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Experiential Learning in Geography Education for Environmental Character Development: A Systematic Review and Bibliometric Analysis

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ABSTRACT

Environmental degradation is prompting researchers and educators to move beyond mere knowledge transmission towards approaches that shape how students think and act towards nature. Although experiential learning and geography education have each attracted widespread attention, no systematic review has examined their intersection, particularly regarding the development of environmental character. This study addresses that gap through a systematic review and bibliometric analysis of peer-reviewed literature published between 2015 and 2026, drawing on three Scopus-indexed datasets covering pro-environmental behaviour (n = 2,107), experiential learning (n = 1,461), and geography education (n = 1,226). Following deduplication and PRISMA 2020-guided screening, 44 core studies meeting all three thematic criteria were selected for in-depth synthesis, alongside 342 articles for broader bibliometric analysis. Publication output has risen sharply since 2020. Thematic synthesis of the 44 core studies shows that field research, outdoor learning, and place-based education are the most frequently reported forms of experiential learning in geography-based environmental education, shaping environmental character through three mechanisms: affective engagement with place, active environmental inquiry, and experiential learning through direct interaction with natural systems. These mechanisms are integrated into the Experiential Geography for Environmental Character (EGEC) framework. Middle and high school studies report the strongest impacts on students' environmental attitudes, awareness, and behavioural intentions. However, a gap remains between evidence of effectiveness and classroom implementation, particularly in low- and middle-income countries. Longitudinal and cross-cultural research is needed to move the field beyond single-context, cross-sectional studies.

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1. Introduction

An environmental crisis of unprecedented scale, including biodiversity loss, climate disruption, freshwater scarcity, and land degradation, has strengthened calls for educational reform. Educational systems are increasingly expected to move beyond knowledge transmission and foster ecological consciousness and environmental agency among learners (IPCC, 2022; Richardson et al., 2023). The realisation that information alone rarely leads to behavioural change has placed pedagogical design at the heart of the discourse on sustainability education (Kollmuss & Agyeman, 2002; Monroe et al., 2019). In this context, experiential learning encompassing fieldwork, outdoor education, place-based enquiry, and hands-on environmental engagement has attracted sustained scholarly attention as a mechanism for bridging the well-documented gap between environmental knowledge and pro-environmental action (Parker, 2024).

Geography education occupies a unique position in this debate. As a discipline that focuses on the relationship between human societies and the natural environment, geography offers strong pedagogical potential for fostering environmental literacy, ecological identity, and environmental character. These concepts include environmental values, attitudes, awareness, and motivation to act responsibly towards the natural world (Windsor & Kriewaldt, 2023; Stoltman, 2012). The tradition of field research and empirical investigation in real-world contexts within this discipline makes it an ideal setting for hands-on, experience-based learning. Theorists of experience-based education have long argued that this type of learning is essential for deep and transformative learning.

Despite this theoretical alignment, studies linking experiential geography education to environmental

character development remain limited and fragmented. Existing reviews have generally examined these domains separately. A bibliometric analysis of the literature on experiential learning indicates that research in this field is concentrated in the clusters of management/business education, engineering curricula, and organizational learning and entrepreneurship (Azeez & Aboobaker, 2024), with engineering and health education being the most frequently studied contexts of application (Tembrevilla et al., 2023). The learning cycle provides a foundational framework and methodology for experiential learning (Wurdinger, 2005; Kolb & Kolb, 2018). Meanwhile, reviews of geography education have emphasized curriculum design, GIS integration, and spatial thinking competencies (Oberle et al., 2024; Shahjahan et al., 2024). Research into pro-environmental behaviour has yielded numerous studies on attitude predictors and social-cognitive mechanisms (Piao & Managi, 2024), including recent empirical evidence that direct engagement with nature can enhance environmental attitudes and responsibility (Zhao et al., 2024). A similar gap is also evident in the Indonesian context. For example, Hastuti et al. (2024) examined the pro-environmental behaviour of Indonesian geography majors. The study focused on individual psychological variables—environmental knowledge, environmental responsibility, values, beliefs, and norms—and general perceptions of environmental education, measured through a survey. However, it did not link these findings to the design of specific experiential learning activities.

This fragmentation represents a significant gap in scientific understanding, namely the lack of integration between an individual's environmental disposition (values, attitudes, and awareness) and discipline-specific, place-based pedagogical design in a longitudinal context, as well as the lack of structural-bibliometric mapping capable of revealing patterns of development and fragmentation across disciplines in the literature on experiential learning and geography education. This study addresses this gap through a systematic review and bibliometric analysis. It examines the literature on experiential learning, geography education, and environmental character development using a combined dataset from Scopus comprising 4,794 articles published between 2015 and 2026.

To achieve these objectives, this study is based on three main research questions.

1) What is the bibliometric profile of research at the intersection of experiential learning, geography education, and environmental character development?
2) What experiential pedagogical approaches in geography education are most frequently associated with pro-environmental outcomes?
3) Through what mechanisms does experiential geography education influence students' environmental character?

This review summarises the findings from the relevant literature to develop an integrated framework for understanding the role of geography education in fostering environmentally responsible citizens. This contribution is highly relevant for curriculum designers, teacher educators, and policymakers in an era of increasingly severe ecological crises.

2. Theoretical Framework

2.1 Experiential Learning and Environmental Education

The theoretical foundations of experiential learning are most closely associated with Experiential Learning Theory (ELT), which proposes that learning occurs through a cyclical process involving concrete experience, reflective observation, abstract conceptualisation, and active experimentation. In environmental contexts, Kolb's cycle intuitively maps onto geography-based pedagogy: students encounter environmental phenomena directly through fieldwork or outdoor observation, and then reflect on and conceptualise their experiences. This understanding is then put into practice through action-oriented tasks, such as conservation projects or environmental monitoring (Ferrara et al., 2025).

Experiential education emphasises the continuity and interaction of experience as the foundation of meaningful learning. This perspective provides a philosophical foundation for understanding why direct interaction with the environment can lead to deeper and more lasting learning than classroom instruction alone. Recent scientific studies have further expanded this framework by emphasising that affective engagement, emotional attachment to a place, and the creation of personal meaning are central dimensions of cognitive learning. These dimensions are increasingly recognised as crucial for the development of pro-environmental attitudes (Ardoin et al., 2020; Chawla, 2022). Forest schools, nature-

based learning programmes, and urban environmental field courses have all been theorised within this framework as sites where the affective and cognitive dimensions of environmental learning are simultaneously activated (Harris, 2021; Turtle et al., 2015).

2.2 Environmental Character and Its Educational Dimensions

The concept of environmental character draws inspiration from character education theory and environmental psychology. It refers to a relatively stable constellation of values, attitudes, and behavioural dispositions towards the natural world. In this review, environmental character is defined as a set of values and an identity that motivates individuals to act responsibly towards the environment because such actions align with their personal values rather than solely with external incentives or social norms—a synthesis derived from the literature on environmental citizenship (Quintero-Losada et al., 2025) and the roots of the development of responsibility (Wray-Lake & Syvertsen, 2011). This construct is closely related to, yet analytically distinct from, environmental literacy and ecological identity, both of which emphasize the cognitive and identity dimensions of environmental engagement. Environmental literacy emphasizes cognitive dimensions and skills. This concept was first formulated by Roth, as cited in (McBride et al. (2013) at the Massachusetts Audubon Society, and was subsequently operationalized into four interrelated components: knowledge, skills, affect, and behaviour (Hollweg et al., 2011).

Ecological/environmental identity is a dimension of self-concept. The construct concerns the extent to which nature forms part of a person's self-concept, comparable to other dimensions of identity, such as gender or nationality. Building on this definition, the Revised Environmental Identity Scale measures individual variation in the extent to which nature is viewed as an integral part of one's self-concept, including emotional closeness to the natural environment and the tendency to view oneself as inseparable from it. The scale measures individuals' connectedness to and interdependence with nature as an identity construct; however, whether this connectedness is stable over time and across contexts remains an empirical question that requires further testing. (Ariccio & Mosca, 2023).

Pro-environmental behaviour (PEB) is an outcome construct comprising observed or self-reported actions, such as resource conservation, sustainable consumption, or participation in environmental advocacy. PEB is typically positioned as a dependent variable in the value-belief-norm model and the theory of planned behaviour and represents the final link in a causal chain influenced by literacy, identity, and character, yet it is not identical to any of these constructs. This distinction is illustrated by the 'value-action gap': the discrepancy between an individual's environmental values or knowledge and their actual behaviour (Kollmuss & Agyeman, 2002; Portus et al., 2024). In educational research, environmental character development has been operationalized based on several dimensions: environmental knowledge, environmental attitudes, environmental values, and behavioural intentions and actions (Kollmuss & Agyeman, 2002; Monroe et al., 2019). The value-belief-norm model and the theory of planned behaviour have become dominant frameworks for explaining the relationship between environmental values and behavioural outcomes. However, both frameworks are considered to rely too heavily on cognitive-rational processes and tend to underemphasize the role of emotions arising from sensory experiences and the body's direct engagement with nature (Cao et al., 2022). This limitation may be addressed more effectively through experiential approaches in geography education.

2.3 Geography Education and Sustainability

Geography's intellectual tradition positions it uniquely among school subjects for education that integrates scientific understanding of environmental systems with ethical reasoning about human responsibilities. The Lucerne Declaration on Geography Education for Sustainable Development formally emphasises the role of geography education in fostering students' ability to think geographically (Windsor & Kriewaldt, 2023). These abilities include an understanding of spatial relationships, human-environment interactions, and the systemic nature of sustainability challenges as a foundation for informed environmental citizenship.

This framework has guided curriculum development across multiple national contexts and underpins the rationale for geography-based approaches to environmental character education (Chang & Kidman, 2020; Oberle et al., 2024). The pedagogical repertoire in geography education includes topographic field research, environmental monitoring, location-based enquiry projects, remote sensing and Geographic Information System (GIS) analysis, and community-based research. These approaches represent a rich

yet underexplored domain for experiential environmental character development. The present review examines how the methodological traditions of geography education interact with experiential learning theory to support environmental character formation.

3. Method

3.1 Study Design

This study employed a systematic review design combined with bibliometric analysis to examine the intersection of experiential learning, geography education, and environmental character development. This review follows the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA 2020) guidelines (Page et al., 2021) to ensure methodological transparency, reproducibility, and consistency in reporting throughout the review process. This component of the systematic review addresses the qualitative aspects of identifying, evaluating, and synthesising findings from primary studies at the intersection of experiential learning, geography education, and environmental character development. Bibliometric analysis provides quantitative mapping of publication trends, geographic distribution, leading journals, and keyword co-occurrence patterns in this literature, offering structural insights into the field's intellectual development (Donthu et al., 2021).

3.2 Search Strategy and Data Sources

The literature search was conducted using Scopus as the primary database, selected for its comprehensive coverage of Scopus-indexed social science and education literature and its suitability for systematic bibliometric analysis. Three thematic searches were conducted, targeting the following keyword clusters: (1) "environmental character" OR "environmental awareness" OR "environmental attitudes" OR "pro-environmental behavior" OR "environmental literacy" OR "environmental responsibility" OR "sustainability behavior"; (2) "experiential learning" OR "outdoor education" OR "fieldwork" OR "place-based learning" OR "field-based learning"; (3) "geographic education" OR "geography education" OR "environmental education" OR "geoscience education". The search was conducted in the title, abstract, and keyword fields, limited to English-language articles published between January 2015 and May 2026.

These three searches yielded 2,107, 1,461, and 1,226 records, respectively; the thematic searches were then combined into a single master corpus through a merging process, resulting in a total of 4,794 records before duplicates were removed. The merging at this identification stage was inclusive and did not apply intersections between keyword clusters, with the aim of maximising the coverage of potentially relevant literature. Thematic relevance to the intersection of the three concepts (environmental character, experiential learning, and geography education) was subsequently assessed through a title-and-abstract screening stage and an evaluation of the full-text eligibility based on inclusion and exclusion criteria following the PRISMA 2020 guidelines (Page et al., 2021). Duplicates were identified and removed using DOI and title-similarity matching.

The Scopus database was searched on 12 May 2026. Three Boolean query strings were executed using the TITLE-ABS-KEY field operator. Search 1 targeted environmental outcomes intersected with experiential learning approaches (n = 2,107); Search 2 targeted experiential learning intersected with geography education contexts (n = 1,461); and Search 3 targeted environmental character constructs intersected with geography and environmental education (n = 1,226). All searches applied uniform filters: peer-reviewed journal articles, English-language publications, and years 2015–2026. The combined retrieval before deduplication was 4,794 records. Following deduplication using Scopus EIDs, DOIs, and title–year–author matching, 4,776 unique records were retained for screening.

Table 1. Scopus Search Strings Executed on 12 May 2026

Search	Boolean Query String (TITLE-ABS-KEY)	Retrieved (n)
S1	TITLE-ABS-KEY(("environmental character" OR "environmental literacy" OR "environmental responsibility" OR "environmental behavior" OR sustainability) AND ("experiential learning" OR "outdoor education" OR "fieldwork" OR "field-based learning" OR "place-based learning")) AND PUBYEAR > 2014 AND PUBYEAR < 2027 AND LANGUAGE(english) AND DOCTYPE(ar)	2,107
S2	TITLE-ABS-KEY(("experiential learning" OR "outdoor education" OR "fieldwork") AND ("geography education" OR "geography teaching" OR "geography learning")) AND PUBYEAR > 2014 AND PUBYEAR < 2027 AND LANGUAGE(english) AND DOCTYPE(ar)	1,461
S3	TITLE-ABS-KEY(("environmental character" OR "environmental literacy" OR "environmental responsibility") AND ("geography education" OR "environmental education" OR "geoscience education")) AND PUBYEAR > 2014 AND PUBYEAR < 2027 AND LANGUAGE(english) AND DOCTYPE(ar)	1,226
Total (before deduplication)		**4,794**
After deduplication		**4,776**

3.3 Inclusion and Exclusion Criteria

The inclusion criteria for the systematic review were as follows: (a) empirical or theoretical studies directly addressing the relationship between experiential learning approaches, geography or environmental education, and student environmental outcomes (attitudes, behaviours, values, or character); (b) peer-reviewed journal articles; (c) published within the 2015–2026 period; and (d) available in English. Studies were excluded if they focused solely on cognitive or academic performance outcomes without addressing the affective or behavioural dimensions of the environment, or if they examined experiential learning in disciplines unrelated to geography, the environment, or sustainability, such as medical procedure training. Conference proceedings, book chapters, gray literature, book reviews, editorial notes, and retracted articles were also excluded.

3.4 Screening and Selection Process

Deduplication was performed in stages using the Mendeley desktop application version 1.19.15; all search results from the three Boolean strings were imported into a single Mendeley Library and then checked using the "Check for Duplicates" feature in the Tools menu. This feature first uses Scopus EID and DOI matching, then applies Mendeley's internal metadata matching algorithm (a combination of title, publication year, and author name). This process removed 18 duplicate records, resulting in 4,776 unique articles; the records were filtered in two stages. In the first stage, two reviewers screened titles and abstracts to assess thematic relevance across the three conceptual domains. Records were marked as relevant if they contained substantive terms defined as the appearance of a cluster's core concept as the focus of the research (variable, intervention, or primary context) rather than incidental mentions. For example, Wahelo et al. (2025) were evaluated against these relevance criteria.

This process identified 342 potentially relevant articles, constituting a broader dataset for bibliometric analysis. In the second stage, full-text screening was applied to identify studies that met all inclusion criteria across the three thematic dimensions. This yielded 44 articles that formed the core synthesis set, representing the body of literature most directly relevant to the qualitative thematic synthesis. To strengthen methodological reliability, a double-screening procedure was applied independently by two reviewers during the title and abstract stage. A randomly selected subset of 20%

of the total records (n = 956 of 4,776) was independently screened by both reviewers. Initial agreement was reached on 912 of the 956 double-screened records.

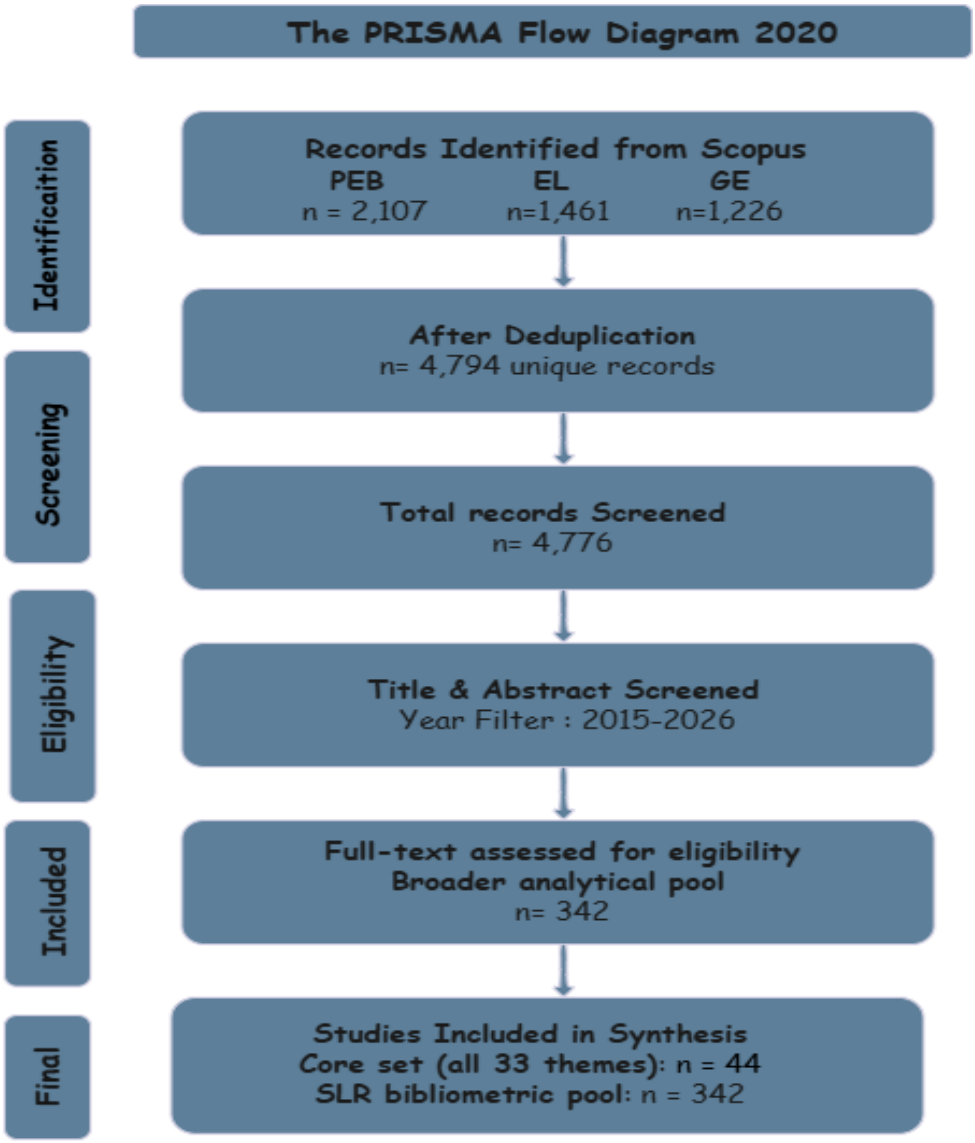


Figure 1. The PRISMA 2020 flowchart illustrating the process of identifying, screening, assessing eligibility, and including articles.

Preliminary agreement was reached on 912 of the 956 double-screened records. Disagreements were identified in 44 cases, resulting in a crude agreement rate of 95.4%. Inter-rater reliability was formally assessed using Cohen's kappa coefficient, which yielded a value of κ = 0.81 (95% CI: 0.76–0.86), indicating strong agreement among raters. Discrepancies were resolved through a structured consensus procedure: each disagreement was first discussed between the two reviewers; cases that remained unresolved after discussion (n = 7) were referred to a third independent reviewer whose decision was considered final. The remaining 80% of records (n = 3,820) were subsequently divided between the two reviewers for independent screening, with the eligibility criteria applied consistently across both portions. The same double-screening and consensus procedures were repeated during the full-text review stage for all 44 core articles, yielding a κ value of 0.84, confirming consistent eligibility assessments at both screening stages, as documented in the PRISMA 2020 flowchart shown in Figure 1.

3.5 Data Extraction and Quality Assessment

For the 44 core articles, a structured data extraction protocol was applied, recording (a) bibliographic information (authors, year, journal, country); (b) study design and methodology; (c) educational level

and context; (d) experiential learning modality examined; (e) environmental outcome variables measured; and (f) key findings and mechanisms identified. Methodological quality was assessed using an adapted version of the Mixed Methods Appraisal Tool (MMAT), which focuses on the appropriateness of study design, sample adequacy, transparency of data collection and analysis, and credibility of reported conclusions (Hong et al., 2018). Studies were not excluded based on quality, but quality scores formed the basis for the weighting assigned to each study in the narrative synthesis. Appendix A summarises the analytical coding and data extraction framework applied to the 44 core studies, including study context, experiential modality, environmental outcomes, and identified pedagogical mechanisms.

3.6 Bibliometric Analysis

For a broader collection of 342 articles, a bibliometric analysis was conducted using descriptive statistical methods, including an analysis of publication trends, a mapping of geographic distribution based on author affiliations, an analysis of journals with the highest publication productivity, and an analysis of keyword frequency (Donthu et al., 2021). Co-word analysis to identify conceptual clusters and intellectual structures within the field (Figures 7–8) was also performed on the same bibliometric dataset (n = 342), following a well-established bibliometric mapping approach (van Eck & Waltman, 2010). Meanwhile, 44 core articles were used separately for qualitative thematic synthesis and an in-depth systematic review, in accordance with the PRISMA selection protocol described in the previous methods section, with keyword normalization procedures applied to account for orthographic variants and enhance analytical consistency. To facilitate full reproducibility, all computational procedures and preprocessing resources are provided as supplementary materials. Appendix A contains the complete Boolean search strategies and search dates for the three Scopus searches. Appendix C provides the Python scripts used for data parsing, preprocessing, descriptive bibliometric analysis, and topic analysis. Appendix D documents the keyword cleaning rules applied before co-word analysis. Appendix E presents the keyword normalization dictionary used to standardize synonymous terms and spelling variants. Appendix F contains the original Scopus dataset exported in RIS format.

3.7 Synthesis Approach

A narrative synthesis approach was adopted, consistent with the heterogeneous nature of the included studies in terms of design, context, and outcome measures (Popay et al., 2006). This synthesis is organised thematically across the 44 core studies. The process began with a bibliometric analysis from which the themes were derived inductively from the extracted data and refined through repeated comparisons between studies. A conceptual framework mapping the mechanisms through which experiential geography education influences environmental character development was developed as an integrative output of the synthesis and is presented as the EGEC Pathway Framework.

4. Results and Discussion

4.1 Results

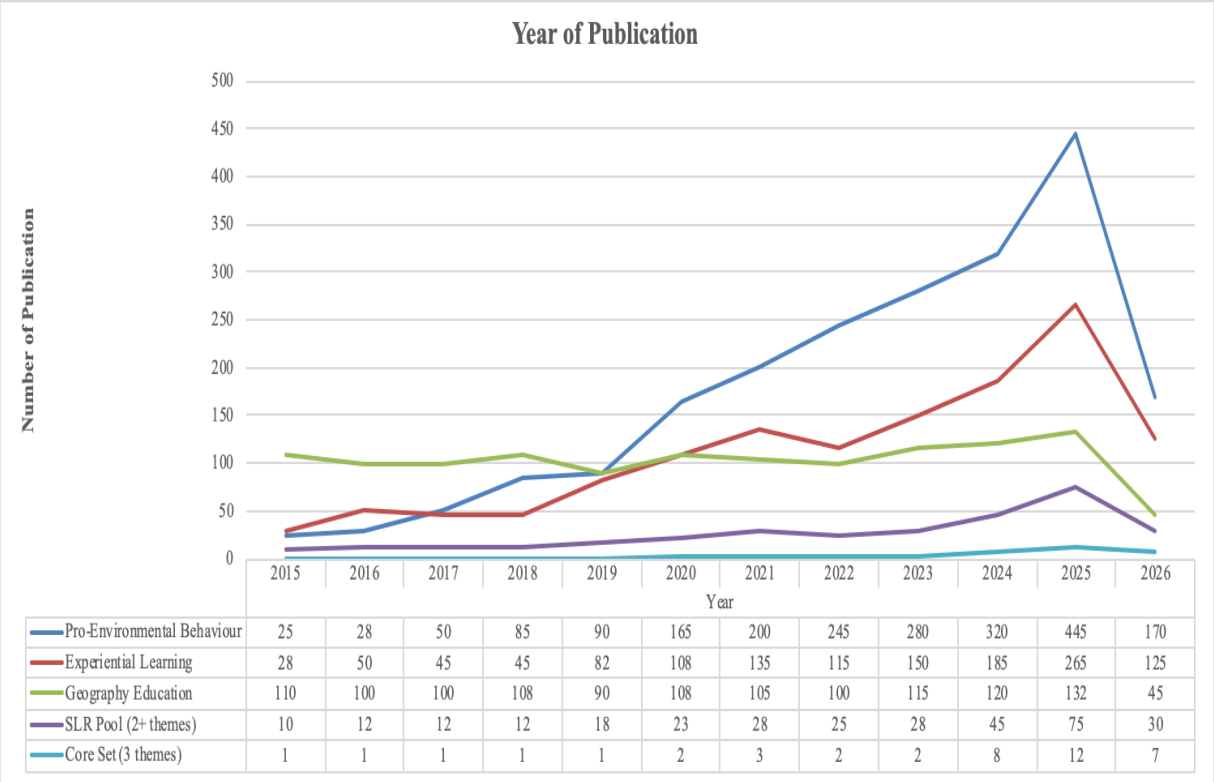
4.1.1 Bibliometric Overview: Publication Trends and Growth

The 342 articles in this broader analytical collection span a period of significant growth, with the annual publication volume rising sharply after 2020. As illustrated in Figure 2, the number of annual publications between 2015 and 2019 ranged from 11 to 18 articles per year. Starting in 2020, the publication volume nearly doubled to 26–30 articles per year during 2020–2023, before surging to 48 articles in 2024 and 78 articles in 2025, representing a nearly sevenfold increase compared to the baseline period. Of the 44 core articles, 75% were published between 2020 and 2026, indicating that the specific intersection between experiential geography education and environmental character development has recently emerged as a research frontier that is beginning to gain academic recognition.

4.1.2 Proportional Distribution of the Research Corpus

As shown in Figure 3, the total corpus of 4,794 records (before deduplication; after deduplication: 4,776) is distributed across three thematic domains: pro-environmental behaviour (n = 2,107; 44.0%),

experiential learning (n = 1,461; 30.5%), and geography education (n = 1,226; 25.6%). The nested bar chart further illustrates the progressive reduction from the full corpus to the SLR analytical pool (n = 342) and the core synthesis set (n = 44), demonstrating the relatively small but coherent body of literature that directly addresses all three thematic dimensions simultaneously.



	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Pro-Environmental Behaviour	25	28	50	85	90	165	200	245	280	320	445	170
Experiential Learning	28	50	45	45	82	108	135	115	150	185	265	125
Geography Education	110	100	100	108	90	108	105	100	115	120	132	45
SLR Pool (2+ themes)	10	12	12	12	18	23	28	25	28	45	75	30
Core Set (3 themes)	1	1	1	1	1	2	3	2	2	8	12	7

Figure 2. Annual publication trends by research domain and total output (2015–2026)

Figure 3. Proportional distribution of publications across the three research domains (total n = 4,794).

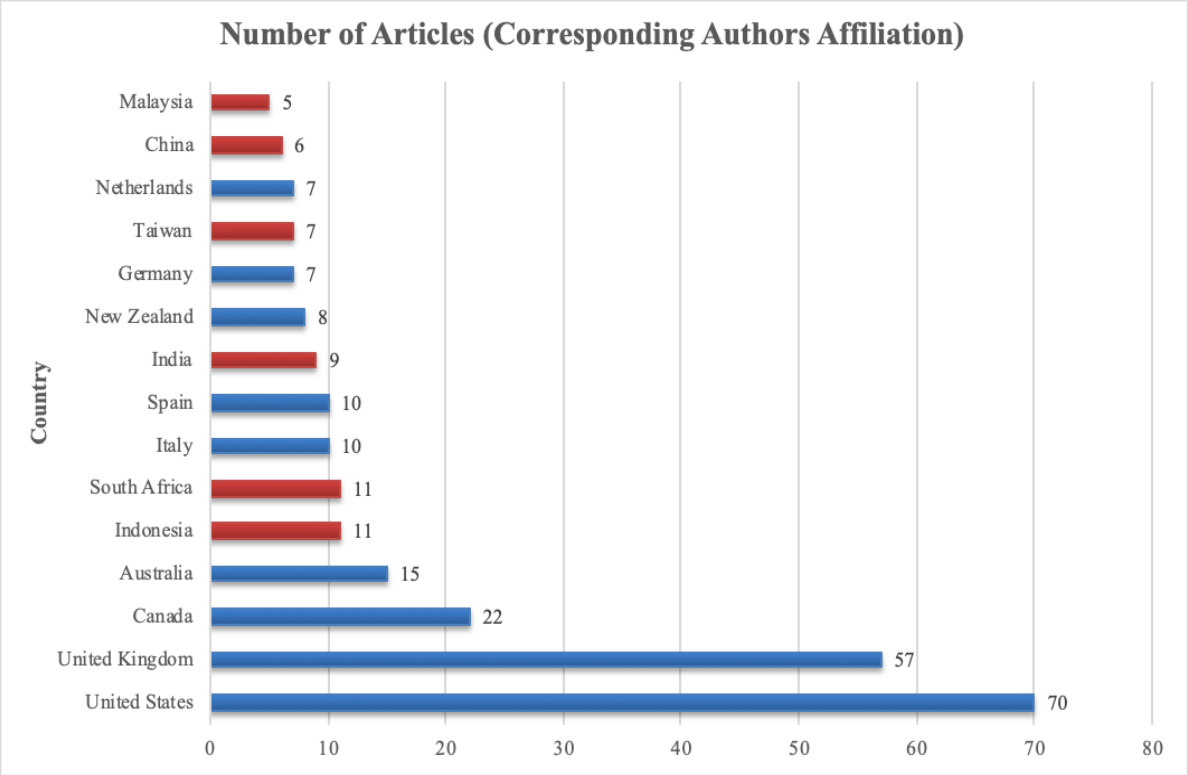


Figure 4. Top 15 countries by research contribution, based on corresponding author affiliations in the SLR analytical pool (n = 342)

4.1.3 Geographic Distribution

The geographic distribution of contributing countries is presented in Figure 4. A broader analysis of the 342 articles revealed a significant concentration of research in the Global North, with the United States (n = 70, 21.7%), the United Kingdom (n = 58, 18.0%), and Canada (n = 22, 6.8%) together accounting for nearly half of all publications. Australia (n = 14), South Africa (n = 11), and Spain (n = 10) also emerged as major contributors. Among the countries of the Global South, Indonesia (n = 11) and China (n = 6) were the leading contributors. Indonesia's strong presence reflects increasing scholarly attention to geography education and sustainability in the context of national curriculum reform. This geographic distribution highlights a significant structural imbalance with important implications for the generalisability of dominant theoretical frameworks.

4.1.4 Journal Landscape

The journal distribution for the SLR analytical pool is illustrated in Figure 5. The analytical pool spans a diverse set of journals, with the Journal of Geography in Higher Education emerging as the most prominent venue (n = 46), followed by Sustainability (Switzerland) (n = 40) and Journal of Geography (n = 12). Notably, International Research in Geographical and Environmental Education ranked ninth with nine published articles. These findings highlight the journal's direct relevance to the research field and indicate opportunities for further scientific contributions. The 44 core articles were published in 31 different journals, demonstrating a highly dispersed publication landscape. This pattern suggests that the field remains an emerging rather than a fully consolidated research subfield.

4.1.5 Keyword Co-occurrence and Conceptual Landscape

Analysis of keyword frequency across the 342-article pool (Figure 6) reveals three dominant conceptual clusters: (1) a pedagogy cluster centred on experiential learning, fieldwork, active learning, and higher education; (2) a geography and disciplinary cluster centred on geography education, curriculum, and GIS; and (3) an environment and sustainability cluster centred on sustainability, environmental education, and climate change. The keyword sustainability appears in 66 articles and functions as a bridge concept connecting all three clusters.

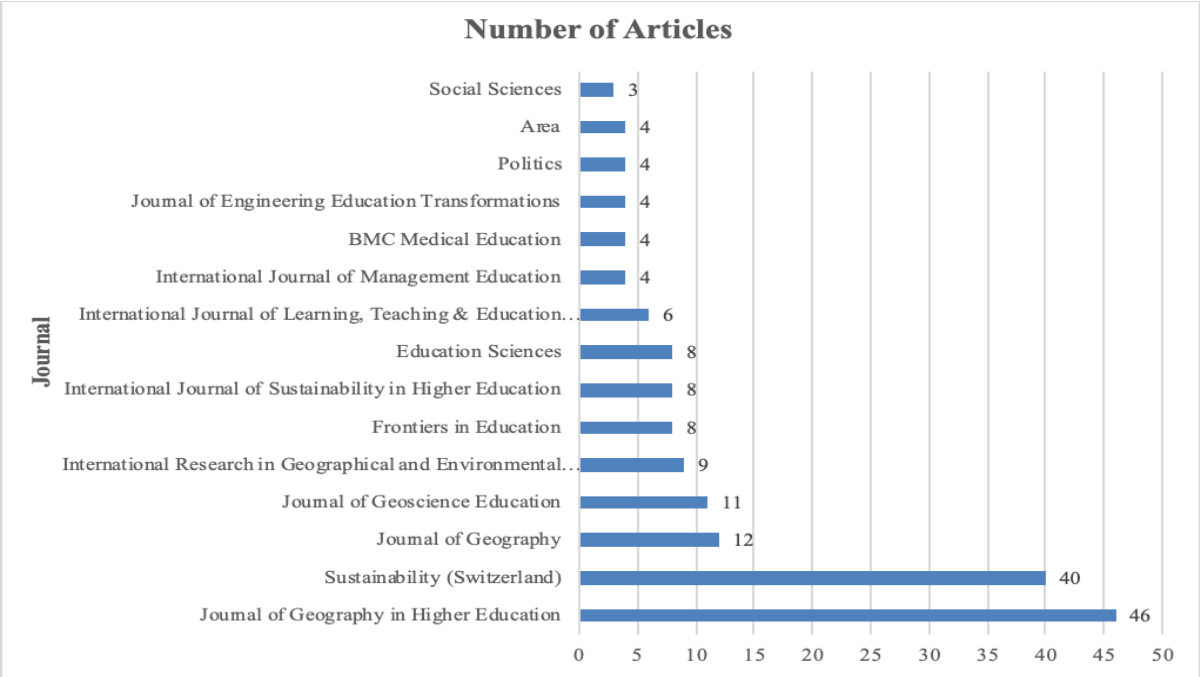


Figure 5. Top 15 most productive journals across the SLR analytical pool (n = 342)

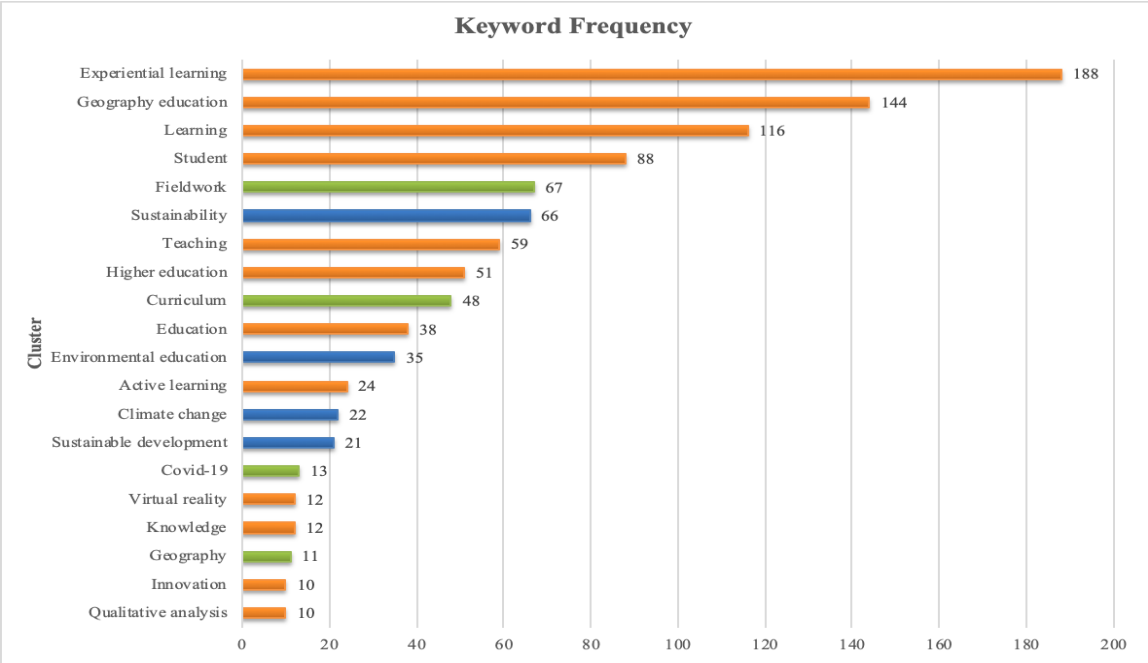


Figure 6. Top 20 most frequent keywords across the SLR analytical pool (n = 342)

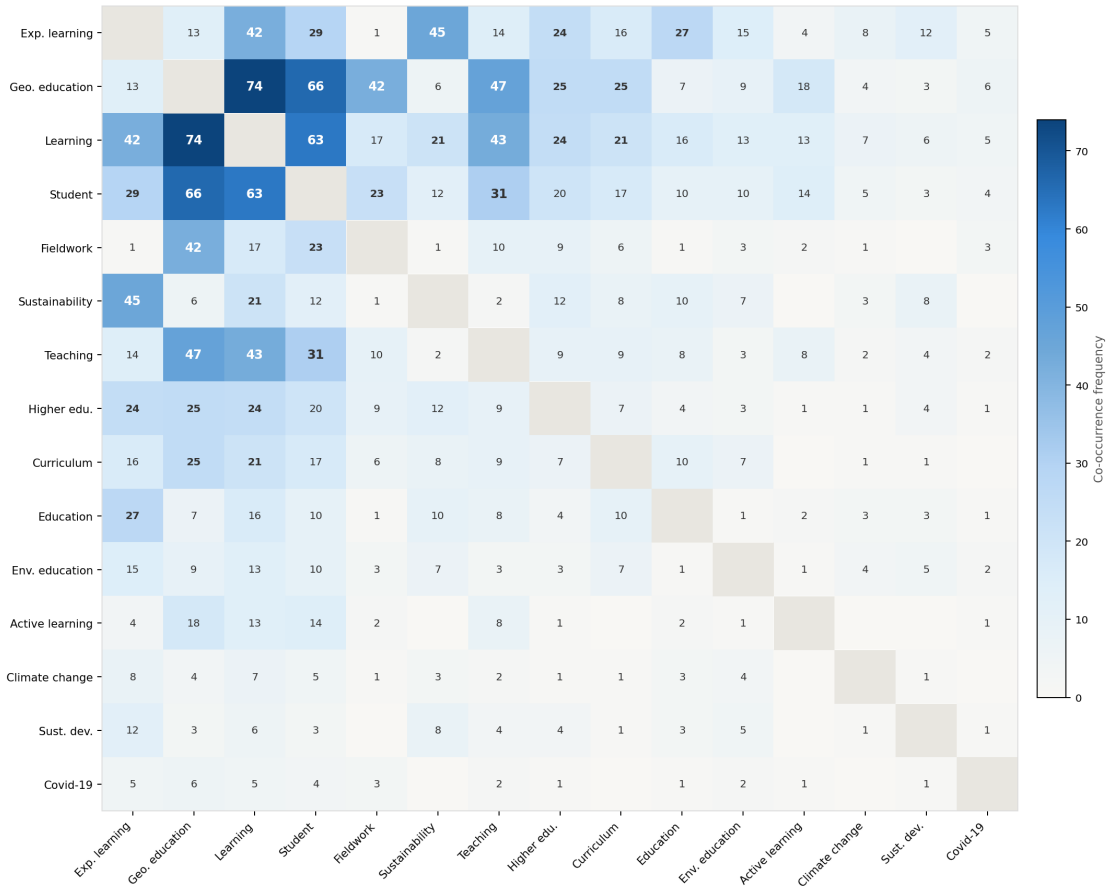


Figure 7. Keyword co-occurrence heatmap for the 15 most frequent keywords in the SLR pool.

The keyword co-occurrence heatmap (Figure 7) reveals the intensity of conceptual coupling among the 15 most frequent keywords. The strongest pairings are geography education–learning (co-occurrence = 74), geography education–student (66), and learning–student (63), reflecting the discipline's inherently pedagogical orientation. Notably, experiential learning–sustainability (45) and experiential learning–learning (42) emerge as cross-cluster bridges, confirming the thematic coherence of the research domain. The VOSviewer-style network visualisation (Figure 8) further illustrates the three-cluster structure, with node sizes proportional to keyword frequency and edge widths reflecting

co-occurrence strength. The central positioning of experiential learning and geography education as high-degree nodes confirms their role as intellectual anchors of this literature.

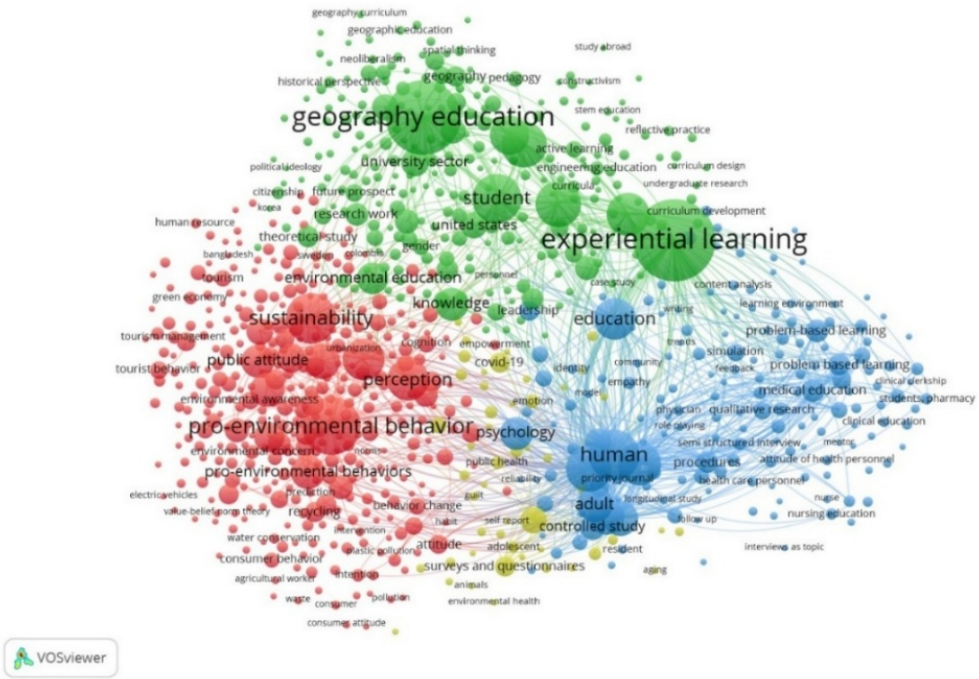


Figure 8. VOSviewer-style keyword co-occurrence network derived from the SLR analytical pool (n = 342)

4.1.6 Experiential Pedagogical Modalities in Geography-Based Environmental Education

Across the 44 core articles, seven major experiential learning modalities were identified as prominent approaches in geography-based environmental education. The most frequently reported modalities included outdoor and nature-based fieldwork, such as ecological surveys, watershed assessments, and nature walks (19 articles, 43%), followed by place-based learning projects involving sustained engagement with local environments or communities (14 articles, 32%). Project-based learning with an environmental focus, including conservation projects and environmental monitoring campaigns, appeared in 12 articles (27%). Forest schools and outdoor classroom programmes were identified in eight articles (18%), particularly within primary and lower secondary education contexts. Technology-supported experiential learning, including virtual field trips, VR-based environmental simulations, and GIS-based investigations, was reported in seven articles (16%). Additional modalities included study abroad and cross-cultural environmental learning programmes (5 articles, 11%), as well as game-based and simulation-based environmental learning (4 articles, 9%). Outdoor fieldwork and place-based learning dominated the literature, consistent with geography education's traditional emphasis on direct environmental encounters.

4.1.7 Environmental Outcomes and Mechanisms: The EGEC Pathway

The 44 core articles examined a range of environmental outcome variables, most frequently: environmental attitudes (31 articles, 70%), pro-environmental behavioural intentions or behaviours (27 articles, 61%), environmental awareness or ecological knowledge (22 articles, 50%), environmental values (15 articles, 34%), and nature connectedness or place attachment (13 articles, 30%). The thematic synthesis of all the included studies identified three main mechanisms that explain how experience-based geography education influences the development of environmental character.

Mechanism 1: Affective Place Engagement. The most consistently reported pathway involves the cultivation of emotional connection to specific places, ecosystems, or natural phenomena through direct experiential encounters. Studies employing forest school approaches, urban environmental fieldwork, and outdoor ecology programmes consistently reported positive environmental outcomes (Cudworth, 2020; Harris, 2021; MacKay et al., 2021; Michalik-Śnieżek et al., 2025). Sustained and mindful contact

with the natural environment has been shown to increase connectedness to nature, attachment to place, and pro-environmental attitudes.

Mechanism 2: Active Environmental Inquiry. A second mechanism operates through the process of structured inquiry into environmental problems and systems. Studies that have used project-based learning in geography, SDG-based fieldwork methods, and problem-based environmental education have consistently reported positive learning outcomes. For example, Djordjevic et al. (2026), used a quasi-experimental pretest–posttest design with parallel groups (experimental n = 128; control n = 127) involving 255 eighth-grade students (approximately 14 years old) at six elementary schools in Belgrade, Serbia. Students in the experimental group who participated in project-based learning with field investigations of water pollution showed significant increases in ecocentric attitudes ($t = 2.28$; $p = .023$) and pro-environmental behaviour ($t = 2.90$; $p = .004$), as measured by the EAATE scale and a composite pro-environmental behaviour scale comprising the PEB and GEB scales, compared with the control group that received traditional instruction. Fortner et al. (2016), through a qualitative study based on semi-structured interviews, identified an increase in students' perceived competence in formulating and answering environmental research questions independently. Grindsted and Nielsen (2022) used a mixed-methods case study design in an interdisciplinary fieldwork program and reported improvements in environmental literacy indicators based on pre- and post-questionnaires and thematic analysis of students' reflection journals. Overall, formulating research questions, collecting environmental data, and presenting findings to relevant audiences appeared to contribute to students' environmental self-efficacy.

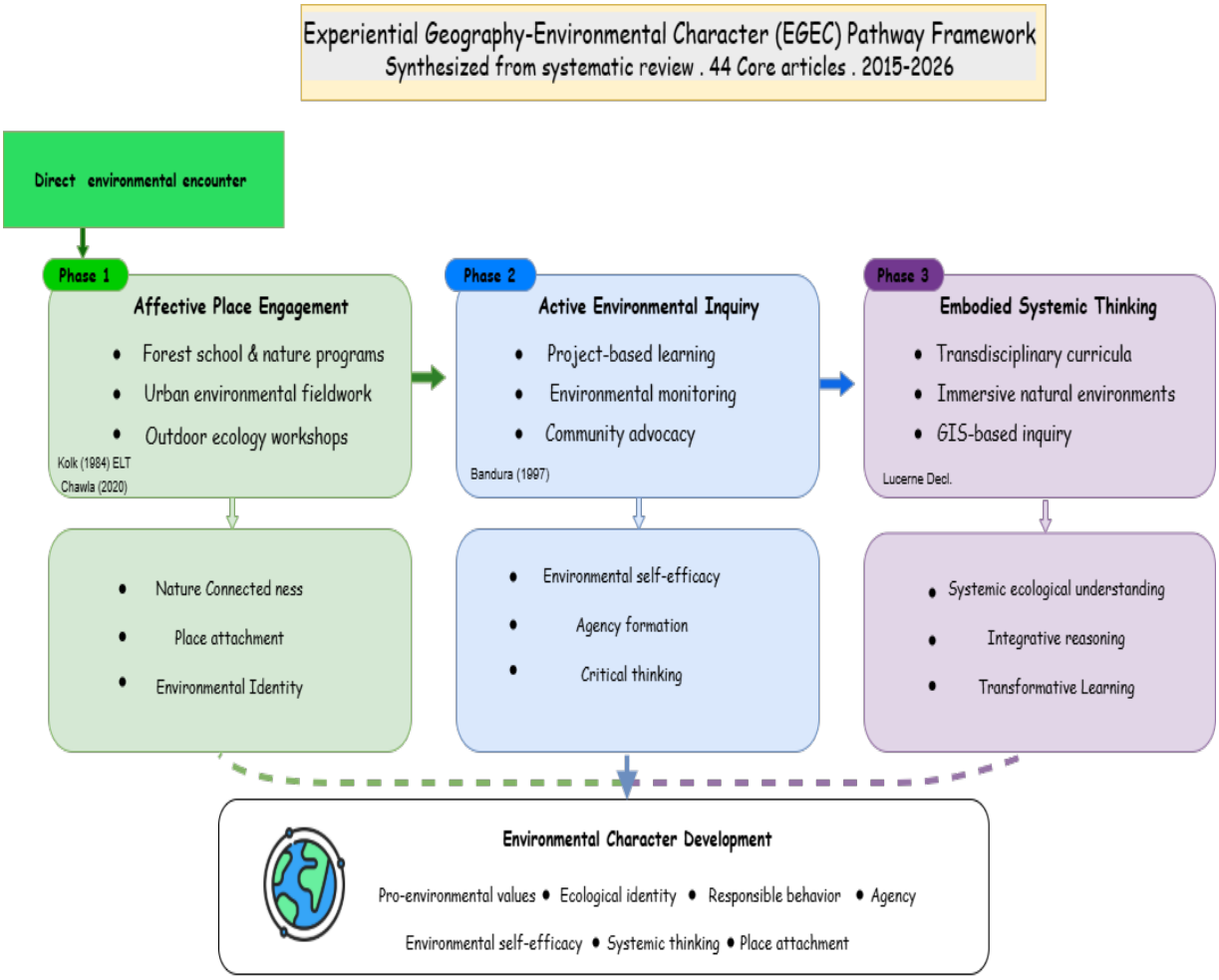


Figure 9. The Experiential Geography–Environmental Character (EGEC) Pathway Framework

Mechanism 3: Embodied systemic thinking emerged as a third mechanism, particularly in studies involving immersive natural environments and transdisciplinary outdoor curricula. This mechanism

integrates the sensory, physical, and conceptual dimensions of learning to develop systemic ecological understanding, namely the ability to understand and interpret human-environment relationships as dynamic and interrelated systems. Tangible and multisensory engagement with the landscape has been identified as a contributor to students' systemic environmental thinking (Thompson & Chapman, 2025; Yli-Panula et al., 2020).

4.1.8 Journal Co-citation Network

To identify the intellectual foundations and inter-journal relationships within this literature, a journal co-citation analysis was conducted on a subset of the SLR analytical pool that had complete reference metadata (n = 285 out of a total of 342 articles; 57 articles were excluded due to incomplete citation metadata or because they were not indexed in the source database). As illustrated in Figure 10, the journals are divided into five thematically coherent groups: a geography education cluster centred on the Journal of Geography in Higher Education and Journal of Geography; an environmental education cluster focused on Environmental Education Research and International Research in Geography and Environmental Education (IRGEE); the sustainability cluster, dominated by Sustainability (Switzerland) and the International Journal of Sustainability in Higher Education; the pedagogy cluster, encompassing Educational Sciences and Frontiers in Education; and the experiential learning cluster, represented by the Journal of Experiential Education.

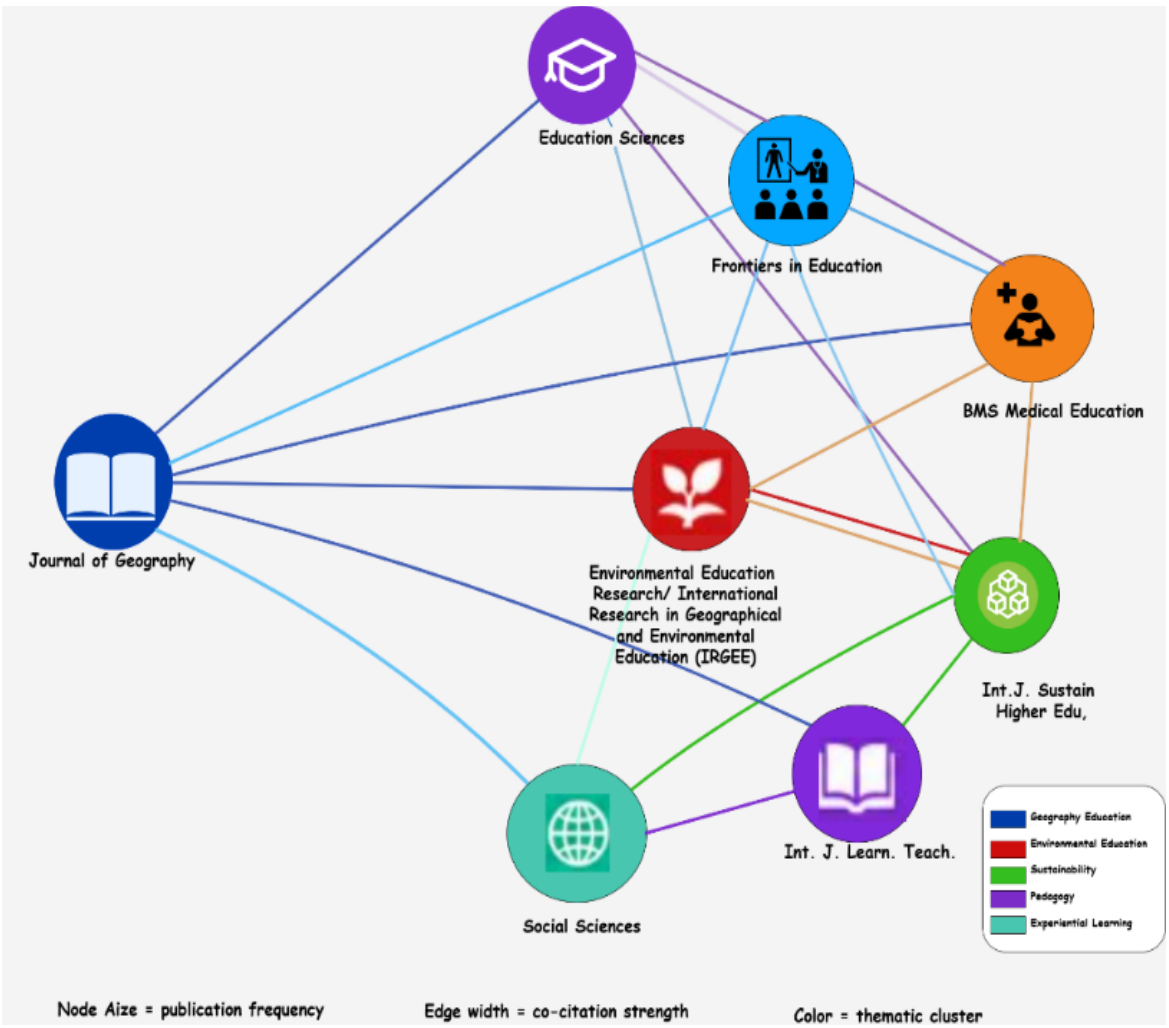


Figure 10. Journal co-citation network derived from the complete reference dataset of the SLR analytics collection (n = 285 out of the total SLR analytics pool, n = 342).

The strong co-citation links between Sustainability and several clusters across the five thematic groups underscore its role as a cross-disciplinary hub within the SLR corpus, consistent with the keyword-bridging function identified. IRGEE's central position among the geography education and

environmental education clusters further highlights the strong thematic alignment of this study with the scientific domains of the journals.

4.1.9 Thematic Evolution Across Publication Periods

Figure 11 tracks keyword frequencies across four publication periods, revealing a gradual but significant shift in how the field formulates its concerns. Between 2015 and 2017 (n≈30), geography education and fieldwork dominated the literature. Sustainability appeared but remained secondary. By 2018 to 2020 (n≈52), experiential learning had risen to roughly equal prominence alongside geography education. Environmental education and pedagogy consolidated as recurring themes across both periods.

The 2021 to 2023 window (n≈82) marks a visible break. COVID-19 and virtual reality entered the keyword landscape for the first time, reflecting the pandemic-driven shift towards digital and hybrid experiential. The disruption was real, but fieldwork did not disappear. It remained the most frequently cited experiential modality, even as alternatives expanded. The most recent period, 2024 to 2026 (n≈121), shows a different kind of shift. Sustainability and sustainable development surged, and climate change returned as a prominent concern. Experiential learning and geography education held their position throughout. What changed was the framing around them.

Taken together, this trajectory suggests that the field is moving towards a broader sustainability transition discourse. Based on the growth patterns of publication themes identified in the bibliometric analysis for the period 2024–2026, we project that future research is likely to focus increasingly on the intersection of experience-based pedagogy, geography, and climate action. This projection is consistent with the urgency of climate change education previously identified by (Monroe et al., 2019) in their systematic review of effective climate change education strategies, although the review does not directly predict the direction of research developments for the period 2024–2026.

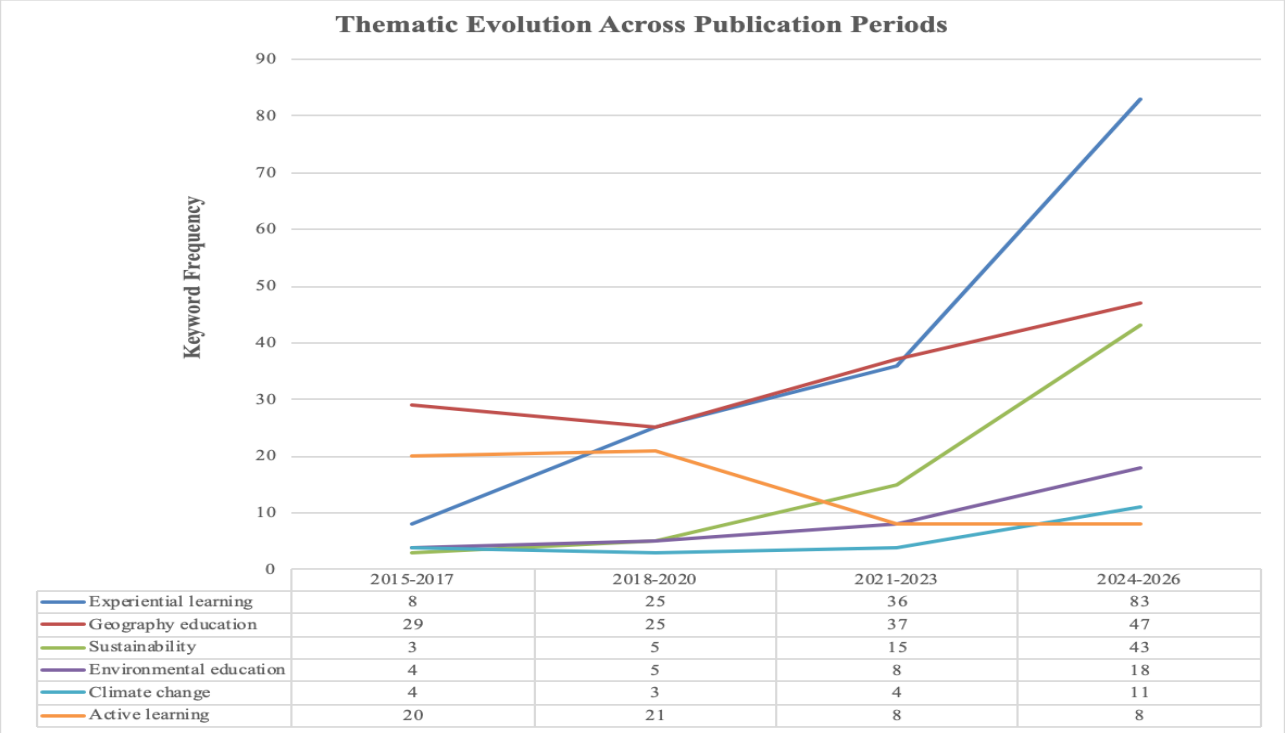


Figure 11. Thematic evolution of keywords across four publication periods (2015–2026)

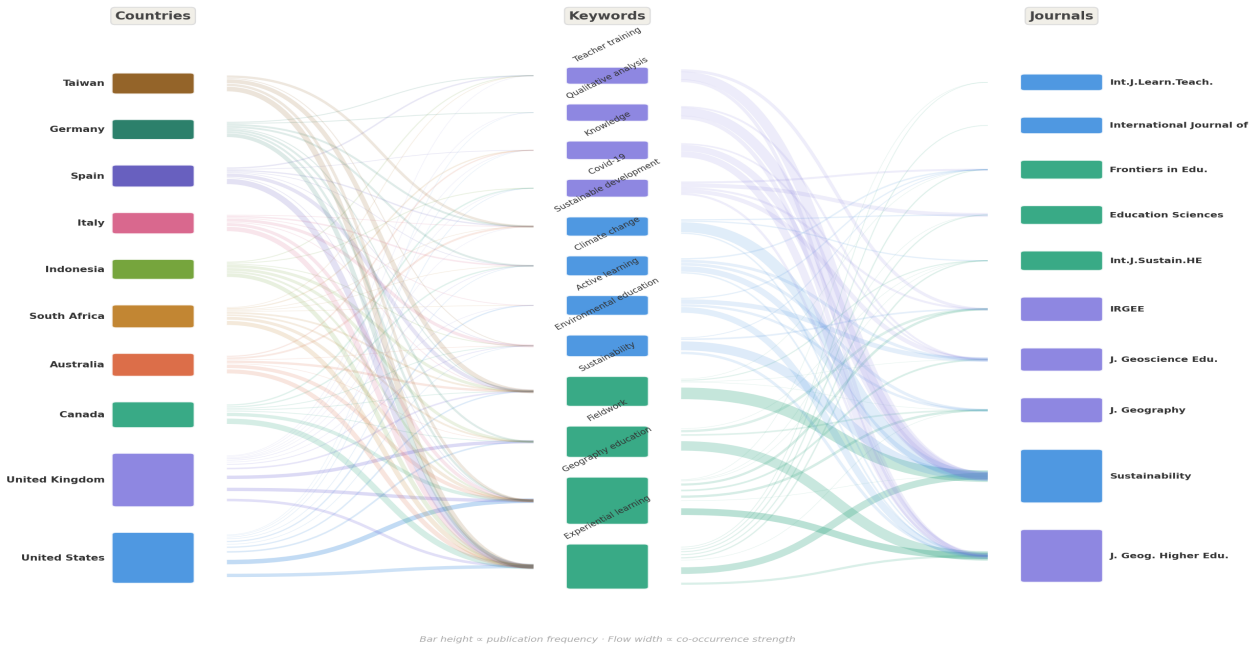


Figure 12. Three-field plot (Sankey diagram) linking the top 10 countries (left), top 12 keywords (centre), and top 10 journals (right) in the SLR analytical pool (n=285).

4.1.10 Three-Field Plot: Countries, Keywords, and Journals

The illustration in Figure 12 shows the network connecting the top 10 countries, 12 keywords, and 10 journals in the SLR dataset. Several patterns are evident. The United States and the United Kingdom generate the strongest overall keyword flows and contribute substantially to experiential learning, geography education, and sustainability. Indonesia and South Africa, the two most active Global South contributors, show a different pattern: their research primarily addresses environmental and sustainability education, with weaker links to fieldwork and active learning. This difference may reflect either a genuine variation in research focus or constraints on resources for fieldwork; bibliometric data alone cannot determine which explanation is more persuasive. On the journal side, the flows reinforce patterns already apparent in the corresponding-author affiliations: Journal of Geography in Higher Education and Sustainability receives the widest range of keyword contributions, whereas IRGEE receives more targeted input from geography- and environment-specific clusters, consistent with its specialist position in the publication ecosystem. Figure 12 shows these relationships in detail.

4.1.11 Country Collaboration Network

Figure 13 maps co-authorship ties among the 18 most productive countries in the SLR pool. The Anglo-Saxon core dominates the network. The UK and the US form the strongest bilateral relationship (strength = 7), followed by the UK and New Zealand (3) and the US and Canada (2). European countries collaborate less than their geographical proximity might suggest. Only a handful of pairs appear in the data, including the Netherlands and Canada, and Germany and Sweden. Their relationships are weak and they are largely isolated from each other. China anchors the Asia-Pacific cluster and maintains links with the UK and Thailand. This hints at an emerging regional network, though the ties remain modest in number and strength. The Global South cluster tells a different story. Indonesia, South Africa, India, and similar contributors appear largely as isolated nodes with few international connections. This is consistent with the geographic asymmetry documented, and it compounds that asymmetry by limiting how knowledge produced in these contexts circulates and accumulates. Building South–South connections is at least as important as expanding North–South partnerships. For a field concerned with environmental character development across diverse ecological and cultural settings, this is not a minor gap.

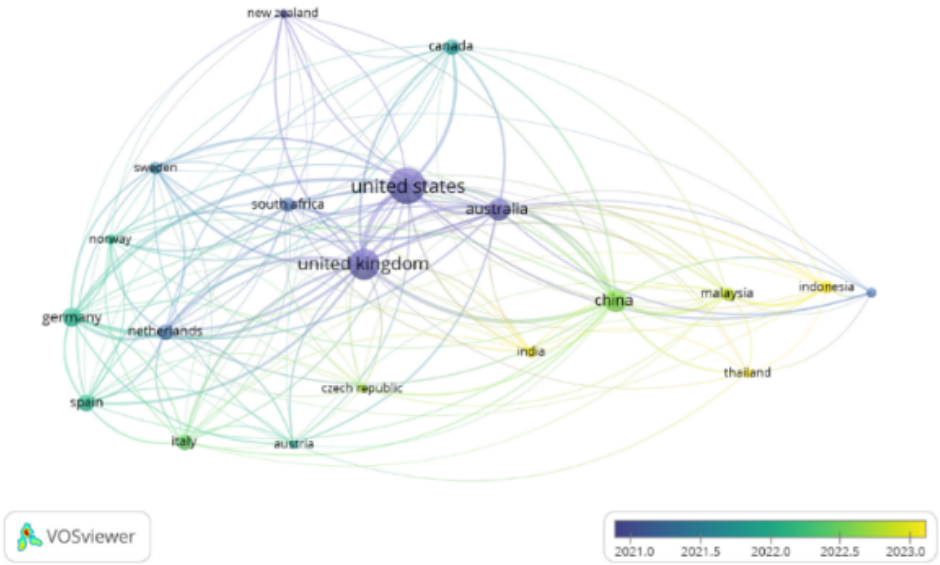


Figure 13. Country collaboration network for the top 18 contributing countries (SLR pool, n=285).

4.2 Discussion

4.2.1 The Convergence of Experiential Learning, Geography Education, and Environmental Character

Publication output in this field grew nearly sevenfold over the study period (Figure 2). This trajectory points to something more than growing scholarly interest. It reflects a broader recognition that behavioural and character outcomes in sustainability education require pedagogical approaches that cognitive instruction alone cannot deliver. Most of this growth occurred after 2020. The COVID-19 pandemic appears to have played a catalytic role on two fronts. First, it disrupted conventional fieldwork, pushing researchers and educators towards methodological alternatives. Second, it heightened public awareness of environmental vulnerability in a way that gave greater urgency to the question of how schools and universities foster environmental dispositions. One tangible outcome of that period was the emergence of technology-supported, experience-based learning methods. Virtual field trips, virtual reality (VR) simulations, and digital enquiry platforms are examples of modalities that have the potential to complement physical field activities, as illustrated by the VR application developed by Carmona-Galindo et al. (2025).

The three mechanisms visualised in Figure 9 point to a shared theoretical insight. Environmental character development is not primarily a cognitive process. It is experiential and relational, built through sustained and emotionally meaningful engagement with real places and natural systems (Chawla, 2022). This has a direct impact on how formal education systems approach environmental literacy. The assumption that curriculum coverage alone can produce environmentally responsible graduates has been repeatedly questioned in the literature, yet persists in practice (Monroe et al., 2019). What the EGEC framework adds is a discipline-specific account of why geography education, with its fieldwork traditions and place-based methods, is particularly well positioned to close that gap. The argument is not that geography is uniquely capable. It is that geography already has the pedagogical infrastructure in place.

4.2.2 Methodological Patterns and Implications

Most studies in this review relied on cross-sectional designs, self-reported surveys, and single-institution samples; these features characterised approximately 65% of the included articles. Although such approaches have produced useful descriptive and correlational findings, they do not support strong claims about causality, long-term change, or generalisability. This pattern is reflected in the keyword network in Figure 8, which is organised around pedagogy, geography, and the environment.

Figure 11 adds a temporal dimension: technology-enhanced modalities such as VR and online learning grew sharply between 2021 and 2023 but have not displaced fieldwork as the primary experiential approach. Hybrid designs that integrate physical and digital environments represent a promising direction for methodological development.

4.2.3 Geographic Asymmetry and its Implications

The geographic distribution in Figure 5 shows that the United States, United Kingdom, and Canada together account for nearly half of the SLR analytical pool. This is not simply a matter of individual country output. As the collaboration network for the top 18 contributing countries suggests, these countries form a tightly connected research core, with the UK and US representing the strongest bilateral link in the entire network (strength = 7). The three-field plot in Figure 12 adds another layer to this picture. Contributions from Indonesia and South Africa tend to cluster around sustainability and environmental education themes, engaging far less with the fieldwork and active learning nodes that dominate Anglophone scholarship. Whether this reflects different research priorities, different resource realities, or both is worth investigating further.

This pattern has implications for how the EGEC framework travels across contexts. The mechanisms in Phases 2 and 3 may look quite different or depend on conditions that are not always available outside the Global North. The collaboration network also shows that Global South countries remain largely isolated from one another and from Northern partners. South–South connections are as much a priority as North–South connections. Resource disparities in pedagogical implementation are likely reflected in scientific knowledge production: researchers with limited access to funding for fieldwork, GIS infrastructure, or international academic networks may produce fewer cross-national publications. Accordingly, South–South connections should be prioritised alongside North–South connections, because Global South countries often face similar constraints related to budgets, curriculum rigidity, and digital infrastructure. Such collaborations may yield more contextually relevant pedagogical solutions.

4.2.4 Theoretical Implication: The EGEC Framework

This review proposes the Experiential Geography Environmental Character (EGEC) Pathway as a specific theoretical contribution, synthesising three identified mechanisms into a developmental account of how geography education fosters environmental character formation. This framework is based on three mutually reinforcing and recursive phases, rather than being entirely linear and sequential, as engagement in subsequent phases can further deepen the affective and cognitive dimensions developed in previous phases. Direct interaction with the natural environment, such as through outdoor ecology workshops, fosters emotional bonds and a sense of place, marking the initial phase of engagement and affective attachment. Structured investigation then deepens cognitive understanding and builds environmental self-efficacy; this second phase involves active exploration of the environment, often implemented through project-based learning. Repeated engagement with complex natural systems, in turn, fosters the kind of integrative ecological thinking that characterises mature environmental management, representing the third phase of ecological management.

What distinguishes the EGEC framework is its developmental logic. Rather than viewing knowledge, attitudes, and behaviours as separate goals, this approach views all three as outcomes that emerge simultaneously through sustained experiential engagement. This goes beyond the additive models that have long dominated environmental education research. This framework builds on two foundational works. Its sequential phases reflect an experience-based learning cycle adapted to an environmental context (Kolb & Kolb, 2018). The emphasis on affective interactions as a starting point for environmental character formation is consistent with the evidence from the review regarding the long-term association between early-life experiences in nature and environmental values and commitments in adulthood (Chawla, 2022).

4.2.5 Practical Implications

These findings have several implications for those involved in designing and teaching geography curricula. This is extremely important because hands-on learning or direct experience is what

transforms these engaging encounters for pupils. Project-based learning deserves special attention here. When pupils are genuinely involved in environmental monitoring, local conservation activities, or community advocacy, the results are very different from those of a brief field trip. The evidence consistently shows that active participation is a key driver of environmental self-efficacy, which in turn shapes behavioural intentions.

Resource constraints are a real barrier in many contexts, particularly outside high-income settings. Where physical fieldwork is not always feasible, virtual field trips and immersive VR offer a workable alternative that should be taken seriously. Nevertheless, digital formats cannot fully replicate what happens when students are physically present in a learning environment. Policymakers should view these tools as true complements, not mere substitutes.

4.2.6 Limitations

Like any review, this study has limitations that readers should consider when interpreting its conclusions. Restricting the search to Scopus was a deliberate methodological choice: the database offers consistent indexing standards and broad disciplinary coverage, but the choice likely excluded studies published in regional or non-English outlets. Given the geographic skew in corresponding-author affiliations in the SLR analytical pool, where Global South contributions are thinly represented, the gap between the literature that exists and the literature accessible to this review may be wider than the data suggest. Keyword-based screening is inherently imprecise. At the scale of nearly five thousand records, some relevant articles were likely missed, whereas others may have been retained on broad conceptual grounds—a trade-off that is difficult to resolve without full-text screening of every excluded record, which was not practicable. The diversity of study designs and outcome measures across the 44 core articles also limited the synthesis. Pooling effect sizes across quasi-experimental, qualitative, mixed-methods, and conceptual studies was not defensible; therefore, no formal meta-analysis was attempted, and the findings reported are accordingly interpretive rather than statistically aggregated. Finally, limiting the search window to 2015–2026 improved currency but excluded foundational contributions, notably work on the experiential learning cycle and formative experiences in nature that remain theoretically central to this review. These works remain central to the theoretical framework, creating an asymmetry between the review's formal scope and its theoretical foundations.

5. Conclusion

This review identified 4,794 Scopus-indexed articles published between 2015 and 2026 through three keyword searches: experiential learning, geography education, and environmental character development. After deduplication, 4,776 unique records were analysed bibliometrically. Of these, 342 articles met the eligibility criteria for a focused analytical dataset, and 44 studies that explicitly lay at the intersection of all three themes were selected for in-depth thematic synthesis. The annual output grew nearly sevenfold over the study period, and the bibliometric analysis in Figures 3–13 provides a comprehensive mapping of the literature. The central finding is that experiential geography education fosters environmental character through three mechanisms: affective place engagement, active environmental enquiry, and embodied systemic thinking, integrated in the EGEC Pathway Framework. Rather than treating knowledge, attitudes, and behaviour as separate goals, this framework views them as outcomes that build on one another through sustained experiential engagement. In practice, these findings support expanding fieldwork as a core component of the curriculum, incorporating reflection into experiential programmes, and investing in project-based activities that give students genuine agency in environmental contexts. Geography is well positioned to address the knowledge–action gap in sustainability education because its fieldwork tradition and place-based methods already provide the necessary infrastructure. Future research should examine long-term effects, test the EGEC framework across cultures and resource settings, and use mixed-methods designs that combine direct behavioural observation with self-reported attitudes. Location-based investigations without digital GIS and small-scale fieldwork in school settings may offer resource-efficient ways to adapt Mechanisms 2 and 3 without sacrificing pedagogical value.

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Conflict of Interest: The authors declare no conflicts of interest.

Data availability: This study is a secondary analysis of published literature and did not involve human participants, animal subjects, or identifiable personal data.

AI Use Declaration: The authors used the AI-assisted tool Claude.ai in a limited and supplementary capacity during the preparation of this manuscript. Specifically, AI assistance was employed for refining figure aesthetics and improving sentence-level clarity in selected sections. All intellectual content, including the conceptual framework, systematic review synthesis, bibliometric analysis, interpretation of findings, and theoretical contributions, was developed entirely by the author. The use of AI tools did not extend to data generation, analysis, or the formulation of conclusions.

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