical resource that enriches ecological understanding, dialogue, and problem-solving. Third, at an institutional and communicative level, EcoFriends contributes to discussions of university social responsibility by framing sustainability education as a communicative process that connects students, universities, and local communities through shared ecological action and civic engagement.

While this balance enhances the model's adaptability, the study nevertheless has limitations. As a design-based conceptual framework, the EcoFriends model has not yet been empirically tested across multiple institutional contexts. Its effectiveness in influencing student learning outcomes, intercultural competence, and measurable ecological indicators remains to be validated through systematic empirical research. Additionally, the dynamics of multicultural collaboration may present challenges,

including language barriers, unequal participation, or cultural misunderstandings, which require careful facilitation and institutional support.

Future research should therefore focus on empirically examining the implementation and impact of the EcoFriends model in diverse higher education settings. Longitudinal studies could investigate whether participation in EcoFriends contributes to sustained pro-environmental behaviors and intercultural competencies beyond the duration of a single course or program. Comparative and cross-cultural studies would further illuminate how institutional, cultural, and regional factors shape the model's applicability and outcomes. Such research would not only strengthen the empirical foundation of the model but also refine its adaptability across global contexts.

In conclusion, the EcoFriends Multicultural Service-Learning Model offers a timely, context-adaptive, and communicatively grounded framework for higher education institutions seeking to localize SDG 15 through inclusive and practice-oriented education. By integrating biodiversity-focused sustainability, service-learning pedagogy, and multicultural collaboration, the model provides a forward-looking vision of how universities can function as active agents of ecological stewardship and intercultural sustainability in an increasingly interconnected world.

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