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EDITORIAL

Methodologies for investigating and fostering plant awareness

1 | INTRODUCTION

As organisers of a symposium in Vienna, Austria, in August 2023, we recognised the need for an interdisciplinary review of the different approaches used to examine plant awareness. In doing so, we were interested in exploring and deepening discourses focused on research methods for this field of enquiry. The symposium led to a call for this special collection. In making the call, we acknowledge that the broad field 'plant awareness' can be seen as missing "a comprehensive mapping of measurement tools, operationalizations, methods and research designs" (Brkovic et al., 2025), to build on a literature review by Stagg and Dillon (2022) about methods and operationalisations utilised in research about human-plant relations. However, there appears to be a lack of methodological reflection in this research field (apart from some notable exceptions considered in later sections), and over-reliance on a limited range of methods, particularly the use of self-reported items. Hence, the motivation for both the symposium, and this special collection, stems from the question: What are the methodologies used for investigating plant awareness, and what are their relative affordances and constraints for advancing our understanding of this phenomenon?

2 | ADDRESSING WEAKNESSES IN THE PLANT AWARENESS CONSTRUCT

Critically, a lack of validated constructs has been an obstacle for the field, resulting in a disparate set of constructs at different levels (see, for example, discussions in Dünser et al., 2025, Brkovic et al., 2025). A construct needs to be a coherent suite of interacting affective, cognitive and behavioural variables, where measurements yield consistent results across different points of time and with different populations (Fried, 2017). Proposed plant awareness constructs include those proposed by Pany et al. (2022) and Parsley et al. (2022). Other instruments (focusing on plant blindness) include those proposed by Fančovičová and Prokop (2010), Batke et al. (2020), Amprazis and Papadopoulou (2020), as well as Kubiatko et al. (2021).

Many of these fall short of the effective practice recommendations for construct definition, design and validation as defined by Lambert and Newman (2023). Common faults include a failure to draw on established psychological definitions for component variables, disparities and blurring between variable definitions and measurement scales or items, an over-reliance on self-reported items, a lack of actions to mitigate response and desirability biases and reliance on an overly low number of response items, with no assessment of internal consistency between scale items.

We know that a construct tends to be complex. A key challenge is the inter-relatedness between the different variables in the construct and how you tease apart their different effects (Lambert & Newman, 2023). In plant awareness, there are inevitably variables that are not explicitly mentioned that contribute to the 'end result'. What you measure, and what you find out, can also be influenced by which sets of knowledge and skills are investigated, for example, identification skills versus conceptual understanding of plant processes. Stagg et al. (2025) recently proposed a framework to explain the theoretical underpinnings for the component variables of plant awareness from an educational perspective. We hope this collection of papers will function as a catalyst for a better focus on the *dimensions* of constructs operating at the centre of contemporary, and future, work on plant awareness. In addition, Amprazis and Papadopoulou (2025) open a discussion on the role of competency frameworks in relation to fostering plant awareness connected to education for sustainability. In their paper, they provide an argument for this approach based on a specific set of competencies. Importantly, in presenting their framework, they warn educators that they 'must be mindful of their choices when using the ESD framework to enhance plant awareness, ensuring they avoid a purely utilitarian view of plant life', a warning that echoes Knapp's concerns when she asked if 'humans are really blind to plants' (Knapp, 2019). In her article, she suggests, "usefulness is often a criterion for inducing care and attention—you want to save something because it will come in handy one day". However, she also warns "focusing our attention on plants that are useful to us today lures us into a utility trap; and is unlikely to overcome plant blindness on its own" (Knapp, 2019).

3 | CHALLENGING FAMILIAR WAYS OF THINKING BY BUILDING BRIDGES

Different disciplines often have specific ways of thinking. Knowing this provides an argument for methodological engagement to take place more closely *across* disciplines, especially, in the case of plant

awareness across the disciplines of psychology and ethnobotany (Schunko et al., 2025), arts-based research (McGinn et al., 2025; Snæbjörnsdóttir et al., 2020) and educational sciences. Sõukand et al. (2025) propose in their paper a novel, language-based method for assessing plant awareness by analysing how individuals describe and recall plants using eco-semiotic and quantitative linguistic perspectives. Of note here, are also recent psychology papers in plant awareness that bring much to the debate, e.g., Zani and Low (2022), Guerra et al. (2024). Furthermore, we suggest that researchers tend to view Wandersee and Schussler's (1999, 2001) works on 'plant blindness' as the theoretical origin of this field and hence ignore other historically relevant methodological papers, for example, Tull (1994) and Katz (1989), both of whom utilised methods drawn from ethnobotany and ethnography.

Plant awareness has been examined by a variety of disciplinary fields e.g., natural sciences, educational sciences, psychology, but from different perspectives and theoretical positions, ideologies and epistemologies. Different disciplines draw on various landmark studies, often in a haphazard way where it is not always the most pertinent study that is drawn on, due to the authors' limited knowledge of a field that is not their own. Schunko et al. (2025) is one attempt to address these disconnects, specifically between educational researchers and ethnobotanists, by providing tangible examples and opportunities for interdisciplinary cooperation between researchers in these disciplines. Incorporating intangible cultural relationships with plants, as explored in the Catalan Pyrenees by Querol i Mercadé et al. (2025), reveals the significance of spiritual, symbolic and place-based connections in shaping plant awareness beyond scientific literacy. Therefore, we suggest two actions to alleviate this issue: promote interdisciplinary collaborations and define a body of literature characterising the field.

4 | DEFINING LITERATURE TO CHARACTERISE THE FIELD

There is no specific *body of literature* formally recognised as central to the methodological basis of our field of interest. To consolidate methodological thinking on plant awareness, we could attempt, in consultation with the global research community, to propose a collection of landmark studies for this area (see, for example, in ecology, Grubb & Whittaker, 2013), in ways that capture the depth and breadth to which diverse disciplines have explored plant awareness from respective perspectives. This could, perhaps, help to highlight the varied disciplines that have made important contributions beyond the natural and educational sciences, e.g., critical plant scholars from the humanities (e.g. Ryan, 2012) and research originating from the field of human geography (e.g., Head et al., 2014; Hitchings & Jones, 2004).

5 | VISUAL AND ARTS-BASED METHODS

We see the current methodological problem in the plant awareness field as an over-reliance on a small number of quantitative methods (especially questionnaires, using self-report items with rating scales). Mixed methods and qualitative approaches have the benefits of being more appropriate for exploratory research where you do not yet fully know the possible variables and provide 'depth' to complement the 'breadth' that quantitative methods offer.

Three of the papers in this special collection use visual (Eugenio-Gozalbo et al., 2025; Linderwell et al., 2025) and arts-based approaches (McGinn et al., 2025). In the symposium, we also had a workshop on arts-based approaches in which it was stated by one presenter that the use of artworks in a research project provided frames and affordances that helped humans to connect to plants on perceptual, emotional and scientific levels (Snæbjörnsdóttir et al., 2020). Using student-generated plant drawings, Linderwell et al. (2025) uncover how socio-cultural and educational backgrounds influence learners' mental models of plants, offering a visual, reflective pathway to assess and reshape plant perceptions.

The emotional elements of art-based work are also discussed by McGinn et al. (2025) in this collection. They found that an art-based participatory approach 'underscored the ability of plants to act as memory anchors, providing lasting connections to places and people from the past'. Thus, art-based methods can be seen as affording contributions to the affective range of impacts possible between plants and humans. This arena has been recognised as a significant area for exploration in recent work both within and beyond this special collection.

6 | PEDAGOGICAL INTERVENTIONS

Two contributions in this collection illustrate innovative pedagogical strategies for fostering plant awareness in educational contexts. Krosnick and Moore (2025) present a design-based research study that explores the integration of herbaria into secondary school teaching. Their 10-module curriculum invites students to engage with the full botanical process – from selecting culturally meaningful plants to collecting, pressing, identifying and digitising specimens for a herbarium. This iterative, collaborative approach, developed alongside educators and scientists, is rooted in authentic scientific practice and positions herbaria as dynamic educational tools rather than static repositories. The study exemplifies how design-based research can effectively bridge the gap between theory and classroom application by continuously refining educational interventions based on empirical feedback.

In contrast, Eugenio-Gozalbo et al. (2025) propose a more introspective, learner-centred method by utilising mind maps as an alternative assessment tool to capture the multidimensional nature of plant awareness in pre-service teachers. Through open-ended visual mapping, students express not only conceptual knowledge but also emotional and associative understandings of plants. This method provides educators with rich diagnostic insights while offering learners a metacognitive space to reflect on their botanical experiences. Unlike standardised tests, mind maps surface the implicit affective and relational dimensions of plant awareness that often remain hidden in quantitative assessments.

Furthermore, the Botanical University Challenge initiative presented by Hall et al. (2025) demonstrates how gamified, collaborative activities can foster botanical engagement and community-building among students, especially in higher education settings. This effort reflects an innovative, informal approach to plant awareness that empowers young scientists across institutions. Together, these studies underscore the value of pedagogical designs that prioritise student agency, emotional engagement and contextual relevance. Whether through embodied, place-based interactions with plants or reflective visual representation, both approaches demonstrate that fostering plant awareness is not merely about knowledge acquisition but also about cultivating meaningful relationships with plants.

7 | FUTURE OUTLOOK

The validated construct and nomological map presented by Dünser et al. (2025) offers nodes of connection to inform current and future work. Brkovic et al. (2025) call for the need to conduct 'large scale questionnaire-based research that would allow for testing measurement models with plant awareness aspects as distinct sources of individual differences' which would, they note, "contribute a stronger theoretical positioning of plant awareness in the broader field of sustainability issues" (Brkovic et al., 2025). This work could complement, and embed, the competency frameworks offered by Amprazis and Papadopoulou (2025). Krosnick and Moore (2025) demonstrate in their study that design-based research based on specific and measured teaching interventions has a pedagogical role to play in deepening plant awareness studies in educational contexts.

Methodological and theoretical connectivity and positioning, is, we believe, essential to the development of the field. It is also important to think about the methodological gaps the contributions in this collection have *not* addressed so that researchers might plan for future investigations. We would especially like to see more research studies that consider disciplinary lenses beyond natural sciences and education, and we were encouraged by papers in this collection that explored methodological approaches that extend these paradigms.

Within this editorial we wish to collect your ideas on the literature concerning plant awareness that informs your research. If you wish to participate, please select this link and complete the survey: https://sosci.univie.ac.at/PA-Literature/.

AUTHOR CONTRIBUTIONS

DS, PP and BS conceptualised the paper. DS wrote the main body of the paper. PP wrote the section on pedagogical interventions. Both PP and BS commented on and added to other sections. ChatGPT was used to generate a first draft of the graphical abstract text.

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The authors declare no conflict of interest.

DATA AVAILABILITY STATEMENT

Data sharing not applicable to this article as no datasets were generated or analysed during the current study.

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