

Multiple-Choice Test Construction Competency of Mathematics Teachers in Public Junior Secondary Schools in Mubi Education Zone, Adamawa State, Nigeria

Stephen Tizhe Kojigili^{1*} & Ijangari Jeremiah²

Faculty of Education, Adamawa State University, Mubi.

*Corresponding Author: Stephen Tizhe Kojigili

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Article History	Abstract
Original Research Article	<i>This study examined mathematics teachers' knowledge of multiple-choice test construction in public junior secondary schools in Mubi education zone of Adamawa state, Nigeria. The study adopted a descriptive survey research design. The population of the study consist of all public junior secondary school mathematics teachers in the five Local Government Areas of Mubi education zone, Adamawa state. Three research questions were raised and two hypotheses were formulated. Data were collected using structured questionnaire titled Multiple-Choice Test Construction Competency (MCTCC). Mean score was used to answer the research questions, while chi-square and t-test statistic were used to test the hypotheses at 0.05 level of significance. Results from the study showed an acceptable level of competence in multiple-choice test construction of public junior secondary school mathematics teachers in Mubi education zone; however, there is a significant difference between professional and non-professional mathematics teachers' competence in multiple-choice test construction. This competency of professional teachers is influenced by workshops, training, years of experience, access to resources on assessment design, educational background, professional development programmes and collaborative discussions. Furthermore, the findings of the study revealed that public junior secondary school mathematics teachers in Mubi education zone do not use item analysis in determining the quality of multiple-choice items they construct. Based on the findings, some recommendations were made, such as training non-professional teachers in teacher education should be done by the state government so as to enhance their assessment skills.</i> Keywords: Multiple-Choice items, Assessment, Test, Construction Competence, items analysis.
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Copyright © 2026 The Author(s): This is an open-access article distributed under the terms of the Creative Commons Attribution 4.0 International License (CC BY-NC) which permits unrestricted use, distribution, and reproduction in any medium for non-commercial use provided the original author and source are credited. Citation: Stephen Tizhe Kojigili & Ijangari Jeremiah. (2026). Multiple-choice test construction competency of mathematics teachers in public junior secondary schools in Mubi Education Zone, Adamawa State, Nigeria. UKR Journal of Multidisciplinary Studies, 2(10), 08-15.	

Introduction

Test is a fundamental aspect of the educational process, serving as an instrument for evaluating learners' understanding, detect students' learning needs and inform instructional decisions. Testing do not only provide teachers and students with feedback on the extent of learning outcomes from what has been taught but also provide an opportunity for further learning to take place when learning objectives have been attained. It also facilitate teaching, detect limitations in instructional delivery and reveal the learners' academic strengths and weaknesses. Tests are used as assessment tool because it measures students' performance or achievement in a particular subject area or task which is then utilized for

making decision about the learners. They are further employed in preparing the learners for standardized tests such as Basic Education Certificate Examination (BECE), West African Examinations Council (WAEC), National Examinations Council (NECO) etc., hence the need to be given adequate consideration.

According to Kojigili (2023), tests are set of items designed to measure sample of behaviour of individuals with respect to what has been taught within a specific subject area. The type of test can either be achievement test, aptitude test, diagnostic test, formative test, placement test, objective test etc. depending on the format, usage and purpose. Assessment in educational setting also plays a vital role in

gauging students' understanding, guiding instructional practices, shaping the learning experiences of students and informing educational policies. As teachers employ various assessment methods in schools, the focus on multiple-choice items in the context of mathematics education becomes important. Multiple-choice tests serve as common assessment tools in educational settings, providing educators with a means to evaluate students' understanding and proficiency across various subjects, including mathematics. Within the context of junior secondary education, where foundational mathematical concepts are established and built upon, the construction of high-quality multiple-choice tests becomes paramount. This implies that assessment incorporates different strategies and techniques to understanding academic progress of students. As mentioned by Ode et al. (2023) test is one of the powerful techniques used to gauge students' abilities as well as enhance their attitude towards learning. The emphasis laid on continuous assessment in Nigeria's education according to them has significantly enhanced the testing system within our education system. For teachers to effectively monitor students' academic progress, it is essential that their tests items be of standard quality (Opateye, 2016).

Among the various assessment methods, multiple-choice tests (MCTs) are commonly employed in most junior secondary schools because they provide teachers with the opportunity to cover a wide range of content efficiently and provide objective scoring. According to Akanbi (2023), in Nigeria, multiple-choice test items are the most prevalent type of test used in nearly all examinations, primarily because of large students' population. Consequently, poorly constructed multiple-choice test items have consequences for learners, their families and the nation's quality of education. This is due to the fact that instructional decisions made by teachers from poorly constructed multiple-choice test items may not have valid evidence and may fail to reflect learners' true academic performance. As a result, educational stakeholders may be unable to deliver appropriate support and learning opportunities tailored to individual's student needs. In the field of mathematics, multiple-choice tests offer a convenient means of assessing students' mathematical proficiency across diverse topics and skills (Hart, 2016). However, the quality of these test items depends heavily on the competencies of the mathematics teachers responsible for their construction. The construction of effective multiple-choice tests items goes beyond just methodological proficiency; it requires mastery of mathematical content, pedagogical strategies, and principles of assessment design.

Teachers' competency, according to Adeosun and Mogokwu (2024) encompasses the knowledge, skills, values, beliefs and motivations that a teacher requires to

function optimally in the teaching profession. This competency may be developed through professional qualification and training, professional development programmes like workshops, seminar etc. and practical field experience. The competency of mathematics teachers in designing multiple-choice test items is critical, as this skill influences both the accuracy and consistency of the assessment outcomes. Poorly constructed test items may confuse students, fail to distinguish between different levels of understanding or encourage guessing rather than genuine demonstration of knowledge. On the other hand, well-crafted questions can assess various cognitive levels, ranging from simple factual recall to advanced thinking abilities like analysis and problem-solving. Teachers must therefore possess competencies in item development, including the ability to formulate clear and unambiguous questions, align items with curriculum objectives, and incorporate advanced cognitive abilities. Without such competencies, the validity and reliability of assessment outcomes may be compromised, leading to inaccurate conclusions about students' abilities and instructional needs. As highlighted by Ode et al. 2023, a teacher who is not equipped with knowledge due to characteristics like qualification, teaching experience and professional training may lack the capacity to construct a valid and reliable test items. Junior secondary school mathematics teachers play a crucial role in influencing students' mathematical understanding and achievement. Therefore, their proficiency in constructing effective mathematics multiple-choice tests items is essential to accurately evaluate students' knowledge and skills in mathematics, thereby improving educational outcomes. Moreover, teachers' competencies in test construction are not only pivotal for assessment quality but also for promoting equity and fairness in education. Construction of high-quality multiple-choice test items require teachers to also possess the knowledge of Table of Specifications (TOS) and put it into practice in order to engage students at various cognitive levels.

Despite the significant role of teacher proficiencies in assessment quality, many teachers seem not to have received adequate training in test construction. For instance, a study by Abdul-Wahab and Ali (2022) revealed that the majority of teachers construct poor test items that do not perform as intended. Also, some teachers admit to having limited competence in test construction and therefore depend on previous test items to evaluate students. As a result, there is a need for research to investigate the competencies required for high-quality multiple-choice test construction and the factors influencing teachers' abilities in their fields. In determining the quality of multiple-choice test items, items analysis is usually conducted on the items constructed. Items analysis

is one of the most significant processes of standardization of a test (Kojigili, 2023). It is a technique used to evaluate the quality of multiple-choice test questions by determining the item difficulty level, item discriminating power and distractor index. Item analysis is carried out after a test has been constructed, administered and marked by the teacher. Item analysis is a method by which students' answer to each question is examined so as to evaluate the quality of the questions and the whole test (Mukherjee & Lahiri, 2015). In the words of Osiesi (2019), Item analysis is particularly useful for improving multiple-choice items that will be reused in future tests, but it can also help remove unclear or confusing questions during a single test.

Mubi education zone of Adamawa state just like any educational setting considers test as a basic criteria for determining students' performance, promotion or placement in all the subjects they offer especially mathematics which is a compulsory subject offered at both primary and secondary school levels in Nigeria. According to Agah (2020), among the various science subjects taught at all levels of secondary education in Nigeria, mathematics education holds a distinctive position. This is because the learning of mathematics fosters the pursuit of truth and objectivity among students. This view aligns with Homuame (2021), who asserted that Mathematics education is a fundamental element of the global education system and its study is particularly important for developing nations because of its perceived contribution to advancement in various spheres of life. Despite the importance of mathematics and the widespread application of multiple-choice tests items in mathematics, there remains a need for empirical research that assess the competency of junior secondary school mathematics teachers in multiple-choice test construction and how they determine the quality of multiple-choice test items they construct. This study seeks to bridge this gap by examining the skills, knowledge, and practices of mathematics teachers in this area. This research seeks to provide valuable insights that will inform professional development initiatives, enhance assessment practices and ultimately improve students' learning outcomes in mathematics.

Statement of the Problem

Most multiple-choice test items in mathematics are often faced with problems such as rote memorization rather than deep understanding of mathematical concepts, limited scope of assessing higher-order thinking skills, issues related to ambiguous wording which lead to misinterpretation by students and inadequate alignment with curriculum standards and learning objectives. These problems can affect the effectiveness of these items in accurately gauging students' proficiency in mathematics, hence affecting educational outcomes. This view aligns

with Akanbi (2023), who posited that poorly constructed multiple-choice test items can affect students, their families and the nation's quality of education. Because teachers' decision based on this poorly constructed multiple-choice test items may not represent students' actual performance.

These problems as observed lies in the varying levels of multiple-choice test construction competencies among public junior secondary school mathematics teachers and their knowledge of item analysis for determining the quality of multiple-choice test items they construct. This inconsistency in competencies may result in assessment that inadequately measure students' mathematical understanding, posing a potential obstacle in the delivery of effective and reliable education in mathematics at the junior secondary school level where fundamental and foundational mathematical concepts are thought and students are prepared for more advanced studies. Based on these, it is not ascertained as to whether junior secondary school mathematics teachers are competent on multiple-choice test items construction and how they determine the quality of mathematics multiple-choice test items they construct in Mubi education zone. Besides there is no known research in this aspect in the education zone, hence, this study is set to investigate the situation on ground relating to the multiple-choice test items construction competency of mathematics teachers at the junior secondary school level in Mubi education zone of Adamawa state.

Purpose of the Study

This study seek to assess the multiple-choice test items construction competency of public junior secondary school mathematics teachers and how they determine the quality of multiple-choice test items they create in Mubi Education Zone, Adamawa State. Specifically, the study objectives are to:

1. evaluate the competency of public junior secondary school mathematics teachers in constructing high-quality mathematics multiple-choice test items in Mubi Education Zone.
2. examine the factors influencing the acquisition and development of mathematics multiple-choice test items construction competency among mathematics teachers in public junior secondary schools in Mubi Education Zone.
3. investigate how public junior secondary school mathematics teachers determine the quality of mathematics multiple-choice test items they construct in Mubi Education Zone.

Research Questions

The following research questions were raised to guide the study:

1. What is the level of competency of public junior secondary school mathematics teachers in constructing high-quality mathematics multiple-choice test items in Mubi Education Zone?
2. What are the factors influencing the acquisition and development of mathematics multiple-choice test items construction competencies among mathematics teachers in public junior secondary schools in Mubi Education Zone?
3. How do public junior secondary school mathematics teachers determine the quality of mathematics multiple-choice test items they construct in Mubi Education Zone?

Research Hypotheses

The following null hypotheses were formulated to guide the study:

H₀₁: There is no significant competency among public junior secondary school mathematics teachers in constructing high-quality mathematics multiple-choice test items in Mubi Education Zone.

H₀₂: There is no significant difference in mathematics teachers' multiple-choice test construction competency based on professional qualification as one of the factors influencing teachers' competency in Mubi education Zone.

Research Methodology

This study adopted a descriptive survey research design. The population of the study comprised all the eighty-three (83) mathematics teachers in public junior secondary

schools in Mubi education zone of Adamawa state which covers Madagali, Michika, Maiha, Mubi north and Mubi south LGAs.

Since the population of the study is not too large, 81 mathematics teachers who were available out of the 83 were used for the study. The data for the study were collected using a structured questionnaire. It was a 31-item questionnaire titled "Multiple-choice Test Construction Competency (MCTCC)" constructed by the researchers. The questionnaire was designed using the modified Likert's four point scale of strongly agree (SA), agree (A), disagree (D) and strongly disagree (SD) and rated 4, 3, 2 and 1 respectively. The instrument was validated by experts in the Faculty of Education, Adamawa state university Mubi, and the corrections and suggestions made were incorporated into the final draft of the instrument.

The data collected were analysed using mean and standard deviation for the research questions. For making judgement on each item, a mean response of 2.50 and above was accepted, while below 2.50 were rejected. The research hypotheses were tested using Chi-square and t-test statistic at 0.05 level of significance.

Results

The results of the analysis of the research questions and hypotheses are presented in the following Tables:

Research Question One: What is the level of competency of public junior secondary school mathematics teachers in constructing high-quality mathematics multiple-choice test items in Mubi education zone, Adamawa state?

Table 1: Descriptive Analysis of Teachers' Competency in Constructing High-quality Multiple-choice Test Items

S/N	Statement	Mean	Std. Dev.	Remark
1.	When constructing multiple-choice test items, I always align the items with the syllabus and learning objectives.	3.60	0.79	Agreed
2.	I do ensure clarity of wording and language in the test items I construct.	3.04	0.64	Agreed
3.	I always avoid unintended clues to the correct answer in the item.	2.80	0.89	Agreed
4.	I do ensure that each item has one correct answer on which all experts would agree.	3.43	0.95	Agreed
5.	I design clear and unambiguous multiple-choice test items.	2.81	1.03	Agreed
6.	Distractors of each item are independent of each other in my test.	3.00	0.9	Agreed
7.	I design test items that measure different levels of cognitive skills.	3.07	0.77	Agreed
8.	I construct multiple-choice test items that are free from bias and stereotypes.	2.93	0.98	Agreed
9.	I always review my test items for clarity and precision.	3.32	0.93	Agreed
10.	Teachers should use appropriate number of items and number them.	3.00	0.87	Agreed
	I am confident in my ability to construct high-quality multiple-choice test items.	3.04	0.84	Agreed
	<i>Grand mean</i>	<i>3.09</i>		

Result from Table 1 shows that the respondents agreed with all the items stated on evaluating teachers' competency. The grand mean of 3.09 indicated that the teachers agreed to the principles of items construction as indication of teacher's competency in constructing high-quality multiple-choice test items. This shows an acceptable level of competence in multiple-choice test construction among

public junior secondary school mathematics teachers in Mubi education zone, Adamawa state.

Research Question Two: What are the factors influencing the acquisition and development of mathematics multiple-choice test items construction competencies among public junior secondary school mathematics teachers in Mubi education zone, Adamawa state?

Table 2: Descriptive Analysis of the Factors Influencing the Acquisition and Development of Teachers' Competency in Multiple-choice Test Construction.

S/N	Statement	Mean	Std. Dev.	Remark
1.	Attending workshops/training on test items construction has influenced the acquisition and development of my competencies.	3.54	0.67	Agreed
2.	I believed that years of experience has helped in improving my skills in constructing multiple-choice test items.	3.11	0.74	Agreed
3.	Access to resources on assessment design has contributed to my competencies in item construction.	3.02	0.96	Agreed
4.	My educational background has prepared me to construct effective multiple-choice test items.	2.77	1.05	Agreed
5.	My school provides support/resources for developing my assessment competencies.	3.07	1.06	Agreed
6.	I believed that ongoing training in assessment design is essential for improving teachers' competency in multiple-choice test items construction.	2.85	0.94	Agreed
7.	Attending professional development programmes can influence the acquisition and development of multiple-choice construction competency.	3.19	0.87	Agreed
8.	Training/workshops on assessment design cannot influence the acquisition and development of multiple-choice test construction competencies.	2.63	1.13	Agreed
9.	I participate in collaborative discussions about assessment practices with colleagues to improve my items construction competencies.	3.01	0.99	Agreed
10.	Years of experience cannot influence the acquisition and development of multiple-choice test construction competencies.	2.26	1.02	Disagreed
	Grand mean	2.95		

Result from Table 2 shows that the teachers agreed to all the statements on factors influencing their acquisition and development of competency in multiple-choice test construction. The grand mean of 2.95 revealed that public junior secondary school mathematics teachers agreed to workshops, training, years of experience, access to resources on assessment design, educational background, professional development programmes and collaborative

discussions as some of the factors influencing their competency in multiple-choice test construction in Mubi education zone, Adamawa state.

Research Question Three: How do public junior secondary school mathematics teachers determine the quality of mathematics multiple-choice test items they construct in Mubi Education Zone, Adamawa state?

Table 3: Descriptive Analysis of Teachers' Method of Determining the Quality of Multiple-choice Test Items

S/N	Statement	Mean	Std. Dev.	Remark
1.	I use item analysis technique to evaluate the effectiveness of my multiple-choice items.	3.15	0.81	Agreed
2.	A good item should be able to discriminate between high-achievers and low achievers.	1.78	0.96	Disagreed
3.	I review each test item for grammatical correctness and clarity.	3.04	0.97	Agreed

4.	A good item should have an item discriminatory index of less than 0.30.	2.67	1.10	Agreed
5.	I analyse students' responses to identify poorly performing test items.	2.96	0.80	Agreed
6.	I always determine the difficulty level of the items I constructed.	2.81	0.95	Agreed
7.	A good item should have an item difficulty level between 0.30-0.70	1.98	0.91	Disagreed
8.	Effective distractors should attract more students from the upper group.	3.19	0.99	Agreed
9.	I don't use items analysis to determine the quality of multiple-choice test items I constructed.	2.85	0.94	Agreed
10.	I ensure that plausible distractors are used when constructing my items.	2.70	0.90	Agreed
Grand mean		2.71		

Table 3 shows the mean response of teachers on how they determine the quality of multiple-choice items they construct. The grand mean of 2.71 revealed that mathematics teachers in Mubi education zone agreed to determining the quality of multiple-choice test items they construct. The teachers agreed on using items analysis for evaluating the quality of multiple-choice test items they have constructed, but their responses on items 2, 4, 7 and 8 indicates otherwise. This is because their responses do not agree with the acceptable criteria for determining the

quality of multiple-choice test items. This shows that public junior secondary school mathematics teachers in Mubi education zone are not familiar with items analysis in determining the quality of multiple choice test items they have constructed.

H₀₁: There is no significant competency among public junior secondary school mathematics teachers in constructing high-quality mathematics multiple-choice test items in Mubi Education Zone.

Table 4: Summary of Chi-Square analysis of the Competency of Public Junior Secondary School Mathematics Teachers in Constructing High-quality Mathematics Multiple-choice Test Items in Mubi Education Zone

Variable	N	Mean	Std.Dev.	χ^2	df	p-value	Remark
Teachers' competency	81	34.04	9.00	76.94	79	0.000	Significant

Result from Table 4 revealed a significant competency among public junior secondary school mathematics teachers in constructing high-quality mathematics multiple-choice test items in Mubi Education $\chi^2(76.94, N = 81), p = 0.000$. Since the p-value is less than the 0.05 level of significance, the null hypothesis was rejected and conclude that, there is a significant competency among public junior secondary school mathematics teachers in constructing

high-quality mathematics multiple-choice test items in Mubi Education Zone, Adamawa State.

H₀₂: There is no significant difference in mathematics teachers' multiple-choice test construction competency based on professional qualification in Mubi education Zone.

Table 5: Summary of t-Test of Mathematics Teachers' Competency in Multiple-choice Test Construction based on Professional Qualification

Group	N	Mean	Std.Dev.	df	t	p-value	Remark
Professional	65	39.89	3.67				
				79	11.20	0.000	Significant
Non-professional	16	26.34	8.09				

Results in Table 5 showed that the probability of p (0.000) is less than 0.05 level of significance ($p < 0.05$). Therefore, the hypothesis was rejected at 0.05 level of statistical

significance and conclude that there is a significant difference between professional and non-professional mathematics teachers' competence in multiple-choice test

construction in public junior secondary schools in Mubi Education Zone, Adamawa State.

Discussion

Findings from research question one showed that the respondents agreed with all the items stated on evaluating teachers' competency. The teachers demonstrated high competence in aligning content with instructional objectives and ensuring that each item has one correct answer on which all experts would agree. The grand mean of 3.09 indicated that the respondents agreed to the principles of item construction as indication of teacher's competency in constructing high-quality multiple-choice test items. This shows an acceptable level of competence in multiple-choice test construction among public junior secondary school mathematics teachers in Mubi education zone, Adamawa state. This finding is in line with the findings of Opie et al. (2021) which found that teachers utilize their knowledge of test construction procedures effectively in constructing multiple-choice tests items. The finding is different from those of Ehigbor and Osumah (2023) and Ajogbeje et al. (2024) which found a low level of multiple-choice test construction competency among teachers.

Findings from research question two showed that the teachers agreed to all the statements on factors influencing their acquisition and development of competency in multiple-choice test construction. The grand mean of 2.95 revealed that public junior secondary school mathematics teachers agreed to workshops, training, years of experience, access to resources on assessment design, educational background, professional development programmes and collaborative discussions as some of the factors influencing their acquisition and development of multiple-choice test construction competency in Mubi education zone, Adamawa state. This finding is line with the findings of Nwogwugwu et al. (2024) who revealed that teachers' teaching experience influenced their application of the components of test construction skills and that teachers' qualifications also influenced their application of item construction and test score interpretation components of testing skills.

Findings from research question three showed a grand mean of 2.71 indicating that mathematics teachers in Mubi education zone agreed that they do determine the quality of multiple-choice test items they construct but not through items analysis. This revealed that public junior secondary school mathematics teachers in Mubi education zone are not familiar with items analysis for determining the quality of multiple choice items they have constructed. This finding is different from that of Oribhabor and Adeosun (2023), Akinboboye and Ayanwale (2021) and Idoma et al. (2023) who revealed that items analysis is conducted on multiple-

choice test items to determine their discrimination index, difficulty index and distracter index. These indices are used to determine the quality of the multiple-choice test items constructed.

The results of the findings from hypotheses especially hypothesis one revealed that there is a significant competency among public junior secondary school mathematics teachers in constructing high-quality mathematics multiple-choice test items in Mubi Education Zone, Adamawa State. This finding is in line with the findings of Opie et al. (2021) who found a significant competency among teachers in constructing multiple-choice tests items. Hypothesis two on the other hand revealed that there is a significant difference between professional and non-professional mathematics teachers' competency in constructing high-quality mathematics multiple-choice test items in public junior secondary schools in Mubi Education Zone. This finding is in line with the findings of Nwogwugwu et al. (2024), Eduwem et al. (2023) and Sani et al. (2024) where they found that teachers' professional qualification influenced their application of multiple-choice test construction skills.

Conclusion

Assessing teachers' multiple-choice test construction competency is key in ensuring that the assessment is of high quality. The responses of teachers on their multiple-choice test construction competencies matched well with the principles and guidelines of items construction which shows an acceptable level of competence from this study's findings. The competence is influenced by workshops/training attended, years of teaching experience, access to resources on assessment design, educational background, professional development programmes and collaborative work by the teachers. The quality of the multiple-choice test items as agreed by many experts can only be determined using item analysis which this study also ascertained.

Recommendations

From the findings of this study, the following recommendations were made:

1. Non-professional teachers should be encouraged and supported to obtain teacher training and certification.
2. Teachers should be encouraged to perform items analysis for every multiple-choice test items constructed.

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