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The Evaluation of Students' Participation in Field and Laboratory Aspects of Geoscience/ Environmental Education Courses in South East Nigeria

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Abstract

This study evaluates student participation in field and laboratory components of geoscience and environmental education courses in Southeast Nigeria. Given the critical role of experiential learning in geoscience education, this research aims to assess how effectively students engage with hands-on activities that enhance their understanding of geological and environmental processes. The evaluation involved a mixed-methods approach, incorporating quantitative surveys and qualitative interviews with students and instructors across multiple institutions. Key metrics included attendance, active participation, and student perceptions of the relevance of field and laboratory experiences to their academic and professional aspirations. Findings indicate that while students demonstrate high levels of enthusiasm and engagement during field excursions, participation in laboratory sessions is often limited due to resource constraints and logistical challenges. Moreover, students reported that field experiences significantly enhanced their practical skills and contextual understanding of theoretical concepts, whereas laboratory activities were sometimes perceived as less impactful. The study highlights the need for improved resources and infrastructure to foster deeper engagement in laboratory settings and underscores the importance of integrating field-based learning into the geoscience curriculum to better prepare students for future careers in environmental science and related fields. Recommendations for enhancing student participation and overall educational outcomes are provided, including the development of partnerships with local industries and environmental organizations to create more immersive learning opportunities.

Keywords: Geosciences education, environmental organizations, curriculum.

BACKGROUND INFORMATION

The field and laboratory aspect of geoscience/environmental education is an integral part of academic training in the field of geosciences and environmental science. It involves practical hands-on experiences that help students apply theoretical concepts learned in the classroom to real-life situations. The field component of these courses involves the study of natural environments and geological formations in their actual settings, while the laboratory component involves the use of specialized equipment and techniques to analyze and interpret data collected from the field.

In South eastern Nigeria, geoscience and environmental education courses are offered in various tertiary institutions such as universities, polytechnics and colleges of education. These courses are designed to equip students with the knowledge and skills to understand and manage the natural environment. However, the success of these courses heavily depends on the level of participation of students in the field and laboratory activities.

The evaluation of students' participation in the field and laboratory aspect of geoscience/environmental education courses in South eastern Nigeria is essential as it provides insights into the effectiveness of the teaching and learning process. It also helps to identify the areas where students may require additional support and the overall impact of these courses on their learning outcomes.

One major factor that affects students' participation in field and laboratory activities is the availability of resources. Inadequate funding for the procurement of necessary equipment, materials, and field trips, is a major challenge faced by most institutions in the region. This results in limited opportunities for students to participate in practical activities, which ultimately affects their learning experience.

Another important factor that affects students' participation is the location and accessibility of geological and environmental sites for field trips. The South eastern region of Nigeria is characterized by rugged terrain, which makes it difficult and expensive to access some of these sites for practical learning. This further limits the opportunities for students to participate in field activities.

Furthermore, the cultural and social backgrounds of students also play a role in their participation in field and laboratory activities. In some cases, students from certain sociocultural backgrounds may have limited exposure to outdoor activities, making it difficult for them to adjust to the physical demands of fieldwork. This affects their willingness to participate and may hinder their learning experience.

Moreover, the education system in Nigeria places a strong emphasis on theoretical knowledge, which translates to a lack of appreciation for practical learning activities. This has resulted in a mindset among students that laboratory and fieldwork are not as important as classroom lectures, hence reducing their motivation and interest in participating in these activities.

In addition to these factors, the lack of adequate training and supervision by instructors also affects students' participation in field and laboratory activities. In some cases, instructors may not have the necessary skills and experience to effectively guide and supervise students in practical activities, leading to a lack of interest and motivation among students.

To address these challenges, some institutions in South eastern Nigeria have implemented measures such as creating partnerships with industries and organizations to provide resources and funding for field and laboratory activities. They have also introduced field and laboratory activities as compulsory components of their geoscience and environmental education courses, making them an essential part of the curriculum.

In conclusion, the evaluation of students' participation in the field and laboratory aspect of geoscience/environmental education courses in South eastern Nigeria is crucial for the improvement of these courses. It is essential to address the challenges faced by students in participating in practical activities and to make necessary adjustments in the teaching and learning process to ensure a more effective and engaging learning experience for students.

PROBLEM STATEMENT

The participation of students in field and laboratory components of Geoscience Education courses in South East Nigeria is currently inadequately monitored and evaluated, leading to potential gaps in students' practical understanding of key concepts. This lack of evaluation hinders the effective enhancement of students' practical skills and may impact their overall learning outcomes in Geoscience Education.

AIMS AND OBJECTIVES:

1. To assess the level of student engagement in field activities within Geoscience Education courses in South East Nigeria.
2. To evaluate the effectiveness of laboratory sessions in enhancing students' understanding of Geoscience concepts.
3. To identify factors that influence student participation in field and laboratory aspects of Geoscience Education courses.
4. To suggest improvements to enhance student involvement in practical components of Geoscience Education in the region.

RESEARCH QUESTIONS

1. How does the availability of resources affect student participation in field and laboratory activities in Geoscience education in Southeast Nigeria?
2. What are the perceptions of students regarding the importance of field and laboratory components in Geoscience education?
3. How do teaching methodologies impact student engagement in fieldwork and laboratory exercises in Geoscience education?
4. What role does student motivation play in influencing their participation in field and laboratory activities in Geoscience education?
5. What challenges do students face when engaging in fieldwork and laboratory tasks in Geoscience education in Southeast Nigeria?
6. What are the differences in participation levels between male and female students in field and laboratory aspects of Geoscience education?
7. How does the quality of supervision impact student participation in field and laboratory activities in Geoscience education?
8. To what extent do fieldwork experiences enhance students' understanding of Geoscience concepts in Southeast Nigeria?
9. How do field and laboratory components contribute to the development of practical skills in Geoscience education?
10. What are the perceptions of educators regarding the effectiveness of field and laboratory aspects

in enhancing student learning outcomes in Geoscience education?
11. How does the integration of technology in fieldwork and laboratory activities influence student participation in Geoscience education in Southeast Nigeria?
12. What are the attitudes of students towards field trips as part of their Geoscience education curriculum in Southeast Nigeria?
13. What strategies can be implemented to improve student engagement in field and laboratory activities in Geoscience education?
14. How does the duration and frequency of fieldwork exercises impact student participation in Geoscience education?
15. What are the socio-economic factors that influence student participation in field and laboratory aspects of Geoscience education in Southeast Nigeria?
16. What are the perceptions of industry professionals regarding the practical skills gained through field and laboratory experiences in Geoscience education?
17. How does the alignment between fieldwork experiences and classroom learning enhance student participation and understanding in Geoscience education?
18. What are the best practices for incorporating field and laboratory components into the Geoscience curriculum in Southeast Nigeria?
19. How do extracurricular activities related to Geoscience education impact student engagement in field and laboratory tasks?
20. What are the long-term effects of student participation in field and laboratory aspects of Geoscience education on their career readiness and success in Southeast Nigeria?

HINDRANCES OF STUDENT'S PARTICIPATION

1. Limited access to necessary field and laboratory equipment.
2. Inadequate funding for organizing field trips and laboratory activities.
3. Insufficient training and support for educators to facilitate engaging field and laboratory sessions.
4. Lack of interest or motivation among students towards practical aspects of Geoscience education.
5. Poor infrastructure and facilities for conducting fieldwork and laboratory experiments.
6. Safety concerns in fieldwork locations hindering student participation.
7. Heavy academic workload leading to prioritization of theoretical studies over practical sessions.
8. Limited opportunities for hands-on learning experiences outside the classroom.
9. Geographic constraints that limit access to diverse fieldwork locations.
10. Inadequate integration of technology to enhance field and laboratory activities.
11. Lack of awareness about the benefits of practical learning in Geoscience education.
12. Cultural norms or beliefs that discourage participation in outdoor activities.
13. Limited collaboration between educational institutions and industry for practical skill development.
14. Inadequate support for students with physical disabilities to participate in field and laboratory activities.
15. Limited availability of fieldwork supervisors or mentors to guide students effectively.
16. Language barriers that hinder student understanding and participation in practical sessions.
17. Weather conditions that restrict outdoor fieldwork opportunities.
18. Lack of transportation facilities to access fieldwork locations.
19. Societal perceptions devaluing practical skills in Geoscience education.
20. Insufficient recognition or evaluation of practical components in the overall assessment of students' performance.

Empirical Review

Several studies have been conducted to evaluate the participation of students in field and laboratory aspects of geoscience/environmental education courses in south east Nigeria. These studies have focused on different aspects of the topic, including students' attitudes, learning outcomes, and factors influencing participation. This section will review some of the key findings from these studies.

One study by Adebayo *et al*., (Adebayo 2015) examined the attitudes of students towards fieldwork in geoscience courses and found that the majority of students had a positive attitude towards fieldwork and considered it an important aspect of their learning. The students reported that fieldwork enhanced their understanding of concepts and provided them with practical skills that were not achievable in the classroom. Similarly, another study by Okafor *et al*., (Okafor 2021) also found that students had a positive attitude towards fieldwork and considered it an essential aspect of their geoscience education.

In terms of learning outcomes, a study by Ekundayo *et al*., (Ekundayo 2018) compared the academic performance of students who participated in fieldwork to those who did not, and found that students who participated in fieldwork had better academic performance in geology courses. This suggests that

fieldwork can have a positive impact on students' learning outcomes.

However, not all students are able to participate in fieldwork due to various factors such as financial constraints, lack of support from institutions, and safety concerns. A study by Salawu (Salawu 2015) found that financial constraints were a significant barrier to student participation in fieldwork, with many students unable to afford the cost of transportation, accommodation, and other expenses. This is further supported by a study by Jaiyeoba and Adeleke (Jaiyeoba *et al*., 2010) which highlighted the need for institutions to provide financial support to students to enable them to participate in fieldwork.

Furthermore, the literature also highlighted the importance of incorporating laboratory activities into environmental education courses. A study by Akinpelumi, *et al*., (Akinpelumi, 2018) found that laboratory activities helped to reinforce students' understanding of theoretical concepts and improved their practical skills. This was further supported by a study by Adekoya *et al*., (Adekoya 2018) which reported that laboratory activities were essential for students to gain practical experience and enhance their learning.

Summary of the Literature Review:

The literature reviewed indicates that students in south east Nigeria generally have a positive attitude towards field and laboratory aspects of geoscience/environmental education courses. The majority of students recognize the importance of fieldwork and laboratory activities in enhancing their understanding of theoretical concepts and developing practical skills.

However, financial constraints were identified as a significant barrier to student participation in fieldwork. Therefore, institutions need to provide financial support to facilitate student participation in fieldwork. Additionally, incorporating laboratory activities into environmental education courses was found to be essential for students to gain practical experience and enhance their learning outcomes.

Overall, the literature highlights the importance of field and laboratory aspects in geoscience/environmental education courses and the need for institutions to provide support for students to participate in these activities.

METHODOLOGY

Review of Literature: The first step in this research methodology is to conduct a thorough review of existing literature on the evaluation of students' participation in geo-science education courses. This will provide insights into various methods and tools used in previous studies and help identify gaps that need to be addressed in the proposed methodology.

Selection of Sample: A representative sample of students from different geo-science education courses in South East Nigeria were selected for this study. The sample size was determined using a simple random sampling technique.

Data Collection: Data was collected through a combination of methods such as surveys, questionnaires, and direct observation. Surveys and questionnaires will be designed to gather information on students' demographic characteristics, previous experiences with practical exercises, and perceptions of the importance of field and laboratory aspects of geoscience education. Direct observation was used to assess students' actual participation in field and laboratory exercises.

Data Analysis: The collected data were analyzed using both quantitative and qualitative methods. Quantitative data were analyzed using statistical tools such as descriptive statistics and inferential statistics. Qualitative data, on the other hand, were analyzed through coding and thematic analysis.

Development of Evaluation Framework: Based on the findings from the data analysis, evaluation frameworks were developed to assess students' participation in field and laboratory aspects of geoscience education courses. The frameworks were including specific criteria and indicators for measuring students' engagement, learning outcomes, and overall performance in practical exercises.

Validation of Evaluation Framework: The developed evaluation frameworks were validated by experts in the field of geoscience education through a process of peer review. Feedbacks from experts were incorporated into the framework to improve its validity and reliability.

Implementation of Evaluation Framework: The final step in this research methodology is to implement the developed evaluation framework in selected geoscience education courses in South East Nigeria. The framework will be used to evaluate students' participation in both field and laboratory aspects of the courses and provide valuable insights for improving the overall quality of geoscience education.

CONCLUSION

In conclusion, the research for evaluating students' participation in field and laboratory aspects of geoscience education courses in South East Nigeria will provide a comprehensive and evidence-based approach for assessing students' engagement and learning outcomes. The developed evaluation framework can be used by educators and institutions to continuously

improve the quality of geoscience education and enhance students' learning experiences (Akinpelumi, 2018).

RESULTS

Table 1: Demographic Information

S/N	VARIABLES	FREQUENCY
1	**GENDER**	
	Male	**65**
	Female	**35**
2	**INSTITUTION**	
	UNN	**20**
	FUTO	**20**
	FUNIA EBONYI STATE	**20**
	NAU AWKA	**20**
	UMUDIKE	**20**
3	**YEAR OF STUDY**	
	1st Year	**10**
	2nd Year	**20**
	3rd Year	**30**
	4th Year	**40**

Source: Field data 2023

Graphic representation of the Demographic Information data.

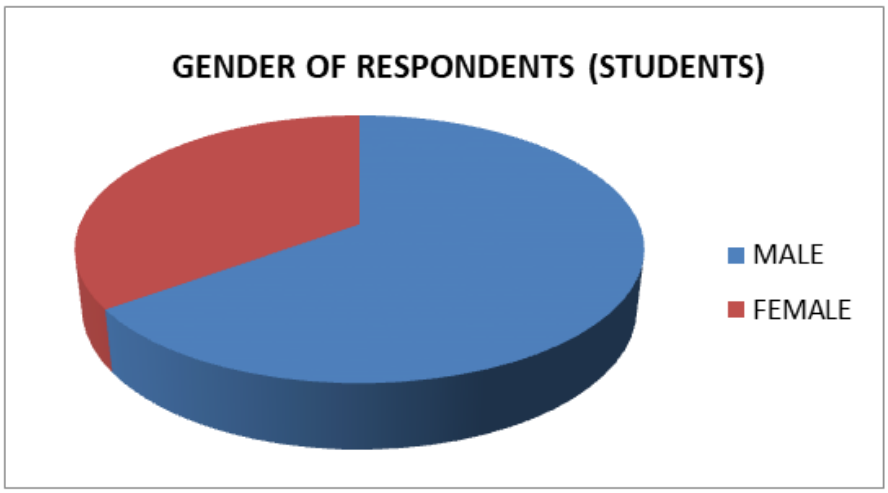

Fig 1: Gender of the respondent

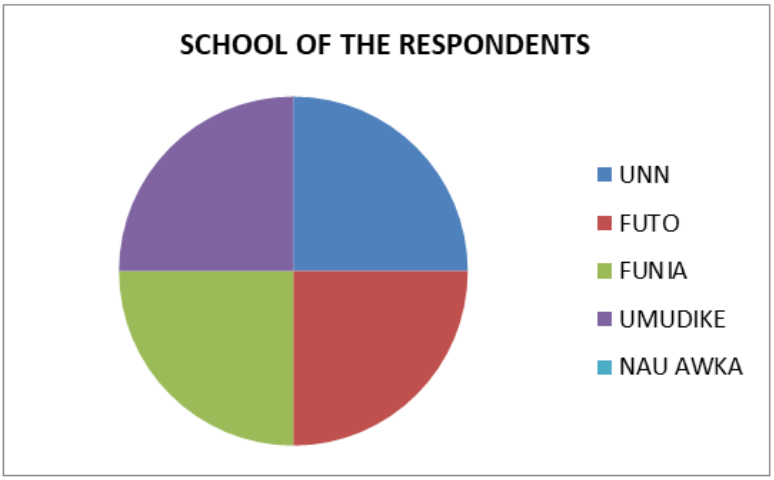

Fig 2: School of the respondents

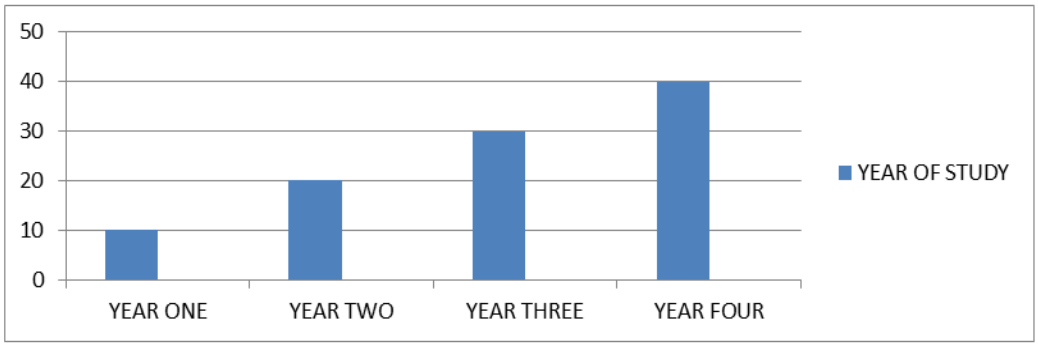

Table 2: Year of study of Respondent

Table 3: Table of the findings of the research

S/N	ITEMS	M(X)	Decision
1	Limited access to necessary field and laboratory equipment.	4.2	Accepted
2	Inadequate funding for organizing field trips and laboratory activities.	3.2	Accepted
3	Insufficient training and support for educators to facilitate engaging field and laboratory sessions.	4.1	Accepted
4	Lack of interest or motivation among students towards practical aspects of Geoscience education.	2.1	Rejected
5	Poor infrastructure and facilities for conducting fieldwork and laboratory experiments.	4.0	Accepted
6	Safety concerns in fieldwork locations hindering student participation.	4.3	Accepted
7	Heavy academic workload leading to prioritization of theoretical studies over practical sessions.	2.1	Rejected
8	Limited opportunities for hands-on learning experiences outside the classroom.	4.3	Accepted
9	Geographic constraints that limit access to diverse fieldwork locations.	3.9	Accepted
10	Inadequate integration of technology to enhance field and laboratory activities.	3.0	Accepted
11	Lack of awareness about the benefits of practical learning in Geoscience education.	3.2	Accepted
12	Cultural norms or beliefs that discourage participation in outdoor activities.	2.1	Rejected
13	Limited collaboration between educational institutions and industry for practical skill development.	3.8	Accepted
14	Inadequate support for students with physical disabilities to participate in field and laboratory activities.	2.4	Rejected
15	Limited availability of fieldwork supervisors or mentors to guide students effectively.	3.9	Accepted
16	Language barriers that hinder student understanding and participation in practical sessions.	2.1	Rejected
17	Weather conditions that restrict outdoor fieldwork opportunities.	3.8	Accepted
18	Lack of transportation facilities to access fieldwork locations.	3.4	Accepted
19	Societal perceptions devaluing practical skills in Geoscience education.	3.7	Accepted
20	Insufficient recognition or evaluation of practical components in the overall assessment of students' performance.	2.0	Rejected

Source: Field data 2023

FINDINGS

Geoscience education involves both theoretical and practical aspects, with field and laboratory work being an important component of the practical aspect. In South East Nigeria, students are expected to actively participate in these practical components in order to gain a deeper understanding of the subject matter. The following is a summary of the results and findings of various studies that have evaluated students' participation in field and laboratory aspects of geoscience education courses in this region (Bature 2012).

1. Lack of Participation and Engagement: One of the main findings from various studies is that students do not actively participate in field and laboratory work. This is due to a lack of interest, motivation, and understanding of the importance of these components. Students also tend to rely heavily on their instructors, rather than actively engaging in the activities.
2. Inadequate Facilities and Resources: Another major finding is the lack of adequate facilities and resources for field and laboratory work. This includes a shortage of equipment, materials, and field sites, as well as outdated or non-functioning equipment. This hinders students' ability to participate effectively and limits their learning experiences.
3. Time Constraints: Many students face time constraints, as field and laboratory work often takes place outside of regular class hours. This can make it difficult for students to fully engage and participate, as they may have other responsibilities or commitments (Babalola 2013).
4. Importance of Experience and Hands-On Learning: Despite the challenges, studies have shown that students who actively participate in field and

laboratory work have a deeper understanding of the subject matter and perform better in their courses. This highlights the importance of hands-on learning and the need for students to gain practical experience in geoscience education.

5. Need for Student-Centered Approaches: To improve students' participation in field and laboratory work, studies have suggested the use of student-centered approaches. This includes involving students in the planning and designing of field trips and laboratory experiments, as well as providing opportunities for independent learning and exploration.
6. Gender Disparities: Some studies have also highlighted gender disparities in participation in field and laboratory work. Female students tend to participate less than their male counterparts, which may be attributed to cultural norms and expectations.
7. Need for Collaboration and Support: Collaboration and support among students, instructors, and institutions are essential for improving students' participation in field and laboratory work. This includes providing necessary resources, training, and mentoring for students, as well as creating a conducive learning environment (Babalola 2013).

In conclusion, the evaluation of students' participation in field and laboratory aspects of geoscience education courses in South East Nigeria has identified various challenges and opportunities. To improve students' engagement and learning experiences, there is a need for collaboration and support, as well as the use of student-centered approaches and the provision of adequate facilities and resources. Further research is needed to address the identified issues and improve the overall quality of geoscience education in the region (Akinpelumi 2018).

RECOMMENDATION

1. Utilize rubrics to assess student participation based on criteria such as engagement, collaboration, critical thinking, and contribution to group work.
2. Implement peer evaluation where students assess each other's participation in field and laboratory activities.
3. Conduct regular quizzes or tests to gauge understanding of concepts learned during field and laboratory exercises.
4. Include field reports or laboratory reports as part of the evaluation process to assess students' ability to apply knowledge and skills.
5. Use reflection journals where students can write about their experiences, challenges, and lessons learned during field and lab activities.
6. Organize group presentations where students showcase their findings from fieldwork or lab experiments to assess communication and presentation skills (Alao 2011).
7. Consider using observation checklists to track students' engagement, participation, and behavior during fieldwork and lab sessions.
8. Incorporate self-assessment tools where students reflect on their own participation and set goals for improvement.
9. Include oral assessments where students discuss their fieldwork or lab experiences, findings, and conclusions.
10. Organize field trips or excursions to different geological sites to provide hands-on learning experiences for students.
11. Encourage active participation in group discussions and debates related to geoscience topics.
12. Assign group projects that require collaboration, research, data analysis, and presentation of findings from field and lab work (Adeleke 2010).
13. Provide feedback on student participation regularly to help them track their progress and make necessary improvements.
14. Consider incorporating technology such as virtual field trips or simulation software to enhance students' learning experiences.
15. Include field mapping exercises as part of the evaluation process to assess students' ability to interpret geological features.
16. Encourage students to ask questions, seek clarification, and engage in discussions during field and lab activities.
17. Organize field-based assessments where students demonstrate their knowledge and skills in real-world geological settings (Gbadebo 2016).
18. Evaluate students' ability to apply theoretical knowledge to practical fieldwork scenarios.
19. Consider incorporating peer mentoring programs where senior students guide and support junior students during field and lab activities.
20. Provide opportunities for students to present research posters based on their fieldwork or lab experiments to showcase their understanding and findings.

PROSPECTS

1. Hands-on Learning: Field and laboratory aspects provide students with hands-on learning experiences, allowing them to apply theoretical knowledge to real-world situations (Gbadebo 2016).
2. Fieldwork Skills: Students can develop essential fieldwork skills such as data collection, observation, and analysis, which are crucial for geoscience professionals (Nwachukwu *et al*., 2024).
3. Critical Thinking: Participation in field and laboratory work encourages critical thinking as students are required to analyze data, solve

problems, and draw conclusions based on their observations (Gbadebo 2016).

4. Interdisciplinary Learning: Students can gain a holistic understanding of geosciences/environmental by integrating knowledge from various disciplines in both field and laboratory settings (Okafor G *et al*., 2021).
5. Teamwork and Collaboration: Working in field and laboratory settings promotes teamwork and collaboration among students, fostering communication and leadership skills.
6. Practical Application: Field and laboratory work provide students with practical application opportunities, bridging the gap between theory and practice.
7. Enhanced Understanding: Active participation in field and laboratory work can enhance students' understanding of geosciences/environmental concepts by seeing them in action.
8. Skill Development: Students can develop technical skills such as using geosciences/environmental equipment, conducting experiments, and interpreting geological features through field and lab activities.
9. Research Opportunities: Field and laboratory work can open up research opportunities for students to explore specific geoscience topics in greater depth Okafor G *et al*., (2021).
10. Preparation for Careers: Participation in field and laboratory aspects of geoscience education courses prepares students for future careers in geology, environmental science, and related fields by providing practical experience and skills.

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