Challenges and Opportunities Influencing the Integration of Environmental Sustainability into Primary Education: Scoping Review

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Abstract.

Since the mid-1990s, environmental sustainability has been part of the core curriculum in primary schools in Tanzania, although the integration of environmental sustainability content in the daily teaching-learning process is not uniform, and is influenced by some structural challenges remaining and the more limited opportunities for its use. This scoping review aimed to identify and outline the breadth of literature documenting challenges and opportunities for integrating environmental sustainability into primary education and the documented evidence for how these challenges and opportunities affect the level of integration in practice. The review was based on the methodology from Arksey and O'Malley (2005) adapted by Levac, Colquhoun and O'Brien (2010) and reported according to PRISMA Extension for Scoping Reviews (Tricco et al., 2018). A structured search was used to locate 463 records and 39 of these were found to be eligible after Population-Concept-Context screening. The charted evidence suggests that there are common themes of curriculum rigidity, teacher preparedness, resource constraints and symbolic rather than substantive policy commitment as principal challenges, while community co-teaching, integrating media, integrating indigenous knowledge and cross-curricular flexibility are recurring opportunities in Tanzanian and similar East and Southern African settings. Very few provide direct measures of the extent to which the balance of challenge to opportunity determines integration in a particular school; most evidence is descriptive rather than explanatory. The review highlights a need for comparative studies that illustrate which opportunities are best able to address which challenges, and provides a set of synthesised evidence to guide curriculum developers and school leaders in considering practical strategies to strengthen integration.

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1. Introduction

1.1 Background and Context

Tanzania has had an environmental education curriculum since 1995, with environmental issues incorporated into subjects in primary school, in response to the recognition of the need for young people to be equipped to respond to environmental degradation (as revealed in the stakeholder primary school curriculum EE mapping). After 30 years of implementation, the country is still facing significant environmental degradation through deforestation, land degradation and pollution, leading to questions of researchers and policy makers as to whether the environmental sustainability content is being embedded in the curriculum and whether it is being embedded deeply enough and regularly enough to impact the learners' knowledge, attitudes and behaviour.

One of the consistent findings in the regional literature is that documents used by African education systems often contain a lot of environmental and sustainability issues within them, but implementation is much more limited. The themes that emerged from this literature are structural constraints, such as rigid curriculum, lack of teacher preparedness and symbolic policy statements not adequately resourced or monitored, which have been reported in Tanzania, as well as in South Africa, Kenya and other East and Southern African education systems. Concurrently, a range of possibilities and practices that schools and teachers have identified for addressing these difficulties has started to be documented, such as using community co-teaching arrangements, integrating stories and indigenous knowledge into the school curriculum, and employing media strategically to influence students' environmental awareness outside of the classroom.

In Tanzania generally, and primary education in particular, several challenges have been reported that are associated with decentralisation of school management, which is associated with the uneven distribution of resources and inconsistent oversight of school management by the district education authorities (DEA) (Matete, 2016). Finally, the more general systemic problems offer a useful background to analyse the more specific problems that face integration into environmental sustainability in a curriculum area where teachers must go the extra mile to gather the resources they need to provide for the subject.

1.2 Rationale for the Review

Many Tanzanian and regional studies have analyzed the problems or opportunities related to integrating environmental sustainability, but few studies have approached the two as a dyad that is capable of explaining differences in the results of integrating environmental sustainability in various schools and contexts. Existing literature is also split at the primary and secondary levels and at the country level in East and Southern Africa, and is lacking a synthetic analysis that is specific to the primary level. A scoping review is a good approach to mapping this dispersed evidence, to clarify which challenges and opportunities are regular and common, and where the evidence base is weak.

1.3 Rationale for a Scoping Review Approach

A scoping review was chosen given that the aim of this study is to map the extent and range of evidence, and clarify key concepts, across a methodologically diverse literature, rather than appraise/pool a homogeneous set of primary studies (Arksey & O'Malley, 2005; Peters et al., 2020). The types of literature included, from qualitative case studies to quantitative surveys

and from doctoral theses to edited scholarly volumes, are heterogeneous in nature, further supporting a scoping instead of systematic review approach (Munn et al., 2018).

1.4 Conceptual Framework

The review is organized by a conceptual framework that sees challenges and opportunities as the independent variable, while the integration of environmental sustainability in primary education is the dependent variable, and the policy environment, teacher preparedness and school leadership as contextual factors that moderate the relationship among the variables, as highlighted in Figure 1.

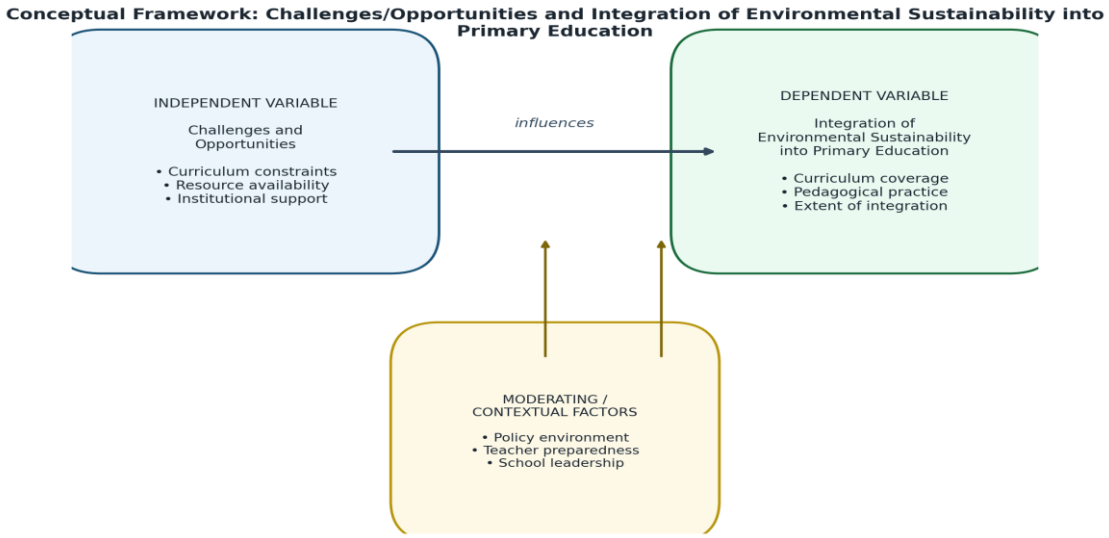


Figure 1. Conceptual framework relating challenges and opportunities with the integration of environmental sustainability in primary education.

1.5 Aim and Objectives

This review aimed to chart the breadth of challenges and opportunities reported in the literature related to the integration of environmental sustainability into primary education, and to the ways that these challenges and opportunities influence the extent of integration achieved. The review had two specific objectives:

i. To map the range of challenges and opportunities for the integration of environmental sustainability in primary education.

ii. To examine documented evidence on how these challenges and opportunities influence the extent of environmental sustainability integration

1.6 Research Questions

i. What range of challenges and opportunities is documented in the literature concerning the integration of environmental sustainability into primary education?

ii. What does the existing literature report about how these challenges and opportunities influence the extent of integration achieved?

1.7 Significance of the Review

The findings are designed to support curriculum developers interested in learning about the barriers to integration that are most frequently found and to inform school leaders about

existing models of successful intervention, like community co-teaching, that have been documented elsewhere, and to guide researchers in designing studies that directly test the relationship between specific barriers, specific opportunities, and measured integration outcomes.

1.8 Operational Definitions

Challenges refer to barriers documented either in the form of structures, structures and institutions, and/or attitudes that hinder the integration of the content of environmental sustainability in the primary school curricula. Opportunities are documented strategies, resources or institutional arrangements that support or enhance such integration. Integration is here defined as the degree of integration as it is in similar reviews, that is, the degree to which environmental sustainability content is actually used in lessons, whether as a separate lesson, in the cross-curriculum approach or in extra-curriculum activities.

1.9 Structure of the Review

The methodology is included in Section 2. The charted evidence is presented in the four thematic areas, including a regional comparison, in Section 3. The findings, gaps and implications for practice and future research are discussed in Section 4. Strengths and limitations are provided in Section 5 followed by a conclusion in Section 6. The appendixes contain supporting material.

2. Methodology

2.1 Review Framework

This review was conducted following the 5 stages scoping review methods of Arksey and O'Malley (2005) as refined by Levac, Colquhoun and O'Brien (2010), and reported against the PRISMA-ScR checklist (Tricco et al., 2018) using eligibility criteria through the Population-Concept-Context (PCC) framework (Peters et al., 2020).

2.2 Eligibility Criteria

Element	Criteria
Population	Primary school teachers, learners, curriculum specialists and school leaders within the United Republic of Tanzania, and comparable East and Southern African primary education systems.
Concept	Challenges and opportunities affecting the integration of environmental sustainability content into primary school curricula and classroom practice.
Context	Primary education settings in Tanzania; comparable primary and secondary sources from South Africa, Kenya and other East and Southern African contexts included where directly informative.
Types of sources	Peer-reviewed journal articles, doctoral theses, and relevant edited scholarly volumes published between 2009 and 2026, in English.

Exclusions	Sources concerned exclusively with tertiary or vocational education, sources without an African primary-education focus, and sources not addressing challenges or opportunities for integration.

2.3 Information Sources and Search Strategy

Literature search was done on Google Scholar, ScienceDirect, PubMed/PMC, African Journals Online, ResearchGate and DOAJ supplemented with relevant edited volumes and institutional repositories. The search terms brought together ideas covering the main themes of challenges and opportunities, environmental sustainability and the primary education context, as outlined in Table 2.

Concept	Search Terms
Challenges and opportunities	"challenges" OR "barriers" OR "opportunities" OR "constraints"
Environmental sustainability	"environmental sustainability" OR "environmental education" OR "education for sustainable development"
Context	"Tanzania" OR "primary school" OR "primary education" OR "curriculum integration" OR "East Africa"

2.4 Study Selection

A total of 463 records were found in a search. 105 duplicates were excluded, followed by 239 records excluded by screening title and abstract, leaving 358 records to be screened by full text. A further 119 of the 120 records were evaluated in full text, with 80 of these excluded, mostly because they referred to tertiary education, or did not specifically discuss challenges and opportunities to integration. A total of 39 sources of evidence were added, summarised in Figure 2.

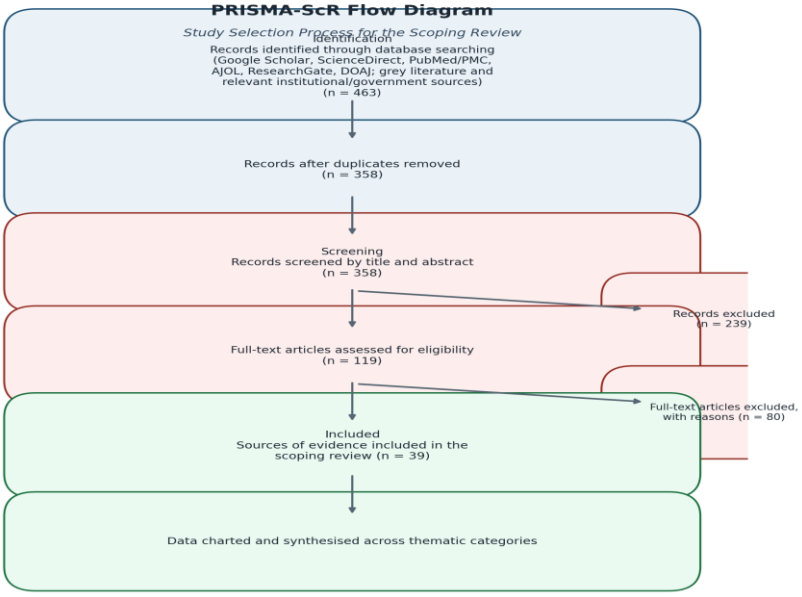


Figure 2. PRISMA-ScR flow diagram for the study selection process

2.5 Data Charting Process

A standardised charting form was developed on five of the sources included here to describe the author(s) and year of the sources, geographic focus, the method of the study, the specific challenges and opportunities reported, and whether there was evidence of their impact on the findings of the study. The charting process was done in an iterative manner, following Levac et al. (2010).

2.6 Synthesis of Results

Due to the diversity of the included evidence, results were synthesised in a narrative manner and then categorized in four thematic groups, identified as emergent from the charted data, in keeping with the current best practice of scoping reviews (Munn et al., 2018).

3. Results: Charting the Evidence

3.1 Overview of Included Sources

The 39 cited sources come from countries all across Tanzania, South Africa, Kenya and Uganda, and some of the comparative/Concept sources address integration of EE in sub-Saharan Africa at large. The most common Tanzanian setting in the studies is Dar es Salaam, followed by Morogoro; while the South African studies, where curriculum-level integration is more methodologically developed, tend to over-represent the country, its environment and sustainability education research programme being more established. In Figure 3, the sources included are broken down by year of publication.

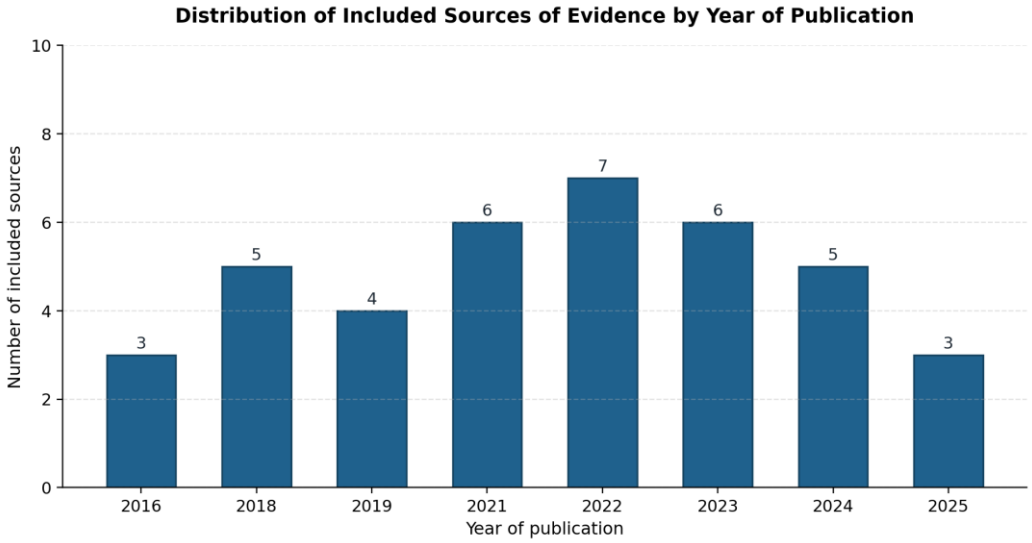


Figure 3. Distribution of the included sources of evidence by year of publication.

Table 3. Summary characteristics of a purposive sample of included sources

Source	Setting	Focus
Matete (2016)	Primary, Tanzania	Challenges facing primary education under decentralised school management

Kimaryo (2011)	Primary, Tanzania	Teachers' perceptions and practices; stakeholder engagement challenges
Wambugu & Okere (2020)	Secondary, Kenya	Opportunities and challenges of integrating climate change education into a competency-based curriculum
Schudel & Lotz-Sisitka (2023)	Secondary, South Africa	Curriculum challenges and opportunities for strengthening environment and sustainability subject knowledge
Decolonising EE (2025, Discover Sustainability)	Early years, pan-African	Curriculum rigidity, teacher preparedness, and indigenous-knowledge-based opportunities
Kayombo, Iftekhar & Mashaza (2025)	Secondary, Tanzania	Ecopedagogical challenges and stakeholder recommendations

3.2 Themes One: Structural and Curricular Challenges

Rigidity of curriculum is one of the most common issues noted on the charted evidence, meaning syllabus and exam design with limited flexibility for teachers to spend time on environmental sustainability curricular content, even if it is included. The challenge is not unique to any one national curriculum design, but rather is a broader challenge in early-years research across pan Africa and in Tanzanian primary level studies, which points to a general tension between wider scope of the curriculum and the more limited space for it in a fixed teaching timetable.

The second structural issue is symbolic, rather than substantive, policy commitment: several sources report that there is a national curriculum framework commitment to environmental sustainability and education for sustainable development, but the commitment is not backed by investment in teacher training, materials or monitoring to support the embedding of these in the classroom, as they are in international frameworks like Sustainable Development Goal Target 4.7. The policy aspiration to resource is not an isolated shortfall in Tanzania, but is a regional phenomenon as revealed in Tanzanian, Kenyan and South African sources.

3.3 Theme Two: Teacher Preparedness and Institutional Support

Just as with the overall teacher-perspectives literature, low teacher preparedness, both content knowledge and pedagogical content knowledge related to environmental sustainability, is mentioned over and over as a key problem. Limited content knowledge and pedagogical content knowledge amongst teachers coupled with contextual and structural constraints within the schools, are reported to be factors that limit effective implementation of geography education in further education and training (FET) level in South Africa and it is recommended that models of teacher training that are based on standards should be adopted to fill this gap in a systematic way, instead of short-course interventions.

The extent to which institutional support (or lack thereof) conditions the extent to which individual teacher effort can overcome systemic constraints also influences how much this effort can make up for systemic constraints. The resourcing and oversight of primary education management in Tanzania under decentralisation show a wide variation between district

education authorities and influence their ability to support environmental sustainability integration to a high degree (Matete, 2016).

3.4 Theme Three: Emerging Opportunities

The charted evidence also reflects a variety of opportunities that have proven effective in enhancing integration in schools and with teachers in the context of structural and institutional challenge. Community co-teaching arrangements, where knowledge holders or community members work directly with the classroom teacher(s) is often cited as an approach of lowering the cost of extending the practical reach of environmental sustainability teaching beyond the reach of a single classroom teacher. The incorporation of indigenous knowledge systems and storytelling are also identified as having potential to offer contextually relevant alternatives to curricula that are traditionally based on Western environmental science framings, while land-based learning and culturally responsive frameworks are proposed as means of creating immediate connections between learners' experience and the content of environmental sustainability.

The role of the media in influencing environmental consciousness outside the formal education system is also referenced as an untapped but promising opportunity; some sources argue the need for the formal education system to be closely connected with the informal environmental education messages that many people receive from the media such as radio, television and now digital and social media.

3.5 Regional Comparison

If one compares challenges and opportunities across the three settings, seen in Tanzania, Kenya and South Africa, broadly the same picture emerges: problems of structure and curriculum recur across the three settings; and particular opportunities highlighted are somewhat different according to the learning and cultural context in each country as summarised in Table 4.

Country	Principal challenge emphasised	Principal opportunity emphasised
Tanzania	Symbolic policy commitment; decentralisation-related resourcing gaps	Community co-teaching; media engagement
Kenya	Fitting new content within a competency-based curriculum	Structured curriculum opportunities within competency-based design
South Africa	Teacher content and pedagogical knowledge gaps	Standards-based teacher training models

3.6 Theme Four: The Relationship between Challenges, Opportunities and Integration

There is still little direct empirical evidence in the literature that can test the importance of the balance of challenges and opportunities as a determinant of integration outcomes. The majority of sources report on challenges and opportunities in a descriptive and parallel fashion, rather than modelling the complex interplay of challenges and opportunities with regard to an actual measured integration outcome. In cases in which the opportunities have been assessed more directly, like in the case of teacher training interventions using the South African standards,

classroom integration results that are in step with the improvements in teachers' reported content and pedagogical knowledge, implying that the specific opportunities can measurably mitigate specific challenges, although such evaluative evidence is not a regular feature across the literature as a whole.

4. Discussion

4.1 Synthesis in Relation to the Conceptual Framework

The charted evidence offers high levels of support for conceptual frameworks for both challenges and opportunities, with somewhat lower levels of support for causal pathways from either concept to measured results of integration. While structural and institutional barriers are well documented throughout contexts and a more recent literature has begun to offer an array of promising opportunities, specifically in relation to community co-teaching and integration of indigenous knowledge, there is in general, less evidence that relates specific opportunities to measurable increases in integration, limiting confident causal claims as to which opportunities are most effective.

Table 5. Summary of key findings against the review's research questions

Research question	Key finding
What range of challenges and opportunities is documented in the literature?	Curriculum rigidity, symbolic policy commitment and limited teacher preparedness recur as principal challenges; community co-teaching, indigenous knowledge integration and media engagement recur as principal opportunities.
How do these challenges and opportunities influence the extent of integration achieved?	Mostly documented descriptively; where tested directly, targeted teacher-training opportunities are associated with measurable gains in integration, but such evaluative evidence is limited.

4.2 Gaps in the Evidence Base

- There were few studies which actually tested whether or not certain opportunities compensate for certain challenges, instead of just stating the challenge and its associated opportunity without testing.
- A lack of primary level evidence when compared to secondary level evidence, especially for South Africa where the more methodologically advanced literature is being developed at the secondary level.
- Lack of intervention or quasi-experimental studies in a primary context in Tanzania that focus solely on community co-teaching or indigenous-knowledge approaches.
- Studies that can be done across country with comparative analysis of specific opportunities for transfer, where such analysis is undertaken explicitly for the purpose of testing transfer across different curriculum architectures.

4.3 Implications for Policy and Practice

Consistently, however, the policy was found to be more symbolic than substantive, meaning that the next step for curriculum developers may be to focus on improving the guidance and monitoring of implementation, instead of additional curriculum redesign efforts. The research

on community co-teaching provides some indication that extending a school's effort to integrate environmental sustainability (ES) into their environment is a relatively inexpensive approach for school leaders—before waiting for a centrally sourced solution. The South African model for training based on standards is a template that can be transferred to teacher training institutions, however the regional comparison in Section 3.5, reminds the reader that there are sufficient differences that direct transferability should be taken cautiously without adapting the model locally.

4.4 Implications for Future Research

The gaps identified suggest intervention studies which explore specific opportunities and specific challenges within the Tanzanian primary context; more primary level content in the broader regional literature; and more comparative research focusing specifically on examining the transferability of promising opportunities (e.g., community co-teaching, standards-based teacher training) across different national curriculum systems.

5. Strengthens and Limitations of the Review

The benefits of this review include a transparent and repeatable search and charting process, which was completed according to the PRISMA-ScR reporting standard (Tricco et al., 2018), and a conceptual approach that enabled challenges and opportunities to be charted as a paired analytical structure, instead of separately. It is notable for its mix of secondary literature and pan-African primary literature, with the primary literature at the secondary level at a much higher proportion than is the case in the primary literature specifically on Tanzania, and for the secondary literature to be included as indicative context rather than directly generalisable to the primary classroom in Tanzania. Unlike conventional reviews, no formal quality or risk of bias appraisal of sources was conducted, as recommended (Peters et al., 2020), and there was a focus only on English-language sources.

6. Conclusion

This scoping review has revealed the spectrum of challenges and opportunities reported in the literature on how to integrate environmental sustainability into primary education as well as what is known about their impact on the success or failure of the integration process. The evidence base provides a relatively uniform descriptive account of the challenges and opportunities, but a much more slender account of how particular opportunities could be used to counter particular challenges in practice. Research to address this gap, with specific intervention research and comparative studies across countries, would help provide greater evidence to curriculum developers, school leaders and teacher training institutions that would help them bridge the curriculum ambition to classroom reality.

More generally, the review indicates that there will be little benefit from redesigning the curriculum. The most promising opportunities that emerged from this literature review—community co-teaching, integration of indigenous knowledge, and standards-based teacher training—have a common theme: they operate in the real-world constraints of teacher roles and schools, and are more likely to be integrated into practice than other approaches that are not grounded in these practical considerations.

Declaration of Interest

The author has no conflict of interest to declare in regard to this review.

Data Availability Statement

This is a scoping review of secondary data and hence new primary data were not produced. Any data extracted from the sources included that are charted are available from the author upon reasonable request.

Appendix A: Template for the Google search log

Table A1. records the number of records retrieved from each information source before de-duplication is performed

Source	Date searched	Records retrieved
Google Scholar	May 2026	187
ScienceDirect	May 2026	39
PubMed / PMC	May 2026	18
African Journals Online (AJOL)	May 2026	62
ResearchGate	May 2026	71
DOAJ	May 2026	41
Edited volumes and institutional repositories	May–June 2026	45
Total (before de-duplication)		463

Appendix B: PRISMA-ScR Reporting Checklist

Table B1: summarises compliance with the 22-item PRISMA-ScR checklist (Tricco et al., 2018).

#	Item	Description	Location
1	Title	Identifies the report as a scoping review	Title page
2	Structured summary	Structured abstract	Abstract
3	Rationale	Rationale in context of existing knowledge	Sections 1.1-1.2
4	Objectives	Objectives and questions with PCC details	Sections 1.5-1.6, 2.2
5	Protocol and registration	Indicates presence of a protocol	Section 2.1
6	Eligibility criteria	Characteristics of sources of evidence used	Section 2.2

7	Information sources	All information sources in the search	Section 2.3, Appendix A
8	Search	Full search strategy for at least one database	Section 2.3, Table 2
9	Selection of sources of evidence	Process for selecting sources of evidence	Section 2.4
10	Data charting process	Methods for charting data	Section 2.5
11	Data items	List and definitions of variables charted	Sections 1.8, 2.5
12	Critical appraisal	Not undertaken (consistent with ScR methodology)	Section 5
13	Synthesis of results	Methods of handling and summarising data	Section 2.6
14	Selection of sources of evidence	Numbers screened, assessed, included	Section 2.4, Figure 2
15	Characteristics of sources of evidence	Characteristics for each source	Section 3.1, Table 3
16	Critical appraisal within sources	Not undertaken	Section 5
17	Results of individual sources of evidence	Relevant data charted	Sections 3.2-3.6
18	Synthesis of results	Narrative synthesis by theme	Sections 3.2-3.6, 4.1
19	Summary of evidence	Summary in relation to objectives	Section 6
20	Limitations	Limitations of the review process	Section 5
21	Conclusions	Conclusions and implications	Sections 4.3, 4.4, 6
22	Funding	Sources of funding	Not externally funded

Appendix C: Glossary of Key Terms

Term	Definition
Community co-teaching	An arrangement in which community members or local knowledge-holders contribute directly to classroom or outdoor environmental learning activities.
Competency-based curriculum	A curriculum structured around demonstrable learner competencies rather than solely content coverage.
Pedagogical content knowledge (PCK)	A teacher's knowledge of how to teach specific subject content effectively, distinct from subject knowledge alone.
PRISMA-ScR	Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews.
Scoping review	A method of evidence synthesis used to map the extent, range and nature of research activity on a topic.

Appendix D: Illustrative Data Charting Extract

Table D1 presents an illustrative extract from the data charting form.

Source	Challenge(s) charted	Opportunity(ies) charted
Matete (2016)	Decentralisation-related resourcing inconsistency	Not directly addressed
Wambugu & Okere (2020)	Fitting new content within fixed curriculum time	Competency-based curriculum flexibility
Schudel & Lotz-Sisitka (2023)	Teacher content and pedagogical knowledge gaps	Standards-based teacher training model
Decolonising EE (2025)	Curriculum rigidity, symbolic policy commitment	Storytelling, community co-teaching, land-based learning

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