# Transgressive pedagogies in a climate-constrained Africa: grounding climate change education and sustainability learning in local communities

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**Introduction:** Despite global recognition of the climate crisis, higher education often remains rooted in traditional, theory-focused paradigms emphasizing economic growth, thereby hindering necessary structural transformations. This study argues for an urgent shift towards practical and experiential learning in higher education, particularly in sustainability learning and climate change education, by adopting transgressive pedagogies and place-based approaches grounded in local communities.

**Methods:** This study employed a series of field learning journeys within Ghana to investigate the impact of practical engagements on students' understanding and appreciation of environmental, social, and climate change challenges. Data was collected to assess changes in students' attitudes toward climate change and sustainability learning, their orientation for environmental stewardship, social change advocacy, and climate action, as well as their dispositions and competencies for partnerships and collaborations in addressing socioecological challenges.

**Results:** The findings demonstrate marked positive changes in students' attitudes toward climate change and sustainability learning. Furthermore, there is evidence of enhanced orientation for environmental stewardship, social change advocacy, and climate action among the students. The study also reveals improvements in students' dispositions and competencies to utilize partnerships and collaborations for addressing socioecological challenges.

**Discussion:** This study highlights the critical importance of place in sustainability and climate change education. Grounding teaching and learning in local contexts through practical, experiential approaches fosters the development of locally relevant competencies and facilitates essential connections between theoretical knowledge and lived experience. The findings underscore the potential of place-based and transgressive pedagogies to cultivate

environmental stewardship, social change agency, and collaborative problem-solving skills in higher education.

# 1 Introduction

Climate change is increasingly affecting every aspect of life globally, but impacts are particularly noticeable in regions where countries have not sufficiently invested in climate adaptation and sustainability transitions, and where they may lack both financial and human resources that match the scale of the challenges. Ghana, as many other countries in sub-Saharan Africa (IPCC, 2022; Antwi-Agyei et al., 2015; Simpson et al., 2021), is highly vulnerable to climate change impacts, making a just green transition (Mbeva et al., 2023) particularly urgent. A range of socioecological challenges constrain the country's climate action and converge to impede the realization of its sustainable development aspirations. Barriers include lack of understanding of mechanisms of climate change and its impacts, as well as low awareness of future projected climate trajectories (Antwi-Agyei et al., 2015; Simpson et al., 2021). In this paper, we therefore wish to argue that new transgressive educational approaches are needed in Ghana's higher education system, capable of fostering locally relevant knowledge, knowhow and collaborative alliances with communities for climate resilience.

The role of education for sustainable development has been highlighted since the 1992 Rio Earth Summit, while the responsibility of higher education was brought to the fore in the UN Higher Education Sustainability Initiative of 2012. While some higher educational institutions, have acknowledged the immediacy and urgency of the climate crisis and responded with the development of bespoke academic courses and programs, not many of these courses have proved sufficiently responsive to current challenges (Albareda-Tiana et al., 2018; McCowan et al., 2022; Ramírez, 2015). Additionally, Selby and Kagawa (2010) have argued that many education for sustainable development approaches are still tied to a paradigm of economic growth, and therefore only serve to lock-in and reinforce business-as-usual, rather than leading to necessary structural transformations.

Universities have largely remained theoretical, structured, brick-and-mortar and job-market oriented with an exclusive focus on economic growth imperative, techno-scientific rationalities and market competitions that pay little or no attention to the link between academic intelligence and real life experiences (Cörvers et al., 2016; Manteaw, 2008; Nightingale et al., 2020). Additionally, focus has remained exam-centered and certification regimes which, in their different forms, aim to unleash graduates onto competitive job markets to harness economic growth and growth-at-all-costs endeavors (Kopnina and Meijers, 2014; Saltman, 2003).

The focus on employability (Mohamedbhai, 2013), combined with colonial legacies of passive lecture-based teaching found in many countries in sub-Saharan Africa (Du Plessis, 2021; Shizha and Makuvaza, 2017), are also characteristic of higher education in Ghana. This poses a barrier to the country's aims of leveraging student learning experiences for socioecological transformations (UNESCO, 2023), as well as reducing the role higher education can play in achieving national climate commitments (Ministry of Environment, Science, Technology and Innovation [MESTI], 2021).

In Ghana, as in many parts of Sub-Saharan Africa, universities face enduring challenges such as inadequate infrastructure, underfunding, limited digital resources, and a shortage of trained faculty. These constraints undermine the transformative potential of higher education and restrict the ability of universities to lead educational reform for sustainability. Consequently, curricular design and pedagogical practices remain poorly aligned with the socioecological realities of local communities. This disconnect contributes to a persistent gap between academic training and the real-life sustainability challenges students encounter after graduation (Banya and Elu, 2001; Mohamedbhai, 2013).

Compounding these structural issues is the persistence of colonial pedagogical traditions that treat knowledge as received, fixed, and transmitted unidirectionally from lecturer to student. In many Ghanaian universities, learning continues to rely heavily on lecture-based delivery within the four walls of the classroom, often limiting opportunities for critical inquiry, creativity, and practical engagement with local contexts (Du Plessis, 2021; Shizha and Makuvaza, 2017). As Freire (1972) warned, such "banking" models of education position students as passive recipients, rather than co-creators of knowledge. This approach reinforces top-down, performative teaching practices and weakens the critical competencies needed to address complex sustainability issues.

While these tendencies are not unique to Ghana, they are particularly concerning given that education is widely recognized as one of humanity's best hopes for advancing sustainable development (Boafo et al., 2024; Fien, 1995; Kwadwo and Konadu, 2020; UNCED, 1992). It is precisely these entrenched dynamics that our transgressive pedagogical approach seeks to confront—by shifting the locus of learning beyond the classroom and co-producing knowledge with communities on the frontlines of climate change and socioecological transformation.

As long as education for sustainable development does not challenge fundamental assumptions and practices of the systems it is embedded within, it thus risks perpetuating the problem (Orr, 2004; Stein et al., 2022), rather than catalyzing solutions. Considering the severe impacts of climate change for the African continent and the constraints sub-Saharan countries face in addressing them, we therefore argue that new ways of teaching and learning in higher education are called for (Sterling, 2010; McCowan, 2021, 2023), and that climate change must be a focus in education for sustainable development (Mochizuki and Bryan, 2015). In this study, we will draw on the notion of transgressive pedagogies (Sefa Dei, 2010; Lotz-Sisitka et al., 2015; Lotz-Sisitka,

2024) and place-centered sustainability praxis (Evans, 2012, 2015) to discuss insights from community-focused experiential learning activities in the period 2018–2024, coordinated by the Center for Climate Change and Sustainability Studies (C3SS) at the University of Ghana.

# 2 Climate constrained Africa–the learning imperatives

## 2.1 The concept and context

In Ghana, as in much of sub-Saharan Africa, sustainable development aspirations are highly "climate-constrained," in the sense that the realization of the country's ambitions is increasingly impeded due to intensifying climate impacts, including extreme weather events, resource scarcity or degradation, and biodiversity loss. Climate change is aggravating existing challenges and vulnerabilities in Ghana, as well as adding new threats. Agriculture remains particularly vulnerable due to heavy reliance on rainfall and underdeveloped irrigation infrastructure, resulting in significant threats to food security and cascading impacts on nutrition, livelihoods, and health (Apraku et al., 2021; Chakona and Shackleton, 2018). Moreover, climate-induced water stresses like recurrent floods and prolonged droughts compromise water safety, increasing the risk of diseases such as malaria and cholera (Mensah and Ahadzie, 2020; Mutschinski and Coles, 2021; Ntajal et al., 2022). Rising temperatures associated with climate change exacerbate air pollution, intensifying respiratory and skin diseases, particularly in Ghana's urban centers (Damte et al., 2023). Compounding these challenges, activities such as illegal small-scale mining ("galamsey") have triggered the resurgence of neglected tropical diseases, including Buruli Ulcer (*Mycobacterium ulcerans*) and Yaws (*Treponema pallidum subspecies pertenue*), illustrating the complex interlinkages between climate, environmental degradation, and health impacts uniquely affecting Ghanaian communities.

Collectively, these intertwined challenges underscore the urgency of transgressive pedagogical shifts within Ghanaian higher education, advocating explicitly for new forms of learning and living that equip students with relevant skills and transformative capacities. However, while climate action is urgent, local constraints affect the capacity to take adequate and locally relevant actions for climate adaptation and mitigation. In many communities across Africa, responses to climate change have been reactionary, incoherent, experimental and premised on faulty knowledge and flawed assumptions (Manteaw, 2020). They have also predominantly been shaped by Western hegemonic perspectives and techno-scientific approaches that prioritize technological and engineered solutions over local epistemologies and indigenous knowledge systems (Lam and Rousselot, 2024). At the same time, across Sub-Saharan Africa, higher education institutions frequently grapple with inadequate resources, outdated curricula, and insufficient integration of local contexts into teaching and learning processes (Banya and Elu, 2001; Mohamedbhai, 2013).

Although climate change is a global phenomenon, both impacts and the means to address them vary across regions and localities. Responses can therefore not ignore place-based particularities

and context specific approaches when addressing unique local challenges (Khan et al., 2016). As Schipper (2020) has argued, a systemic approach is also necessary, to avoid the growing occurrences of maladaptation which manifest through exclusion, encroachment, entrenchment and enclosure (for examples from the Asia-Pacific region, see for instance Sovacool et al., 2017).

## 2.2 Connecting education to locality

Against this background, we argue that education and learning about climate change must include a focus on place and context-specificity, and that local realities must be meaningfully integrated into curricula and pedagogy. In Ghana, persistent challenges—such as underfunded infrastructure, limited curricular relevance, and weak connections between academic content and local socioecological contexts—continue to impede the transformative potential of higher education (Boafo et al., 2024; Owusu-Agyeman and Fourie-Malherbe, 2019). Despite decades of awareness about these constraints (Banya and Elu, 2001), many universities remain reliant on abstract, lecture-based teaching with little room for community engagement or experiential learning (Boakye-Yiadom et al., 2025).

The current lack of deep knowledge and understanding of climate change — alongside an insufficient appreciation of unfolding environmental and social changes in local communities—makes intentional, place-based education an urgent pedagogical priority. Such an approach must foreground the exploration of local perceptions of change and engage both learners and communities in identifying possible pathways to address those changes.

Gruenewald (2014) refers to this dual process as "decolonization and re-inhabitation": a critical learning approach that uncovers what has gone wrong in local places and explores how they may be restored for sustainable and peaceful living. This means grounding education in lived realities and giving students the opportunity to develop place attachment and a sense of belonging (Schweizer et al., 2013). Jucker (2002) similarly calls for the reconnection of education to locality, advocating for a community-focused, context-sensitive education that addresses real-world challenges and opportunities. These ideas resonate with place-centered sustainability praxis (Evans, 2012, 2015), which emphasizes the need for co-created, grounded learning that enables students to act meaningfully within their communities.

## 2.3 Transgressive pedagogies: conceptual clarifications and application

"We need to put down our books about nature and get into a rainstorm, be startled by the dear we startle, climb a tree like a chameleon. It's good for the soul to go where humans do not have a great say about what happens. . .This is where we take our reasoned minds. . ." (Benyus, 1997).

### 2.3.1 Defining transgressive pedagogy

Transgressive pedagogies have been described in literature as educational strategies deliberately designed to disrupt traditional

learning boundaries and norms, thereby fostering deeper critical reflection and social transformation (Lotz-Sisitka et al., 2015; Lotz-Sisitka, 2024; Sefa Dei, 2010). According to Sefa Dei (2010), transgressive pedagogies engage learners actively in questioning established educational paradigms, promoting critical awareness, and encouraging active participation in community-relevant knowledge production. Similarly, Lotz-Sisitka (2024) define transgressive pedagogies as learning processes characterized by social experimentation and boundary-crossing, aimed explicitly at addressing systemic sustainability challenges. Kolb and Kolb (2022) further emphasize that these pedagogies typically rely on experiential learning methods, directly engaging learners with communities and contexts outside the formal classroom setting. Such educational approaches challenge established teaching conventions, positioning learners as active knowledge producers rather than passive knowledge recipients.

### 2.3.2 Application of transgressive pedagogy in Ghanaian context

Inspired by calls to move beyond conventional classroom instruction and engage directly with nature and society (Benyus, 1997), the faculty at the Center for Climate Change and Sustainability Studies (C3SS) at the University of Ghana undertook a pedagogical shift in March 2018. This shift responded explicitly to the limitations of traditional lecture-based teaching, which frequently fails to equip students with practical skills and critical engagement necessary for addressing complex socio-ecological challenges (Condeza-Marmentini and Flores-González, 2019). Our approach—anchored explicitly in transgressive pedagogy—intentionally challenges rigid, hegemonic, and theory-heavy teaching practices common in Ghanaian higher education (Addae and Quan-Baffour, 2018). Instead, we foster experiential, interdisciplinary, and collaborative learning through place-based community engagements that explicitly address Ghana's unique climate and sustainability challenges.

In practice, this involves immersing students directly in real-world environmental issues facing Ghanaian communities, such as those around Mole National Park and Bui Dam, to bridge the gap between theoretical classroom discussions and on-the-ground realities. Through structured experiential activities (Table 1), our pedagogical practice encourages students to critically interrogate their assumptions, engage deeply with local sustainability challenges, and co-create knowledge through direct interactions with affected communities and ecosystems (Bryan, 2022; Makrakis et al., 2024).

It is from this premise that transgression in teaching and learning becomes imperative, facilitating social experimentation, critical exploration, and creative connections between intellect and lived experience (Walsh et al., 2021). This approach aligns strongly with Evans' (2012, 2015) notion of place-centered sustainability praxis, emphasizing intentional pedagogical strategies enabling learners to acquire skills and dispositions necessary for effective climate action within local communities. Such skills, though by no means exhaustive, are critically essential in fostering what Chambers (2012) describes as self-critical epistemological awareness, or the ability of learners to literally see socio-ecological injustices and actively explore transformational possibilities.

Through this pedagogy, we propose pragmatic, experiential learning approaches in which local Ghanaian communities—with their distinct environmental and social challenges—serve as vibrant sites for critical reflection and practical sustainability action (Kolb and Kolb, 2022). This focus underscores Ghana's acute vulnerability to climate change, exemplified by far-reaching socio-ecological impacts in climate-sensitive sectors such as agriculture and water resources (Maino and Emrullahu, 2022; Manteaw, 2020).

## 3 Methodology

### 3.1 Study context

The University of Ghana, the premier University of Ghana, is a known center of academic excellence and offers degree programs in a range of disciplinary areas. The university is not only well-positioned to develop new programs in climate change, sustainable development, and allied disciplines, but also has a track record of inter-and transdisciplinary learning approaches that prioritizes the intentional integration of climate change and socio-ecological issues in its diverse academic programs.

Situated in Accra, Ghana's capital city, the University benefits from its strategic location within a major urban center characterized by a dynamic mix of economic activities and social interactions. This positioning provides students and faculty with direct access to key government agencies, research institutions, and non-governmental organizations actively engaged in climate change and sustainability initiatives. The proximity to

TABLE 1 Range of activities undertaken during field learning journeys.

| Issues | Approach | Expected outcome(s) |
|---|---|---|
| Examination of issues | Community entry | Self-critical discoveries |
| Citizen engagement | Stakeholder identification | Enhanced socio-cultural learning |
| Data poverty | Fact finding | Improved data building and validation |
| Environmental social learning | Place-based learning | Stronger place attachment and learning |
| Coastal resilience | Observation and local interactions | Deeper appreciation of land-water interactions |
| Traditional knowledge systems | Community immersion | Convergence of science and tradition |
| Forestry and biodiversity degradation | Field assessments | Conservation strategies and biodiversity insights |
| Disaster risk | Risk analysis discussions and interactions | Enhanced preparedness and mitigation strategies |
| Loss and damage | Impact assessments | Comprehensive loss documentation and analysis |

these institutions enhances opportunities for collaboration, policy engagement, and real-world application of academic knowledge.

A significant step in advancing climate and sustainability education at the University of Ghana was the establishment of the Center for Climate Change and Sustainability Studies (C3SS) in 2017. This flagship initiative has reinforced the university's role as a hub for climate change and sustainability discourses, not only within Ghana but also across Africa and globally. Through its graduate programs, C3SS is dedicated to training the next generation of professionals equipped to address the pressing challenges of climate change and sustainable development. The overarching goal of the Center is to position the University of Ghana as a leading institution in climate change, sustainability education, and research, fostering innovative solutions that extend beyond national borders. The strategy to achieve this involves a mix of four separate but interconnected approaches:

(a) training the next generation of Africa's human resources for climate action
(b) building climate change adaptation research capacity
(c) influencing policy through public awareness and targeted advocacy and
(d) disseminating knowledge and best practices in climate change adaptation and mitigation.

In C3SS, we run a Climate Change and Sustainable Development program in Master of Science (M.Sc.), Master of Philosophy (MPhil) and Doctor of Philosophy (Ph.D.). The range of courses and accompanying curricula are broad and include ecosystem-based adaptation, climate-smart agriculture, climate change legal frameworks, climate communication, climate change mitigation and adaptation, carbon accounting, climate change and health, green business and more. While all programmes and approaches are interlinked and interdependent, this study focused primarily on how students are trained and how their training equips them to influence climate and sustainability decisions and actions at both national and subnational levels.

The programs in Climate Change and Sustainable Development attract a diverse cohort of students with varying backgrounds and motivations. The program is designed to accommodate students from various academic disciplines, including natural sciences, social sciences, engineering, and humanities. This multidisciplinary approach enriches the learning environment and fosters a holistic understanding of climate change and sustainability challenges. While some students may be driven by diverse career aspirations and the pursuit of well-paid jobs, many are genuinely committed to contributing to their communities and addressing environmental sustainability challenges in Ghana and beyond. The special emphasis placed on experiential learning, community engagement, and practical applications in the different courses are aimed at fostering a sense of responsibility and place-awareness and to equip students with the knowledge, skills and dispositions to apply theory to real world problems in the search for solutions.

Teaching staff comprises a diverse group drawn from different disciplines across the university. They come with different by complementary expertise and backgrounds that of experts with backgrounds in various disciplines relevant to climate change

and sustainable development. This multidisciplinary expertise ensures a comprehensive and well-rounded learning experience for students. The faculty members are actively involved in research and consultancy, bringing their practical experience and insights into the classroom.

## 3.2 The field learning journeys: a framework for experiential education

Since its inception, the Field Learning Journeys have been an integral part of the master's programs at C3SS, with each student cohort participating in at least one long and two short field trips. These journeys, which bring together MPhil and MSc students, serve as immersive learning experiences that reinforce classroom theories through firsthand engagement with climate change impacts.

The structured design of these journeys follows a place-based and experiential learning framework (Figure 1). Students are placed directly in the environments and communities experiencing environmental change, enabling them to assess the realities of climate adaptation, biodiversity loss, and sustainability interventions. This engagement supports co-creation of knowledge, fosters interdisciplinary understanding, and nurtures long-term collaborations between students and local communities.

Key components of the field learning journeys include:

- Stakeholder engagement: Identifying and involving local leaders, policymakers, and practitioners.
- Site selection and preparation: Selecting ecologically and socially relevant locations that align with course objectives.
- Field activities: Conducting observations, interviews, and collaborative projects with community members.
- Critical reflection and post-trip analysis: Encouraging students to document experiences, analyze findings, and apply theoretical frameworks.

This structured yet flexible approach democratizes the learning process, allowing students to play an active role in site selection and research focus. By doing so, we foster agency and encourage learners to co-design their educational experiences.

## 3.3 Site selection criteria and learning applications

The selection of field sites follows a rigorous process to ensure diverse learning opportunities. The chosen locations reflect varied ecological and socio-economic conditions, exposing students to multiple dimensions of climate change and sustainability challenges. Furthermore, faculty members with diverse expertise and backgrounds contribute to the selection of sites, ensuring a truly multidisciplinary perspective. The following criteria guide site selection:

- Ecological diversity: Inclusion of forests, wetlands, coastal areas, agricultural zones, and urban environments.
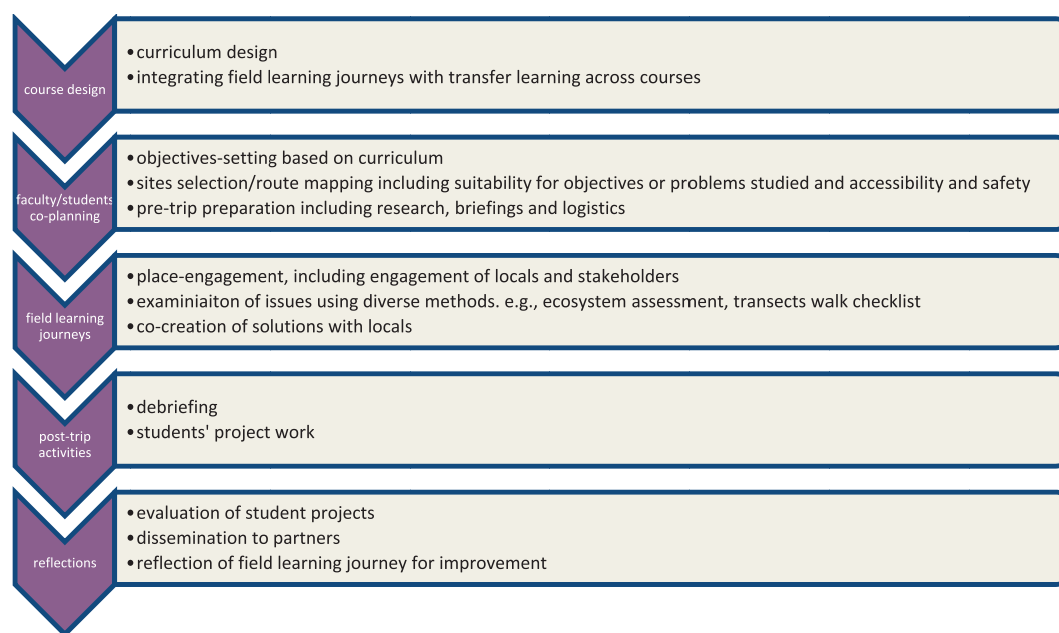
FIGURE 1
Steps in advancing transgressive pedagogies.

- Socio-economic context: Representation of communities facing different levels of development and environmental risk.
- Community engagement: Sites where local knowledge and traditions intersect with climate change challenges.
- Climate change vulnerability: Locations that showcase adaptation and mitigation efforts.
- Sustainability initiatives: Case studies of successful environmental interventions.
- Curriculum integration: Direct alignment with course topics to ensure conceptual continuity.
- Logistical feasibility: Consideration of travel time, accessibility, and safety.

Through these immersive experiences, students gain firsthand insights into how environmental theories manifest in real-world settings, allowing for critical interrogation and validation of conventional models.

## 3.4 Data collection and learning assessment

A qualitative, multi-method approach was used to document student learning and evaluate the effectiveness of the field-based pedagogy. Data collection methods included:

- Observational field notes: Students recorded direct observations and reflections on environmental conditions and community interactions.
- Structured discussions and debriefing sessions: Facilitated daily group reflections to deepen critical engagement.

- Expert presentations and community dialogs: Integration of local perspectives through guest lectures and participatory discussions.
- Reflective journals: Personal documentation of evolving understanding and conceptual shifts.
- Post-trip assignments and project work: Application of theoretical knowledge to real-world sustainability challenges.
- Thematic analysis: Qualitative analysis of field notes, discussions, and journals to identify emergent learning patterns.

To ensure methodological clarity and rigor, data were collected through multiple structured activities. Students maintained observational field notes detailing direct experiences, conducted structured daily group reflections guided by thematic inquiry, and engaged with expert presentations from local stakeholders on socio-ecological dynamics. After each trip, students completed reflective journals and specific assignments explicitly linking their experiential learning to classroom theories. Faculty engaged in regular peer debriefing to discuss emergent themes, and member-checking was conducted with select student participants to validate authenticity.

## 3.5 Data analysis

The study employed a qualitative thematic analysis to examine students' experiential learning outcomes from the *Field Learning Journeys*. Data was sourced from observational field notes, reflective student journals, post-trip debriefings, and recorded discussions. The analysis was conducted manually, following an open coding process to identify key themes
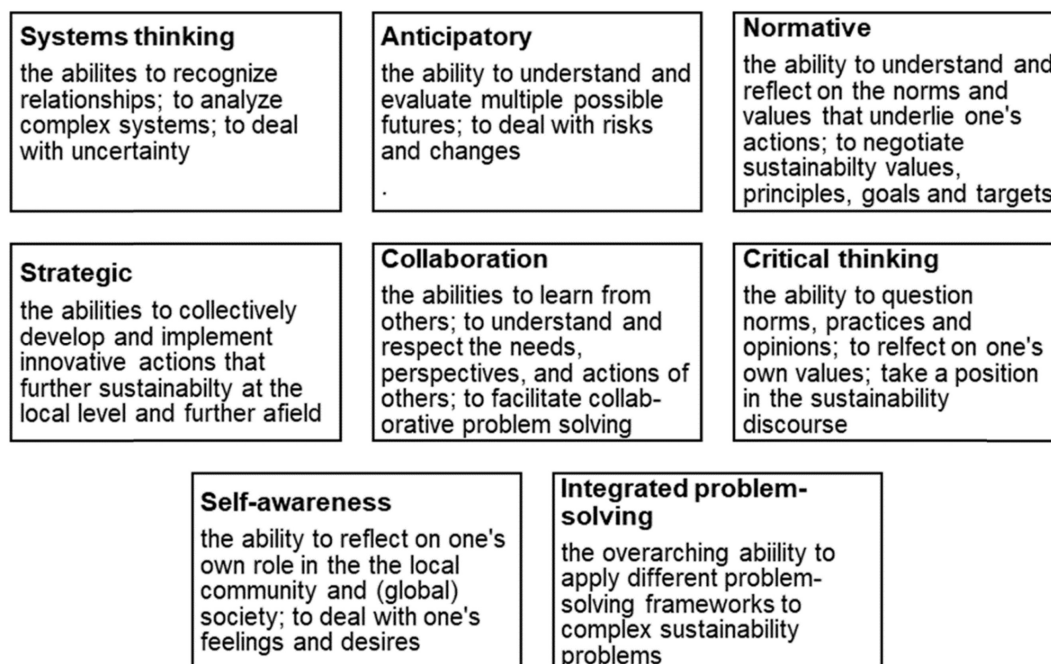
**FIGURE 2**
Critical skills to acquire in effective climate and sustainability education.

such as *place-based learning*, *knowledge co-creation*, *critical thinking*, and *attitudinal shifts toward climate action* (Figure 2). A hybrid deductive-inductive approach was applied, drawing on established concepts in transgressive pedagogy—such as experiential engagement and social learning—while allowing new insights to emerge from the data.

The analysis centered on four thematic clusters: cognitive and behavioral shifts in students' environmental consciousness and agency; critical thinking and systems learning in navigating socio-ecological complexities; collaborative knowledge production through community engagement; and skills development for climate resilience, including problem-solving, anticipatory thinking, and advocacy. To ensure credibility, findings were triangulated across multiple data sources, with faculty members engaging in peer debriefing to refine interpretations. Additionally, select student participants were involved in member-checking to validate key insights. The final synthesis connected findings to broader discussions on experiential learning, sustainability education, and climate pedagogy, highlighting the transformative potential of transgressive learning approaches.

# 4 Findings and lessons learned

In this section, we share our observations of how our transgressive learning ventures have influenced students' learning experiences. We first present an overview of the journeys undertaken to date followed by how learning happened, and the lessons observed and their implications for climate change and sustainability learning.

## 4.1 Overview of field learning journeys

Our first trip was in March 2018 and our Center has succeeded in organizing the field learning journeys year on year since (Table 2). Fortunately, in 2020, the group returned from the trip before COVID-19 restrictions were implemented. During the trip, we focused on coastal communities to expose students to both climate-induced and non-climate-induced impacts on coastal ecological systems. Selected coastal communities gave students the opportunity to see first-hand the complexity of challenges coastal communities face and especially as they relate to sea-level rise and storm surges.

### 4.1.1 Anlo Beach: migration, land access, and coastal vulnerability

Another impactful field learning experience took place at Anlo Beach, a predominantly fishing community located near Shama in Ghana's Western Region (Table 2). This rural settlement is primarily inhabited by migrant fisherfolk from the Volta Region, whose migratory status presents significant challenges in accessing land for relocation. The community's geographical position—nestled between the sea and the estuary of the Pra River—renders it highly susceptible to coastal erosion, tidal flooding, and the adverse effects of sea-level rise. These environmental pressures have led to the destruction of homes and infrastructure, exacerbating the residents' precarious living conditions.

Upon arrival at the community, students observed firsthand the severe coastal erosion, and the remnants of structures lost to the encroaching sea. An open-air community dialogue was organized, where local leaders—predominantly women engaged in fish processing and trade—shared their experiences of displacement, the struggle to secure alternative land for resettlement, and

TABLE 2 Trips undertaken since inception.

| Year | Thematic focus | Places visited | Outcomes |
|---|---|---|---|
| 2018 | Agriculture, forestry and land degradation | Atiwa, Bunso | Appreciation of food (in) security |
| 2019 | Urbanization and disaster risk | Accra City tour | Understanding urban systems exposure, sensitivity, and adaptive capacity |
| 2020 | Coastal ecology and agriculture impact of environment | Anlo Beach (Shama), Komenda, Benso Oil Palm Plantation, Nzulezu Stilt Village | Appreciation of coastal vulnerabilities and issues around loss and damage due to land degradation |
| 2020 | Energy systems Biodiversity and community resource management | Bui Dam Buabeng Fiema Monkey Sanctuary, Mole National Park | Solar, hydro and mix generation sources. Biodiversity conservation and habitat preservation |
| 2022 | Water, sanitation and hygiene (WASH) and recycling | Accra, Agyin Kotoku | Linkages between water resources, sanitation, hygiene, and health |
| 2023 | Climate change and water | Fuller and Kintampo Falls | Appreciation of the nexus between climate change and water resource |
| 2024 | Nature-based solutions and eco-based disaster risk reduction and resilience | Ada Foah, Anloga, Wli Agumatsa, Akosombo | Deeper understanding of gray infrastructure, biodiversity, and ecosystem roles in disaster risk reduction |

the socio-economic impacts of environmental degradation on their livelihoods.

These interactions provided students with profound insights into the complexities of environmental justice, particularly how socio-economic and migratory statuses influence vulnerability and access to resources.

Faculty-led reflection sessions encouraged students to connect these observations to broader themes of climate-induced displacement, land tenure systems, and the formulation of inclusive adaptation strategies that consider the unique vulnerabilities of migrant communities. The Anlo Beach community's experience specifically enabled students specializing in climate adaptation, governance, and policy-making to critically interrogate the gap between national adaptation policies in Ghana, such as the National Climate Change Policy (2013) and the Nationally Determined Contributions (NDCs), and the on-the-ground realities of community displacement, ecological degradation, and socio-political conflicts.

Another key site frequently selected and visited is Mole National Park, located in the Savannah region of Ghana (Figure 3). This national biodiversity conservation park serves as an active classroom beyond the university, offering critical experiential insights into biodiversity conservation, human-nature interactions, climate change, ecosystem degradation, and the socio-economic and socio-cultural dynamics of environmental management in local communities.

At Mole National Park, students gain firsthand knowledge of the effects of changing climate conditions on water availability and its consequential impacts on biodiversity. They also explore issues of human-nature interactions and systems connectivity, encountering experiences of poaching, gaming, and human-wildlife conflicts. Through structured discussions with local conservationists, students also interrogated the tensions between conservation efforts and local livelihoods, recognizing the limitations of rigid conservation models that exclude community participation. These insights prompted discussions on the need for more inclusive and context-sensitive conservation policies.

For instance, during visits to Mole National Park, students directly observed the complex interactions between climate change-induced water scarcity, biodiversity impacts, and community livelihoods. Initially inclined toward standard conservation solutions such as restricting community access to park resources, students' perspectives shifted significantly through dialogs with local conservationists and residents. They discovered the socio-cultural complexities of conservation, recognizing the value of inclusive governance frameworks and adaptive co-management models that integrate local knowledge with scientific insights, thus enhancing their understanding of context-specific conservation strategies.

Such place-based insights and experiences are invaluable to students learning and have proved influential in helping students appreciate not just the science of climate change and environmental sustainability, but also and perhaps more importantly, the complexity of climate and natural resource governance and the multi-dimensional strategies needed to ensure effective stewardship of nature's resources in local communities. Consequently, the field learning journeys are not simple excursions but immersive experiences that cultivate students' abilities to critically analyze socio-environmental trade-offs, policy effectiveness, and governance frameworks.

### 4.1.2 Bui Dam: energy development and the trade-offs of progress

One of the most immersive field learning journeys was to the Bui Dam, located on the Black Volta River at the Bui Gorge, straddling the border of Ghana's Bono and Savannah Regions (Table 2). As Ghana's second-largest hydroelectric facility, the dam plays a crucial role in national energy generation and development planning. However, it also exemplifies the complex trade-offs between energy development, conservation, and community livelihoods. Constructed at the heart of Bui National Park, a biologically significant area known for its population of hippopotamuses and diverse wildlife, the dam's reservoir submerged parts of the park and triggered the resettlement of over 1,200 people, primarily fisherfolk and farmers. These impacts make the Bui site particularly relevant for understanding climate-constrained development challenges.

FIGURE 3
Map illustrating the 2020 travel route across various regions of Ghana. The letters (a, b, c, etc.) indicate key locations visited during the trip, including national parks, conservation areas, agroforestry sites and other points of interest (Source: Authors).

The field trip involved 27 students, accompanied by three faculty members and two administrative assistants. The visit began with a technical briefing by officials from the Bui Power Authority, who offered insights into the dam's planning, implementation, and management, with emphasis on environmental and social safeguards. Students were then taken on a guided tour of the dam infrastructure and adjoining environmental zones.

In the afternoon, the group visited a nearby resettled community, where structured dialogs were held with community leaders and residents. These sessions, facilitated by the university team in collaboration with local leaders, enabled students to listen to the lived experiences of displacement, disrupted livelihoods, and adaptation strategies. Through reflective note-taking and group discussions, students interrogated the tensions between large-scale infrastructure development and social justice. Many expressed that hearing directly from the community altered their theoretical assumptions and deepened their understanding of sustainability as

a relational and contested concept. One student wrote in their field journal report:

"*This visit really shook my worldview. I used to think of dams as symbols of progress. But after hearing from these communities, I now understand that progress can come with pain. Sustainability must mean justice for people, not just megawatts.*"

The faculty-led reflection session that followed encouraged students to connect these insights with systems thinking and ethical decision-making frameworks discussed in the classroom, reinforcing the transgressive intent of the pedagogical approach.

Through the engagement of locals, students gained a firsthand understanding of how problems are experienced differently by demographic groups. This helped to enhance their *self-awareness skills* as well as develop empathy toward the challenges faced by communities. This direct interaction with local people in their places also reinforced the value of *collaborative problem-solving*, as students worked with local stakeholders to reflect on and

devise potential solutions (Figure 2). The driving questions guiding the different place-based and place-focused interactions are: what happened here, what has changed, how did it change and how can we restore or reinhabit these places? These questions, and through interactive engagements, allow students to gain critical insights about these places and to appreciate the history of places to understand how the future might look.

Students, therefore, learned the importance of incorporating diverse perspectives into their problem-solving processes, recognizing the need for "place-specificity" in terms of cultural sensitivity and local relevance in developing solutions. A striking observation was how students' initial reliance on technocratic solutions evolved into a deeper appreciation for local knowledge and resourcefulness. This shift was particularly evident in discussions on community-led adaptation strategies, where students acknowledged the agency of local actors rather than perceiving them as passive victims of climate impacts. The driving questions guiding the different place-based and place-focused interactions were: *What happened here? What has changed? How did it change? And how can we restore or reinhabit these places?* These questions allowed students to gain critical insights about these places and appreciate the history of environmental change, helping them envision potential future scenarios.

*Critical thinking skills* were sharpened through the realization that theoretical knowledge might not always directly apply to the realities on the ground. Students were challenged to think creatively and adapt their theoretical knowledge to develop practical solutions for the unique challenges faced. For example, students initially proposed standard afforestation strategies in response to land degradation but, after interacting with farmers, they recognized the need for diversified agroforestry models that balance ecological restoration with livelihood security. This realization highlighted the gap between academic learning and practical application, which we highlight in this paper, prompting students to critically evaluate their learning and be innovative.

Students experiences in local communities and with local people, particularly in Damongo and Larabanga in northern Ghana, facilitated their appreciation of collaborative skills and the principles of citizen science and co-creation. By working closely with locals, students gained insights into the community's coping mechanisms and the values underpinning their priorities (normative skills). This experience taught them the importance of co-creating solutions with those who are directly affected by environmental challenges, thereby enhancing the sustainability and effectiveness of proposed interventions.

## 4.2 Lessons learned

"The ecological crisis raises fundamental questions about the dominant cultures' way of knowing, its moral values, and its way of understanding human/nature relationships" (Bowers, 1997, p. 65).

### 4.2.1 Place-based learning and contextual understanding

We have observed and recorded significant shifts in students' attitudes to learning and, indeed, learning about places. Thus, through a combination of lecture-room based learning, education

travel and field experience, our learning transgressions have highlighted the importance of place and place-based learning experiences that provide opportunities for students to explore and understand human-nature interactions and associated impacts. This is highlighted in Student A's comments (Figure 4). These transformative experiences, as students gained, are affirmed in literature where Barton and Dlouhá (2014); Mintz and Tal (2014) and Molderez and Fonseca (2018) all have implied that skills training and knowledge development are best optimized when complemented with experiences that create opportunities for personal development.

### 4.2.2 Transformative learning and attitudinal shift

Student A's (Figure 4) reflection poignantly illustrates the transformative learning and attitudes we observe as educators. It evidences how firsthand experiences in affected communities foster not only a deeper understanding of socio-ecological issues but also engenders a commitment to environmental stewardship and social change. We have observed that local community interactions significantly activate students' commitment to environmental and social change, highlighting the profound impact of real-world experiences on their attitudes. This immersion leads to a lasting adoption of sustainable behaviors and competencies among students. We observed that as students became more aware of "places" and the contextual socio-ecological challenges faced, they developed a greater sense of responsibility and felt better placed to help address such challenges, like food and water insecurity, by co-designing solutions with local people, leveraging on both theory and practice. Student feedback underscores the effectiveness of our innovative teaching methods in nurturing the next generation of leaders in environmental stewardship and policy advocacy. Field experiences enrich students with critical thinking skills and a purpose-driven mindset, beyond academic learning. Hence, these journeys profoundly inspire students toward advocating for equity and sustainability, beyond education. This demonstrates the critical role that experiential learning plays in the educational framework of the University of Ghana's C3SS and establishes a standard for incorporating real-world experiences into academic curricula to develop globally aware, involved, and proactive citizens. Our conclusion, therefore, is that such transgressive pedagogical experiences have been helpful in shaping not only the intellectual growth of our students, but also their dispositions and ability to lead the quest for transformational solutions.

### 4.2.3 Critical systems thinking and multi-stakeholder perspectives

Field engagements encourage students to approach sustainability challenges as interconnected systems rather than isolated issues. On such trips, students are put into groups and given real-life case study assignments that require trans/inter-disciplinary approaches to address. Our observations reveal students develop critical skills such as pragmatism, critical thinking, and systems thinking, each vital for effective climate action. Student C's (Figure 4) reflection on the Nzulezu visit underscores significant growth in collaborative learning. Experiencing the interplay between human settlements and natural ecosystems firsthand encourages critical thinking and

FIGURE 4
Student opinions shared via post-field learning trips evaluations.

problem-solving skills essential for addressing climate change and sustainability challenges. In another example, during discussions on the impact of mining activities on water quality, students moved beyond environmental concerns to consider economic dependencies, governance failures, and policy contradictions, demonstrating an emerging ability to navigate complexity. Field experiences also foster creativity, as students encounter real-world challenges that differ markedly from classroom theories. This teaches the necessity of adaptable and inventive approaches beyond standard problem-solving methods. These experiences expose students to complex real-world situations, enabling them to bridge theoretical knowledge with practical applications. Most students, out of these experiences, develop the necessary skills required for effective climate action.

### 4.2.4 Knowledge co-creation with locals

Our expeditions enable students to actively engage in co-creating solutions with the communities directly impacted by climate challenges [Student C(ii) in Figure 4]. The failure of many adaptation projects can often be traced back to a lack of genuine local involvement in the expert-driven solutions. Students rapidly grasp the importance of deeply understanding and engaging with local communities to tackle socio-ecological challenges effectively. Also, the students learn about the initiatives the locals take to either cope or even completely mitigate the challenges they face, which is in line with the argument we make for new ways of learning (and teaching) to be developed. At Nzulezu, they learned how traditional stilt architecture naturally mitigates flood risks, prompting reflections on how indigenous design principles could inform modern urban resilience planning. These insights reinforced the necessity of integrating indigenous knowledge into climate adaptation frameworks. Recent studies endorse citizen science to empower communities and enhance collaboration with experts. The rise of nature-based solutions and their global endorsement highlight

the need for their implementation through collaborative, co-creative efforts. Consequently, several nature-based solutions projects have adopted Living Labs (or Life Labs, Open Air Laboratories or Action Labs), first used in the early 1990s and conceived as an inclusive approach to planning, project design and implementation through experimental that fosters innovation (Lupp et al., 2020). Hence, here, our students have developed community engagement, cultural awareness and exchange, reflecting and scientific journaling and citizen and stakeholder engagement skills. Field studies in coastal communities offer students invaluable insights into the realities of coastal erosion, sea-level rise, and local adaptation strategies. In most instances, the extent of impact, changes and adaptation options in affected communities help students to appreciate the complex nature of the challenge and how adaptation solutions could be approached.

### 4.2.5 Influence on career pathways

The reflections of students such as D and B (Figure 4) from their field learning journeys underscore our pedagogical aim of instilling pragmatism and agency. These experiences not only shape students' career aspirations, such as D's commitment to climate action and B's interest in sustainable agriculture but also deepen their understanding of complex environmental issues. Some students shifted from generic environmental science aspirations to more specialized interests such as climate justice advocacy, biodiversity conservation, and sustainability entrepreneurship. These shifts demonstrate that experiential learning fosters professional development beyond academic coursework.

## 5 Limitations of the study

While this study provides valuable insights into the role of transgressive pedagogies in climate change education, it is not without limitations. First, the analysis relies on qualitative data,

which, although rich in depth and context, may be subject to researcher bias in interpretation. Efforts were made to mitigate this through triangulation and peer debrief, but inherent subjectivity remains. Second, the study focuses on a specific cohort of students at the University of Ghana, limiting the generalizability of findings to other higher education institutions, particularly those with different socio-cultural and institutional contexts. Future research could expand the scope to multiple universities across Africa to compare and refine insights.

Additionally, data collection primarily involved self-reported reflections and discussions, which may introduce social desirability bias, as students might have expressed views they perceived as favorable to educators. Combining this with more objective measures, such as long-term behavioral tracking, could enhance the robustness of findings. Lastly, logistical and resource constraints limited the number of field learning journeys, potentially restricting the diversity of experiential insights. Future studies could explore virtual or hybrid experiential learning models to assess their effectiveness in contexts where physical field trips are not feasible. Despite these limitations, the study contributes significantly to the discourse on transformative learning in sustainability education, offering a strong foundation for further inquiry and pedagogical innovation.

# 6 Conclusion: place-centered sustainability praxis and pedagogy

> "...our cultural experience is 'placed' in the 'geography' of our everyday lives, and in the 'ecology' of the diverse relationships that take place within and between places" (Gruenewald, 2014, p. 137).

Place-Centered Sustainability Praxis, according to Evans (2012, 2015), is rooted in an ontology in which humans and their other-than-human neighbors exist and maintain systems stability through reciprocal relationships with each other in local places. In practice, a place-centered pedagogy and praxis brings a focus on the locale by highlighting the power of local places to engage students academically and in ways that connect lecture-room theories with local realities to ensure intellectual rigor and insightful understanding of local problems and their relationships with global problems and how transformational solutions may be explored through collaboration.

As societies across the world, and more so in Africa, continue to face the stark reality of mounting sustainability challenges, represented by growing social inequalities, economic uncertainties, environmental degradation and climate change challenges, the urgency for transformative solutions has become imperative requiring new approaches to how people live, learn and act in their places. Also, as evidence of climate change impacts become pervasive and verifiably evident in local communities and across key climate-sensitive sectors, the irony in most African countries, including Ghana, is that not many people living in affected communities have the requisite knowledge, understanding and capacity to respond to emerging impacts.

Even more concerning is the fact that most education systems, especially higher education, have failed to connect what has been learned in classrooms as theories to place-based experiences to deepen teaching and learning. Education and learning, for the most part, have remained rigidly abstract and theoretically limiting learning and the definition of knowledge development and acquisition to school sites and lecture rooms and in ways that ignore the learning attributes inherent in the places and communities in which schools are located. As we have found out in our learning journey expeditions, A place-centered sustainability praxis and pedagogy brings innovation and pragmatism in education and learning for climate change and sustainability by challenging the meaning of education and learning.

Known also as Place-Based Education (PBE) or community-focused-learning, a place-centered praxis and pedagogy challenges the meaning of education and learning by asking seemingly simple questions such as: Where am I? What is the nature of this place? What happened here? What has changed and how may we restore this place? These are critical questions that guide social learning and socio-ecological transformation. They are the types of questions needed for a genuine self-appraisal, what Chambers (2012) describes as Self-Critical Epistemological Awareness (SEA)—a process through which learners, literary see their places as never before—and are empowered through experiential insights to make critical connections between lecture room-based knowledge and community-based realities.

This study's conclusion emphasizes the necessity of a fundamental shift in educational practices, arguing against conventional, theory-heavy methods and in favor of a dynamic, experiential learning model based in local communities and settings. We have shown, via "transgressive pedagogies," how profoundly immersive field experiences improve students' comprehension of intricate socio-ecological concerns, developing their critical thinking skills and strengthening their commitment to sustainable practices. These results not only point to the transformative potential of place-centered sustainability praxis in developing future leaders capable of addressing the most urgent climate change issues, but they also make a case for a systemic reassessment of pedagogical approaches in African higher education institutions.

By incorporating local realities into the curriculum, we strengthen the role of education as a key driver of social change and ecological stewardship while also enhancing the learning experience and enabling students to make significant contributions to the sustainability debate. Our research urges educational policymakers and practitioners to embrace this transition toward a more engaged, relevant, and effective learning experience. It also advocates for the implementation of these pedagogical innovations as standard. And where field learning journeys cannot be frequent or possible for various reasons, virtual options can be explored. Alternatively, online data pools with case studies of local adaptation like WOCAT, weADAPT, GeoIKP, Equator Initiative and Oppla (Schröter et al., 2021).

The findings from our transgressive pedagogical approaches at the University of Ghana demonstrate clearly that transitioning toward experiential, place-based education is essential for equipping students to navigate Ghana's specific climate and sustainability challenges. Moving forward, educational institutions in Ghana and similar contexts should integrate such experiential

learning frameworks systematically, enabling students to connect theoretical knowledge with practical, context-specific applications. Future research should also explore broader comparative studies across institutions in Africa to refine insights and expand transgressive pedagogy's transformative potential.

## Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, upon reasonable request.

## Ethics statement

The studies involving humans were approved by the Office of Research Innovation and Development, University of Ghana. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

## Author contributions

BM: Conceptualization, Data curation, Formal Analysis, Investigation, Methodology, Project administration, Resources, Supervision, Validation, Visualization, Writing – original draft, Writing – review and editing. YB: Conceptualization, Investigation, Methodology, Resources, Software, Validation, Visualization, Writing – original draft, Writing – review and editing. EO: Conceptualization, Formal Analysis, Investigation, Project administration, Resources, Supervision, Validation, Writing – original draft, Writing – review and editing. KE: Conceptualization, Data curation, Formal Analysis, Investigation, Methodology, Visualization, Writing – original draft, Writing – review and editing. AA: Investigation, Project administration, Resources, Supervision, Writing – original draft, Writing – review and editing.

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## Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

## Generative AI statement

The authors declare that no Generative AI was used in the creation of this manuscript.

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