Reimagining Plant Taxonomy Education Through Campus-Based Experiential Learning

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Abstract
Plant taxonomy is a fundamental discipline in biological sciences, yet it is often perceived by students as abstract, complex, and disconnected from real-world application. In recent years, experiential learning strategies have gained prominence as effective approaches to enhance engagement and understanding in science education. Among these strategies, campus tours conducted as on-site field studies represent a highly accessible, cost-effective, and impactful pedagogical tool. This review article examines the role of campus tours in plant taxonomy education, with particular emphasis on program planning and initial arrangements, conduct of the program, post-program evaluation, pedagogical understanding, community benefits, conservation awareness, and innovation. The review further analyzes the complementary roles of institutional management, faculty members, and students in ensuring the success of such initiatives. Drawing upon existing literature and case-based evidence from higher education contexts, the article highlights how campus-based field studies not only improve conceptual clarity and student enthusiasm but also foster environmental stewardship and community engagement. The review concludes by proposing an integrated framework for implementing campus tours as a sustainable educational practice that aligns academic objectives with institutional greening and biodiversity conservation goals.
Keywords: Plant taxonomy, campus tours, experiential learning, field studies, conservation education, campus biodiversity, higher education pedagogy

1. INTRODUCTION

Plant taxonomy provides the scientific foundation for understanding plant diversity, classification, nomenclature, and evolutionary relationships. It plays a crucial role in fields such as ecology, agriculture, forestry, environmental management, and conservation biology. Despite its significance, plant taxonomy faces declining student interest across many higher education institutions. Students often perceive taxonomy as difficult, static, and heavily reliant on memorization of morphological terms and classification systems (Eslit, 2025).

Conventional classroom-based teaching methods, dominated by lectures, diagrams, and preserved specimens, often fail to convey the dynamic and contextual nature of plant diversity (Shotemirovna, 2025). As a result, learners may struggle to relate theoretical knowledge to real-world plant identification and ecological understanding. These challenges have prompted educators to seek alternative pedagogical strategies that promote active learning and student engagement.

Experiential learning, particularly through field-based education, has emerged as a powerful approach in biological sciences. Field studies allow learners to interact directly with living organisms in their natural or semi-natural habitats (Uetz, Clark & Stoffer, 2022), thereby enhancing observational skills, conceptual clarity, and long-term retention of knowledge. However, extensive off-campus field trips can be limited by logistical constraints, financial costs, time availability, and safety concerns.

University campuses, which often host a wide range of native and cultivated plant species, provide an underutilized yet highly effective platform for field-based learning. Campus tours designed as structured on-site field studies can transform institutional green spaces into living laboratories for plant taxonomy education (Gunnels, et. al., 2021). This review article explores the multifaceted role of campus tours in plant taxonomy studies, emphasizing pedagogical processes, institutional responsibilities, student participation, and broader societal benefits.

2. Plant Taxonomy Education and the Need for Experiential Approaches

2.1 Challenges in Teaching and Learning Plant Taxonomy

Plant taxonomy involves the identification and classification of plants based on morphological, anatomical, and sometimes molecular characteristics. While intellectually rigorous, the subject is often perceived by students as dry and overly theoretical. The extensive use of technical terminology, dichotomous keys, and taxonomic hierarchies can overwhelm learners, particularly when concepts are introduced without sufficient contextual grounding (McComas, 2013).

Another challenge lies in the limited exposure to living plants. Herbarium specimens, though essential, represent static samples that lack ecological context. Seasonal variation, growth habits, phenotypic plasticity, and plant–environment interactions are difficult to convey within laboratory settings alone (Willis, et. al., 2017).

2.2 Experiential Learning as a Pedagogical Solution

Experiential learning theory, as articulated by educational theorists such as Kolb (2013), emphasizes that meaningful learning occurs through a continuous cycle of direct experience, reflection, conceptualization, and application. Rather than treating learners as passive recipients of information, experiential learning positions students as active participants who construct knowledge through engagement with real-world situations (Swenson, Greiman & Nelson, 2018). This approach is particularly relevant to the teaching and learning of plant taxonomy, a discipline that relies heavily on observation, comparison, and interpretation of living organisms.

In the context of plant taxonomy, experiential learning enables students to observe diagnostic characters in living plants (Chien, et.al., 2019), which is often difficult to achieve through textbooks or preserved specimens alone. Features such as leaf arrangement, venation patterns, inflorescence types, floral symmetry, and fruit morphology are more clearly understood when examined in situ. Direct observation of living plants also allows students to appreciate variation within species, seasonal changes, and developmental stages, thereby strengthening their taxonomic reasoning skills.

Another important advantage of experiential learning is the opportunity it provides for students to compare closely related species in natural settings (Jose, Patrick & Moseley, 2017). When students encounter multiple species from the same genus or family growing within a shared environment, they are better able to identify subtle morphological differences that distinguish one taxon from another. Such comparative analysis enhances critical thinking and reduces reliance on rote memorization. Through repeated field exposure, students gradually develop confidence in using diagnostic characters and taxonomic keys, which are essential skills for botanical studies.

Experiential learning also facilitates a deeper understanding of habitat-specific adaptations (Preston, Patrick & Acharya, 2026). Plants do not exist in isolation; their morphology and physiology are shaped by environmental factors such as soil type, moisture availability, light intensity, and human disturbance. Campus-based field studies allow students to observe how different species adapt to varying microhabitats, such as shaded gardens, open lawns,

roadside plantations, or waterlogged areas. This contextual learning helps students link form and function, reinforcing the ecological relevance of taxonomic traits.

Furthermore, experiential learning encourages students to connect taxonomic knowledge with broader ecological and conservation perspectives (Hix, 2015). By observing plant diversity within a familiar campus environment, students begin to recognize the ecological roles of different species and their contribution to ecosystem stability. This awareness often leads to discussions on biodiversity conservation, invasive species management, and sustainable landscaping practices. As a result, taxonomy is no longer viewed as an isolated academic subject but as a foundational discipline with real-world applications.

Campus tours align closely with experiential learning principles (Parr, & Trexler, 2011). by offering repeated, low-cost, and accessible exposure to plant diversity within a familiar environment. Unlike distant field excursions, campus tours can be conducted regularly, allowing students to revisit species and observe seasonal changes. The familiarity of the campus setting reduces anxiety and encourages active participation, while the low logistical demand makes the approach sustainable for institutions. Through such on-site field experiences, campus tours effectively operationalize experiential learning theory in plant taxonomy education, promoting deeper understanding, sustained interest, and environmentally responsible attitudes among students.

3. Campus Tours as On-Site Field Studies

3.1 Concept and Rationale

Campus tours, when systematically structured as academic activities, represent a purposeful and pedagogically sound approach to on-site field-based learning. Unlike informal or recreational walks, academically oriented campus tours are designed with clearly defined learning objectives, aligned with curricular requirements in plant taxonomy, ecology, and environmental science. These tours involve guided exploration of campus vegetation, enabling students to observe, analyze, and interpret plant diversity within a real and familiar setting. By transforming the campus into a living laboratory, such tours bridge the gap between theoretical instruction and practical application.

The conceptual foundation of campus tours lies in experiential and place-based learning theories, which emphasize learning through direct interaction with the environment. Campus vegetation often includes a wide variety of plant taxa such as native species, ornamentals, medicinal plants, trees, shrubs, climbers, and grasses. This diversity provides ample opportunities for teaching diagnostic morphological characters, plant family characteristics, ecological associations, and functional adaptations. As a result, campus tours support interdisciplinary learning by integrating taxonomy with ecological and environmental perspectives.

One of the primary rationales for campus-based field studies is accessibility and convenience **(**Pan, et. al., 2025). Since the learning environment is located within the institution, students and faculty can engage in field studies without the time constraints and safety concerns often associated with off-campus excursions. This ease of access allows for flexible scheduling and frequent field exposure, which is essential for reinforcing learning and building observational skills.

Another significant advantage is the reduction of financial and logistical constraints **(**Williamsson, 2022). Traditional field trips require transportation, accommodation, permissions, and additional funding, which may limit participation or frequency. Campus tours, by contrast, utilize existing institutional resources and require minimal expenditure. This makes them inclusive and sustainable, particularly for institutions with large student populations or limited budgets.

Campus tours also provide opportunities for repeated observations across seasons (Peacock, Mewis, & Rooney, 2018), a critical aspect of botanical education. Seasonal changes in flowering, fruiting, and vegetative growth can be observed directly, allowing students to understand plant life cycles and phenological patterns. Repeated visits enhance retention and deepen understanding.

Finally, campus-based field studies facilitate the integration of theory with practice (Nayagam, 2025). Concepts introduced in classrooms—such as morphological terminology, taxonomic keys, and ecological adaptations—are reinforced through direct observation. This integration enhances conceptual clarity, encourages active learning, and helps students appreciate the relevance of plant taxonomy in real-world contexts.

4. Initial Arrangements for Campus Tour Programs

4.1 Planning and Coordination

Effective campus tour programs depend on systematic planning and thoughtful organization, even though the overall effort involved is considerably lower than that required for off-campus field trips. Proper initial arrangements ensure that the academic objectives of the tour are met and that students derive maximum educational benefit from the activity. Planning also helps in maintaining consistency, safety, and alignment with curricular goals.

The first step in organizing a campus tour involves the identification of suitable campus locations that support diverse plant species (Kusumawardani, Muzzazinah, & Ramli, 2019) Most campuses include gardens, roadside plantations, lawns, arboretum sections, and semi-natural green spaces. Faculty members must survey these areas in advance to document plant diversity and select locations that represent a wide range of taxa, growth forms, and ecological conditions. Such diversity enables comprehensive coverage of taxonomic concepts and morphological variations during the tour.

The selection of plant groups aligned with syllabus requirements is another critical component of initial planning. Rather than attempting to cover all available species, faculty members strategically choose representative taxa that illustrate key families, genera, and diagnostic characters relevant to the course content. This targeted approach ensures that the campus tour directly reinforces classroom instruction and examination-oriented learning outcomes, thereby enhancing its academic relevance.

Scheduling the tours to coincide with flowering or fruiting seasons significantly improves the effectiveness of plant taxonomy instruction (Buck, et. al., 2019). Reproductive structures are essential for accurate identification and classification, and their availability varies seasonally. Careful scheduling allows students to observe flowers and fruits in their natural state, facilitating a better understanding of floral morphology, inflorescence types, and fruit characteristics.

Finally, coordination between faculty members and institutional authorities is essential for the smooth conduct of campus tours (Welsh, & Metcalf, 2003). Administrative support ensures access to campus green spaces, avoids conflicts with other activities, and promotes long-term protection of campus vegetation. Such coordination also strengthens institutional commitment to experiential learning and biodiversity conservation, contributing to the sustainability of campus tour programs.

4.2 Resource Utilization

Campus tours as an instructional strategy in plant taxonomy are particularly effective because they primarily rely on existing institutional resources (Ratnayaka, 2017), making them both sustainable and easily scalable across diverse educational settings. Unlike conventional field excursions that demand extensive infrastructure, travel arrangements,

and financial investment, campus-based field studies capitalize on resources that are already available within most higher education institutions.

The most significant resource supporting campus tours is campus flora itself. University campuses typically host a rich assemblage of plant species, including ornamental trees, shrubs, medicinal plants, lawns, climbers, and, in many cases, native or semi-natural vegetation. This diversity provides ample material for teaching taxonomic principles such as plant families, morphological variation, growth habits, and ecological associations. Since these plants are permanently available, they allow repeated observation across seasons, supporting continuous learning and long-term engagement without additional cost.

Faculty expertise forms the intellectual backbone of campus tour programs. Experienced faculty members in botany, taxonomy, or environmental science guide students in identifying diagnostic characters, interpreting morphological traits, and understanding taxonomic relationships. Faculty-led discussions help bridge theoretical knowledge with field observations, ensuring academic rigor while maintaining an interactive learning environment. Importantly, faculty involvement does not require specialized training beyond existing disciplinary expertise, making implementation feasible across institutions (Kusumawardani, Muzzazinah, & Ramli, 2019).

The use of simple field tools further enhances the practicality of campus tours. Basic equipment such as hand lenses, notebooks, pencils, and standard identification keys is sufficient for effective learning. These tools encourage students to observe carefully, record findings, and engage actively with plant material. In contrast to advanced laboratory instruments, such tools are inexpensive, durable, and easy to maintain, ensuring long-term usability.

The reliance on these readily available resources makes campus tours financially viable, environmentally sustainable, and adaptable to varying institutional capacities. Even colleges with limited budgets can implement campus-based field studies without compromising educational quality. As student numbers increase, the approach remains scalable, reinforcing campus tours as an inclusive and long-term solution for experiential learning in plant taxonomy

5. Conduct of the Campus Tour Program

5.1 Structure of the Field Study

The effective conduct of a campus tour as an on-site field study requires a structured yet flexible instructional approach that promotes active learning while maintaining clear academic focus. Although conducted in an informal outdoor setting, a well-organized campus tour follows a systematic sequence that enhances student engagement and ensures alignment with learning objectives in plant taxonomy.

The program typically begins with an introduction to the objectives and expected learning outcomes. Faculty members outline the purpose of the tour, the taxonomic concepts to be covered, and the skills students are expected to develop. This orientation helps students understand the relevance of the activity and prepares them mentally to observe, analyze, and interpret plant characteristics. Clearly stated objectives also encourage students to take ownership of their learning during the tour.

Following the introduction, the tour proceeds with guided observation of selected plant species. Faculty members lead students through designated campus locations, drawing attention to representative plants that illustrate key taxonomic groups or morphological traits. Students are encouraged to observe plants in their natural growth form, noting features such as habit, leaf arrangement, venation, and reproductive structures. This guided observation forms the foundation for experiential learning by allowing students to directly engage with living specimens.

A crucial component of the tour is the demonstration of morphological characters used in taxonomy. Faculty members explain diagnostic features in situ, such as floral symmetry, inflorescence types, ovary position, and fruit morphology. Demonstrating these characters on living plants helps students translate theoretical descriptions into practical understanding, reducing confusion associated with abstract terminology.

The tour also emphasizes interactive questioning and discussion, creating a dialogic learning environment. Students are encouraged to ask questions, share observations, and compare interpretations. This interaction promotes critical thinking and reinforces conceptual clarity through peer and instructor feedback.

Finally, students are encouraged to attempt plant identification independently or in small groups using morphological clues and identification keys (Buck, et. al., 2019). Such student-led identification attempts build confidence, enhance analytical skills, and shift the learning process from teacher-centered instruction to active student participation.

5.2 Student Engagement During the Program

Although students may contribute minimally to initial arrangements, their engagement during the program is often high. The informal, interactive environment encourages participation, curiosity, and peer learning. Students actively observe, compare, and discuss plant features, leading to deeper understanding.

6. Post-Program Evaluation and Feedback

6.1 Assessment of Learning Outcomes

Post-program evaluation is a critical component of campus tour–based learning, as it provides systematic insight into the effectiveness of the activity, student learning outcomes, and areas for improvement. Unlike traditional classroom assessments, evaluation following experiential learning activities must address both cognitive and affective domains, capturing changes in understanding, skills, and attitudes toward plant taxonomy.

One commonly used method is the administration of feedback questionnaires. These questionnaires allow students to share their perceptions of the campus tour, including clarity of concepts, level of engagement, relevance to the syllabus, and overall satisfaction. Structured questionnaires using Likert-scale items can quantify student responses (Ivanov, Ivanova, & Saltan, 2018), while open-ended questions provide qualitative insights into individual experiences. Such feedback helps educators assess the impact of the program and refine future tours.

Reflective writing assignments represent another effective evaluation tool. Through reflective journals or short essays, students articulate what they observed, learned, and felt during the campus tour. Reflection encourages learners to connect field experiences with theoretical knowledge, reinforcing conceptual understanding. It also allows students to critically evaluate their learning process, identify challenges, and recognize personal growth in observational and analytical skills.

Group discussions conducted after the tour facilitate collective reflection and peer learning (Bold, 2008). During these discussions, students share observations, clarify doubts, and compare interpretations of plant characteristics. Faculty members can assess comprehension through student responses and address misconceptions immediately. Group discussions also promote collaborative learning and help students appreciate diverse perspectives.

Finally, informal assessments of identification skills provide direct evidence of learning outcomes (Looney, & Santibañez, 2021). Faculty members may ask students to identify selected plants, explain diagnostic characters, or classify species into appropriate families. These informal assessments, conducted without the pressure of formal examinations, allow instructors to gauge practical understanding and skill development. Together, these

evaluation methods ensure a comprehensive assessment of the educational value of campus tours and support continuous improvement of experiential learning practices.

6.2 Student Perceptions and Satisfaction

Students often report increased enthusiasm and confidence in plant identification following campus tours. Many express support for the continuation and expansion of such programs, recognizing their value in making learning enjoyable and meaningful.

7. CONCLUSION

Campus tours conducted as on-site field studies represent a powerful, innovative, and sustainable approach to plant taxonomy education. By integrating planning, effective implementation, post-program evaluation, and institutional collaboration, campus tours enhance pedagogical understanding while fostering conservation awareness and community engagement. The complementary roles of management, faculty, and students are essential for maximizing the impact of such programs. As higher education institutions seek to align academic excellence with environmental responsibility, campus-based field learning emerges as a vital strategy for revitalizing plant taxonomy education and nurturing environmentally conscious citizens.

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