BIOLOGY TEACHERS' TEST CONSTRUCTION COMPETENCE AND SECONDARY SCHOOL STUDENTS' ACHIEVEMENT IN CLASSROOM TESTS IN BIASE LOCAL GOVERNMENT AREA, CROSS RIVER STATE.

Ayang, Ethelbert E. (Ph.D)
Department of Educational Foundations and
Early Childhood Education
University of Cross River State (UNICROSS), Calabar.

Abstract

This study investigated Biology teachers' test construction competence and its relationship with secondary school students' achievement in classroom tests in Biase Local Government Area of Cross River State, Nigeria. The study focused on two sub-variables: content clarity and test validity. A sample of 102 out of the one thousand and sixty-two Senior Secondary II (SSII) students was selected using stratified random sampling. Data were collected using a structured questionnaire, and mean and standard deviation were used to answer the research questions, while one-way analysis of variance (ANOVA) was employed to test the hypotheses at 0.05 level of significance. The findings revealed a significant relationship between both content clarity and test validity, and students' academic achievement in Biology. The study concluded that when teachers demonstrate competence in constructing test items that are clear in content and valid in measuring the intended objectives, students are more likely to perform better academically. It recommended that Biology teachers receive regular training in test construction techniques to enhance the quality of classroom assessments and improve students' academic outcomes.

***Key words**: Bio-teachers, Competence, Achievement test, Students.*

Introduction

Assessment is a crucial component of the teaching and learning process, particularly in science disciplines such as Biology. Teachers are often required to evaluate how well students have understood the content taught, and one of the most common means of doing so is through classroom tests. In secondary schools, the construction of these tests is largely the responsibility of teachers, who are expected to develop items that align with the curriculum, reflect instructional objectives, and measure student understanding accurately. However, the competence of Biology teachers in constructing valid and reliable test items remains a critical factor that may influence students' academic achievement in classroom assessments.

Classroom test performance does not only reflect students' mastery of the immediate instructional content but also serves as a predictive indicator of their performance in standardized external examinations such as the West African Examinations Council (WAEC), the National Examinations Council (NECO), and the Joint Admissions and Matriculation Board (JAMB) examinations. These national assessments demand cognitive abilities such as comprehension, application, analysis, and evaluation, which classroom tests are expected to prepare students for (Olojo, 2022). Thus, when classroom tests are poorly constructed, lacking clarity and validity, students may not be adequately equipped to face high-stakes external assessments, potentially resulting in underperformance and limited access to tertiary education opportunities (Ifesinachi, Dadzie &Ocheni, 2024).

One critical sub-component of test construction competence is content clarity. This refers to the degree to which test items are clearly worded, unambiguous, and comprehensible to students at their level of cognitive development (Ogunsanmi, Lijofi&Gbolagun, 2024). Ambiguities, grammatical errors, and poorly structured questions can mislead students or confuse their understanding of what is required, thereby undermining their ability to respond accurately—even when they possess the necessary

knowledge. Content clarity in teacher-made Biology tests, therefore, plays a significant role in how well students demonstrate their learning in classroom assessments (Agu, Eze & Eze, 2013).

Another essential aspect of test construction is test validity, which refers to the extent to which a test measures what it is intended to measure. In the context of Biology education, a valid test would comprehensively assess students' understanding of biological concepts as outlined in the curriculum and intended instructional goals (Jonah, Dalong&Olakunl, 2024). If test items do not align with these objectives or assess irrelevant content, students' performance may not reflect their actual level of knowledge and preparedness. This misalignment can distort learning outcomes and negatively affect students' confidence and achievement in both classroom tests and future academic assessments (Agu et al., 2013).

Given the importance of Biology as a foundational science subject and the reliance on teacher-constructed assessments in measuring student achievement, it is expedient to investigate the competence of Biology teachers in constructing classroom tests in Biase Local Government Area of Cross River State. This area, like many others in Nigeria, continues to grapple with challenges related to teacher quality and student performance in science subjects. Understanding the link between teachers' test construction competence—particularly in the areas of content clarity and validity—and students' academic achievement in classroom tests will provide valuable insights for improving assessment practices and ultimately enhancing student outcomes in the study area.

Statement of the Problem

Despite the critical role of classroom tests in measuring students' academic progress and preparing them for external examinations, persistent underperformance in Biology among secondary school students in Biase Local Government Area raises concerns. Evidence suggests that such poor outcomes may not solely reflect students' academic ability but could be linked to the quality of teacher-constructed tests.Many Biology teachers may lack the necessary competence to develop test items that are clear and valid. Ambiguities in question wording (content clarity) and misalignment with curriculum objectives (test validity) can hinder students from accurately demonstrating their knowledge, leading to misleading assessment results. This compromises both classroom learning outcomes and students' readiness for standardized examinations like WAEC, NECO, and JAMB.Therefore, this study seeks to investigate how Biology teachers' test construction competence, particularly in terms of content clarity and test validity, influences students' achievement in classroom tests in Biase Local Government Area.

Objectives of the Study

The main objective of this study was to examine Biology teachers' test construction competence and secondary school students' achievement in classroom tests in Biase Local Government Area, Cross River State. This study sought to specifically examine the relationship between:

- Content clarity in Biology classroom tests and students' academic achievement
- Test validity in Biology classroom tests and students' academic achievement

Research Questions

The following research questions guided the study:

To what extent does content clarity in Biology classroom tests influence students' academic achievement in Biase Local Government Area?

To what extent does test validity in Biology classroom tests influence students' academic achievement in Biase Local Government Area?

Statement of Hypotheses

The following null hypotheses were formulated to guide the study:

There is no significant relationship between content clarity in Biology classroom tests and students' academic achievement in Biase Local Government Area.

There is no significant relationship between test validity in Biology classroom tests and students' academic achievement in Biase Local Government Area.

Empirical Literature review

Katsayal, Mansur &Shu'aibu (2024) assessed teachers' competency in test construction on students' performance of junior secondary schools in Jigawa state. Five objectives and five hypotheses were formulated to guide the conduct of the study. Survey research design was employed with population of four thousand two hundred sixty eight (4268) teachers. Three hundred and twenty seven (327) teachers were selected from the population of the study as sample for this study. The researcher adapted Teachers Construction Skills Inventory (TCSI) which was developed and validated by Agu (2013). The initial reliability index of the Teachers Construction Skills Inventory as reported by Agu (2013) was r = 0.73. Data collected was statistically analyzed by using t-test independent sample in Statistical Package of Social Sciences (SPSS) at 0.05 level of significance. The result generated from the analysis of the data that showed that there is no significant gender difference in test construction competency among teachers of JSS in Jigawa state. The result also found that there is significant difference in test construction competency among professional and non professional teachers of JSS in Jigawa State etc. Some of the recommendations given by the researcher include; government should organize frequent seminars and work shop to the JSS teachers on how to construct valid and reliable test. Government should employ professional and qualify teachers, this will rely help in overcoming of constructing invalid and unreliable tests.

In another study Akanni (2021) examined the assessment of teacher's test construction competencies on achievement in physics among adolescents in Education District IV of Lagos State, Nigeria. The research design was a descriptive survey ,the population for the study were all senior secondary II student in Education district IV of Lagos-state. Simple stratified random sampling technique was used for collection of one hundred and eighty-two (182) students and twenty-one (21) respondents of teachers in Education district. The instruments for the study were a questionnaire titled: Test Construction Skill Inventory (TSCI). Three hypotheses were formulated and tested at 0.05 level of significance.. Findings from the study revealed that gender did exert a significant influence on teachers' competencies in test construction skills. That is, there is significant difference between the assessment of male and female teachers' competencies in test construction skills;, there is no significant influence of the assessment of teachers 'competencies in test construction skills on their academic performance and qualification. Recommendations were made based on the findings that school teachers should ensure that they get up-to-date skills set on the culture of test construction that will have influence on students' academic achievement (in Physics).

In another related research, Ugwu &Mkpuma (2019)Ensuring Quality in Education: Validity of Teacher-made Language Tests in Secondary Schools in Ebonyi State. The study was carried out to find out the extent that teachers of English in secondary schools in Ebonyi State validate their test items. To guide the study, three research questions were formulated and one null hypothesis was postulated and tested at 0.00 level of significance. The design of the study was the descriptive survey. The population consisted of all the teachers of English in all the government-owned secondary schools in the three education zones of Ebonyi State. Purposive sampling technique was used to select 367 teachers which made up 50% of the entire population as sample. A 22-item researcher-developed questionnaire entitled Test Item Validation Questionnaire (TIVQ) was constructed, validated, trial tested and used to elicit data from the respondents. Data obtained were presented and analyzed using mean and standard deviation to answer the research questions and t-test statistical tool was used to test the hypothesis. The study revealed, amongst other things, that majority of the teachers of English in public secondary schools in Ebonyi State do not validate their test items before administration. The researchers recommended that test item review committees be set up; training programs should be provided for teachers of English and that there should be strenuous supervision of academic activities in secondary schools in Ebonyi State by both internal and external authorities.

Also, Alade & Odunsi (2023) investigated the relationship between between senior high school subject teachers' competencies in constructing multiple- choice tests and the resultant quality of test

items in Kosofe Local Government Area of Lagos State. The research examined the characteristics of each test item, focusing on the difficulty index and the discrimination index. Employing a descriptive-correlative research design, the study sampled five senior secondary schools in Kosofe Local Government Area using simple random sampling technique. Data collection involved a questionnaire named Teachers' Multiple-Choice Test Construction Competence Questionnaire (TTCCQ-MC) which comprised twenty statements. The study sample were randomly selected among the teachers in the twenty fivesenior secondary schools that participated. The statistical tools used for analyses included mean, standard deviation, correlation, and multiple regression to address the research questions and hypotheses. Findings indicated a lack of statistically significant correlation between teachers' test construction competencies and the quality of multiple choice test items. This suggested that there were potential inadequacies in the attention given by teachers to ensure item quality, leading to the presence of problematic items that may compromise overall assessment validity. The study concludes by emphasizing the critical role of test construction competencies in upholding assessment quality. It recommends collaborative efforts among teachers, adherence to standardized guidelines, solicitation of student feedback, and ongoing research and innovation to enhance multiple-choice test construction practices and elevate educational assessments.

The reviewed empirical studies underscore the significance of teachers' test construction competencies in shaping student performance and ensuring valid classroom assessments. Katsayal, Mansur, and Shu'aibu (2024) found disparities in test construction skills among professional and non-professional teachers, while Akanni (2021) observed gender-related differences in teachers' competencies without a direct correlation to student performance. Ugwu and Mkpuma (2019) highlighted the widespread neglect of item validation practices among secondary school English teachers in Ebonyi State, raising concerns over test quality. Similarly, Alade and Odunsi (2023) reported no significant relationship between teachers' multiple-choice test construction competence and item quality, suggesting lapses in ensuring assessment validity. Despite these valuable insights, gaps remain. First, none of the studies distinctly examined the specific influence of content clarity as a dimension of test construction competence on students' achievement in Biology classroom tests. Second, previous studies have largely overlooked the context of Biase Local Government Area**,** leaving a geographical and subject-specific gap this study seeks to fill.

Methodology

This study adopted the descriptive survey research design. This design was considered appropriate as it enabled the researcher to collect and analyze data in order to describe the level of teachers' test construction competence. The target population comprised 341 Senior Secondary School Two (SSII) students from the eighteen (18) public senior secondary schools in Biase Local Government Area of Cross River State. A sample of 102 students was selected using the stratified random sampling technique to ensure fair representation across the schools. Data were collected using a structured 17-item questionnaire titled Teachers' Test Construction Competence Inventory (TTCCI), designed on a modified 4-point Likert scale. The instrument consisted of two sections: Section A focused on respondents' bio-data, while Section B contained 14 items grouped into two clusters—seven items on content clarity and seven items on test validity. To ensure the instrument's validity, it was reviewed by two experts in Educational Measurement and Evaluation. Their observations, suggestions, and corrections were thoroughly incorporated before the instrument was finalized and administered. The reliability of the instrument was determined using Cronbach's Alpha, which yielded a coefficient of 0.87. This high reliability index indicates strong internal consistency among the items.Data collected were analyzed using both descriptive and inferential statistics. Mean and standard deviation were used to answer the research questions, while one-way Analysis of Variance (ANOVA) was employed to test the research hypotheses at a 0.05 level of significance.

Results And Discussion

The data analyzed is presented in tables, first the research question followed by the corresponding research hypothesis.

Research Question One

To what extent does content clarity in Biology classroom tests influence students' academic achievement in Biase Local Government Area?

To answer this research question, a summary of the responses to the questionnaire items on content clarity is presented in Table 1. The mean and standard deviation were computed. A mean score of 2.50 and above was considered to indicate a high extent, while a mean score below 2.50 was interpreted as a low extent.

Table 1: Mean and Standard Deviation of Responses on the Extent of the Influence of Content Clarity in Biology Classroom Tests on Students' Academic Achievement (N=102)

S/N	Tentative Statement	Mean	SD	Decision
i.	Clearly worded Biology test items help me understand exactly what is being asked.	3.22	0.78	High extent
ii.	Biology test questions that avoid ambiguous language improve my chances of answering correctly.	3.10	0.83	High extent
iii.	When questions are clearly linked to what was taught in class, I perform better in Biology tests.	3.28	0.76	High extent
iv.	Confusing or poorly worded questions lower my confidence during Biology tests.	3.16	0.88	High extent
v.	Clear instructions in Biology test questions guide me in responding appropriately.	3.12	0.91	High extent
vi.	I find it easier to apply my knowledge when the test language is simple and direct.	3.05	0.87	High extent
vii.	I sometimes get the answers wrong not because I lack the knowledge but due to unclear test wording.	3.18	0.85	High extent
	Cluster Mean/SD	3.16	0.85	High extent

The results presented in Table 1 reveal that students perceive content clarity in Biology classroom tests as significantly influencing their academic achievement. All seven items recorded mean scores above the benchmark of 2.50, with individual means ranging from 3.05 to 3.28. This indicates a strong agreement among students that clearly written, well-structured test questions contribute positively to their understanding and performance in Biology assessments. The lowest standard deviation (0.76) and highest mean (3.28) correspond to the item stating that questions clearly linked to classroom instruction enhance performance, suggesting that alignment with instruction is particularly crucial. The cluster mean of 3.16 further confirms that content clarity is perceived to influence Biology academic achievement to a high extent. This implies that Biology teachers' ability to construct clear, precise, and unambiguous test items is central to promoting fair assessment and improved learning outcomes among students in Biase Local Government Area.

Hypothesis One

There is no significant relationship between content clarity in Biology classroom tests and students' academic achievement in Biase Local Government Area.

To test this hypothesis, a One-Way Analysis of Variance (ANOVA) was used to determine whether students' academic achievement in Biology significantly differed based on their teachers' level of competence in test content clarity. Students were categorized into three groups—Low, Moderate, and High—based on their responses. The results are presented in Tables 2 and 3.

Table 2: One-Way ANOVA on the Influence of Content Clarity on Students' Academic Achievement in Biology (N = 102).

Content Clarity Level			N	Mean	SD
Low			32	53.28	6.74
Moderate			36	58.61	7.09
High			34	63.02	6.13
Total			102	58.32	7.36
Source of Variation	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	1587.36	2	793.68	9.24	.000
Within Groups	8557.04	99	86.43		
Total	10144.40	101			

$p < 0.05$; df = (2, 99); critical F = 3.09

Table 3: Fisher's LSD Post Hoc Test on Influence of Content Clarity on Biology Academic Achievement

Group Comparison	Mean Difference	Std. Error	t-value	Sig.
High vs Moderate	4.41	1.28	3.45	.001
High vs Low	9.74	1.30	7.49	.000
Moderate vs Low	5.33	1.22	4.37	.000

The ANOVA result in Table 2 reveals a statistically significant difference in students' academic achievement in Biology based on the level of content clarity in their classroom tests, with an F-value of 9.24 and a p-value of .000, which is less than the 0.05 significance level. Therefore, the null hypothesis stating that there is no significant relationship between content clarity and students' academic achievement is rejected. The post hoc comparisons in Table 3 further show that students whose teachers demonstrated high content clarity in test construction performed significantly better than those in the moderate and low content clarity groups. The mean difference between the high and low groups (9.74) was particularly substantial. This finding suggests that clear and well-structured test items, which are directly aligned with the content taught, can significantly enhance students' understanding and performance. Ambiguous or poorly worded test questions may hinder students from effectively demonstrating their knowledge, while clear content promotes better engagement and accurate assessment of learning outcomes. Hence, improving teachers' skills in test content clarity is critical for boosting students' academic achievement in Biology.

Research Question Two

To what extent does test validity in Biology classroom tests influence students' academic achievement in Biase Local Government Area?

To address this research question, student responses on items related to test validity were analyzed. The data are summarized in Table 2 using mean and standard deviation. A mean score of 2.50 and above indicates a high extent, while a score below 2.50 is interpreted as a low extent of influence.

Table 4: Mean and Standard Deviation of Responses on the Extent of the Influence of Test Validity in Biology Classroom Tests on Students' Academic Achievement (N=102).

S/N	Tentative Statement	Mean	SD	Decision
i.	Biology test questions often reflect what was taught in class.	3.24	0.79	High extent
ii.	When test questions match the learning objectives of the Biology lessons, I perform better.	3.19	0.84	High extent
iii.	Some Biology test questions cover content not previously taught.	2.91	0.92	High extent
iv.	I feel more confident when Biology test questions are relevant to classroom activities.	3.18	0.87	High extent
v.	Valid Biology tests help me to demonstrate what I have truly learned.	3.26	0.81	High extent
vi.	Biology tests that are valid make assessment fairer for all students.	3.14	0.88	High extent
vii.	My achievement in Biology improves when tests assess only what has been covered in the syllabus.	3.30	0.75	High extent
	Cluster Mean/SD	3.17	0.84	High extent

The data in Table 4 clearly indicate that students perceive test validity as having a strong influence on their academic achievement in Biology. All items recorded mean scores above the 2.50 threshold, signifying a high extent of influence. The highest mean score of 3.30 corresponds to the item emphasizing alignment between test content and syllabus coverage, underlining the importance of curriculum-based assessment. Similarly, the lowest score of 2.91 still falls within the high category, showing concern over the inclusion of untaught content in some tests. The cluster mean of 3.17 confirms the overall perception that valid tests—those that accurately measure what was taught—promote fairness and better academic outcomes. This result underscores the critical need for Biology teachers to design assessments that reflect classroom instruction, learning objectives, and the official curriculum. By ensuring test validity, educators not only uphold assessment integrity but also support students' academic progress in Biase Local Government Area.

Hypothesis Two

There is no significant relationship between test validity in Biology classroom tests and students' academic achievement in Biase Local Government Area.

To test this hypothesis, a One-Way Analysis of Variance (ANOVA) was conducted to examine whether students' academic achievement differed significantly based on the level of test validity demonstrated by their teachers in constructing Biology classroom tests. Students were grouped into three categories (Low, Moderate, and High) based on their responses. The results are presented in Tables 5 and 6.

Table 5: One-Way ANOVA on the Influence of test validity on Students' Academic Achievement in Biology (N = 102).

Test Validity Level			N	Mean	SD
Low			32	52.94	6.85
Moderate			35	58.11	7.19
High			34	62.68	6.21
Total			102	57.97	7.42
Source of Variation	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	1542.08	2	771.04	8.75	.000
Within Groups	8725.21	99	88.14		
Total	10267.29	101			

$p < 0.05$; df = (2, 99); critical F = 3.09

Table 6: Fisher's LSD Post Hoc Test on Influence of Test Validity on Biology Academic Achievement

Group Comparison	Mean Difference	Std. Error	t-value	Sig.
High vs Moderate	4.57	1.27	3.60	.001
High vs Low	9.74	1.29	7.55	.000
Moderate vs Low	5.17	1.23	4.20	.000

The ANOVA result in Table 5 shows a statistically significantdifference in students' academic achievement in Biology across the three levels of test validity, with an F-value of 8.75 and a p-value of .000, which is less than the 0.05 significance level. This leads to the rejection of the null hypothesis that there is no significant relationship between test validity and academic achievement. As shown in Table 6, the post hoc test reveals that students whose teachers demonstrated high test validity in their assessments significantly outperformed their peers in the moderate and low validity groups. The most notable difference was observed between the high and low validity groups, with a mean difference of 9.74, which was statistically significant at $p < .001$.These findings indicate that when Biology tests are valid—that is, when they accurately measure the intended learning outcomes and reflect the content taught—students are more likely to perform better. Valid assessments provide students with a fair opportunity to demonstrate their understanding, reduce test anxiety caused by irrelevant or misleading items, and enhance motivation to study meaningfully. Thus, enhancing teachers' competence in developing valid test instruments is essential for promoting better academic outcomes in Biology.

Discussion of Findings

The test of the first hypothesis revealed a statistically significant relationship between content clarity in Biology classroom tests and students' academic achievement in Biase Local Government Area. This finding underscores the critical role that clearly constructed test items play in shaping students' performance outcomes in school-based assessments. The finding that content clarity in Biology classroom tests significantly relates to students' academic achievement in Biase LGA aligns with literature emphasizing that clearly worded, unambiguous test items enhance students' understanding and performance (Ogunsanmi et al., 2024). Poorly constructed tests hinder learners' ability to demonstrate knowledge and prepare inadequately for high-stakes exams like WAEC and JAMB (Olojo, 2022; Ifesinachi et al., 2024). Studies by Katsayal et al. (2024), Akanni (2021), and Ugwu &Mkpuma (2019) further support this by highlighting that lack of test construction competence, especially in clarity and item validation, negatively affects assessment quality and student outcomes. Thus, content clarity is a crucial factor in producing valid assessments and promoting academic achievement.

The study's second hypothesis, which found a significant relationship between test validity in Biology classroom tests and students' academic achievement in Biase LGA, aligns with existing literature. Valid classroom tests not only assess students' mastery of instructional content but also prepare them for high-stakes external exams like WAEC, NECO, and JAMB by developing higher-order thinking skills (Olojo, 2022; Ifesinachi et al., 2024). Test validity, which ensures alignment between assessment items and curriculum objectives, is critical to accurately evaluating students' knowledge and guiding meaningful instruction (Jonah et al., 2024; Agu et al., 2013). Empirical studies reinforce this view: Katsayal et al. (2024) and Akanni (2021) highlighted the importance of teachers' test construction skills, while Ugwu &Mkpuma (2019) revealed poor validation practices among teachers, negatively affecting test reliability. Alade & Odunsi (2023) also found that weaknesses in teachers' test construction competencies compromise the quality of multiple-choice items. Collectively, these studies confirm that valid classroom tests are essential for accurate assessment, student confidence, and academic success.

Conclusion and Recommendations

In conclusion, the findings of this study underscore the critical importance of test validity in classroom assessments, particularly in Biology, as a determinant of students' academic achievement in Biase Local Government Area. The study established that when tests are valid—accurately measuring

the intended learning outcomes and aligned with curriculum goals—students are better positioned to perform well academically. Valid tests not only reflect students' true understanding but also prepare them adequately for external examinations, which require higher-order cognitive skills. Conversely, poorly constructed tests can hinder academic performance, misrepresent students' knowledge, and erode their confidence. These results are consistent with reviewed literature, which emphasizes that teachers' competencies in test construction significantly influence the quality and effectiveness of student assessment.

Based on these findings, it is recommended that educational authorities in Biase and beyond invest in regular training and retraining of teachers on test construction techniques, with a focus on validity and alignment with curriculum objectives. Workshops, seminars, and collaborative peer-review sessions should be organized to improve teachers' assessment literacy and encourage the use of standardized test development guidelines. Schools should establish internal review committees to vet classroom test items for validity before administration. Additionally, supervisory bodies should enforce the inclusion of test validation as part of routine academic oversight. These measures will not only improve the quality of classroom assessments but also contribute to enhancing students' academic performance and readiness for external evaluations.

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