
Biodiversity and Beyond: Campus as a Living Lab for Sustainability and Social Learning

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Abstract

Biodiversity loss driven by human-induced environmental degradation is a global issue, with significant implications even at the micro-level, such as educational campuses. This paper reports on a seven-year biodiversity restoration and service-learning initiative at UCC India, developed in response to the ecological damage caused by the 2018 Kerala floods. The 24-hectare campus, which served as a temporary refuge for over thirteen thousand people during the disaster, experienced substantial vegetation loss. In the aftermath, a collaborative effort involving students, faculty, and local communities aimed to restore and enhance campus biodiversity through the establishment of fruit tree gardens, conservation of rare and endangered species, and integration of traditional ethnobotanical knowledge. The initiative adopted a multidisciplinary methodology combining classroom instruction, fieldwork, herbarium studies, and reflective learning. Results indicate 44.56% of species are available year-round, with 40.22% used in traditional medicine and nearly half underutilized or unknown to the local population. The project not only improved ecological resilience but also enriched student learning, particularly in linking theoretical knowledge with real-world applications. This model demonstrates the potential of biodiversity-centered service learning in advancing environmental sustainability and aligns directly with the United Nations Sustainable Development Goal 15 (Life on Land).

Keywords: Biodiversity, Service-Learning, Ethnobotany, Campus Greening, Sustainable Development, Student Engagement, Environmental Education

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Introduction

The Anthropocene epoch is marked by an alarming rate of biodiversity loss, primarily driven by human activities such as urbanization, deforestation, and climate change (Cendrero et al., 2020). This period highlights the urgent need for effective conservation strategies, and educational institutions play a crucial role in this endeavor. They serve not only as custodians of local biodiversity but also as vital centers for environmental education (Kassas, 2002). By fostering a culture of sustainability and ecological awareness, these institutions can significantly contribute to the preservation of biodiversity.

In 2018, Kerala experienced a catastrophic flood that severely impacted the 24-hectare campus of UCC India, resulting in damaged pathways, destroyed vegetation, and a general loss of ecological balance. The flood underscored the vulnerability of ecosystems to extreme weather events, further emphasizing the need for restoration and conservation efforts.

In response to these challenges, the "Campus as Garden" (Baur, 2022) concept emerged as a restorative initiative aimed at reintroducing plant diversity to the campus through structured greening activities. This initiative sought to revitalize the campus environment by establishing fruit tree gardens, reviving traditional knowledge systems, and cultivating rare, endangered, and threatened (RET) plant species. The project was designed not only to restore the ecological integrity of the campus but also to engage students and the local community in meaningful environmental stewardship.

Despite facing limited funding, the "Campus as Garden" initiative thrived due to the active involvement of students, faculty leadership, and community participation. This collaborative approach fostered a sense of ownership and responsibility among participants, encouraging them to take an active role in the restoration of their environment. The initiative also provided a platform for students to apply their academic knowledge in real-world contexts, thereby enhancing their learning experiences.

The primary objective of this research paper is to document a seven-year service-learning initiative that integrated biodiversity study with educational practice at UCC India. This initiative aimed to evaluate the impact of these efforts on student learning, campus biodiversity, and community awareness. Throughout the course of the initiative, various activities were implemented to enhance biodiversity on campus. These included planting native species, creating habitats for local wildlife, and organizing workshops to educate students and community members about the importance of biodiversity (Puri, & Joshi, 2017). The revival of traditional knowledge systems play a crucial role in this process, as it allowed participants to reconnect with their cultural heritage while promoting sustainable practices (Pai, et. al., 2025).

Students attained increased awareness of environmental issues and a greater appreciation for biodiversity (Bergman, 2016). Furthermore, the initiative was expected to foster a sense of community among participants, as they collaborate on projects and share their knowledge and experience.

In terms of campus biodiversity, the "Campus as Garden" initiative led to a noticeable increase in plant diversity and the establishment of healthy ecosystems. The cultivation of RET species contributed to the overall ecological balance of the campus, while the creation of fruit tree gardens provided valuable resources for both the campus community and local wildlife.

By integrating academic knowledge with practical application, this initiative has its objective to restore the campus environment, empowering the students and the community to be active participants in conservation efforts. As we move forward in the Anthropocene epoch, it is imperative that educational institutions continue to embrace their role as stewards of biodiversity and champions of environmental education.

Methodology

The project adopted an interdisciplinary, experiential learning model that integrated classroom instruction with hands-on fieldwork. Key methodological steps included:

- **Classroom Learning:** Sessions led by botanists provided foundational knowledge about plant biology, taxonomy, and ethnobotany.
- **Field Visits & Plant Collection:** Students conducted supervised explorations of the campus to collect and identify plant species.
- **Literature Review & Herbarium Studies:** Collected specimens were compared with existing literature and preserved in a developing campus herbarium.
- **Data Processing:** Plant data were analyzed for seasonal availability, utility (medicinal, edible, etc.), and public awareness.
- **Reflective Learning:** Students engaged in written and oral reflections to connect theoretical knowledge with real-world biodiversity.

Each year, students focused on a unique thematic area—such as beneficial trees, types of vegetation, herbal medicine, or phytochemical constituents—allowing for diverse exploration and deeper learning.

Results and Discussion

The biodiversity study documented 490 plants within the campus. The availability of plant species on campus revealed that 44.56% of the species were accessible year-round, while 52.17% were seasonally available, excluding the summer months. Additionally, 3.27% of the species were restricted to the monsoon period.

In terms of plant utilization, it was found that 40.22% of the documented species were used by local populations for herbal medicines. Furthermore, 9.2% of the species were identified as edible. Notably, 44.56% of the species were either unknown or neglected by local users, indicating a significant gap in ethnobotanical knowledge within the community.

These findings underscore a pressing need to preserve and promote awareness of plant resources, particularly in regions where access to formal healthcare is limited.

This long-term campus greening initiative demonstrates the power of integrating environmental education with active student participation. The project enabled liberal arts and science students to experience biodiversity directly in their learning environment. The integration of biodiversity studies into the campus setting provided liberal arts and science students with direct, experiential learning opportunities that significantly enriched their academic engagement. Unlike conventional classroom-based instruction, the program allowed students to interact with diverse plant species in their natural habitat, fostering a deeper understanding of ecological concepts, plant taxonomy, and ethnobotanical practices. This hands-on exposure bridged the gap between theory and practice, enabling students to contextualize their knowledge within real-world environmental challenges and solutions. For liberal arts students, who may not typically engage with field-based scientific inquiry, the initiative opened new avenues for interdisciplinary thinking—linking biodiversity with cultural heritage, sustainability ethics, and indigenous knowledge systems (Mazzocchi, 2020). Science students, on the other hand, gained practical skills in species identification, herbarium techniques, ecological data analysis, and field documentation. These experiences cultivated a sense of environmental stewardship and scientific curiosity, reinforcing the importance of biodiversity conservation not just as a scientific endeavor, but as a shared societal responsibility (Al-Barakat et. al. 2025). Furthermore, collaborative learning among students from diverse academic backgrounds promoted peer-to-peer knowledge exchange and highlighted the value of integrating multiple perspectives in addressing environmental issues (Altınay, 2017). Overall, the project demonstrated the transformative potential of campus-based biodiversity initiatives in fostering holistic, socially relevant education.

Understand traditional and local uses of plant resources

Through field-based learning, interactions with local communities, and guided sessions with subject experts, students were introduced to the ethnobotanical significance of various plant species present within the campus. Many of these plants, though commonly found, were often overlooked in mainstream academic curricula. Students learned that a substantial proportion of the flora—particularly herbs, shrubs, and trees—are integral to local healing practices, dietary supplements, and cultural rituals.

The documentation of medicinal and edible uses of plants, some of which are passed down orally through generations, revealed the depth of indigenous knowledge systems and their relevance to contemporary healthcare challenges, especially in rural and tribal regions where modern medical facilities may be limited. By linking botanical knowledge with community practices, the students gained insights into the socio-cultural dimensions of biodiversity (Schunko, Stagg & Dünser, 2025). This understanding helped to bridge the disconnect between scientific knowledge and traditional wisdom, promoting respect for local knowledge holders and supporting the broader goals of biocultural conservation.

Furthermore, the activity cultivated critical thinking about the sustainability of resource use, conservation ethics, and the need to preserve traditional knowledge in the face of rapid urbanization and cultural erosion.

Gain insight into the interconnectedness of human and ecological systems

Another key learning outcome of the campus biodiversity initiative was the development of student insight into the interconnectedness of human and ecological systems. Through direct interaction with the local environment, students came to recognize that human well-being is deeply rooted in healthy ecosystems. The presence, loss, or degradation of plant biodiversity was not perceived merely as an ecological issue, but as a factor directly impacting livelihoods, nutrition, health, and cultural identity—particularly in communities dependent on natural resources (Kumar et. al. 2021).

The study of ethnobotanical practices further highlighted how traditional knowledge systems have evolved in close relationship with local flora, reflecting generations of observation, adaptation, and sustainable use. For instance, the identification of plants used in herbal medicine or seasonal diets provided concrete examples of how ecological resources support not just physical health but also social resilience and economic sustainability.

This awareness extended to global challenges as well, such as climate change, deforestation, and biodiversity loss, positioning students to think critically about the ripple effects of environmental decisions. By understanding the feedback loops between ecological degradation and human vulnerability—especially in disaster-prone or marginalized regions—students were better equipped to appreciate the urgency of conservation and the value of integrated, systems-based approaches to sustainability (Dominelli, 2023). For international students, the experience was particularly enriching, offering visual and contextual understanding of plants they may encounter only as processed products in their home countries.

The interdisciplinary, inclusive approach supported the goals of environmental sustainability and encouraged the adoption of SDG-aligned practices in education. Furthermore, the presence of RET species on campus has sparked interest in conservation among both academic and non-academic stakeholders.

Conclusion

The initiative at UCC India highlights how campuses can become living laboratories for biodiversity education and environmental stewardship. By transforming a post-disaster campus into a thriving garden, students and faculty not only restored ecological balance but also engaged meaningfully with the broader community.

This model shows that even low-cost, locally driven efforts can foster environmental awareness, preserve traditional knowledge, and contribute to global sustainability goals. The inclusion of service-learning as a pedagogical tool amplified student motivation and created opportunities for cross-cultural learning and community collaboration.

Recommendations

Based on the outcomes and reflections from this project, the following recommendations are proposed:

- **Institutionalize Biodiversity Education:** Incorporate biodiversity and ethnobotany modules across disciplines.
- **Scale Up Service-Learning Models:** Encourage other institutions to adopt biodiversity-based service learning as part of their sustainability agenda.
- **Enhance Community Involvement:** Facilitate active participation of local communities in biodiversity documentation and conservation.
- **Develop Biodiversity Registers:** Maintain updated records of campus flora to monitor changes and ensure conservation.
- **Seek Policy Integration:** Align campus biodiversity efforts with regional and national biodiversity strategies.

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