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# Navigating complexity in sustainability and climate action: comparing participatory action research and developmental evaluation in higher education

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## Abstract

**Purpose** – This paper aims to investigate how sustainability and climate action are integrated in higher education through collaborative research methodologies. Specifically, it addresses the challenges encountered by those using participatory action research (PAR) and suggests developmental evaluation (DE) as a potentially suitable alternative participatory methodology in certain contexts.

**Design/methodology/approach** – A comparative analysis of PAR and DE is conducted, highlighting their strengths and limitations in sustainability and climate action initiatives within higher education. Philosophically grounded in pragmatism, the study draws on existing literature to clarify the theoretical foundations and practical implications of both methodologies, focusing on their application in complex, dynamic environments.

**Findings** – While PAR is well-represented in educational research and holds potential for transformative change in sustainable development and climate action, it presents challenges, including the need for multiple action research cycles. In addition, PAR can struggle to accommodate epistemological differences among participants. In contrast, DE offers a flexible alternative, allowing for diverse epistemologies while integrating complexity theory and systems thinking, both crucial for sustainability and climate action.

**Originality/value** – This paper advances the discussion on collaborative methodologies in sustainability and climate action research by proposing DE as a viable alternative to PAR in higher education. The proposed DE model provides a new framework for researchers and practitioners, especially in contexts where PAR's traditional requirements create obstacles.

**Keywords** Sustainability in higher education, Collaborative methodologies, Participatory action research, Developmental evaluation, Educational research, Sustainable development, Climate action, Complexity, Systems thinking, Higher education, Pragmatism, Epistemological diversity

**Paper type** Research paper



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## Introduction

It is widely recognised that higher education (HE) plays a crucial role in promoting sustainable development and climate action, both locally and internationally (Serafini *et al.*, 2022). This includes contributing to the achievement of the United Nations' Sustainable Development Goals (SDGs) and driving societal transformation toward sustainable futures (UN, 2015). The scope of this field is broad, covering areas such as leadership, culture, campus, curriculum, research and engagement with local communities.

The HE research literature on sustainability and climate action advocates for increased use of participatory methodologies (de Sousa, 2021; Nhamo, 2012; Wiek *et al.*, 2014). Also often referred to as collaborative methodologies, these approaches are favoured by educational researchers for their ability to bridge research and practice (Ebersöhn *et al.*, 2012), delivering transformative outcomes (Mellor, 2021; Cyr, 2021). In this article, the authors use the term 'participatory research' to describe methodologies that prioritise the active involvement of those affected, fostering collaboration throughout the research process, including problem identification, knowledge creation and action. For some, this involves engaging historically marginalised groups in shaping sustainability and climate action initiatives (Reed *et al.*, 2024). For others, the focus is on collective action (Perz *et al.*, 2022). Accordingly, participatory methodologies are flexible in design, methods and data analysis, allowing adaptation to contextual factors.

Participatory action research (PAR) is arguably the most widely practiced form of participatory research, combining systematic inquiry with community engagement and action (Cochran-Smith and Lytle, 2009). For the purpose of this article, PAR is defined as a methodology in which researchers and community members collaboratively generate knowledge through active investigation and intervention (Coghlan and Brydon-Miller, 2014; Coghlan, 2019). The participating communities are often those historically excluded from decision-making processes, and the research generally explicitly aims to create meaningful change within the studied context while building community capacity (Coghlan and Brydon-Miller, 2014; Coghlan, 2019). In sustainable development, PAR is considered potentially transformative (Keahey, 2021) and, in climate action, it is credited with building capabilities to address climate change and influence policy (Godden *et al.*, 2020; Nussey *et al.*, 2022). However, despite these benefits it is important to acknowledge that all methodological choices present challenges, making these choices both significant and context dependent.

In her literature review on PAR in sustainable development research, Keahey (2021, p. 301) identifies challenges across social, methodological, organisational and academic domains. In addition, ambiguity about what constitutes PAR can be daunting, particularly for novice researchers (Feekery, 2024). Given these challenges, researchers may benefit from considering alternative participatory methodologies that maintain the benefits of collaborative inquiry while potentially offering different advantages in certain contexts. This article explores one such alternative: developmental evaluation (DE). While DE has been used less extensively than PAR, it has shown promise in educational research (Leonard *et al.*, 2016). In this article, DE is defined as a methodology for collaborative research and evaluation that supports development and guides adaptation to emergent and dynamic realities in complex environments (Patton, 2011). The central research question guiding this study was:

*RQ1*. To what extent does DE provide a viable alternative to PAR for HE research and practice in sustainability and climate action?

To address this question, the next section reviews both PAR and DE and is followed by consideration of the theoretical framework of philosophical pragmatism, which underpinned the approach to this study, including the research question and comparative analysis (Dewey, 1916;

Peters and Jandrić, 2017). After presenting the findings, the discussion section explores when, how and why DE might serve as a viable alternative to PAR in sustainability and climate action in HE. The implications for research and practice are addressed, and the article concludes with a summary of key findings, study limitations and future research directions.

## Literature review

### *Participatory action research*

Participatory methodologies play a significant role in HE research on sustainability and climate action, aligning with efforts to achieve the SDGs (Cebrián, 2017; Cornet *et al.*, 2024; Rasyid, 2020). In climate action, participatory processes are considered essential for achieving optimal outcomes and ensuring social justice (Nussey *et al.*, 2022). Within HE, Disterheft *et al.* (2012, p. 357) assert that "participatory processes are indispensable for promoting sustainable development". Educational researchers also favour these methodologies for their emphasis on context, process, knowledge sharing and common goals (Ebersöhn *et al.*, 2012). Furthermore, participatory methodologies can help achieve other HE objectives, such as enhancing student engagement and connecting with local communities (Cornet *et al.*, 2024; Seale, 2010). When applied in sustainability or climate action initiatives, participatory methodologies enable staff and students to contribute to institutional transformation toward more sustainable campuses (Disterheft *et al.*, 2012). Finally, within sustainability education, they encourage critical thinking and collaborative reasoning to address environmental challenges (de Sousa, 2021).

Though not the only participatory methodology, PAR is arguably the most widely cited and used. It emphasises a democratic approach aimed at positive social change and transformation including addressing climate change (Brydon-Miller, 2014, 2022). Many PAR practitioners trace its roots to the Latin American context, particularly scholars like Borda *et al.* (2006) and Freire (2021). In this context, cycles of participation, action and research address power dynamics, promoting agency among marginalised groups through reflexivity. Freire's work has been particularly influential in educational research, promoting a critical approach that challenges traditional power hierarchies. Numerous studies assert that participatory methodologies support action and research in sustainable development and climate action (Parkes and Panelli, 2001; Restrepo-Mieth *et al.*, 2023).

In her systematic literature review of PAR in the field of sustainable development, Keahey (2021) highlights threats to the methodological integrity of PAR as a result of failure to meet PAR standards, concluding that greater transparency and critical reflection is required. In HE, this issue is likely more common among researchers in disciplines without a tradition of critical reflexivity or acknowledgement of researcher subjectivity and positionality, which are grounded in individual values (Whitehead and McNiff, 2006). Keahey (2021, p. 301) also identifies four key challenges in using PAR – labelled as social, methodological, organisational and academic – as discussed next.

First, PAR researchers may encounter social challenges, particularly in working toward power redistribution and navigating differing values among participants (Greenbank, 2007; Lake and Wendland, 2018).

Second, methodological challenges arise from the complexity of the subject matter and working with participants from diverse disciplines and epistemological perspectives (Bowl *et al.*, 2008). Methodology often reflects specific ontological and epistemological assumptions (Grix, 2002) and must align with them. While PAR can be framed as constructivist and pragmatist (Brydon-Miller *et al.*, 2020, p. 108), it is often philosophical grounded in critical theories, described as "rooted in postcolonial, postmarxist, and postmodern critiques of power informing Freirean pedagogy and emancipatory social science" (Keahey, 2021, p. 292). Thus, for researchers using this form of PAR, integrating opposing philosophical approaches can be

challenging, particularly when the focus is on addressing traditional power hierarchies (Janes, 2016; Lake and Wendland, 2018). In addition, the fragmented literature on PAR, with its multiple models and ambiguity surrounding its application and scope, can be daunting, especially for novice researchers (Chevalier, 2019; Feekery, 2024).

Third, organisational challenges, as noted by Keahey (2021), stem from time and resource constraints, which can exacerbate researchers' workloads. Action research involves multiple cycles of action, research and reflection, making it complex and time-consuming (Avriel-Avni and Gan, 2019; Zuber-Skerritt and Perry, 2002). Herr and Anderson (2015, p. 80) liken this process to "designing a plane while flying it", which can be overwhelming for those with limited resources.

The fourth challenge identified by Keahey (2021) is academic, encompassing the context of high workloads, lack of institutional support and the lower academic prestige often associated with PAR studies. Researchers wishing to combine research and practice in climate action or sustainability initiatives need institutional support. Without such support, it is logical that some may be deterred.

In addition to the four challenges mentioned, Chevalier and Buckles (2013) critique PAR for its focus on micro-level issues, arguing that it sometimes overlooks meso- and macro-level factors. They advocate for integrating systems thinking into PAR (p. 403), emphasising the role of complexity and emergent phenomena in open systems. Wooltorton *et al.* (2015) echo this call, proposing a community action research methodology for HE sustainability research that incorporates "systems thinking, collaboration, transdisciplinary, complexity, a future orientation, partnerships for change, critical and creative thinking and solution finding for wicked, whole system problems" (p. 433). These systemic issues and the importance of complexity will be further explored in the next section, which outlines DE methodology and presents a DE model.

*DE as an alternative participatory methodology*

It is important to establish that DE is considered a participatory methodology according to the definition provided earlier – that is, it foregrounds collaboration throughout the research process, including in problem identification, knowledge creation and action. DE shares many characteristics with PAR and is seen as a utilisation-focused approach that can be applied in real time, participatory settings (Rey *et al.*, 2014). Originally introduced by Patton (1994), DE was further developed by him and others in the context of evaluation (Gamble, 2008; Patton, 2011, 2016).

As noted by Cook (2021) the need for evaluative practice in HE is growing. Although DE has been less widely applied in the HE context, it has shown promise in studies of innovations in teaching, learning and curriculum change, when the subject of evaluation is complex, evolving and innovative (Dickson and Saunders, 2014; Lam and Shulha, 2015). For example, Boyle *et al.* (2024) used DE to support a student-staff partnership integrating education for sustainable development in an undergraduate law curriculum. While staff led the research design, DE's focus on emergent issues allowed for timely adjustments based on student priorities, making it a flexible alternative to PAR. Mitchell and Lemon (2020) have also demonstrated DE's viability in community-based sustainability work. In their study, DE and action research were combined to support community implementation of various sustainability and climate action initiatives.

DE, like PAR, integrates evaluative research within an innovation or change process, enabling continuous reflection and adaptation. Unlike formative and summative evaluation, which are used to judge a model already in use (Scriven, 1996), DE focuses on new or adapted processes where the purpose is to explore possibilities.

In this journal, Kopnina and Meijers (2014) discuss the challenges of evaluating education for sustainable development (ESD) initiatives and the difficulties that arise when ideological assumptions conflict. Their conclusion – that plural perspectives undermine ESD objectives (p. 200) – arguably overlooks the complex and evolving realities of sustainability and climate action in HE, where plural perspectives are not only common but essential to participatory research processes. In contrast, Patton (2016), describes DE as a tool for social innovators, specifically designed to adapt to complex, dynamic environments, where successfully navigating multiple perspectives is key to making meaningful progress.

Social innovation, as opposed to economic innovation, seeks to create moral, ethical and sustainable improvements in society, including education (Lam and Shulha, 2015), by implementing change using alternative approaches. Patton (2016) asserts that DE is always context-specific, making a rigid checklist neither justified nor helpful. Nevertheless, adherence to certain essential characteristics, as detailed in the following section, remains important.

DE introduces eight sensitising concepts that should inform DE processes, outcomes, design and use (Patton, 2011, 2016). These concepts, herein referred to as characteristics of DE, are flexible ideas that require adaptation and specification within the given context, ideally achieved through co-creation (Patton, 2016, p. 257) and systems thinking (Gates *et al.*, 2021). As shown in Figure 1, these eight characteristics guide researchers and evaluators in examining the context, identifying patterns and drawing implications (Patton, 2011, p. 146), providing a comprehensive framework for adaptive and context-specific DE in dynamic environments.

Although DE shares similarities with action research in general, and PAR in particular, multiple cycles are not required. A single stage of data gathering, analysis and reflection can suffice, allowing for control of time and resources. For example, Boyle and Cook (2023) demonstrated how DE supported teachers in rapidly transitioning a postgraduate campus-based programme to online delivery during the COVID-19 pandemic.

DE explicitly integrates complexity theory and systems thinking (Peter and Swilling, 2014; Voulvoulis *et al.*, 2022), which can be underutilised in PAR (Chevalier and Buckles, 2013).

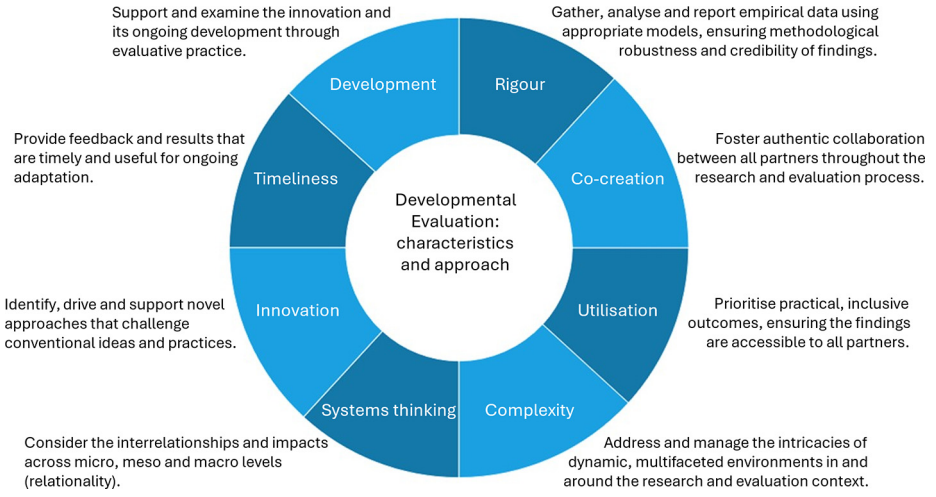


**Figure 1.** DE characteristics and approach
**Source**: Authors own work

Complexity theory focuses on complex systems, highlighting non-linearity, emergence and the interaction of multiple components. The dynamic nature of HE systems, sustainability and climate action (Barnett, 2000; Giesenbauer and Müller-Christ, 2020) makes complexity theory particularly useful. It emphasises that environments with unpredictable interactions between multiple factors cannot be fully understood without acknowledging their complexity. Uncertainty in outcomes is a defining feature of complex environments, in contrast to simple or complicated ones (Glouberman and Zimmerman, 2002). In simple environments, outcomes are more predictable and, even in complicated settings, responses can be predicted after analysis. However, in complex environments, clear cause-and-effect relationships do not exist (Glouberman and Zimmerman, 2004). Complexity theory identifies six key elements of such environments: nonlinearity; emergence; dynamic interaction; adaption; uncertainty; and coevolution (Furtado and Sakowski, 2014). These characteristics are integral to the multi-level systems where DE is applied (Patton, 2011).

Systems thinking provides a holistic approach to research, focusing on micro, meso and macro-level features, and their interactions within the research context (Christou *et al.*, 2024). Boundaries are subjectively defined, acknowledging that neither action nor research occurs in isolation. Emphasising interdependence and relationships within a system highlights how elements influence each other and the system as a whole (Jacobson *et al.*, 2019). This perspective situates micro-level research objects within a meso-level HE system and a macro-level climate change and sustainable development system, addressing Chevalier and Buckles' (2013) critique of PAR's micro-level focus.

## Theoretical framework

Pragmatism provides the epistemological foundation for DE, PAR and this study's methodological approach. While caution is needed to avoid using pragmatism as a catch-all term for practically oriented research (Dillon and O'Brien, 2018), when thoughtfully applied, it offers a philosophically robust framework for participatory research methodologies. In particular, a growing body of literature supports pragmatism's distinct contribution to educational research (Gordon, 2016; King, 2022; Wills and Lake, 2020).

Deweyan pragmatism's emphasis on incorporating multiple perspectives (Dewey, 2008) transcends simple "what works" approaches to build relevant knowledge from lived experience (Biesta, 2007; Biesta and Burbules, 2003). This approach has particularly influenced HE research and practice (Biesta and Burbules, 2003), offering valuable tools for addressing complex challenges, like sustainability and climate action, through its promotion of pluralistic approaches to ethics and wicked problems (Fesmire, 2020; Peters and Jandrić, 2017).

The alignment between pragmatism and participatory research methodologies is evident in their shared emphasis on individual contributions and inclusive decision-making. Freedom of inquiry, arguably the central moral value of Deweyan pragmatism (Morgan, 2014), enables communities to identify and address matters of collective concern. Moreover, as noted previously, a redistribution of power is often at the heart of PAR. While some argue that pragmatism understates power relations (Allen, 2008) its conceptualisation of power as collective intelligence-informed social action (Bergman, 2015; Odera, 2018; Nolan and Stitzlein, 2011) is particularly relevant to collaborative research. Pragmatic power can be understood as collective agency exercised in social contexts to find practical solutions, while acknowledging that power itself does not determine truth (Hildreth, 2009; Wolfe, 2012).

This study's research question emerges from pragmatic principles by examining the interdependent relationship between research process and outcome. By investigating how different methodological approaches affect sustainability and climate action research, it explores the practical implications of alternative processes and beliefs (Morgan, 2014). This

pragmatic orientation guided both the methodology and analysis detailed below, seeking contextual, warranted assertions rather than absolute truths while acknowledging the inherent complexity and fallibility of research.

**Methodology**

The research question, *"To what extent does DE provide a viable alternative to PAR for HE research and practice in sustainability and climate action?"* guided the methodology. To examine this question systematically, the researchers analysed six studies situated in HE (listed below), which they identified through Keahey's (2021, p. 296) comprehensive systematic review of PAR in sustainability.

*List of studies analysed*

- Junyent, M., and de Ciurana, A. M. G. (2008).
- Kawabe, M., Kohno, H., Ishimaru, T., and Baba, O. (2013).
- Maritz, A. (2017).
- McMahon, M., and Bhamra, T. (2012).
- Trott, C. D., Weinberg, A. E., and McMeeking, L. B. S. (2018).
- Williams, A., Holden, B., Krebs, P., Muhajarine, N., Waygood, K., Randall, J., and Spence, C. (2008).

Keahey's review was selected as the starting point as it represents the most recent systematic review in this field. The researchers' independent analysis of these six articles – which constituted the complete set of HE studies within Keahey's review – focused on evaluating their potential alignment with DE principles, a distinct analytical lens from Keahey's original review objectives. This approach, of using an existing systematic review to identify the case sample, offered several methodological advantages. First, it provided a transparent and replicable selection process, avoiding potential selection bias that could arise from either random sampling or preferential selection of published papers. Second, while the study drew on Keahey's systematic review process to identify relevant articles, the analysis was entirely independent and focused on different research objectives. This means that any potential limitations in Keahey's review methodology would not impact the findings, as these six studies served as a discrete case sample for the comparative analysis. However, it is important to acknowledge that while this sampling approach ensures transparency and replicability, it may limit broader generalisability of the findings.

Keahey's (2021) selection criteria included only studies that featured the terms "sustainable development" or "sustainability" in the title, keywords or abstract. Although "climate action" is explicitly mentioned in only one article (Trott, 2018), all the studies address SDG 13 (Climate Action) indirectly through initiatives like awareness raising and education.

In this study, for each article analysed, key details were manually extracted, including: the goal of the PAR; its focus (micro/meso/macro); philosophical grounding; participant types; acknowledged challenges; and outcomes (see Findings, Table 1). Each study was then assessed against the eight characteristics of DE to determine whether it could be categorised as DE based on the information provided in the article (see Findings, Table 2). The analysis further assessed the potential benefits of such categorisation to ultimately determine the most suitable methodology for each study – DE or PAR (see Findings, Table 3). It is important to clarify that it is not the authors' intention to imply that the original studies should have been conducted or classified as DE. Rather, the aim is to explore whether using DE might have

**Table 1.** Summary of key details from the reviewed participatory action research (PAR) studies

| Publication | Goal of the PAR | Focus/foci (micro/meso/macro) | Philosophical grounding | Participants | No. of cycles of action, research and reflection | Acknowledged challenges | Outcomes |
|---|---|---|---|---|---|---|---|
| Junyent and de Ciurana (2008) | To develop a model (ACES) for reorienting university curricula towards sustainability through participatory action research | Meso/macro | Complexity paradigm, interdisciplinary approach | University teaching staff and researchers from five European and 11 Latin American universities, representing diverse disciplines | Ongoing cycles: While the exact number of cycles is not specified, the study involved continuous stages of action, reflection and adaptation throughout the collaborative process across multiple universities | Difficulties in overcoming traditional disciplinary fragmentation, ensuring university-wide commitment, time and resource limitations | Creation of the ACES model, a flexible framework for greening curricula, which guides institutions towards sustainability in university studies. It promotes interdisciplinary work and social responsibility in education |
| Kawabe *et al.* (2013) | To promote social learning and capacity building for sustainable coastal governance through university-community partnership | Meso | Emphasising experiential learning, collaboration and community engagement to promote sustainable governance. (thus a good fit for Deweyan pragmatism) | University faculty, students, coastal community members, fisherfolk, environmental education interpreters, local governments | Several cycles across different projects | Ensuring continuity of learning, reducing the heavy workload of faculty members actively involved in program preparation and coordination | Development of social learning and engagement for sustainable coastal governance, enhanced collaboration between university and coastal community |

(*continued*)

**Table 1.** Continued

| Publication | Goal of the PAR | Focus/foci (micro/meso/macro) | Philosophical grounding | Participants | No. of cycles of action, research and reflection | Acknowledged challenges | Outcomes |
|---|---|---|---|---|---|---|---|
| Maritz (2017) | To develop and validate a model of entrepreneurship education programmes (EEPs) based on PAR | Meso (institutional programs) | Pragmatist and constructivist (emergent inquiry) | Entrepreneurship education scholars and professors from various countries | Multiple cycles were implied through iterative learning and validation of EEP models | Time constraints, fragmentation of EE research, difficulty in generalising results | Developed a legitimised and justified EEP model that reflects contemporary educational and contextual needs |
| McMahon and Bhamra (2012) | To integrate social sustainability into design education through international collaborative projects, enhancing skills beyond traditional design competencies | Meso (design education and collaboration between universities) | Pragmatism, education for sustainable development | Undergraduate design students from universities in New Zealand, Ireland and Chile (though Chilean students withdrew due to an earthquake) | Two cycles of action research involving collaboration between international student teams | Communication challenges, cultural differences, lack of synergy and logistical issues (time zones and academic calendars) | Enhanced collaboration, critical thinking and cross-cultural engagement among design students, with mixed results due to varying communication and participation levels |

(*continued*)

**Table 1.** Continued

| Publication | Goal of the PAR | Focus/foci (micro/meso/macro) | Philosophical grounding | Participants | No. of cycles of action, research and reflection | Acknowledged challenges | Outcomes |
|---|---|---|---|---|---|---|---|
| Trott, Weinberg and McMeeking (2018) | To address community-defined sustainability challenges and promote student development through PAR-based undergraduate research experiences | Micro (focus on student and community development), meso (HEI partnerships with communities) and macro (sustainability goals) | Critical and constructivist paradigms, informed by prefigurative politics and sustainability | Undergraduate students, community members, university faculty | Multiple cycles of collaboration, action and reflection over the course of the summer program | Time constraints for building trust between students and community; epistemological challenges faced by students adjusting to community-driven research | Improved student understanding of sustainability challenges, interdisciplinary collaboration and strengthened community engagement. Development of non-traditional academic outputs like a mobile app for land-loss awareness |
| Williams *et al.* (2008) | To enhance quality of life (QoL) in saskatoon through a multi-stakeholder, participatory approach, focusing on social, environmental and economic determinants of health | Meso and macro | Participatory action research (PAR), emphasising community-driven research and practical outcomes that bridge research, policy and social change | University researchers, community leaders, policymakers, local community members | Two cycles (2001 and 2004), with a third planned for 2007 | Coordinating stakeholders, knowledge transfer, addressing diverse community needs, particularly socio-economic disparities | Developed a comprehensive community action plan, hosted community forums, engaged media and influenced policy development to address socio-economic disparities |

**Source(s):** Authors own work

**Table 2.** Mapping of DE characteristics for the reviewed studies

| Publication | DE characteristics | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Developmental | Rigorous | Co-created | Utilisation focus | Complexity | Innovation | Systems thinking | Timely |
| Junyent and de Ciurana (2008) | Yes, focused on reorienting curricula towards sustainability | Yes, well-defined methodology and interdisciplinary approach | Yes, multiple universities involved in collaborative action | Yes, aimed at sustainability outcomes in education | Some discussion, but less explicit regarding characteristics of complexity | Yes, new model for sustainability in curricula | Linked to complexity but limited articulation | Limited because seeking to achieve long-term sustainability education outcomes |
| Kawabe *et al.* (2013) | Yes, continuous learning and adaptation of governance | Yes, systematic data collection and analysis | Yes, collaborative work with local communities | Yes, focused on real-time, practical governance outcomes | Highlighted in coastal governance challenges. Explicit consideration may have been helpful | Yes, new approaches to sustainable coastal governance | Yes, addressed governance systems and community interaction | Yes, ongoing real-time application |
| Maritz (2017) | Yes, focused on improving entrepreneurship education | Yes, iterative research approach to validate the model | Yes, collaboration with international scholars | Yes, practical application for improving education programs | Yes, discussed challenges of complexity in entrepreneurship | Yes, developed an innovative education program model | Limited articulation. DE could help researchers to apply systems thinking in this research, which may lead to better articulation of the benefits of the research | Yes, focused on current needs in education |
| McMahon and Bhamra (2012) | Yes, project development adapted based on cycles | More focused on action than empirical rigor | Yes, international collaboration between students and faculty | Yes, applied real-time outcomes for social sustainability | Social sustainability recognised as a complex, contradictory area | Yes, focused on integrating social sustainability in education | Appreciation of system thinking approach, focused on international collaboration challenges | Yes, rapid adaptation to logistical challenges |

(*continued*)

**Table 2.** Continued

| Publication | DE characteristics | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Developmental | Rigorous | Co-created | Utilisation focus | Complexity | Innovation | Systems thinking | Timely |
| Trott, Weinberg and McMeeking (2018) | Yes, focused on adaptive student learning processes | Yes, systematic research approach | Yes, collaboration between students and communities | Yes, practical focus on addressing sustainability challenges | Yes, emphasised complexity in sustainability challenges | Yes, innovation in student development and community engagement | Yes, integrated systems of learning, community and sustainability | Yes, continuous student reflection and application |
| Williams *et al*. (2008) | Yes, aimed at improving quality of life in saskatoon | Yes, well-documented research process | Yes, extensive community collaboration | Yes, aimed at improving policy and social change outcomes | Yes, discussed the complexity of urban challenges | Yes, innovative solutions for socio-economic disparities | Yes, addressed community systems in health and governance | Yes, real-time community involvement and policy changes |

**Source(s):** Authors own work

**Table 3.** Assessment of the best fit methodology (DE or PAR) for the reviewed studies

| Publication | Best fit (DE or PAR) | Reasoning |
|---|---|---|
| Junyent and de Ciurana (2008) | PAR | The research involved extensive collaboration across multiple universities with a focus on transformative, iterative processes for sustainability education, aligning well with PAR's principles |
| Kawabe *et al.* (2013) | DE | Appears to take a philosophically pragmatic approach. Focused on social learning and adaptive capacity in coastal governance, where DE's strengths in handling complex, dynamic environments and real-time adaptation make it a better fit than PAR |
| Maritz (2017) | DE | Aimed to develop and validate entrepreneurship education programs through iterative research and practical applications, making DE's real-time feedback and flexibility potentially a better fit than PAR. Explicit consideration of complexity and its characteristics may have added further insight regarding interactions |
| McMahon and Bhamra (2012) | PAR | Focused on international collaboration in design education for social sustainability, with long-term, participatory processes and transformative goals, aligning well with PAR's focus on transformative action |
| Trott, Weinberg and McMeeking (2018) | DE | Emphasised continuous learning and adaptation in sustainability challenges, aligning well with DE's focus on complexity, systems thinking and real-time feedback for student and community growth. Recognises top-down and bottom up influences and promotes a bottom-up approach |
| Williams *et al.* (2008) | PAR | Two cycles completed with a third planned, focused on community-driven quality of life improvements, emphasising social justice, power redistribution and community transformation, making PAR the best fit for this research. Positions bottom-up models as most effective |

**Source(s):** Authors own work

been advantageous in addressing challenges and concerns highlighted by Keahey (2021) in her review, as discussed in the literature review (PAR) section of this article. Both authors conducted the comparative analysis, with cross-checking to ensure methodological rigor. The findings – as the tables described above – are presented next.

## Findings

The analysis of the six HE studies revealed diverse approaches to PAR across different institutional contexts and scales (Table 1). The studies operated at varying levels of focus, from micro-level student engagement through to macro-level institutional change, with most encompassing multiple levels simultaneously. A notable observation was the predominant use of pragmatist and constructivist philosophical frameworks, though specific theoretical groundings varied between studies. The number of action research cycles also showed considerable variation, ranging from clearly defined dual cycles to ongoing iterative processes that evolved throughout the research period.

The systematic mapping of these studies against DE characteristics (Table 2) highlighted strong alignment with certain DE principles, particularly in areas of co-creation and utilisation focus. However, the degree of alignment varied across other characteristics such as systems thinking and explicit engagement with complexity. When considering methodological fit (Table 3), three studies showed stronger alignment with DE approaches while three were better suited to PAR, suggesting that both methodologies have distinct value propositions for HE sustainability research.

Key challenges identified across the studies included time constraints, coordination with partners and the complexity of addressing sustainability challenges within institutional contexts. These observations provided a foundation for examining how different methodological approaches might address such challenges, as detailed in the subsequent discussion section.

## Discussion

The integration of sustainability and climate action initiatives in HE occurs within what has been described as a supercomplex environment (Barnett, 2004). This complexity necessitates the use of methodologies that can address the dynamic, multi-level nature of HE alongside sustainability and climate action. PAR has traditionally played a significant role in these contexts, given its emphasis on participation, collaboration and cycles of reflection and action. However, the findings presented in this article indicate that DE, with its flexibility, focus on complexity, systems thinking and real-time adaptation, may offer a suitable alternative in certain contexts, particularly in cases where PAR's traditional requirements create barriers.

Both methodologies – PAR and DE – support participatory research and contextual action. Both also support the use of mixed methods, which is arguably a means of accommodating different disciplinary orientations (Reunamo and Pipere, 2011). However, the findings revealed that DE may, at times, be the more appropriate methodology for studies needing to accommodate complexity in dynamic environments. For instance, in the work by Kawabe *et al.* (2013), which focused on promoting social learning and adaptive governance in coastal communities, the real-time adjustments and adaptation in response to an evolving governance challenge suggest DE, as opposed to PAR, may be more useful both for the researchers and collaborators involved. Moreover, the study's emphasis on continuous learning and practical outcomes also aligns closely with DE's strengths, as DE facilitates systems thinking, ongoing reflection and real-time feedback. Similarly, Maritz's (2017) study might have benefited from DE's flexible approach, allowing for innovation while addressing the complexity of entrepreneurship education. DE enables the study of experiences in a situation while accounting for contextuality, thus integrating research and practice in a similar way to PAR. In DE, the ideal

evaluator-researcher stance is being part of the innovation team, facilitating change and evaluation, relying on respectful relationships and supporting shared values (Patton, 2011). Thus, as in PAR, in DE an insider role and context dependent research are seen as necessary.

Conversely, the findings also show that PAR remains highly relevant in contexts focused on long-term transformation and empowerment through participatory processes. For instance, Junyent and de Ciurana (2008) aimed to reorient university curricula toward sustainability through extensive collaboration across multiple universities. In this case, PAR's iterative processes and focus on transformative action appeared well-suited to the project's goals, which required engaging diverse university staff and researchers in ongoing cycles of reflection, action and adaptation. Similarly, Williams *et al.* (2008), who sought to improve the quality of life in Saskatoon through a multi-stakeholder approach, benefited from PAR's emphasis on social justice and power redistribution, making it the most suitable methodology for their participatory, community-driven project.

The suitability of PAR in such cases can be linked to its alignment with Habermas' categories of knowledge constitutive interests: the technical; the practical; and the emancipatory (Gunbayi, 2020). The critical orientation of PAR places emphasis on the "emancipatory" interest, which seeks to liberate individuals from structures of domination (Elliott, 2007). This focus on empowerment and social change makes PAR particularly effective in projects where transformative action and social justice are central aims, such as the work of Junyent and de Ciurana (2008) and Williams *et al.* (2008). However, for researchers working within more realist or pragmatic paradigms, such as those from science backgrounds, the use of PAR may feel less appropriate. As Keahey (2021, p. 306), citing Fals-Borda (1987), notes, these researchers may inadvertently misapply PAR, leading to what she describes as the risk of elite co-option, which undermines the methodology's transformative potential.

Although offering methodological rigour, a key challenge of PAR identified in the literature is its emphasis on multiple cycles of action, research and reflection, which can be time-consuming and resource-intensive (Zuber-Skerritt and Perry, 2002). Keahey (2021) found that, in her overall literature review of PAR in sustainable development, one third of studies did not mention the use of cycles. The findings presented in this article support these concerns, as some of the reviewed studies acknowledged time and resource constraints as significant challenges. For instance, McMahon and Bhamra (2012), who used PAR to integrate social sustainability into design education through international collaborations, reported difficulties related to communication, cultural differences and logistical challenges across multiple countries. These issues, coupled with PAR's requirement for multiple action research cycles, created barriers to implementation. DE, by contrast, offers a more flexible approach, allowing a single cycle of action, research and reflection to be valid. This is evident in Trott *et al.* (2018), where DE could have been a suitable methodology to support student learning and community engagement through timely feedback and real-time adaptation.

DE's ability to integrate complexity theory and systems thinking further enhances its utility in sustainability and climate action. Both are critical in addressing the dynamic, multi-level systems within which sustainability and climate action initiatives take place. DE facilitates explicit consideration of complexity characteristics such as uncertainty and emergence. It also draws attention to dynamic interactions at different system levels and to the boundaries drawn by researchers. The findings presented in this article illustrate how DE's focus on complexity, as highlighted by Peter and Swilling (2014) and Voulvoulis *et al.* (2022), may have been particularly useful in studies like Kawabe *et al.*'s (2013), where the complexity of coastal governance required a flexible, adaptive approach. Similarly, Maritz (2017) may have benefitted from DE's systems thinking, to help address the complexities

inherent in entrepreneurship education, allowing for innovation while recognising the challenges of fragmentation and generalisation within the field.

While PAR is typically viewed as a bottom-up methodology, emphasising participant empowerment (Low *et al.*, 2000), DE is presented as valuable in contexts where both top-down and bottom-up influences are relevant (Patton, 2011). Keahey (2021) stresses that PAR for sustainable development should prioritise grassroots control (p. 292). Although some argue that top-down and bottom-up approaches are both useful in PAR, much of the literature favours a bottom-up approach (Jacobs, 2006). Mazon *et al.* (2020) critique universities' top-down promotion of sustainability, arguing that students are not sufficiently active in this field, highlighting the need for more bottom-up approaches. DE, designed to function in contexts where top-down meets bottom-up (Patton, 2011), offers a way to address these concerns, particularly in institutions where shifting control to less powerful participants is hindered by systemic barriers.

Despite its advantages, DE is not without its limitations. The dual role of evaluator and researcher in DE, and the need for reflexivity, can present challenges, compounded by the limited literature on reflexivity in DE (Rey *et al.*, 2014). DE's reliance on the eight characteristics (Figure 1; Patton, 2011, 2016), while not intended as strict criteria, may be difficult to achieve in practice. Some scholars, such as Miller (2016), argue that achieving all eight characteristics is challenging. However, DE's flexibility allows researchers to focus on specific characteristics that are most relevant to their context. For example, while Junyent and de Ciurana (2008) displayed strengths in areas such as co-creation and developmental innovation, their articulation of complexity and systems thinking was less explicit, suggesting that DE could have provided a more structured framework to address these areas.

Another challenge for DE lies in its relative novelty and the limited foundational body of research compared to PAR. DE is heavily influenced by its originator, yet Patton's approach is not universally accepted, especially in contexts where social and political interactions are key drivers of change (Smith, 1989; Weiss, 1988). However, this criticism does not diminish DE's potential utility, particularly when external factors, such as lack of resources or competing values, are accounted for using systems thinking, as DE encourages.

Finally, DE's focus on utility may overlook important social and political dynamics. However, its use of systems thinking helps mitigate this concern by considering external influences, such as resource constraints and institutional norms. Nevertheless, those wishing to place particular emphasis on power dynamics may find DE's pragmatic approach less helpful.

Regardless of the approach – DE or PAR – pragmatism supports the use of mixed methods, inclusivity and interdisciplinarity, which are essential in sustainability research and climate action (Feilzer, 2010; King, 2022). Pragmatism is especially useful in accommodating differing views on what constitutes valuable knowledge or valid data, which is a key challenge in interdisciplinary collaboration (Keahey, 2021, p. 300). Fien (2002) advocates for an eclectic research design for advancing sustainability in HE, while Wills and Lake (2020) argue that, in social research, pragmatism aligns well with a focus on practical utility and collective action.

Building on these pragmatic foundations, this study reveals important implications for selecting between DE and PAR in HE sustainability and climate action research. Both methodologies offer valuable participatory approaches, but their optimal application depends on specific contextual factors and intended outcomes.

DE appears particularly well-suited to institutional climate action initiatives where the primary focus is systems-level change in complex, dynamic environments. Its flexibility allows continuous embedding throughout a project without requiring formal cycles of action and reflection, making it especially effective for initiatives requiring rapid adaptation and

evaluation. For example, DE could effectively support the iterative development of a university-wide carbon reduction strategy, where multiple participants and systems need to adapt quickly to emerging challenges.

PAR, in contrast, demonstrates particular strength in projects emphasising social justice and community empowerment. Its structured cycles of action and reflection create space for deep community engagement and collective learning. PAR might be the preferred choice when, for instance, collaborating with local communities to develop climate resilience strategies or when working with marginalised groups to ensure their voices shape institutional environmental policies.

For HE community members – including students, academics, researchers and managers – selecting the appropriate methodology is crucial for optimising both practical outcomes and knowledge creation. This choice should be guided by careful consideration of:

- project objectives (systems change vs. social transformation);
- institutional context (complexity, timeframes, existing power structures);
- participant makeup (institutional vs. community-based);
- required flexibility (continuous adaptation vs. structured cycles); and
- primary focus (evaluation and improvement vs. empowerment and justice).

Understanding these methodological distinctions may enhance the credibility and effectiveness of sustainability and climate action research, while ensuring that chosen approaches align with both practical needs and ethical considerations.

**Conclusion**

Collaborative methodologies are essential for achieving sustainability goals in HE internationally. This article examined two participatory approaches, PAR and DE, to address the complexities of sustainability and climate action research, aiming to determine whether DE offers a viable alternative to PAR.

The findings reveal that while PAR is effective in fostering transformative change, researchers can face challenges in meeting its standards, such as the requirement for multiple action research cycles, which brings time and resource implications. In addition, there can be difficulties accommodating diverse epistemological perspectives. DE, with its focus on complexity, systems thinking and pragmatic flexibility, provides a suitable alternative in contexts that demand real-time feedback and adaptability. DE is especially appropriate when the subject of evaluation is complex, evolving and innovative, and when research must be completed within a short timeframe. One cycle of DE is valid, but DE can also accommodate multiple cycles. DE thus offers an alternative to PAR, fostering collaboration between evaluator-researchers and the co-creation of research. Its focus on utility allows for flexible, non-prescriptive methods, with timely feedback supporting innovation, learning and development.

The authors aimed to present DE as a potential participatory methodology for sustainability and climate action research in HE. By offering DE as an alternative and developing a visual model to support its application, the goal is to provide researchers, especially those who find action research or aspects of PAR challenging, with a practical and useful approach.

There are some limitations to consider, including the subjective nature of the authors' assessment. Both authors have previously engaged in action research and participatory methodologies within a pragmatic or critical pragmatic paradigm, and this philosophical perspective must be acknowledged. The sample size was necessarily small, as it was limited to studies included in an existing systematic review, all categorised within the field of sustainability and sustainable development. While all studies were indirectly related to

climate action, only one explicitly made this connection. Therefore, conclusions regarding appropriate participatory methodologies are not universally applicable or transferable, as each project is context dependent and unique. Nevertheless, to support credibility, the authors have aimed for full transparency in the literature analysed and criteria used, enabling others to apply these and assess whether PAR or DE might be appropriate.

Future research comparing DE and PAR could focus specifically on student-led climate action in HE. One area for investigation would be examining DE's capacity to redistribute power among participants, particularly in comparison to PAR's established role in empowering marginalised groups. In addition, further research on DE could refine its use in HE by developing tools for integrating reflexivity and addressing the dual role of evaluator-researcher. Expanding the evidence base for DE across various contexts, including its effectiveness in challenging existing power structures, would strengthen its value as an alternative methodology for tackling sustainability and climate action challenges in HE.

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