

Analysis of the psychometric properties of National Examination Council (NECO) Geography Examination Questions on Senior Secondary School Students' Academic Achievement in Adamawa State

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Article History	Abstract
Original Research Article	<i>This study was carried out to analyze the psychometric properties of National Examination Council (NECO) Geography Examination questions on students' academic achievement in Adamawa State, Nigeria. The study adopted a descriptive correlational survey research design. Two research questions and two research hypotheses were raised and formulated for the study. The study was conducted on a total of 211 students answering multiple-choice geography 2023 and 2024 NECO examination questions. The instrument for data collection was an adopted multiple-choice past questions of Geography National Examination Council (NECO). The instrument for the study were validated by expert and trial tested which was found reliable for the study. The data collected was analyzed using descriptive statistics of mean and standard deviation, discrimination index, difficulty index while the hypotheses formulated was answered using linear regression analysis. Findings from research questions shows that 51% of NECO 2023 and 53% of NECO 2024 of Geography examination questions were difficult; 53% of 2023 NECO and 68% of 2024 NECO Geography examination questions were good items. The findings from hypothesis one reveals significant relationship between difficulty index of NECO 2023 and 2024 and students' academic achievement ($p<0.05$); findings from hypothesis two indicates a significant relationship between discriminating index of NECO 2023 and 2024 Geography examination questions and students' academic achievement ($p<0.05$); The study therefore recommends among others that, examination bodies such as NECO should strive to maintain a balanced mix of easy, moderate, and difficult items to ensure fairness and comprehensive assessment of students' abilities in geography.</i>
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Introduction

Assessment occupies a central position in the educational process because it provides information about learners' achievement, instructional effectiveness, and the attainment of educational objectives. Educational assessment is not only used for grading students but also serves as a mechanism for making decisions regarding promotion, certification, placement, and curriculum improvement. The quality of decisions derived from assessment largely depends on the psychometric soundness of the instruments used in measuring students' learning outcomes. Consequently, examination questions are expected to possess adequate psychometric properties to ensure valid,

reliable, and fair measurement of students' academic achievement.

Psychometric properties refer to the statistical and measurement characteristics of test items and examination instruments that determine their quality and effectiveness in assessing learners. According to Anastasi and Urbina (2010), psychometric analysis provides empirical evidence regarding the quality of test items and the extent to which they measure intended learning outcomes. Therefore, psychometric properties are indispensable aspect of educational assessment because it provides empirical

evidence regarding the quality and functionality of test items (Rezigalla et al., 2024; Alhazmi et al., 2024).

One of the most important psychometric characteristics of a test item is the item difficulty index. Item difficulty refers to the proportion of examinees who answer an item correctly. An item is considered easy when a large proportion of candidates answer it correctly and difficult when only a small proportion answer it correctly (Crocker & Algina, 2008). The difficulty level of examination questions significantly influences students' performance and the accuracy of score interpretation. Examination items that are excessively difficult or excessively easy may fail to provide meaningful information about students' abilities and achievement levels (Aduloju & Okoh, 2021).

Another critical psychometric property is the discrimination index, which indicates the extent to which an item distinguishes between high-performing and low-performing students. According to Nitko and Brookhart (2014), a good test item should effectively discriminate among students based on their level of mastery of the content being assessed. Items with poor discrimination may not accurately reflect differences in students' achievement and can reduce the overall quality of an examination (Mohammad, 2022; Kennea et al, 2023; Usman & Danjuma, 2025; Kasali & Adeyemi, 2022; Oribhabor & Adeosun, 2020).

Geography as a school subject, occupies an important position in the Nigerian secondary school curriculum because it equips learners with knowledge and skills related to the physical environment, human activities, environmental management, spatial analysis, and sustainable development. The subject contributes significantly to national development through the promotion of environmental awareness, resource management, and informed decision-making. Consequently, the assessment of Geography learning outcomes should be based on psychometrically sound examination items capable of accurately measuring students' knowledge, understanding, and application of geographical concepts.

In Nigeria, the National Examination Council (NECO) is one of the major examination bodies responsible for conducting Senior School Certificate Examinations (SSCE). Since its establishment in 1999, NECO has played a crucial role in evaluating students' academic achievement and certifying graduates of secondary education. The results generated from NECO examinations are used for admission into tertiary institutions, employment opportunities, and other educational decisions. Given the high-stakes nature of the examination, it is imperative that the examination questions possess acceptable psychometric

properties (Federal Republic of Nigeria, 2014; NECO, 2023).

Despite the significance of NECO examinations, concerns have been expressed by educational researchers, teachers, and stakeholders regarding the quality of examination questions and the fluctuating performance of students in Geography across all the examination years. Reports from examination bodies and educational studies have indicated persistent variations in students' achievement levels across examination years. Such variations may not solely be attributable to instructional quality, stress, self-concept, self-esteem, attitude of students towards the subject, teacher's qualification, test anxiety, students' gender, motivation, method of assessment policies used, Socio-economic status, parental attitude, school resources, students' preparedness, examination difficulty levels, and the psychometric characteristics of assessment instruments (Dawn, 2020; Gobena, 2024; Herrera et al 2020; Abdullahi, 2024; Kojigili & Alex, 2020; Filgona & Sababa, 2017). An examination of students' achievement patterns in NECO Geography examinations would provide valuable insights into performance trends and the extent to which examination questions influence students' outcomes in Adamawa State.

Despite the importance of psychometric evaluation in enhancing examination quality, limited empirical studies have comprehensively analyzed the psychometric properties of NECO Geography examination questions in Adamawa State, particularly across multiple examination years. Most existing studies have focused on students' performance trends without adequately examining the quality of the test items responsible for generating such performance outcomes. Given the strategic role of NECO examinations in educational certification and progression, there is a need to investigate the difficulty levels and discrimination indices. Such an investigation would provide valuable evidence for improving examination quality, enhancing the validity of assessment outcomes, and promoting better educational decision-making in Adamawa State, Nigeria.

Statement of the Problem

The quality of any examination depends largely on the psychometric soundness of its test items. Examination questions that possess appropriate levels of difficulty, adequate discriminatory power, and effective distractors and compliance to item writing guidelines are more likely to produce valid and reliable measures of students' academic achievement. Conversely, poorly constructed items may lead to inaccurate assessment outcomes, misclassification of students, and erroneous educational decisions.

Over the years, students' performance in Geography in the National Examination Council (NECO) Senior School Certificate Examination has shown variations across examination periods. While several factors such as instructional quality, learning environment, teacher competence, and students' study habits have been identified as contributors to academic achievement, the psychometric characteristics of examination questions remain an important but relatively underexplored factor. There is concern that some examination items may be excessively difficult, excessively easy, possess low discriminatory power, contain non-functional distractors, or fail to abide by the rule of item writing thereby limiting their effectiveness in measuring students' actual achievement.

Furthermore, despite the critical role of NECO examinations in certification and educational placement, limited empirical evidence exists regarding the psychometric quality of Geography examination questions administered by the examination body. Without systematic psychometric evaluation, it becomes difficult to determine whether the examination items adequately assess the intended learning outcomes and provide accurate information about students' performance.

The absence of sufficient empirical information on the difficulty indices, discrimination indices, and distractor efficiencies of NECO Geography examination questions creates uncertainty regarding the quality of the examination and the validity of the decisions based on students' scores. Consequently, stakeholders in education may lack the necessary evidence required for improving item construction practices and enhancing examination quality. It is against this background that this study seeks to analyze the psychometric properties of NECO Geography examination questions and examine their influence on senior secondary school students' academic achievement. Specifically, the study intends to determine the difficulty levels and discrimination indices of NECO 2023 and 2024 Geography examination questions and how they are related to senior secondary school students' academic achievement in Adamawa State Nigeria.

Research Questions

1. What is the level of item difficulty of National Examination Council (NECO) Geography

examination questions of 2023 and 2024 in Adamawa State, Nigeria?

2. What is the level of item discrimination of National Examination Council (NECO) Geography examination questions of 2023 and 2024 in Adamawa State, Nigeria?

Research Hypotheses

H₀1: There is no significant relationship between the item difficulty level of National Examination Council (NECO) Geography examination questions of 2023 and 2024 on students' academic achievement in Adamawa State.

H₀2: There is no significant relationship between item discrimination level of National Examination Council (NECO) Geography examination questions of 2023 and 2024 on students' academic achievement in Adamawa State.

Methodology

This study adopted a descriptive correlational research survey design. The Population of the study comprised of all the SS3 students of the public secondary schools sampled in Adamawa State. A sample size of 211 senior secondary school (SS 3) geography students participated in the study. This was obtained through a multistage sampling technique. An adopted Past 2023 and 2024 National Examination Council (NECO) Geography examination multiple-choice questions were used as instrument for data collection. The instrument was made up of 60 items. Each item had five response options: A, B, C, D, and E in which only one among the options is the correct answer. The instruments were validated by experts and trail tested on some sample of students and was found reliable for the study. The data collected were analyzed using mean, standard deviation, difficulty index, discrimination index, frequency count and regression analysis.

Results

Research Question One: What is the level of item difficulty of National Examination Council (NECO) Geography examination of 2023 and 2024 in Adamawa State?

Table 1: Summary of the level of item difficulty of National Examination Council (NECO) Geography examination of 2023 and 2024 in Adamawa State

Examination Year	Difficulty Level	Index Range	Number of Items	Percentage
2023	Difficult	0.00 - 0.39	31	51.7%
	Moderate	0.40 – 0.66	21	35.0%
	Easy	0.67 – 1	8	13.3%
2024	Difficult	0.00 - 0.39	32	53.3%
	Moderate	0.40 – 0.66	17	28.3%
	Easy	0.67 – 1	11	18.3%

The fact that over 50% of items in both years were classified as difficult suggests that NECO Geography papers in this period were significantly challenging for the average student in Adamawa State. This sustained high difficulty level directly correlates with the observed trend of low academic performance, as students are frequently confronted with items that exceed their cognitive mastery.

Research Question Two: What is the level of item discrimination of National Examination Council (NECO) Geography examination questions of 2023 and 2024 in Adamawa State?

Table 2: Summary of the level of item discrimination of National Examination Council (NECO) Geography examination questions of 2023 and 2024 in Adamawa State

Assessment Year	Good Items (D>25)	Bad Items (D<25)	Negative Items
NECO 2023	32 (53.3%)	28 (46.7%)	11
NECO 2024	41 (68.3%)	19 (31.7%)	6

The 2023 examination showed a concerning lack of discrimination, with nearly half of the items failing to distinguish effectively between ability groups. Specifically, 11 items carried negative values, including Item 9, 16, and 45. However, the 2024 examination showed a marked improvement, with 68.3% of items achieving "good" status. This suggests that while difficulty remained high in 2024, the items were better calibrated to differentiate between students who had mastered the material and those who had not.

H₀1: There is no significant relationship between the item difficulty level of National Examination Council (NECO) Geography examination questions of 2023 and 2024 on senior secondary school students' academic achievement in Adamawa State.

Table 3a. Summary of regression analysis of item difficulty level of National Examination Council (NECO) Geography examination questions of 2023 on senior secondary school students' academic achievement in Adamawa State

Variable	N	Mean	Std.D	df	Beta Coefficient	R ²	t	P-value	Decision
Item Difficulty Level of NECO 2023	60	0.43	0.19						
				153	-.088	.008	12.48	0.000	Significant
NECO 2023	95	40.40	10.83						

Result in Table 3a indicates that probability value of 0.00 is less than 0.05 level of significance ($p < 0.05$). Therefore, the null hypothesis is stand to be rejected and conclude that there is significant relationship between item difficulty level of National Examination Council (NECO) 2023 and senior secondary school students' academic achievement in Adamawa State.

Table 3b. Summary of regression analysis of item difficulty level of National Examination Council (NECO) Geography examination questions of 2024 on senior secondary school students' academic achievement in Adamawa State

Variable	N	Mean	Std.D	df	Beta Coefficient	R ²	t	P-value	Decision
Item Difficulty Level of NECO 2024	60	0.40	0.22						
				164	-.088	.010	16.702	0.000	Significant
NECO 2024	106	41.54	9.52						

The findings in Table 3b indicates that probability value of 0.00 is less than 0.05 level of significance ($p < 0.05$). Therefore, the null hypothesis is stand to be rejected and conclude that there is significant relationship between item difficulty level of National Examination Council (NECO) 2024 and students' academic achievement in Adamawa State.

H₀2: There is no significant relationship between item discrimination level of National Examination Council (NECO) Geography examination questions of 2023 and 2024 on senior secondary school students' academic achievement in Adamawa State.

Table 4a. Summary of Regression Analysis of Item Discrimination Level of National Examination Council (NECO) Geography Examination Questions of 2023 on senior secondary school students' academic achievement in Adamawa State

Variable	N	Mean	Std	df	Beta Coefficient	R ²	t	P-value	Decision
Item Discrimination Level of NECO 2023	60	0.31	0.25						
				153	-.121	.015	18.74	0.000	Significant
NECO Performance 2023	95	40.40	10.83						

As shown from Table 4a, that probability value of 0.00 is less than 0.05 level of significance ($p < 0.05$). therefore, the null hypothesis is stand to be rejected and conclude that there is significant relationship between item discrimination level of National Examination Council (NECO) 2023 and students' academic achievement in Adamawa State.

Table 4b. Summary of Regression Analysis of Item Discrimination Level of National Examination Council (NECO) Geography Examination Questions of 2024 on senior secondary school students' academic achievement in Adamawa State

Variable	N	Mean	Std.D	Df	Beta Coefficient	R ²	T	P-value	Decision
Item Discrimination Level of NECO 2024	60	0.27	0.32						
				59	-.126	.016	26.45	0.000	Significant
NECO Performance 2024	106	41.54	9.52						

The results in Table 4b indicates that probability value of 0.00 is less than 0.05 level of significance ($p < 0.05$). Therefore, the null hypothesis is stand to be rejected and conclude that there is significant relationship between item discrimination level of National Examination Council (NECO) 2024 and students' academic achievement in Adamawa State.

Discussion

This study is carried out analyze the psychometric property of National Examination Council (NECO) geography examination questions on senior secondary school students' academic achievement in Adamawa state Nigeria.

The psychometric analysis of the 2023 and 2024 NECO Geography examination questions provides a clear evidence-based explanation for the trends in student achievement in Adamawa State. The most salient finding is the high proportion of difficult items in both examination cycles, exceeding 50% in both 2023 and 2024. While a standardized test is intended to be rigorous, an over-concentration of difficult items can suppress mean achievement scores to the point where the assessment fails to accurately capture the progress of the majority of students. The research confirms that this high difficulty is a

primary driver of the low achievement observed in Adamawa.

Result from hypothesis one shows that there is significant relationship between item difficulty index of NECO 2023 and 2024 and students' academic achievement in Adamawa state. This finding is consistent with the findings of Aduloju and Okoh (2021), who found that a large majority of BECE mathematics items were classified as difficult rather than moderate.

Result on hypothesis two reveals a significant relationship between discriminating index of the two examination years and students' academic achievement in Adamawa State. This finding highlights significant technical strengths in the NECO Geography papers. The 2024 examination, in particular, showed high discriminating power (68.3%), which is superior to results found in some other recent studies, such as Usman and Danjuma (2025), Kasali and Adeyemi (2022), Oribhabor and Adeosun (2020) where the items analyzed were not discriminating.

Conclusion

This study therefore concludes that the examinations proved to be a highly effective instrument for discriminating between students of varying ability levels.

These findings confirm that NECO successfully develops standardized assessments that are robust, consistent, and capable of ranking students with precision. However, the sustained high difficulty level of the examination items remains a critical issue. The significant negative relationship between item difficulty and achievement indicates that the Geography papers are frequently calibrated at a level that exceeds the mastery of many candidates in Adamawa State. This imbalance, combined with the observed gender performance gap, suggests that the high-stakes nature of these examinations may be creating an environment where only a small minority of students can achieve the distinction or credit grades required for higher education.

Recommendations

The following recommendations were made;

1. Examination bodies such as NECO should strive to maintain a balanced mix of easy, moderate, and difficult items to ensure fairness and comprehensive assessment of students' abilities in geography;
2. Regular psychometric analysis of examination items should be institutionalized to ensure that test items remain valid, reliable, and capable of discriminating effectively among students;
3. Geography teachers should be trained in test construction and item analysis to enable them to design classroom assessments that align with standardized examination practices.

References

1. Aduloju, M. O., & Okoh, O. (2021). Analysis of item difficulty and discrimination indices as functions of changes in mathematics objective test of the Benue State Examination Board Basic Education Certificate Examination (BECE) from 2015 to 2017. *Nigerian Journal of Educational Research and Evaluation*, 20, 163-181.
2. Aiken, L. R. (2003). *Psychological Testing and Assessment*. Boston: Allyn & Bacon.
3. Alhazmi, E., Sheng, Q. Z., Zhang, W. E., Zaib, M., & Alhazmi, A. (2024). *Distractor Generation in Multiple-Choice Tasks: A Survey of Methods, Datasets, and Evaluation*. *arXiv*. <https://doi.org/10.48550/arXiv.2402.01512>.
4. Anastasi, A., & Urbina, S. (2010). *Psychological Testing* (7th ed.). New Delhi: Pearson.
5. Crocker, L., & Algina, J. (2008). *Introduction to Classical and Modern Test Theory*. Mason, OH: Cengage Learning. Routledge
6. Federal Republic of Nigeria. (2014). *National policy on education* (6th ed.). NERDC Press.
7. Filgona, J., & Sababa, L. K. (2017). Effect of gender on senior secondary school students' academic achievement in geography in Ganye Education Zone, Adamawa State, Nigeria. *European Journal of Education Studies*, 3(4), 394-410.
8. Gobena, G. (2024). Effects of academic stress on students' academic achievement and its implication for their future instruction. *International Journal of Instruction*, 9(1), 113-130.
9. Herrera, L., Al-Lal, M., & Mohamed, L. (2020). Academic achievement, self-concept, personality and emotional intelligence in primary education. Analysis by gender and cultural group. *Font.psychol* 10(3075).
10. Kasali, J., & Adeyemi, A. A. (2022). Estimation of item parameter indices of NECO mathematics multiple choice test items among Nigerian students. *Journal of Integrated Elementary Education*, 2(1), 43 – 54.
11. Kenea, T. K., Mikire, F., & Negawo, Z. (2023). The psychometric properties and performance of teacher-made test in measuring students' academic performance in Ethiopian public universities: *Baseline Survey Study*, 1-23. DOI: <https://doi.org/10.21203/rs.3.rs-3095433/v1>
12. Kojigili, S. T., & Alex, V. (2020). Influence of test anxiety on senior secondary school students' performance in Geography in Gombi Educational Zone, Adamawa State, Nigeria. *Journal of psychometry and Assessment Technique*, 1(1), 198-205.
13. Mohammad, A. S. N. (2022). *Psychometrics revisited*. Recapitalization of the major trends in TESOL.
14. National Educational Research and Development Council (NERDC). (2013). *Senior secondary school geography curriculum*. NERDC Press.
15. National Examinations Council (NECO). (2023). *Guidelines for the conduct of senior school certificate examinations*. NECO Publications.
16. Nitko, A. J., & Brookhart, S. M. (2014). *Educational Assessment of Students* (7th ed.). Boston: Pearson.
17. Orihaor, C. B. & Adeodun, P. K. (2022). Item statistics of the selected teacher-made multiple-

choice Mathematics test items in Edo State, Nigeria. *Uniafrica Journal of Education*, 2(1 & 2), 34-41.

18. Rezigalla, A. A., Eleragi, A. M. E. S. A., Elhussein, A. B., Alfaifi, J., ALGhamdi, M. A., Al Ameer, A. Y., Yahia, A. I. O., Mohammed, O. A., & Adam, M. I. E. (2024). Item analysis: The impact of distractor efficiency on the difficulty index and discrimination power of multiple-choice items. *BMC Medical Education*, 24(1), 445.
19. Usman, T. & Danjuma, A. (2025). Item psychometric properties ad students' academic performance. An analysis of the 2022 Mathematics placement examination in Hadija Town, Jigawa State. *International Journal of Education and national Development*, 3(1), 18-24.