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Exploring High School Geography Teachers' Perceptions of Place-Based Education Initiatives for Environmental Stewardship in Ghana

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Abstract

Environmental stewardship is a critical component of sustainable development, necessitating innovative educational approaches to foster awareness and action among youth. Place-based education (PBE) has emerged as a promising strategy for engaging students with their local environments to enhance environmental learning. This study explores the perceptions of Senior High School Geography teachers in Ghana regarding PBE initiatives for promoting environmental stewardship, with specific attention to three dimensions: Active Learning Practices, Authentic Assessment Strategies, and Systemic Challenges. The study employed a mixed-methods approach, collecting quantitative data through questionnaires administered to 312 Geography teachers while conducting interviews with 9 participants. The findings reveal that while teachers recognise the potential of PBE in fostering environmental consciousness, systemic challenges, including curriculum constraints, inadequate resources, and limited teacher training, hinder its effective implementation. Additionally, teachers employ varied active learning practices and assessment strategies to integrate environmental education into geography instruction. This study underscores the need for policy interventions, curriculum reforms, and targeted professional development programs to enhance the effectiveness of PBE in Ghanaian high schools. The insights gained contribute to the broader discourse on environmental education and inform strategies to strengthen geography education as a tool for sustainable development.

Keywords: Environmental stewardship, place-based education, Geography education, environmental sustainability, Senior High School

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1 Introduction

In recent years, the global community has witnessed escalating environmental challenges, ranging from climate change and biodiversity loss to pollution and resource depletion. These challenges not only threaten ecosystems and natural habitats but also have profound socio-economic implications for communities worldwide. Environmental degradation and sustainability challenges are pressing issues globally, and Ghana is no exception (Ali et al., 2021). With a growing population, rapid urbanisation, industrialisation, and agricultural expansion, Ghana faces various environmental threats, including deforestation, water pollution, land degradation, and climate change impacts (Ampim et al., 2021; Ofoezie et al., 2002). In response, there has been a growing recognition of the need for effective environmental education initiatives to foster awareness, understanding, and action among individuals and communities. Addressing these challenges requires concerted efforts from all sectors of society, including the education sector (Hopkins & McKeown, 2002).

Environmental stewardship refers to the responsible management and care of natural resources to ensure their sustainable use and preservation for future generations (Bennett et al., 2018). It encompasses a range of actions and practices aimed at protecting the environment, conserving biodiversity, and mitigating the impacts of human activities on ecosystems (Chapin et al., 2011). Environmental stewardship is increasingly recognised as a critical component of sustainable development, requiring individuals and communities to understand, value, and protect their natural surroundings (Chapin et al., 2010). In the context of education, environmental stewardship entails fostering a sense of responsibility and commitment towards the conservation and sustainable use of natural resources. Environmental stewardship involves individuals, communities, governments, and organisations working together to promote sustainable practices and reduce environmental degradation (Klooster, 2010).

Education plays a crucial role in fostering environmental stewardship by raising awareness about environmental issues, promoting a sense of responsibility towards nature, and empowering individuals to take action to protect the environment (Kopnina, 2018; Amoah-Nuamah et al., 2025). Environmental education programs in schools, colleges, and communities are essential for equipping people with the knowledge, skills, and values needed to become effective stewards of the environment. Environmental education has been recognised as a key strategy for fostering environmental stewardship and promoting sustainable practices among citizens, particularly the youth (Monroe et al., 2008; Boca & Saraçlı, 2019; Liefländer et al., 2013). Environmental education is integrated into the school curriculum, with subjects like geography playing a crucial role in raising students' awareness about environmental issues (Velempini, 2016; McGibbon & Van Belle, 2015; Boakye, 2015). However, the effectiveness of environmental education in instilling environmental stewardship values and behaviours among students remains a topic of debate.

Within the 2023 Geography Curriculum for Secondary Education (SHS 1–3), the role of geography in fostering environmental sustainability is linked directly to the curriculum's philosophy, rationale, and goal (Amoah-Nuamah et al., 2025; Ministry of Education, 2024). The curriculum's philosophy emphasises that learners can be supported to develop geographical skills in space-time analysis and human-environment interrelationships, while building contemporary technologies and competencies for further studies, the world of work, and adult life. Its rationale positions geography as the study of Earth's landscapes, processes, and human–environment relationships and emphasises learners' ability to read, interpret,

and analyse their environment in ways that contribute to the development of their localities and the wider world (MOE, 2024). The goal further requires senior high school geography learners to make sense of spatial phenomena and processes in their localities and beyond, while demonstrating 21st-century skills, Gender Equality and Social Inclusion (GESI), and responsible citizenship (National Council for Curriculum and Assessment [NaCCA], 2023). Accordingly, Place-Based Education is not treated in this study as an external addition to the geography curriculum, but as a pedagogical pathway for achieving the curriculum's emphasis on locality, environmental problem-solving, human–environment interrelationships, and responsible local and global citizenship.

The Senior High School Geography curriculum in Ghana therefore provides an important context for examining teachers' perceptions of PBE. Through topics such as climate change, natural resource management, environmental degradation, hazards, and conservation, geography education is expected to develop students' understanding of environmental issues and their capacity to contribute to sustainable practices in their communities. However, the effectiveness of geography education in fostering environmental consciousness depends on curriculum interpretation, teaching methods, assessment practices, and teacher preparedness (Bednarz et al., 2013). Geography teachers consequently play a crucial role in translating curriculum intentions into classroom and community-based learning experiences that shape students' environmental attitudes, values, and actions.

One approach that has gained prominence in environmental education is Place-Based Education (PBE) (McInerney et al., 2011; Ontong & le Grange, 2018). Place-Based Education emphasises connecting students with their local environment, community, and culture to enhance learning and foster environmental stewardship (Ontong & le Grange, 2018). By grounding education in real-world contexts, PBE aims to make learning relevant, meaningful, and engaging for students. Despite the potential of PBE to promote environmental stewardship, its implementation in Ghanaian schools, particularly within the geography curriculum, is not well understood. Senior High School Geography teachers play a pivotal role in shaping students' understanding of environmental issues and their attitudes towards environmental stewardship (Ferguson et al., 2021). However, little is known about how these teachers perceive and utilise PBE initiatives to achieve these goals.

Environmental degradation and sustainability challenges persist in Ghana (Nachibi & Morgan, 2023), necessitating effective educational interventions that promote environmental stewardship among youth. Although PBE has gained traction globally as a promising approach to environmental education (Conlon, 2023), its implementation and effectiveness within the Ghanaian senior high school geography curriculum remain understudied. This gap is important because geography teachers are responsible for translating curriculum aims into active learning, authentic assessment, and locally relevant environmental learning experiences. Therefore, the purpose of this study is to explore senior high school geography teachers' perceptions of implementing PBE for environmental stewardship in Ghana, focusing specifically on Active Learning Practices (ALP), Authentic Assessment Strategies (AAS), and Systemic Challenges (SC).

By examining these three dimensions of PBE, the study provides insight into the extent to which current geography teaching practices support the environmental sustainability orientation of the 2023 SHS geography curriculum. The findings are intended to inform curriculum implementation, teacher professional development, and policy decisions aimed

at strengthening geography education as a vehicle for environmental stewardship in Ghanaian Senior High Schools.

2 Theorization of the Problem: Place-Based Education

As educational discourse evolves, the Place-Based Education (PBE) framework has gained prominence for its ability to link students' learning to their immediate cultural and geographic environments (Yemini et al., 2025; Harasymchuk, 2015). PBE promotes active engagement with local issues, enabling students to develop a deep sense of place and community responsibility. According to Walker (2024), education grounded in students lived experiences fosters meaningful exploration of local challenges and opportunities, providing a foundation for civic engagement and ecological awareness. However, many traditional instructional models emphasize standardized content over localized, experiential learning (Marshall, 2019).

Although several international studies have demonstrated the benefits of PBE in enhancing student engagement, community participation, and environmental awareness (Hamilton & Marckini-Polk, 2023; Chowdhury & Alzarrad, 2025; Schroeder et al., 2019; Kassim et al., 2024; Semken et al., 2017; Abdallah, 2025; Cincera et al., 2019; Biller, 2024; Rigdel & Thapa, 2023), empirical evidence on its implementation within senior high school geography education in developing countries, particularly Ghana, remains underexplored. Specifically, little is known about how geography teachers interpret PBE in relation to active learning practices, authentic assessment strategies, and systemic challenges within the new SHS geography curriculum. To address this gap, the present study asks: What are senior high school geography teachers' perceptions of implementing place-based education for environmental stewardship in Ghana, and how do these perceptions reflect active learning practices, authentic assessment strategies, and systemic challenges? This presents a significant theoretical and practical gap, especially in contexts where environmental education is urgently needed in response to local issues such as deforestation, land degradation, flooding, and urban pollution.

In Ghana, while the 2023 senior high school geography curriculum includes critical environmental topics, such as environmental degradation, environmental hazards and their management, climate-related processes, land-use change, and human–environment interactions, these topics may still be delivered in abstract or examination-driven ways if teachers lack the flexibility, resources, and pedagogical support needed to connect them to students lived environments. This claim is supported by earlier studies showing that geography and environmental education in several African contexts often remain teacher-centred, content-heavy, and insufficiently linked to local environmental action (Dube, 2014; Kidman & Papadimitriou, 2012; Mtitu, 2014). It is also consistent with the 2023 geography curriculum's own critique of the previous 2010 curriculum, which noted limited emphasis on 21st-century skills, human–environment problem-solving, active pedagogies, and adequate tools for effective geography teaching (NaCCA, 2023). Investigating how PBE can be integrated into Ghanaian geography instruction is therefore essential for bridging the gap between curriculum intentions and classroom/community practice.

3 Methodology

3.1 Research design

This study adopted a descriptive cross-sectional mixed-methods design. The design was appropriate because the study sought to capture Senior High School Geography teachers' perceptions of implementing Place-Based Education for environmental stewardship at a particular point in time. The quantitative component generated broad evidence on the three dimensions of PBE explored in the study: Active Learning Practices, authentic Assessment Strategies, and Systemic Challenges, while the qualitative interviews provided contextual explanations of teachers' experiences and the meanings they attached to these practices and challenges. The mixed-methods design therefore supported a more comprehensive understanding of how geography teachers interpret and implement PBE within Ghana's senior high school geography curriculum.

3.2 Study Participant and Sampling Technique

The study employed a regionally stratified census approach to investigate the perspectives of Senior High School (SHS) Geography teachers across four regions of Ghana: Ashanti, Eastern, Central, and Greater Accra. The target population comprised 328 Geography teachers from 108 Senior High Schools within the selected regions. The adoption of a census approach was informed by the relatively manageable population size and the methodological advantage of encompassing the entire eligible population rather than relying on a selected sample. This approach was intended to maximise population coverage and capture the diversity of teachers' perspectives across different geographical and institutional contexts. However, achieving complete enumeration was constrained by the implementation of the double-track school system, which affected the availability of some teachers during the data collection period. Despite repeated efforts to contact teachers who were initially unavailable, 312 participated in the study, yielding a response rate of 95.1%. This rate satisfies the 95% response-rate benchmark recommended for census surveys by the National Center for Education Statistics (NCES, 2002), indicating a high level of participation and substantial coverage of the defined study population. Nevertheless, the potential for nonresponse bias associated with the 16 nonparticipating teachers cannot be entirely discounted.

The selection of the four regions was purposive, guided by their educational significance, geographical diversity, and relevance to the study's focus on place-based geography education and environmental stewardship. Greater Accra and Ashanti encompass major urban and commercial centres where environmental challenges, including flooding, solid waste management, pollution, and urban expansion, are particularly prominent. Conversely, the Central and Eastern regions encompass a range of coastal, peri-urban, agricultural, and forest-transition environments, providing contrasting socioecological contexts within which geography education is situated. These geographical variations were considered pertinent to understanding how teachers' environmental experiences and local contexts may shape their perspectives on geographical learning and environmental stewardship. The accessibility of schools and teachers during the data collection period was also considered in determining the geographical scope of the study.

To facilitate systematic population coverage, the study incorporated regional stratification into the census framework, with each of the four regions constituting a primary stratum. Within these strata, schools were further considered according to geographical location, institutional size, and the availability of geography teachers. This organisational procedure was particularly important in accommodating variations in teacher availability arising from

the double-track school system. Rather than selecting teachers through random sampling within the respective strata, efforts were directed towards recruiting all eligible geography teachers across the identified schools. Regional stratification therefore served as a framework for coordinating recruitment and ensuring geographical coverage, while census enumeration constituted the principal approach to participant inclusion. This combination facilitated the inclusion of teachers from diverse educational and socioecological settings and provided a basis for examining variations in their perspectives across the four regions. Nevertheless, because the regions were purposively selected, the findings should be interpreted primarily in relation to the defined study population rather than generalised uncritically to all SHS geography teachers in Ghana.

In addition to the survey, key informant interviews were conducted with nine geography subject heads who were purposively selected because of their leadership roles, teaching experience, and familiarity with geography curriculum implementation in their schools. The interviewees were drawn from the same four regions to ensure that the qualitative component remained aligned with the regional coverage of the survey. The number of interviews was guided by saturation, as no substantially new themes emerged after the ninth interview.

Table 1: Key Informant Interviewee characteristics

Participant ID	Gender	Age (Years)	Region	Grade Level Taught	Years of Experience
P1	Male	45	Ashanti	SHS 2–3	18
P2	Male	55	Ashanti	SHS 1–3	25
P3	Female	39	Eastern	SHS 1–2	15
P4	Female	42	Central	SHS 1–3	17
P5	Male	38	Central	SHS 1–3	12
P6	Male	47	Greater Accra	SHS 1–3	22
P7	Female	41	Eastern	SHS 2–3	14
P8	Male	44	Greater Accra	SHS 1–3	19
P9	Male	36	Ashanti	SHS 1–2	10

3.3 Data Collection Instrument and Procedure

Primary data were collected using a structured questionnaire and a semi-structured interview guide. The questionnaire items were self-developed for this study but were conceptually guided by existing literature on place-based education, environmental education, active learning, authentic assessment, and barriers to environmental education implementation (Gruenewald, 2003; Smith & Sobel, 2004; Semken et al., 2017; Anderson & Jacobson, 2018; Hamilton & Marckini-Polk, 2023). No single existing scale was adopted wholesale. Instead, the item pool was developed to reflect the specific focus of this study and the Ghanaian senior high school geography context.

The questionnaire was organised into four sections covering respondents' background information, Active Learning Practices (ALP), Authentic Assessment Strategies (AAS), and Systemic Challenges (SC). Items were measured on a five-point Likert scale to assess teachers' level of agreement and frequency of practice. Face and content validity were established through a review of relevant literature and expert assessment by specialists in geography

education, environmental education, and pedagogy. Based on the feedback received, the questionnaire items were revised to improve clarity, relevance, and alignment with the study objectives. The internal consistency of the final instrument was assessed using Cronbach's alpha, while exploratory factor analysis was conducted to examine the underlying structure of the ALP, AAS, and SC dimensions.

The questionnaires were administered directly to the selected respondents at their respective schools. Before administration, the purpose of the study was explained to the respondents, and informed consent was obtained. The researcher was assisted by five trained research assistants during the data collection process. The research assistants were trained on the objectives of the study, the content of the questionnaire, ethical considerations, and the procedures for administering and retrieving the questionnaires to ensure consistency in data collection. Respondents were given adequate time to complete the questionnaires, after which the completed copies were retrieved either immediately or at an agreed time. The entire data collection exercise lasted approximately three weeks. Following retrieval, the completed questionnaires were checked for completeness and consistency and assigned identification codes before data entry. The hard copies were securely stored in a location accessible only to the researcher, while the electronic dataset was kept on a password-protected computer. The completed questionnaires were subsequently coded and entered into the appropriate statistical software for analysis.

The interview guide addressed the same three dimensions, Active Learning Practices, Authentic Assessment Strategies, and Systemic Challenges, to allow the qualitative data to explain and extend the questionnaire results. The interviews explored how teachers used local environmental issues, field activities, community examples, project work, and other PBE-related practices in geography lessons. All interviews were conducted in quiet and private spaces within the participants' respective schools, depending on their availability. These locations were chosen because they were convenient for the participants, minimised disruption to their teaching responsibilities, and provided an appropriate environment for open and confidential discussion. Where possible, interviews were held in private offices, staff rooms, or other spaces with minimal interruptions to support both the quality of the interaction and the audio recordings. The interviews were conducted in English and lasted approximately 90 minutes. With the participants' consent, all interviews were audio-recorded and supplemented with field notes to capture relevant observations and contextual information that might not be fully reflected in the recordings. Data collection continued until thematic saturation was reached, that is, when additional interviews were no longer generating substantially new themes or insights relevant to the study objectives.

3.4 Data Analysis

Quantitative data were analysed using the Statistical Package for the Social Sciences (SPSS), version 26. Descriptive statistics, including frequencies and percentages, were employed to summarise respondents' socio-demographic characteristics and response patterns across the three dimensions of place-based education: Active Learning Practices (ALP), Authentic Assessment Strategies (AAS), and Systemic Challenges (SC). The internal consistency of the measurement scales was evaluated using Cronbach's alpha. Principal component analysis (PCA) was conducted to examine the dimensional structure of the questionnaire items. Prior to extraction, the suitability of the data was assessed using the Kaiser–Meyer–Olkin (KMO) measure of sampling adequacy and Bartlett's test of sphericity. Component retention was guided by Kaiser's criterion of eigenvalues greater than 1 and supplemented by parallel analysis. Direct Oblimin rotation was applied to facilitate interpretation of the component

structure while allowing for potential correlations among the three dimensions. The rotated component loadings were subsequently examined to evaluate the association of individual items with their respective components.

Qualitative data obtained from the key informant interviews were transcribed and subjected to thematic analysis. The researcher engaged in repeated readings of the interview transcripts and field notes to gain familiarity with the data and identify recurring patterns and perspectives. Using QDA Miner, relevant segments of the transcripts were systematically coded, and related codes were organised into themes corresponding to the three dimensions of the study: Active Learning Practices, Authentic Assessment Strategies, and Systemic Challenges. Representative quotations were incorporated to substantiate the identified themes, contextualise the quantitative findings, and preserve participants' perspectives. The analysis also acknowledged the researcher's positionality, recognising that their disciplinary background in geography education and interest in environmental stewardship could influence the interpretation of participants' experiences. Particular attention was therefore given to grounding interpretations in participants' accounts while remaining mindful of potential assumptions arising from the researcher's academic perspective. The integration of quantitative and qualitative findings facilitated a more nuanced understanding of geography teachers' perceptions and provided contextual insights into the pedagogical practices and institutional conditions shaping the implementation of place-based education in Ghanaian senior high schools.

3.5 Ethics Approval and Participant Consent

The study followed applicable ethical procedures for research involving human participants. Participants were informed about the purpose of the study, the voluntary nature of participation, the procedures involved, and their right to withdraw at any stage without penalty. Written informed consent was obtained before questionnaire administration and interviews. Participants also consented to the use of anonymised findings for academic publication. Confidentiality and anonymity were maintained by removing identifying information from transcripts and reporting participants' views using codes. The dignity, safety, and well-being of participants were prioritised throughout the research process.

4 Results

4.1 Geography Teachers' Perceptions on Implementing Place-Based Education for Environmental Stewardship

This section presents an analysis of senior high school geography teachers' perceptions of the implementation of PBE as a strategy to promote environmental stewardship in Ghana. The analysis is organised around the three dimensions that guided the questionnaire development and the research purpose: Active Learning Practices (ALP), Authentic Assessment Strategies (AAS), and Systemic Challenges (SC) (see Table 2). These categories evaluate the extent to which teachers integrate PBE into teaching, how they assess students through locally relevant and real-world tasks, and the challenges they encounter in implementing PBE-related activities.

The internal consistency of the questionnaire was assessed using Cronbach's alpha coefficient. The analysis yielded an aggregate reliability coefficient of approximately 0.98, indicating strong internal consistency among the items analysed. However, given that the instrument encompassed three conceptually distinct dimensions, Active Learning Practices (ALP), Authentic Assessment Strategies (AAS), and Systemic Challenges (SC), the aggregate

coefficient was interpreted with caution, as it does not independently establish the reliability of each dimension. Furthermore, the exceptionally high coefficient suggests the possibility of item redundancy or conceptual overlap, underscoring the importance of evaluating the internal consistency of each dimension separately. The distributional characteristics of the data were examined using skewness and kurtosis, with absolute skewness values below 2 and kurtosis values below 7 considered indicative of acceptable departures from normality (Chou & Bentler, 1995). Principal Component Analysis (PCA) was subsequently employed to examine the dimensional structure of the questionnaire. Prior to component extraction, the suitability of the data was evaluated using the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett's test of sphericity. The KMO measure exceeded the minimum threshold of 0.50, while Bartlett's test was statistically significant ($p < 0.05$), supporting the suitability of the correlation matrix for component analysis (Taherdoost et al., 2022). The number of components retained was determined using Kaiser's eigenvalue-greater-than-one criterion, supplemented by parallel analysis (Patil et al., 2010; Wood et al., 2015). Direct Oblimin rotation was applied to facilitate the interpretation of the component structure while allowing for potential correlations among the underlying dimensions. The analysis identified three principal components corresponding to systemic challenges (SC), authentic assessment strategies (AAS), and active learning practices (ALP). Individual items were subsequently evaluated based on their loadings in the rotated pattern matrix and their theoretical relevance to the respective components.

4.2 Active Learning Practices

The active learning practices (ALP) component captures teachers' perceptions and reported use of instructional approaches that emphasise local environmental contexts, experiential learning, and active student participation. Of the 20 items initially examined, 15 met the specified minimum component-loading threshold of 0.50 and were retained, with loadings ranging from 0.519 to 0.843 (Table 2). The remaining five items (ALP8, ALP16, ALP17, ALP19, and ALP20) were excluded because they did not satisfy the retention criterion for the intended component. Notably, ALP19 and ALP20 exhibited comparatively low loadings on the authentic assessment strategies (AAS) component rather than the intended ALP component, suggesting limited alignment with the underlying construct. Among the retained items, involving students in solving local environmental problems (ALP13) recorded the highest loading (0.843), followed by incorporating local environmental issues into teaching (ALP2; 0.799), promoting environmental responsibility through PBE (ALP5; 0.779), and discussing sustainable development (ALP18; 0.763). These findings suggest that local environmental problem-solving, contextualised instruction, and environmental responsibility constitute prominent indicators of the ALP component.

Table 2 : Active Learning Practices

Item Code	Item Statement	Cronbach's α	Component 1 (SC)	Component 2 (AAS)	Component 3 (ALP)	Loading ≥ 0.5
ALP1	Place-based education enhances understanding of geographical concepts	0.981			.713	Yes
ALP2	Frequency of incorporating local environmental issues	0.981			.799	Yes

Item Code	Item Statement	Cronbach's α	Component 1 (SC)	Component 2 (AAS)	Component 3 (ALP)	Loading ≥ 0.5
ALP3	Confidence in knowledge of Ghana-specific environmental issues	0.981			.577	Yes
ALP4	Engaging students in discussions on stewardship in Ghana	0.981			.683	Yes
ALP5	PBE fosters environmental responsibility	0.981			.779	Yes
ALP6	Importance of incorporating local context	0.981			.539	Yes
ALP7	PBE aligns with Geography education goals	0.981			.519	Yes
ALP8	Use of real-world Ghanaian examples	0.981			.311	No
ALP9	Confidence in integrating PBE principles	0.981			.614	Yes
ALP10	Local issues make lessons more engaging	0.981			.528	Yes
ALP11	Frequency of field trips	0.981			.759	Yes
ALP12	Effectiveness of PBE in promoting local appreciation	0.981			.572	Yes
ALP13	Involving students in solving local problems	0.980			.843	Yes
ALP14	Importance of Ghana-specific issues	0.981			.691	Yes
ALP15	Group projects on local issues	0.981			.614	Yes
ALP16	Seeking community resources for local issues	0.981			.319	No
ALP17	Textbooks' adequacy in addressing local issues	0.981			.291	No
ALP18	Frequency of discussing sustainable development	0.981			.763	Yes
ALP19	Confidence in integrating stewardship	0.981		.423		No
ALP20	Empowering students for positive change	0.981		.414		No

Table note: ALP = Active Learning Practices; Of the 20 items initially assessed, 15 were retained based on component loadings ≥ 0.50 on the intended ALP component. Five items were excluded. Component loadings are reported as presented in the analysis.

The qualitative findings provided further insights into how teachers perceived the contribution of experiential and locally grounded learning to students' understanding of

environmental issues. One geography subject head explained, "Students understand environmental topics better as they physically explore their surroundings. For instance, a field visit to a local forest allows them to see deforestation's effects firsthand." This observation complements the quantitative findings on the incorporation of local environmental issues (ALP2; 0.799) and the use of field trips (ALP11; 0.759), highlighting the perceived importance of direct environmental experiences in geographical learning.

The findings further revealed that teachers associated PBE with opportunities for developing students' environmental responsibility through practical and community-oriented activities. One subject head observed that "practical activities enable students to transform theoretical ideas into actual environmental behaviours," while another explained, "I incorporate my students into school and communal activities, including tree planting and community clean-ups because this allows them to use theoretical knowledge in practical experiences." These accounts provide contextual support for ALP5 (0.779), suggesting that teachers perceive practical environmental activities as opportunities to connect classroom knowledge with environmental stewardship.

Similarly, the high loading recorded for involving students in solving local environmental problems (ALP13; 0.843) underscores the prominence of problem-solving within the ALP component. One participant illustrated this practice by stating, "Students were tasked to investigate the primary causes and propose measures to curb floods in their community as a vacation project, which fosters critical thinking and empowerment." This example demonstrates how locally relevant environmental problems can provide opportunities for students to apply geographical knowledge through inquiry and problem-solving. Collectively, the quantitative and qualitative findings indicate that teachers perceive PBE as a pedagogical approach that connects geographical concepts to students' lived environments through fieldwork, community participation, and locally relevant environmental investigations. However, these findings reflect teachers' perceptions and reported practices rather than independently measured improvements in students' learning outcomes or environmental behaviours.

4.3 Authentic Assessment Strategies

The authentic assessment strategies (AAS) component captures teachers' reported use of instructional and assessment approaches that connect geographical learning to real-world environmental issues and promote students' active engagement. Of the 19 items initially examined under this construct, 10 met the specified minimum component-loading threshold of 0.50 and were retained. The retained items recorded loadings ranging from 0.513 to 0.798, while nine items were excluded for failing to meet the retention criterion (Table 3). Among the retained items, the use of local and indigenous knowledge (AAS11) recorded the highest loading (0.798), followed by real-life scenarios (AAS6; 0.739), hands-on learning experiences (AAS8; 0.718), and inquiry-based learning (AAS1; 0.698). These findings highlight the prominence of locally grounded knowledge, experiential activities, and inquiry-oriented approaches within the authentic assessment component.

Table 3: Authentic Assessment Strategies

Item Code	Item Statement	Cronbach's α	Component 1 (SC)	Component 2 (AAS)	Component 3 (ALP)	Loading ≥ 0.5
AAS1	Use of inquiry-based learning	0.981		.698		Yes
AAS2	Use of field trips/outdoor experiences	0.981		.577		Yes
AAS3	Use of community experts in lessons	0.981		.363		No
AAS4	Encouragement of student-led projects	0.981		.297		No
AAS5	Incorporation of technology (GIS, etc.)	0.981		.264		No
AAS6	Use of real-life scenarios	0.981		.739		Yes
AAS7	Group projects on local environmental issues	0.981		.326		No
AAS8	Hands-on experiences (experiments, etc.)	0.981		.718		Yes
AAS9	Discussions on sustainable practices	0.981		.513		Yes
AAS10	Connecting learning with real-world issues	0.981		.421		No
AAS11	Use of local/indigenous knowledge	0.981		.798		Yes
AAS12	Use of multimedia resources	0.981		.547		Yes
AAS13	Independent student research	0.981		.362		No
AAS14	Role-playing/debates on policies	0.981		.342		No
AAS15	Student reflection on environmental attitudes	0.981		.635		Yes
AAS16	Local community involvement in curriculum	0.981		.275		No
AAS17	Project-based learning activities	0.981		.397		No
AAS18	Case studies showing socio-environment links	0.981		.645		Yes
AAS19	Opportunities for students to implement action	0.981		.658		Yes

Note: AAS = Authentic Assessment Strategies; Of the 19 items initially assessed, 10 satisfied the minimum component-loading criterion of ≥ 0.50 and were retained, while nine were

excluded. The reported loadings should be verified against the final rotated component solution

The qualitative findings provided further insights into how these approaches were incorporated into geography teaching. One teacher explained that "Encouraging students to investigate local environmental challenges deepens their understanding and engagement." This observation aligns with the relatively high loading recorded for inquiry-based learning (0.698), suggesting that opportunities for students to investigate environmental issues constitute an important aspect of the AAS component. Similarly, the strong loading for real-life scenarios (0.739) reflects the emphasis placed on connecting classroom learning to familiar environmental conditions. As one geography subject head explained, "Linking topics like water shortages to real-life community issues makes the content more meaningful." Hands-on learning experiences also emerged as a prominent indicator (0.718), reinforcing the importance of practical engagement in geographical learning. A teacher noted that "Firsthand experience with environmental issues through field studies strengthens students' comprehension." Taken together, the quantitative and qualitative findings suggest that teachers recognise the importance of contextualised, experiential, and inquiry-based approaches in supporting students' engagement with environmental issues. However, the findings primarily reflect teachers' reported practices and perceptions rather than direct evidence of improvements in students' learning outcomes.

4.4 Systemic Challenges

The systemic challenges (SC) component captures the institutional, curricular, resource-related, and contextual constraints that teachers perceive as limiting the implementation of place-based education (PBE) for environmental stewardship. Of the 12 items initially assessed under this construct, six met the specified minimum component-loading threshold of 0.50 and were retained, with loadings ranging from 0.576 to 0.787 (Table 4). The remaining six items were excluded because their loadings fell below the established criterion. Among the retained items, resource limitations (SC1) recorded the highest loading (0.787), followed by the influence of standardised testing (SC6; 0.751), limited awareness among students and parents (SC7; 0.698), resistance from policymakers (SC11; 0.687), difficulties aligning PBE with curriculum requirements (SC3; 0.612), and time constraints (SC9; 0.576). These findings indicate that resource availability, assessment pressures, stakeholder awareness, and institutional conditions were prominent indicators of the systemic challenges component.

Table 4: Systemic Challenges

Item Code	Item Statement	Cronbach's α	Component 1 (SC)	Component 2 (AAS)	Component 3 (ALP)	Loading ≥ 0.5
SC1	Lack of resources as a barrier	0.981	.787			Yes
SC2	Limited professional development	0.981	.322			No
SC3	Challenge aligning PBE with the curriculum	0.981	.612			Yes
SC4	Lack of administrative support	0.981	.367			No
SC5	Resistance from colleagues/stakeholders	0.981	.291			No

Item Code	Item Statement	Cronbach's α	Component 1 (SC)	Component 2 (AAS)	Component 3 (ALP)	Loading ≥ 0.5
SC6	Standardized testing impedes PBE	0.981	.751			Yes
SC7	Lack of awareness among students/parents	0.981	.698			Yes
SC8	Societal attitudes affect PBE adoption	0.981	.246			No
SC9	Time constraints	0.981	.576			Yes
SC10	Difficulty finding up-to-date resources	0.981	.267			No
SC11	Resistance from policymakers	0.981	.687			Yes
SC12	Language barriers as a challenge	0.981	.231			No

Note: SC = Systemic Challenges; Of the 12 items initially assessed, six met the minimum component-loading criterion of ≥ 0.50 and were retained, while six were excluded. Item-retention decisions should be verified against the final rotated component solution.

The qualitative findings provided contextual insights into how these constraints affected teachers' implementation of PBE. Resource limitations emerged as a recurring concern, particularly regarding the availability of maps, field equipment, and financial support for outdoor learning activities. One teacher explained, "Our schools lack essential materials like maps and field equipment, which limits our ability to implement experiential learning." Curriculum requirements and examination pressures were also identified as constraints on the flexibility needed to incorporate locally relevant environmental activities. As one geography subject head observed, "The standardized curriculum does not provide enough flexibility to include local environmental case studies." This perspective is consistent with the relatively high component loadings recorded for standardised testing (0.751) and curriculum alignment difficulties (0.612).

Beyond curricular and resource constraints, participants highlighted administrative procedures and institutional resistance as additional challenges to implementing field-based and community-oriented learning. One teacher explained, "To organize even a simple field trip, we need consent from parents, school management, and approval from the district and regional education directorates. These cumbersome processes often deter us from carrying out such valuable field trips." This account provides further context for the institutional barriers associated with PBE implementation, although administrative support did not meet the specified retention threshold in the quantitative component analysis. Taken together, the quantitative and qualitative findings suggest that the implementation of PBE extends beyond individual teachers' pedagogical preferences and is shaped by the availability of resources, curriculum and assessment demands, institutional procedures, and broader stakeholder support.

5 Discussion

This section discusses the results in relation to the three dimensions of PBE explored in the study: Active Learning Practices, Authentic Assessment Strategies, and Systemic Challenges. The findings show that Senior High School Geography teachers generally recognise the value of PBE for environmental stewardship, but their ability to implement it depends on pedagogical, assessment-related, and institutional conditions.

The findings indicate that teachers perceive fieldwork, local examples, community clean-ups, tree planting, and problem-solving projects as useful ways of making geography more meaningful to students. This supports the view that PBE can shift geography education from abstract classroom explanations to experiential learning grounded in students' immediate surroundings. The strong loading for involving students in solving local environmental problems shows that teachers see PBE as a pathway for developing critical thinking and environmental responsibility. This finding aligns with Smith and Sobel (2014), who argue that place and community based education strengthens students' engagement by connecting school learning to real community issues. It also resonates with Ardoin et al. (2023), who note that experiential environmental education can deepen civic and ecological engagement. In the Ghanaian context, where students encounter issues such as flooding, waste disposal, deforestation, and land degradation in their own communities, active learning practices can help students interpret environmental problems as lived realities rather than distant textbook concepts.

The results also show that teachers value inquiry-based learning, real-life scenarios, case studies, reflection, and hands-on tasks as ways of assessing students' understanding of environmental issues. These strategies are important because they move assessment beyond recall and encourage learners to apply geographical knowledge to real problems. This finding is consistent with the 2023 SHS geography curriculum's emphasis on interactive teaching, assessment for learning, problem-solving, and higher-order thinking (NaCCA, 2023). It also supports constructivist views of learning, where learners actively build knowledge through investigation, reflection, and application (Herrington & Oliver, 2000; Hmelo-Silver et al., 2007). In this study, teachers' use of real-life scenarios, local environmental investigations, and field activities suggests that authentic assessment can help students demonstrate environmental understanding in ways that are practically relevant to their communities.

Despite teachers' positive perceptions of PBE, the findings reveal that implementation is constrained by resource limitations, curriculum pressures, standardised testing, time constraints, and bureaucratic approval processes. These challenges are significant because PBE requires field equipment, transport, flexible lesson time, community partnerships, and administrative support. Teachers' concerns about limited materials and rigid curriculum expectations are consistent with earlier studies that identify resource constraints and examination-oriented schooling as barriers to environmental education and innovative geography pedagogy (Kidman & Papadimitriou, 2012; Miller & Twum, 2017; Rakuasa & Latue, 2023). The findings therefore suggest that teacher willingness alone is insufficient. For PBE to contribute effectively to environmental stewardship, curriculum implementation must be supported by resources, professional development, assessment flexibility, and simplified approval procedures for fieldwork and community-based learning.

The study demonstrates that PBE has strong potential to support the environmental sustainability goals of senior high school geography education in Ghana. However, this

potential can be realised only when active learning and authentic assessment practices are supported by enabling institutional conditions. The discussion therefore reinforces the need for curriculum implementation strategies that help teachers connect the 2023 geography curriculum's emphasis on human–environment relationships, localities, and responsible citizenship to students' everyday environmental experiences.

6 Conclusions

This study sought to explore Senior High School Geography teachers' perceptions of implementing Place-Based Education for environmental stewardship in Ghana, focusing specifically on Active Learning Practices, Authentic Assessment Strategies, and Systemic Challenges. The findings show that teachers recognise the value of PBE in making environmental learning more practical, locally relevant, and action-oriented. Through fieldwork, local examples, community activities, inquiry-based learning, and project-based tasks, teachers can help students connect geography concepts to the environmental issues affecting their own communities. These practices align with the 2023 SHS geography curriculum's emphasis on human-environment interrelationships, spatial understanding, problem-solving, 21st-century skills, and responsible citizenship. However, the study also revealed that the effective implementation of PBE is limited by inadequate resources, rigid curriculum and assessment demands, time constraints, limited professional development, and bureaucratic procedures for field-based learning. These challenges show that PBE cannot be strengthened through teacher effort alone. It requires institutional support, curriculum flexibility, and policy-level commitment to make local environmental learning a regular part of senior high school geography education.

7 Recommendations for policy and practice

The findings have several implications for geography education policy and practice in Ghana and beyond. First, the Ministry of Education together with Ghana Education Service should increase investment to support PBE, including field equipment, teacher training programmes, transport support for fieldwork, and access to local environmental data. Second, curriculum implementor (Ghana Education Service) should provide teachers with practical guidance and flexibility to incorporate place-based case studies, community projects, and environmental problem-solving activities into Geography lessons. Third, teacher should recognise assessment practices as authentic tasks such as field reports, community investigations, reflective portfolios, and project-based assignments, rather than relying mainly on standardised tests. Finally, the Ministry of Education and school administrators should streamline approval processes for fieldwork and strengthen partnerships between schools, local communities, environmental agencies, and district education offices. These measures can help ensure that geography education fosters environmental literacy, civic responsibility, and practical stewardship among students.

8 Limitations of the study

This study, while providing significant insights into Senior High School Geography teachers' perceptions of Place-Based Education (PBE) initiatives for fostering environmental stewardship in Ghana, does have notable limitations that must be acknowledged. One limitation of this study is the potential for selection bias due to the impact of the double-track educational system, which resulted in the absence of some geography teachers during data collection. This may have influenced the representativeness of the sample, as certain perspectives might have been underrepresented. Additionally, the study was confined to four regions in Ghana, which, although diverse, may not fully capture the broader national context.

Finally, while efforts were made to ensure reliability and validity, the cross-sectional design limits the ability to assess changes in perceptions over time, necessitating further longitudinal studies to examine evolving attitudes toward Place-Based Education initiatives for environmental stewardship.

9 Funding

The author received no specific funding for this work.

10 Conflicts of interest/Competing interests

The author declares no known competing interest

11 Availability of data and material

The data supporting the findings of this study will be made available upon reasonable request from the corresponding author.

12 Code availability

Not applicable

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