Cultivating Belonging, Agency and Biodiversity: Transformative Learning in a Women*-Led Community Garden

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Abstract: This paper examines community gardens as socio-material learning environments that enable transformative learning under conditions of social inequality. Drawing on a participatory action research case study from the Horizon Europe project PLANET4B in Graz, Austria, we analyse the co-creation of a women*-led community garden (*GAIA Gartenberg*) within the framework of a *Bio-/Diverse Edible City*. The initiative involved women* experiencing intersecting forms of marginalisation and was intentionally designed as an inclusive, low-threshold, and care-oriented learning space. Building on transformative learning theory and informed by feminist STS perspectives, the analysis traces how learning emerged through relational, affective, and embodied practices rather than solely through cognitive knowledge transfer. Empirically, the paper reconstructs the gradual formation of a learning community through phases of contextualisation, trust-building, experiential co-creation, and the transition toward collective stewardship. Participatory and arts-based methods enabled participants to engage with biodiversity and diversity as lived and situated concerns embedded in everyday practices such as gardening, food, and collective decision-making. The findings highlight the central role of facilitation, brave spaces, and supportive institutional conditions in fostering agency, belonging, and response-ability. We argue that community gardens, when understood as socio-material infrastructures rather than solely as food-producing sites, can support transformative learning processes that connect personal change with broader socio-ecological transformation, while remaining highly context-dependent.

Keywords: Transformative learning, Co-creation, Community gardening, BIODIVERSITY, INTErsectionality

1. Introduction

In recent years, increasing attention has been directed toward educational initiatives addressing ecological crises such as climate change and biodiversity loss. Many of these initiatives aim to promote behavioural change by encouraging more sustainable lifestyles and consumption patterns. Yet, despite growing awareness, a persistent discrepancy remains between individuals' values and their actual behaviours. This so-called *knowing–doing gap*, or *attitude–behaviour/value–action gap*, has been extensively examined in environmental psychology (Bentler et al., 2023).

STS and feminist scholars have long argued that such gaps cannot be understood solely as cognitive failures but must be analysed through the socio-material and affective conditions that shape possibilities for action (Haraway, 1988; Suchman, 2007). From this perspective, knowledge, agency, and behaviour emerge through relations among bodies, infrastructures, tools, institutional arrangements, and more-than-human actors. The focus thus shifts from individual deficits to the relational, material, and political conditions that enable or constrain engagement with ecological issues, including structural inequalities, institutional path dependencies, and symbolic orders that shape participation and whose knowledge counts (Jasanoff, 2004).

Against this backdrop, the article examines the *Bio-/Diverse Edible City Graz* case study within the Horizon Europe project PLANET4B. The study employed a participatory action research approach and initiated learning communities (LC) at two interconnected scales. At the meso-level, a policy learning community engaged stakeholders from municipal administration, education, environmental sectors, social work, and the arts. At the micro-level, which represents the focus of this article, a community garden (*GAIA Gartenberg*) was co-created by and for women* from diverse backgrounds, many of whom were experiencing intersecting forms of marginalisation. Our analysis focuses on the conceptualisation and implementation of this co-created learning environment, exploring how biodiversity-related issues can become more accessible and meaningful within everyday contexts. We conclude with reflections on how researchers can design inclusive, experiential, and co-creative learning spaces that foster agency and support long-term socio-ecological transformation.

1.1 Inequalities in Access to (Edible) Urban Nature

The ecological and social value of urban green spaces has been widely recognised across urban planning, community development, and public health (Kumar et al., 2025). Ecologically, gardens and green corridors provide habitats for biodiversity (Goddard et al., 2010), mitigate urban heat (Bowler et al., 2010; Wang & Ren,

2025), improve air quality (Nowak et al., 2006), and enhance water retention critical for climate adaptation (Gill et al., 2007). In edible urban landscapes, they also support pollination and local food production (Lin et al., 2015).

Socially, green spaces promote physical and mental health (van den Bosch & Sang, 2017), facilitate informal learning (Adams & Branco, 2017), and strengthen social cohesion through participatory practices (Rogge et al., 2020). Community-managed spaces such as urban gardens can foster local identity, intercultural exchange, and empowerment, particularly among marginalised groups (Anguelovski, 2013; Ilieva et al., 2022).

However, access to these benefits is uneven. Urban green spaces are shaped by contested power relations and intersecting inequalities related to class, gender, migration status, and ability (Haase et al., 2017; Crenshaw, 1989). Beyond physical access, symbolic dimensions such as cultural practices, perceptions of safety, and senses of belonging are equally decisive (Steinwender et al., 2023). Even well-intentioned sustainability initiatives can reproduce exclusion or fuel green gentrification (Anguelovski et al., 2022), while shifting responsibility to citizen volunteers often mirrors broader neoliberal governance dynamics (Mayer, 2012). These tensions are especially pronounced in the context of edible cities.

1.2 The Bio-/Diverse Edible City

Urban food-related practices are described through a range of concepts, including urban gardening, urban agriculture, and the edible city. Among these, the edible city concept is particularly comprehensive. Edible City Solutions (ECS), as defined by Säumel et al. (2019), encompass diverse practices ranging from community and school gardens to rooftop farms, aquaculture, and high-tech forms of urban agriculture.

Beyond food provision, the edible city also functions as a narrative framework for urban transformation. Similar to the Transition Movement (Hopkins, 2008), it mobilises hopeful imaginaries of community-based sustainability (Barry & Quilley, 2009). Building on this idea, we introduce the concept of the "Bio-/Diverse Edible City", foregrounding both biodiversity ("bio") and social inclusion ("diverse"). Our focus on women* reflects persistent gendered inequalities and disproportionate exposure to material and social disadvantage (Statistik Austria, 2023). While food poverty has been analysed elsewhere (Lampl et al., 2024), this paper examines how the Bio-/Diverse Edible City, as both a material and narrative framework, can support deeper processes of learning and change through transformative learning.

1.3 Transformative Learning

Transformative learning (TL), introduced by Mezirow (1990; 2000), refers to processes of critical reflection that reshape individuals' frames of reference. Over time, TL has developed into a diverse field of theory and practice (Austrian Commission for UNESCO, 2024). It involves reconfiguring deeply embedded meaning structures that are often resistant to change (Schneidewind et al., 2016). Phase models typically describe TL as beginning with disorienting experiences, followed by reflection, dialogue, and experimentation, leading to new perspectives (Grund et al., 2024). These processes emphasise the relational and social dimensions of learning, challenging individualistic interpretations.

Situated within emancipatory pedagogies, TL also addresses systemic transformation by promoting participatory and experiential approaches that question dominant norms and support the co-creation of alternative futures. In sustainability contexts, emotions play a central role, requiring pedagogical spaces characterised by trust and supportive relationships (Grund et al., 2024).

Here, the concept of the "*brave space*" is particularly relevant (Arao & Clemens, 2013). *Brave spaces* invite learners to engage holistically, including with emotional and contradictory aspects, and support both personal and collective transformation (hooks, 1994). Co-created and flexible environments enhance agency and ownership (Casanova et al., 2023), embedding transformation in everyday practice (Singer-Brodowski, 2023). Trust, co-agency, and meaningful participation are therefore key conditions for transformative learning.

1.4 Community Gardens as Spaces for Transformative Learning

Community gardens are increasingly recognised as fertile spaces for transformative learning that engages cognitive, emotional, social, and ethical dimensions. Through experiential practices and collective decision-making, participants connect to local ecologies and food systems, develop critical awareness of social and environmental injustices, and build practical skills and ecological literacy (Mezirow, 2000; Aiken, 2016; Egerer et al., 2019). Their communal and dialogic character facilitates reflection, empowerment, and intergenerational learning, particularly in contexts where access to green spaces, healthy food, and participatory governance is limited (Okvat & Zautra, 2011; Pudup, 2008). As such, community gardens function as transformative learning

environments where knowledge is co-created through embodied interaction with land and community (Sipos et al., 2008).

2. Methodology

Our case study followed a participatory action research (PAR) approach that intertwined the co-creation of a community garden with iterative research interventions and continuous qualitative reflection. The methodological design was grounded in transformative learning theory and further informed by STS perspectives on co-production and care practices. In this paper, we reflect on the learning environment created through the *GAIA Gartenberg* community garden and on the learning processes.

2.1 Case study Description

2.1.1 Context: Urban gardening and the bio-/diverse edible city in Graz

In recent years, over 30 publicly accessible community gardens emerged in Graz, alongside an unknown number on private or semi-public housing estates. Most are community-driven or embedded in neighbourhood work initiatives and receive varying levels of municipal support under sustainable gardening guidelines. While food production is visible, these spaces primarily function as sites of social exchange and informal learning.

Although the idea of an "*Edible City Graz*" has been adopted by some municipal actors, including the Department of Green Spaces, implementation remains fragmented, and ecological and social dimensions are rarely integrated into a coherent strategy.

Against this backdrop, the PLANET4B case study was built on these local developments and prior action research on social access to green space (e.g. Social Gardening, RESISTIRÉ). We introduced the concept of the "*Bio-/Diverse Edie City Graz*" as both a guiding vision and a pilot intervention. The approach aimed to explore how ecological concerns, particularly biodiversity, can be meaningfully connected to social issues such as unequal access to food and green infrastructure.

To operationalise this approach, two interconnected learning communities (LCs) were established: a policy LC focusing on governance processes and institutional perspectives, and a citizens' LC centred on the co-creation of a women*-led community garden. This paper focuses on the latter.

2.1.2 Case study design and research implementation

The citizens' LC was implemented between March and September 2024 in Graz, Austria, and focused on the co-creation of the *GAIA Gartenberg* women's community garden, developed through close collaboration between IFZ researchers, practitioners from Forum Urbanes Gärtnern (FUG), and 10–15 participating women*. Weekly meetings were held on Fridays for three-hour sessions, primarily on-site and occasionally at a nearby community centre.

The garden was intentionally designed as a women*-only space and co-facilitated by pedagogically trained female gardeners from FUG. Facilitation was guided by principles of *brave spaces*, accessibility, and care. Weekly sessions combined gardening activities with collective decision-making, reflection exercises, shared meals, and structured research workshops addressing biodiversity, food systems, and diversity.

A series of structured research interventions was embedded in the ongoing gardening practice to support learning and generate empirical material. Initial community-building activities were led by FUG and expanded through co-creative research units. These included a nature experience stroll at the future garden site, storytelling, community mapping to identify needs and barriers (Taliep & Ismail, 2023), and socio-scientific inquiry workshops (e.g. on apple varieties; Zeidler & Kahn, 2014) addressing biodiversity, seasonality, labour conditions, and food system dynamics. An additional workshop focused on diversity, accessibility, and inclusion, linking personal experiences to broader questions of justice.

Co-creative processes were central to the study design. Participants jointly developed the garden design, established, e.g. a thematic Milpa or "Three Sisters" bed inspired by Kimmerer (2013), and collectively named the garden *GAIA Gartenberg*.

All weekly meetings followed a recurring structure of check-ins, gardening work, shared meals, reflective discussions, and check-outs (Krause et al. 2024). These elements functioned both as pedagogical tools and as integral components of the research design, enabling the generation of rich qualitative insights into learning processes, collaboration, and the socio-material dynamics shaping engagement with biodiversity.

2.1.3 Data sources

In addition to the methods implemented to address several aspects of biodiversity with the women's group as part of the case study, as described above, three methods for assessing our activities were conducted as a post-process evaluation.

First, we examined the reflection protocols and research notes from each meeting or gathering, as well as the associated research units held with the women's group. These protocols were initially created by the FUG team members, who guide the women* through the process. The IFZ research team contributed additional information when they participated, including notes from the debriefings conducted and documented immediately after each event.

Second, we conducted interviews with the women* (7 out of 15 participants) to explore their experiences, perceptions, and the outcomes of their engagement.

Third, we conducted three workshops involving members of both the policy LC and the citizens LC, using the '*Systematisation of Experiences*' method (Herout & Schmid, 2015). This method enabled individuals to reflect on shared experiences and learn collectively. Central to the method is recognising those who have actually lived the experience, aiming to create a space for sharing interpretations and feelings without fear or shame. Rather than merely extracting lessons, the method seeks to foster participatory and emancipatory learning, empower participants, and facilitate social transformation.

3. Results

The findings presented here trace the facilitated emergence of a learning community through urban gardening with women* in diverse and often precarious life situations. The findings are presented chronologically, highlighting key phases in the group's development: contextualisation and entry, group formation and stabilisation, experiential co-creation, and the transition toward self-organisation and stewardship.

3.1 Creating Enabling Conditions for low-threshold Participation

Before establishing the citizens' LC, we explored the setting's social context, spatial characteristics, and related factors, with support from the Eggenlend community centre. A central aim was to make biodiversity tangible and relevant for participants whose everyday lives were shaped by economic precarity, caregiving responsibilities, linguistic barriers, food security, and social participation.

To enable meaningful and sustained participation, appropriate framework conditions were established. Reflecting on this phase, we identified key resources at multiple levels.

1. *Physical resources* included a dedicated garden plot (slightly remote but easily accessible and sufficiently large) provided by the city administration, along with essential infrastructure such as water, soil, compost, tools, and storage space, enabling safe and continuous gardening and learning.
2. *Financial resources* from the PLANET4B project covered material needs as well as process facilitation, childcare, translation, and other measures enhancing accessibility and continuity.
3. *Personal and social resources* were crucial for understanding the local context and reaching participants. Community workers, neighbourhood organisations, and practitioners in community-based work acted as trusted intermediaries, using established networks and trust-based relationships to engage women* from diverse, often marginalised backgrounds and to lower initial participation barriers.
4. *Symbolic and institutional resources* included the absence of local resistance and general goodwill from municipal actors, particularly in green space and urban development. Explicit political support for urban social gardening and minimal administrative or social obstruction created a symbolic space to experiment, fail, and grow without excessive scrutiny.

Together, these conditions enabled low-threshold participation and flexible responses to participants' needs.

Early engagement formats were deliberately designed to foster connection and reduce participation thresholds. Activities such as a "nature experience walk" served as relational entry points into biodiversity, inviting participants to share personal memories of plants, food, and places. Rather than being didactic, these moments supported meaning-making grounded in lived experience. Structural and emotional barriers, including language, prior negative institutional experiences, or unfamiliarity with environmental topics, were addressed through multilingual facilitation, informal settings, and an appreciative approach to existing knowledge and practices.

3.2 Group Formation and Emergence of Self-organisation

Over the first weeks, the group gradually developed into a cohesive learning community. Group formation did not build on pre-existing networks but emerged through facilitated relational processes. Regular rhythms, shared meals, check-ins, and check-outs supported continuity and trust, while facilitation practices allowed space for ambivalence and negotiation.

A formative moment occurred during the construction of the garden fence. Although some participants initially suggested involving male relatives, the group decided to build it themselves despite limited technical experience. This collective effort became a symbolic act of claiming the space and was later described by participants as pivotal in shifting their relationship to the garden from something provided to something owned.

As confidence grew, participants increasingly initiated ideas, such as composting systems, storytelling areas, and thematic beds, and assumed responsibility for planning and decision-making. Facilitation gradually shifted from leading to enabling. Challenges related to weather, scheduling, and uneven participation were addressed through collectively negotiated solutions. Shared symbols, rituals, and appreciation practices helped stabilise the group and sustain engagement.

3.3 Experiential Learning and Co-creation

In later phases, learning became more explicitly co-creative. Biodiversity and diversity moved from peripheral topics to shared objects of inquiry, emerging through embodied practice rather than predefined curricula. Several sessions were framed as research units facilitated by IFZ staff and local experts in environmental education, diversity, and participatory art.

Participatory methods supported inquiry-based learning. Community mapping helped participants explore spatial dimensions of biodiversity while articulating situated knowledge. In another session, socio-scientific inquiry using apples as an everyday object enabled reflection on ecological, cultural, and economic dimensions of agrobiodiversity. Across these activities, biodiversity was approached not only scientifically but also emotionally, culturally, and aesthetically, enhancing its relevance to participants' everyday lives.

3.4 Taking Responsibility and Looking Ahead

By mid-summer, a core group began expressing interest in taking long-term responsibility for the garden. This shift from participation to stewardship had been anticipated and gradually supported by the facilitation team. A follow-up community mapping played a key role in envisioning future uses of the site, particularly given uncertainty about long-term land access.

None of the participants had prior experience managing a community garden or founding a civic association. The process of establishing a nonprofit organisation, therefore, became a learning process in itself, conducted collaboratively and grounded in shared values. Legal and organisational aspects were addressed in accessible ways, with a focus on capacity-building rather than compliance alone.

Beyond securing the garden's future, this process stimulated broader civic aspirations. Several women* expressed interest in continued engagement with urban development and environmental issues, marking an expansion of agency beyond the garden itself.

4. Discussion

The engagement with the citizens' learning community highlights the transformative potential of inclusive urban gardening initiatives, while also revealing their tensions and conditions of possibility. Transformation unfolded across intrapersonal, interpersonal, and collective levels, shaped by affective, relational, and socio-material dynamics.

At the intrapersonal level, participants' understandings of biodiversity shifted from abstract notions of "nature" toward meanings grounded in everyday practices such as food preparation, sensory engagement, and garden care. This confirms the importance of embodied and experiential learning for rendering ecological issues relevant in contexts shaped by precarity and competing everyday demands. Notably, many women* did not initially identify as structurally disadvantaged. Experiences of marginalisation surfaced only gradually, particularly in reflective interviews, underscoring the need to approach vulnerability as relational and emergent rather than as a fixed category.

Interpersonal transformation proved equally significant. While some participants brought prior gardening experience, collective gardening and shared decision-making were new to most. Practices such as co-planning,

shared responsibility, and the collective construction of the garden fence fostered trust, ownership, and agency. The decision to cultivate shared rather than individual plots reinforced a collective ethos and supported mutual learning.

Establishing the garden as a brave space was central to these dynamics (Arao & Clemens, 2013). Such spaces allow for vulnerability, emotional engagement, and the negotiation of difference, enabling participants to navigate cultural, linguistic, and generational diversity while fostering belonging and co-agency. Transformative learning thus emerged not as a linear process of knowledge acquisition, but as a relational and affective process grounded in shared experience.

Participatory and arts-based methods further supported reflection-in-action and anchored complex issues of biodiversity and diversity in everyday relevance. By offering multiple entry points into learning, these approaches enabled participants to engage with ecological questions through emotional, cultural, and practical lenses. Over time, participants' sense of self-efficacy deepened, culminating in a transition from participation to stewardship as a core group assumed responsibility for the garden and co-developed a nonprofit association. The facilitation of legal and organisational processes in accessible ways highlights the importance of capacity-building for sustaining engagement beyond project timelines.

At a structural level, the case points to key conditions for just transitions. Emotionally safe environments, low-threshold access, multilingual facilitation, and alignment with participants' lived realities were foundational rather than supplementary. While the material space of the garden was crucial, symbolic and institutional spaces that allowed experimentation, recognition, and failure were equally important. These findings align with feminist and critical pedagogies that conceptualise learning as situated, relational, and power-sensitive (Haraway, 1988; Calderwood & Rizzo, 2023). As Singer-Brodowski (2023) and Casanova et al. (2023) argue, when learners actively shape their learning environments, transformative change becomes embedded in everyday practice.

Ultimately, *GAIA Gartenberg* functioned less as a food-producing site than as a socio-material learning environment cultivating belonging, co-agency, and response-ability. Its significance lies in demonstrating how community gardens, when intentionally designed as inclusive and relational spaces, can support transformative learning processes that link personal change with broader socio-ecological transformation.

5. Conclusions

The *Bio-/Diverse Edible City Graz* case demonstrates how transformative learning can emerge through the co-creation of inclusive, experiential environments when supported by enabling institutional and social conditions. Two factors were particularly decisive.

First, the broader political and institutional context proved supportive. Municipal objectives aligned with citizen-led urban greening, and community gardening benefited from explicit political backing. Combined with funding and institutional support from the PLANET4B project, this created material, symbolic, and process-related resources that enabled experimentation and continuity.

Second, facilitation and local partnerships were central. The expertise of the facilitation team and local actors in environmental education, participatory methods, and socially sensitive engagement enabled an adaptive and responsive process. Challenges such as delayed land access and language barriers were addressed through flexible arrangements, including real-time translation tools, highlighting the relational and co-creative nature of the learning environment.

Within this context, the *Bio-/Diverse Edible City Graz* functioned as a low-threshold entry point into biodiversity and ecological questions, grounded in familiar practices such as gardening, food, and storytelling. These embodied and relational activities enabled participants to connect abstract environmental concerns to lived experience, fostering agency, belonging, and response-ability. The garden's significance thus lay less in food production than in cultivating socio-material spaces where new ways of knowing, relating, and acting could emerge.

The initiative also generated broader effects beyond the immediate learning community. Cooperation with the municipal green space department laid the foundation for ongoing support and future activities in the surrounding area, positioning the *GAIA Gartenberg* as a nucleus for further socio-ecological engagement. At the same time, the case illustrates the limits of transferability: without comparable time, funding, facilitation capacity, and political support, similar initiatives may be difficult to replicate.

Rather than offering a universal model, this case provides a context-sensitive example of how transformative learning can take root when social, material, and institutional conditions align. It underscores that transformative learning is not a fixed method but an emergent process embedded in everyday practice, collective agency, and the co-creation of spaces that enable just and sustainable transitions.

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Ethics Declaration: This research followed ethical standards for participatory qualitative research, as defined in the PLANET4B Data Management Plan. Participation was voluntary and based on informed consent. Confidentiality and anonymity were ensured, and particular care was taken to address power asymmetries and accessibility in working with women* in precarious life situations.

AI Declaration: Parts of the writing process were supported by AI tools: ChatGPT (v4) was used to refine language and phrasing based on author-provided drafts. The final text was carefully revised and proofread by the authors.

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