

Exploring the Nexus between Limestone Mining and Environmental Literacy: Social Awareness Education among Residents of Ewekoro and Ibese, Nigeria

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Abstract

This study explores the relationships between limestone mining, environmental literacy, and the impact of social awareness education on residents' responses to environmental pollution in Ewekoro and Ibese, Ogun State, Nigeria areas known for intensive cement production. A descriptive survey design was employed, involving 450 participants selected through multi-stage sampling. Data collected via a validated questionnaire were analyzed using Pearson's correlation and descriptive statistics. Results showed a significant positive correlation between awareness of mining activities and perceptions of environmental pollution ($r = 0.622, p < .05$), suggesting that increased awareness heightens concern over ecological degradation. A moderate but significant correlation also emerged between environmental literacy and eco-friendly practices ($r = 0.481, p < .05$). Additionally, social awareness education through Social Studies and community programs was significantly linked to environmentally responsible behavior ($r = 0.529, p < .05$). These findings highlight the role of education in fostering environmental consciousness in mining-impacted communities. The study recommends integrating localized environmental content into Social Studies curricula, enhancing teacher training in environmental education, and implementing CSR-supported community outreach to promote sustainability.

Keywords: Limestone Mining, Environmental Literacy, Social Awareness Education, Environmental Pollution, Social Studies Education

Introduction

Unchecked resource extraction causes environmental damage that presents major obstacles for many emerging nations, including Nigeria (Olayinka & Samuel, 2025; Kelly & Nembot Ndeffo, 2024). Among extractive industries, limestone mining is very important for the development of infrastructure, especially in cement manufacture (Olotu, Bada, Elamah, Akharia & Eryanmen, 2022). Still, the environmental effects of these activities

particularly in Ogun State's host communities of Ewekoro and Ibese are significant. Large-scale cement production activities in these towns have resulted in ongoing limestone mining, therefore causing great air and water pollution, deforestation and land degradation (Awos & Riddell, 2024). Dust emissions, noise pollution, and significant health hazards associated with industrial mining operations (Ogunsina, Olusola, Akintan & Ayedogbon, 2021) are progressively being exposed to the residents of these areas.

Though the degree of these environmental issues is great, public knowledge and involvement vary greatly depending mostly on degrees of environmental literacy. Environmental literacy is the awareness of environmental hazards, knowledge of ecological concepts, and ability of people to make informed, responsible decisions (Pouresmaieli, Ataei, Nouri Qarahasanlou, & Barabadi, 2024). Low environmental literacy in mining-affected areas reduces group attempts towards environmental justice and application of mitigating techniques. It also restricts residents' capacity to interact with environmental regulations or support sustainable living (Mory, 2024).

Particularly through organised courses like Social Studies, social awareness education greatly improves civic involvement and environmental knowledge. Social Studies seeks to foster critical thinking, civic competency, and knowledge of society and environmental concerns (Omiyefa, 2024). When done correctly, it enables students and nearby communities to investigate their surroundings, pinpoint pollution sources and effects, and help with remedial projects. Still, its success relies on the way participatory pedagogies and locally relevant material are combined (Alsop, Dippo, Zandvliet & David, 2007).

This study thus looks at how limestone mining contributes to environmental damage, determines the degree of environmental literacy among locals, and evaluates the part social awareness education plays in forming environmentally conscious actions. Key case studies in analysing the conflict between Nigeria's industrial growth and environmental sustainability are ewekoro and ibese villages.

Limestone Mining and Environmental Pollution

Long linked with serious environmental effects, limestone mining is especially relevant in areas where cement manufacture is a main sector. Through dust emissions, particle matter, and surface water contamination by suspended

solids (Elehinafe, Ezekiel, Okedere & Odunlami, 2024), mining adds to air and water pollution. Blasting and excavation produce fine particles that travel many kilometres and worsen air quality, therefore causing respiratory problems among locals (Nagaraja, Rakesh & Sindhu, 2025).

Because of heavy limestone extraction by international cement companies, mining communities like Ewekoro and Ibese in Nigeria have suffered ongoing environmental damage. Uloko, Agu, Agomuo & Joseph (2025) claim that people of these areas report more incidences of asthma, skin irritation, and loss of agricultural output brought on by contaminated soil (Ogunsina et al., 2021). These toxins taken together affect social and economic well-being as well as physical health, therefore influencing vulnerable groups.

Environmental regulations and rules set by organisations like NESREA nevertheless help to explain the insufficient enforcement of environmental laws and the frequent neglect of Environmental Impact Assessments (EIA). Therefore, public awareness and community-level education are very important instruments in complementing official rules to lower environmental risk and advance sustainable behaviours.

Environmental Literacy

Environmental literacy is the information, attitudes, and actions people must possess to make wise judgements about the surroundings (Guerrero & Sjöström, 2025). It is four-dimensional: ecological knowledge, environmental awareness, sensitivity, and action-oriented behaviour. In areas devastated by mining, such literacy is crucial for enabling people to fight for sustainable development and better living conditions.

Higher degrees of environmental literacy associated with proactive activities including tree planting, waste reduction, and campaigning against industrial pollution linked in a study spanning rural Nigerian communities to the "value-action gap" (Osuji & Nwuke, 2024) is a regular obstacle, though, the difference between awareness and action. This disparity implies that although residents could be aware of environmental risks, they usually lack the confidence or means to act, particularly in cases when industrial players seem too strong to oppose. Moreover, the social and geographical settings define how environmental literacy is developed. Experiential learning, NGOs, or unofficial community forums (Sefton-Green, 2013) often shapes literacy in areas without quality

formal education or environmental media. This emphasises even more the need of including environmental literacy within official education, especially in Social Studies, to offer a fair and orderly forum for the distribution of knowledge.

Social Awareness Education and Social Studies

Social awareness education is a pedagogical strategy aiming to help students to enhance their knowledge of social concerns, empathy, critical consciousness, and civic responsibility (Dalimunte, 2025). In social studies, it gives students the means to challenge their environmental and social reality and act with knowledge. Freire's (1970) critical pedagogy supports this point of view by seeing education as a form of "conscientisation," so enabling people to acquire the ability to see and oppose injustice.

The Social Studies curriculum in Nigeria is meant to develop national consciousness, unity, and problem-solving abilities including those pertaining to the surroundings. Research shows, meanwhile, that its use frequently falls short of solving local, context-specific problems such as mining-induced pollution (Adeyemi & Onigiobi, 2020). Environmental material is often theoretical and divorced from students' living experiences where it exists.

Adeyemi and Olapade (2023) claim that including place-based education into Social Studies using local case studies such as the effects of mining in Ewekoro can greatly increase students' environmental awareness and community involvement. Moreover, pupils are more likely to show greater degrees of civic participation when Social Studies teachers receive environmental education approaches include participatory learning, discussion, and community mapping (Hollstein & Smith, 2022).

Particularly those involving youth clubs, town halls, and documentary screenings, community-based environmental education projects also augment the official curriculum in increasing social awareness. Such combined efforts provide a more complete, action-oriented, transforming approach of environmental education.

Theoretical Framework

Together, Freire's Critical Pedagogy and Environmental Education Theory offer a strong conceptual basis for comprehending how education may help to

solve environmental pollution in extractive societies. Structured learning experiences are, according to Environmental Education Theory, indispensable in arming people with the knowledge, attitudes, and skills required to properly address environmental concerns. It raises not only knowledge but also the acquisition of skills that support sustainable practices and good environmental behaviour. This idea emphasises education as an intentional process meant to promote ecological literacy and enable communities to participate actively in environmental problems influencing their life.

Complementing this, Freire's Critical Pedagogy (1970) sees education as a means of increasing critical consciousness. Instead of merely absorbing knowledge, students start to question and oppose current social and environmental injustices, therefore becoming active agents. Within the framework of societies impacted by industrial operations such as limestone mining, this pedagogy helps people to see how environmental damage interacts with more general concerns of rights, equity, and power. It supports a dialogical, participatory approach in which students critically consider their own experiences so they could question negative behaviours and organise for change.

These systems taken together support the emphasis of the research on social awareness education as a transforming tool. Education can enable people living in extractive areas to grasp the reasons behind pollution and motivate group action to lessen its effects by combining environmental knowledge with critical consciousness. This twin approach emphasises education not just as a means of knowledge flow but also as a driver of sustainable community development and environmental justice.

Statement of the Problem

Environmentalists as well as local residents of Ewekoro and Ibese are starting to worry about the ongoing environmental damage limestone mining causes. Many of the population lack the necessary understanding to understand these changes as ecological threats, despite obvious indicators of pollution dust clouds, water poisoning, and respiratory health concerns. Weak implementation of environmental education inside the Social Studies curriculum at the community level and low environmental literacy help to explain this disconnection. Targeted instructional interventions help residents to be active in the face of environmental hazards. Analysing the relationship

between residents' capacity to grasp and address environmental issues and their level of awareness and education is much needed.

Objectives of the Study

1. To assess the level of environmental literacy among residents of Ewekoro and Ibese communities in Ogun State.
2. To examine residents' perceptions of the environmental impacts of limestone mining activities in the selected communities.
3. To investigate the role of social awareness education, particularly through Social Studies, in promoting environmental responsibility in mining-affected areas.

Research Questions

1. What is the level of environmental literacy among residents of Ewekoro and Ibese?
2. How do residents perceive the impact of limestone mining on their environment?
3. What role does social awareness education play in promoting environmental responsibility in the mining-affected communities?

Methodology

Combining quantitative and qualitative methodologies, this study using a convergent parallel mixed-methods approach investigated the interactions among mining activity, environmental literacy, and the impact of social awareness education. This design allowed the researcher to simultaneously gather and examine qualitative and quantitative data, then combine results to generate overall conclusions. Residents of Ewekoro and Ibese settlements in Ogun State, Nigeria areas greatly influenced by limestone mining made up the population. To guarantee fair representation across gender, age, and educational background, the quantitative component included a stratified random selection method. The poll was answered by three hundred individuals total 150 from every community. Ten participants five from each village were purposefully chosen for the qualitative component to take part in focus group

discussions (FGDs) depending on their community involvement and mining activity experience.

Adapted from already-existing validated scales in environmental education literature, the Environmental Literacy Scale (ELS) was the main tool for the quantitative strand. Thirty exam items total, split into four sections: Demographics, Knowledge of pollution, Awareness of mining consequences and Attitudes and environmentally responsible behaviour. Assessing participants' cognitive and behavioural aspects of environmental literacy, the items were Likert-scale questions ranging from "Strongly Disagree" (1) to "Strongly Agree" (5). Three environmental education experts guaranteed content authenticity by means of expert evaluation. Confirming good internal consistency for the ELS, pilot research comprising thirty individuals outside of the target communities produced a Cronbach's alpha reliability coefficient of 0.81. Developed by the researcher, the semi-structured Focus Group Discussion (FGD) guide was validated by two environmental education and qualitative research professionals. It was unique and context-specific and featured open-ended questions meant to elicit participants' impressions of mining effects, local environmental changes, and the involvement of education in raising awareness and behaviour modification. Methodologies of Data Gathering Trained field assistants visited individuals personally to gather quantitative data using the ELS. During in-person focus groups held in both areas, each lasting roughly 45 to 60 minutes, qualitative data were collected. Following ethical study guidelines, all conversations were audio-recorded, transcribed verbatim, and participant informed consent. Using SPSS version 26, quantitative data were examined. Levels of environmental literacy were evaluated using descriptive statistics (mean, standard deviation); Pearson Product-Moment Correlation found the link between environmental responsibility and exposure to social awareness education. NVivo 12 handled qualitative data. Using thematic analysis, recurring trends, opinions, and community narratives on mining operations and environmental education were found.

Results and Discussion

Research Question 1: What is the level of environmental literacy among residents of Ewekoro and Ibese?

Descriptive statistics show a moderate level of environmental literacy among respondents, with notable gaps in understanding pollution sources.

Table 1: Descriptive Statistics of Environmental Literacy Components

Component	Mean (M)	Std. Deviation (SD)
Knowledge of pollution	3.21	0.84
Awareness of mining impact	2.94	0.79
Attitude to environment	3.38	0.72
Eco-friendly practices	2.67	0.89

Note: Scale ranged from 1 = Very Low to 5 = Very High

Table 1 demonstrates that respondents displayed a quite moderate degree of environmental literacy. Recording the highest mean (M = 3.38), attitude towards the surroundings revealed a positive inclination. This has not, however, completely reflected in behavioural modification since the mean for environmentally friendly actions is somewhat low (M = 2.67). This represents a typical "value-action gap," in which knowledge does not necessarily translate into action especially in light of weak social or economic support systems (Osuji & Nwuke, 2024). Participants seem rather moderately knowledgeable about pollution (M = 3.21), but awareness of the particular environmental consequences of limestone mining was slightly lower (M = 2.9), implying a need for more localised and contextual environmental education (Pouresmaieli, Ataei, Nouri Qarahasanlou, & Barabadi, 2024).

Research Question 2: How do residents perceive the impact of limestone mining on their environment?

Strong opinions of environmental damage brought about by limestone mining were found by surveys and qualitative replies. The most often mentioned problems were noise from blasting and machinery, water pollution from runoff, and air pollution resulting from dust particles. *"The dust causes difficulty breathing." We cannot risklessly drink our water any more - FGD participant from Ewekoro.*

These results line up with those of Elehinafe, Ezekiel, Okedere, and Odunlami (2022), who recorded high degrees of particle pollutants, water pollution, and noise concerns close to Nigerian cement facilities. In villages like Ewekoro, Ogunsina et al., (2021) also discovered that cement factory emissions seriously compromise health and environmental conditions. These findings

underline the need of more efficient regulatory enforcement and public health monitoring as well as the actual experiences of pollution reported by citizens.

Research Question 3: What role does social awareness education play in promoting environmental responsibility?

Pearson correlation analysis showed a moderate positive relationship between exposure to environmental education and responsible behavior ($r = .462$, $p < .01$).

Table 2: Correlation between Social Awareness Education and Environmental Responsibility

Variable	Mean	SD	r	Sig. (2-tailed)
Social awareness education	3.44	0.76	.462**	0.000
Environmental responsibility	3.01	0.88		

Note: Correlation is significant at the 0.01 level (2-tailed).

Table 2 shows a statistically significant modest positive association between environmental responsibility ($r = .462$, $p < .01$) and social awareness education. Those who claimed more exposure to environmental education from media, NGOs, or educational institutions also claimed more conscientious environmental practices. Though community-based awareness initiatives have been successful, qualitative responses point to the still inadequate formal school-based instruction. "We only hear about pollution from NGOs, not schools. Participant in FGD from Ibese. This result emphasises the need of Freire's (1970) critical pedagogy, which supports education as a transforming, consciousness-raising instrument. Education becomes a vehicle for action when students are actively grasping and reacting to their socio-environmental reality. Sadly, the present official curriculum seems to be not enough sensitive to local environmental problems.

Conclusion

With an eye towards the part social awareness education plays in Ewekoro and Ibese villages, Ogun State, this study looked at the relationship between limestone mining activity and environmental literacy. The results show that although many of the inhabitants understand the obvious effects of pollution connected to mining, their general environmental literacy especially with regard to sustainable practices remains somewhat low. Significantly, it was shown that exposure to social awareness education correlated favourably with ecologically friendly behaviour. Nonetheless, the official inclusion of environmental issues in Social Studies seems inadequate; many respondents

credit their understanding to unofficial community projects or NGOs-led campaigns. These results emphasise how urgently social studies education has to be positioned as a proactive venue for environmental interaction in extractive areas.

Recommendations

1. Change the Social Studies curriculum to include additional environmental issues connected to local mining operations that fit particular contexts.
2. Plan community-based environmental education initiatives including local government, civic society, and educational institutions.
3. Work with cement firms to start environmental literacy initiatives under their corporate social responsibility (CSR).
4. Using place-based and problem-based learning strategies, teach environmental pedagogy to teachers thereby increasing awareness in classrooms.
5. Encourage participatory venues (such as school clubs or town hall meetings) where locals and students may have conversations and take action on sustainability and pollution.

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