

**IMPROVING TEACHERS' KNOWLEDGE AND ITEM WRITING COMPETENCE IN PUBLIC SENIOR SECONDARY SCHOOLS IN JIGAWA STATE, NIGERIA**

BY

**Abdul-Wahab Ibrahim Ph.D.:**

Department of Education, Faculty of Education, Sule Lamido University, Kafin Hausa, Jigawa State, Nigeria; E-mail: abdulwahab.ibrahim@slu.edu.ng

&amp;

**Ali Abdullahi Taura Ph.D.:**

Department of Education, Faculty of Education, Sule Lamido University, Kafin Hausa, Jigawa State, Nigeria; E-mail: alia.taura@slu.edu.ng

**Abstract**

*This study investigated effects of treatment on teachers' test development, construction, and item writing competence in public Senior Secondary Schools in Jigawa state. It also determined the effects of treatment on teachers' knowledge of basic concepts and procedures in test construction, analysis and interpretation of test scores for effective classroom learning. This is with a view to improve the validity of achievement tests used in secondary schools. A three-group experimental design was adopted and used in the study. The population comprised all male and female teachers in the employment of Jigawa state government. 400 teachers who have spent five years and above in active teaching in public Senior Secondary Schools in the state constituted the sample in the study. Three self-developed research instruments were used to collect data. These are: "Test Development Questionnaire (TDQ); Item Writing Questionnaire (ITQ), and Impact Assessment Questionnaire (IAQ)". Data collected were analysed using One-Way Analysis of Variance (ANOVA) and Fisher's Protected t-test statistics. The results revealed a significant effect of treatment on teachers' test development, construction, and item writing competence in Senior Secondary Schools in Jigawa state. Also, there was a significant effect of treatment on teachers' knowledge of basic concepts and procedures in test development, construction, and item writing in Senior Secondary Schools in Jigawa state. There was a significant effect of treatment on teachers' competence on test analysis and interpretation of test scores for effective classroom learning. It was concluded that improving teachers' test development competence will enhance both validity and equity in testing in secondary schools in the country. Thus, teachers need to possess relevant test construction and development competencies to be able to deliver quality assessment of students in their various subjects' area of specializations.*

**Keywords:** *Teacher, Knowledge, Test construction, Item writing, Competence*

**Introduction**

In many education systems around the world, teachers' test development, construction and item writing ability play an important and indispensable part to cater for the diverse and often competing demands of the various stakeholders and users of assessment information, for example, selecting the best students for the next level of education, monitoring school performance, or allocating limited resources. As a result of the great value placed on testing, it is believed that testing provides incentives to students and their teachers to improve academic performance (Ibrahim, 2018). The society accessibility to test results also pushes schools to provide any support necessary for the same purpose. These efforts therefore, are believed to help raise the level of achievements. However, it has also been argued that testing only motivates teachers and students to work towards performance goals rather than learning goals. The increase in scores, especially in high-stakes testing context, most likely indicates teachers' and

students' familiarity with test requirements and formats rather than the real improvement in learning. Also, the ability of teacher-made test to measure the whole range of knowledge and skills that students are supposed to acquire is questionable. Consequently, teachers, in order to drive up test scores, tend to teach to the test, focusing on what is to be tested and developing test taking strategies, but ignoring those skills not covered in the test (Ibrahim, 2022).

Tamakloe et al. (2019) described a test as a device or procedure for measuring a sample of an individual's behaviour in a specific learned activity or discipline. Crooker and Algina (2018) further gave a description of test to be a standard procedure for obtaining a sample of behaviour from a specified domain. These tests are normally administered to students after a period of instruction, if for achievement purposes. Considering the sensitive role that information from a test play in making educational decisions for students as well as management, it is important to say that both test developers and users must make conscious effort to improve the validity and the reliability of the test in order to get objective information that approximate the individual's true characteristic, which the test developer seeks to estimate. Unfortunately, test construction role of teachers has been reported as a main source of anxiety, especially with teachers with few years of teaching experience (Ebinye, 2011). This anxiety, according to Ebinye (2011), largely stems from inadequate test construction skills of these teachers. Scholars have also argued that test construction among teachers is not encouraging (e.g., Amedahe, 2019; Hamafyelto et al., 2015; Kazuko, 2018). The implication is that teachers may end up taking inaccurate information about student learning. For instance, Ololube (2018), which assessed the test construction skills of teachers in Nigeria, reported poor test construction skills among non-professional teachers. Another study by Onyechere (2018) concluded that most teachers construct poor items which actually failed to function as it was supposed to. Some teachers, acknowledging that they have weak test construction skills resort to past or already existing questions to assess students.

Similar finding was reported by Amedahe (2019), who found that Senior High School teachers in the Central Region of Ghana have inadequate skills in constructing both essay and objective type tests. Every classroom teacher is expected to possess and apply requisite skills in construction of good items for class assessments. A good test item must be both valid and reliable. A test is valid if it is suitable for the intended purpose. On the other hand, a test is reliable if it measures what it is supposed to measure consistently under all conditions (Ibrahim, 2016). Teachers today, perhaps more than ever before, have a need to be knowledgeable consumers of test information, constructors of assessments and protocols, and even teachers about testing (Rudner & Schafer, 2012).

Most achievement tests used in Nigerian secondary schools for continuous assessments are teacher-constructed tests. Teachers, therefore, need to apply some acceptable degree of test construction skills in order to be able to develop valid and reliable tests that will yield accurate feedback of students' achievement. Test construction skills include the competencies needed for developing quality tests based on stipulated principles of test construction (Afolabi, 2012; Ali, 2019). These competencies are outlined by Ujah (2020) as: objectivity, communicative, item validation skills and skills for applying appropriate strategies for ascertaining the reliability of test instruments. To Silker (2003), skill in test construction enables a teacher to construct tests with precision, appropriateness of language-use, objectivity and good grading scales. Teachers need not be experts in educational measurement and evaluation to construct valid and reliable tests, but there are basic test construction skills which every teacher ought to possess to construct quality tests. These skills help teachers to: structure items to elicit clear and concise answers from students; construct tests that will be appropriate for learners of different ages, abilities, and gender; set tests so that students finish within time and do not grow scared of tests (Afolabi, 2012; Ali, 2019). Lack of test construction skills by teachers might result in false assessment of students' achievements. Some researchers (Esomonu, 2012; Paulson, 2013) viewed this incompetency in test construction by

teachers as a major cause of malpractice in school examinations by both teachers and students in Nigerian secondary schools.

Ali and Ibrahim (2022) conducted a capacity building training programme to determine whether there exists effect of treatment on teachers' knowledge of basic test development and construction skills in public Junior Secondary Schools in Jigawa state, Nigeria. Also, the study examined if there exists effect of treatment on subject and vocational teachers' item writing and test analysis skills, teachers' ability to categorize and interpret test scores for learning improvement in public Junior Secondary Schools in the state. The population studied comprised all male and female teachers in government-owned Junior Secondary Schools in all 27 Local Government Areas (LGAs) of Jigawa state, Nigeria. 520 secondary school personnel constituting 400 subject and vocational teachers, 40 Guidance Counsellors and 80 School Administrators constituted the sample in the study. Three self-developed research instruments were used in the study to collect data, while independent t-test statistics was used to test hypotheses in the study at 0.05 level of significance. The results showed that there existed a significant effect of treatment on subject and vocational teachers' knowledge of basic test development and construction skills in Junior Secondary Schools in Jigawa state. Also, there was a significant effect of treatment on subject and vocational teachers' item writing skills and teachers' skills in item and test analysis in Junior Secondary Schools in the state. However, a non-significant effect of treatment on subject and vocational teachers' ability to categorize and interpret test scores for learning improvement in Junior Secondary Schools in Jigawa state existed. It was concluded that continuous improvement in test development and construction is imperative for the 21<sup>st</sup> Century classroom teachers in the country. The study recommended that there was an urgent need to strengthening teacher education in view of competence-based test and item writing skills enhancement amongst secondary school teachers in Nigeria.

Likewise, Ibrahim (2018) conducted a quasi-experiment on how to improve assessment and evaluation skills of teachers in public primary and secondary schools in Jigawa State, Nigeria. The population comprised of teachers who were teaching in all government primary and secondary schools in the state. 115 randomly selected participants comprised the sample in the study. Three self-constructed instruments were administered and used to collect data in the study. Frequency counts, percentiles, mean scores, standard deviations, independent t-test, Analysis of Covariance (ANCOVA), and Fisher's t-test statistical techniques were used to analyse the collected data in the study. The results revealed that there was low level of compliance to and implementation of the objectives of Continuous Assessment in the state. Also, there was a significant effect of the treatment on the teachers' skills in evaluation techniques of cognitive, affective and psychomotor domains of learning in public schools. He concluded that there was a need to train and retrain all public school teachers in the state on the concept and philosophy of Continuous Assessment in educational system in Nigeria.

Subsequent research by Amani et al. (2021) examined secondary school teachers' competences, awareness of skills and procedures for constructing quality classroom tests in Tanzania. 246 secondary school teachers who were drawn from four regions in Tanzania participated in the study. A semi-structured questionnaire was used as the data collection tool for the study. Frequencies, percentages, and charts were used to analyse the data. The findings showed that the majority of the participant teachers lacked competences for preparing quality classroom tests, particularly on the use of Table of Specification and test-item analysis. Also, teachers lacked professional support on how to prepare matching items, short answers, and multiple-choice test items. Again, a preponderant majority of teachers had never received in-service training on the subjects of assessment and testing. The researchers concluded strengthening initial teacher education in view of competence-based assessment.

Against this background, a number of studies have suggested that faulty test items affect students' comprehension and ability to provide accurate answers to the items, the inference drawn about what a

student knows and understands may be compromised (Adediwura, 2012; Leighton & Gokiart, 2015). Faleye (2016) observed that classroom teachers generally write poor items and that a typical classroom teacher in a secondary school cannot construct valid multiple-choice test items. Therefore, the effectiveness of Teacher-Made-Test and item writing ability relies to a great extent on ensuring that both those who design and undertake evaluation activities as well as those who use their results possess the proper skills and competencies. This is crucial to provide the necessary legitimacy to those responsible for evaluation and assessment. Thus, the need to enhance the test development, construction and item writing skills of teachers in all government-owned secondary schools in Jigawa state is regarded as one of the most significant innovations of the National Policy on Education. As a corollary to the above, this study investigated test development, construction, and item writing competencies of teachers in Senior Secondary Schools in Jigawa state. It also identified types of Teacher-Made-Tests as achievement tests used for maximal educational outcomes in schools; as well as basic concepts and procedures in test development, construction, item writing. It also facilitates Senior Secondary School teachers' skills in item and test analysis; and equip teachers on how to construct and produce Teacher-Made-Tests and interpret test scores for learning improvement.

### Objectives of the Study

The broad objective of this study is to investigate test development, construction, and item writing competencies of teachers in Senior Secondary Schools in Jigawa state. In order to achieve this goal, the specific objectives of this study are to:

1. investigate whether difference existed due to training in teachers' test development, construction, and item writing competence in Senior Secondary Schools in Jigawa state.
2. examine if difference existed due to training in teachers' knowledge of basic concepts and procedures in test development, construction, and item writing in Senior Secondary Schools in Jigawa state.
3. determine whether difference existed due to training in teachers' competence on test analysis and interpretation of test scores for effective classroom learning.

### Research Hypotheses

Based on the objectives of this study, the following null hypotheses were postulated to provide further guide to the study:

1. There is no significant effect of treatment on teachers' test development, construction, and item writing competence in Senior Secondary Schools in Jigawa state.
2. There is no significant effect of treatment on teachers' knowledge of basic concepts and procedures in test development, construction, and item writing in Senior Secondary Schools in Jigawa state.
3. There is no significant effect of treatment on teachers' competence on test analysis and interpretation of test scores for effective classroom learning.

### Methodology

#### Research Design

A three-group experimental design described by Campbell and Stanley (1963, p. 6; cited in Cohen et al., 2018) was adopted and used in this study. It was an equally randomised experimental research design, which was used to investigate test development and item writing competency of teachers in public Senior Secondary Schools in Jigawa state, Nigeria. This design was employed because the study conducted a treatment based on capacity building training programme to determine test development and item writing competencies of teachers in government-owned Senior Secondary Schools in Jigawa state. According to Cohen et al. (2018), an experiment is a research design in which a researcher has no control over randomly assigning participants to levels of a manipulated variable of interest. Using the classic notation system provided by Campbell and Stanley (1963, p. 6; cited in Cohen et al., 2018), a diagram to illustrate the quasi-experimental research design as used in this is as follows:

R O<sub>1</sub>X<sub>1</sub>O<sub>4</sub>    Group 1

R O<sub>2</sub>X<sub>2</sub>O<sub>5</sub>    Group 2  
R O<sub>3</sub>O<sub>6</sub>        Group 3

The first two rows represent the Experimental Groups while the third is the Control Group. R represents equal random assignment into Experimental Group (E) and Control Group (C). Whereas, O<sub>1</sub>, O<sub>2</sub>, and O<sub>3</sub> are Pretest Observations, as O<sub>4</sub>, O<sub>5</sub>, and O<sub>6</sub> the Posttest Observations. Noteworthy, X<sub>1</sub> is treatment (training) in test development and construction competencies, X<sub>2</sub> is treatment (training) in item writing competency for teachers in public Senior Secondary Schools in the state. The design enables the main effects of training (treatment) and their interaction to be analysed. Not only this, but also, the design is to obtain teachers' views of their test development, construction and item writing experiences thus far on the achievement tests used in their respective schools and to try to ascertain whether they consider the activities they have been involved in worthwhile and to help them to become more skillful in test development, construction, and item writing as secondary school teachers.

### Participants

The population studied comprised all male and female teachers in government-owned Senior Secondary Schools in all 27 Local Government Areas (LGAs) of Jigawa state, Nigeria. As inclusion criterion to be eligible to participate in the study, the teachers had to be employees in the government-owned schools and must have spent not less than 5 years on the job, and show willingness to take part in the study. However, 400 teachers, from 40 selected Senior Secondary Schools make up the accessible population in the study. Also, a total of 40 public Senior Secondary Schools from 20 of the 27 Local Government Areas of Jigawa state were selected through stratified random sampling and participated in the study, as some degrees of homogeneity were assumed. Thus, the investigators recruited a study sample that shares certain characteristics by formally stating specific inclusion and exclusion study criteria when designing this study. For example, inclusion criteria include that participants must be subject teacher of either an Arts or Science or Commercial and Vocational subject as Technical, Computing, and Home Management subjects and English language speaking; while exclusion criterion was that participants must not be under the five years of teaching or employment of Jigawa State Ministry of Education as teachers in Senior Secondary Schools in the state. From each of the 40 schools, 20 teachers (5 each from Arts, Science, Commercial and Vocational Subjects), thus giving a total of 400 teachers in the training (experiment). From the sample list obtained from Jigawa state Ministry of Education, it was established that there were five recognized Educational Zones across Jigawa State namely: Dutse, Gumel, Hadejia, Kazaure, and Ringim zones. Noteworthy, unequal number of participants were selected among men and women teachers because of disproportionate number of male teachers to female teachers in the state Senior Secondary Schools, therefore, there was no gender bias or gender insensitivity and inequality in the study. Specifically, no gender discrimination was intended and promoted in the study as the participants were selected as they existed in Jigawa State.

### Instrumentation

Three self-developed research instruments were used in the study. These are: "Test Development Questionnaire (TDQ); Item Writing Questionnaire (ITQ), and Impact Assessment Questionnaire (IAQ)". The design of the instruments was based on information obtain from relevant literature reviewed. The instruments chosen possessed the three psychometric properties of validity, reliability and usability (Ibrahim, 2017). Each of the instruments was briefly described as follows:

**Test Development Questionnaire (TDQ):** This is a 30-cluster item training questionnaire covering pedagogical areas of subject and vocational areas of instruction related to Junior Secondary Schools. It consists of content analysis, test blueprints, and different objective and essay test formats used in Junior Secondary schools in the state.

**Item Writing Questionnaire (ITQ):** This is a 24-item questionnaire covering item writing principle and item review of all subject and vocational pedagogical contents as taught in Junior Secondary Schools. It

has two scales of needs and performance. The needed scale had 4-point scale response options of Highly Needed (HN), Averagely Needed (AN), Slightly Needed (SN), and Not Needed (NN), with corresponding value of 4, 3, 2, and 1 respectively. The performance scale has 3-point response options of High Performance (HP), Average Performance (AP), No Performance (NP), with a corresponding value of 3, 2, and 1 respectively.

**Impact Assessment Questionnaire (IAQ):** A 30-item questionnaire, which consists of three main sections with each section comprised of 10 items each. Also, it enjoys three-point Likert Scale.

### **Validity and Reliability of the Instruments**

The content and validity of the three instruments were established using expert judgments. Experts in Guidance and Counselling, Psychology of Education, Tests and Measurement were able to review the items in the questionnaires in terms of relevance to the subject-matter, coverage of the content areas, appropriateness of the language usage and clarity of purpose. The experts' judgments were strictly adhered to for adequate content and face validity. Further, a pilot study was conducted using Cronbach Alpha and Split-Half reliability methods to determine the internal consistency of the instruments over time. Specifically, the "Test Development Questionnaire (TDQ) showed reliability coefficient value of 0.82;  $p < 0.05$ ; while reliability coefficient value obtained for "Item Writing Questionnaire (ITQ)" was 0.75;  $p < 0.05$ ; and the "Impact Assessment Questionnaire (IAQ)" revealed reliability coefficient value of 0.79;  $p < 0.05$ . These reliability coefficient values were considered high enough for the study.

### **Treatment for the Groups**

The essence of the study was to enable teachers in Senior Secondary Schools refresh their skills in the area of Test Development and Construction as well as Item Writing with a view to improving the quality of test items. Also, the study assisted teachers to have a proper balance of psychometric and other properties of available test item formats, hence enhancing quality decision-making on testing. Therefore, the pedagogical contents of the treatment included but not limited to:

- Overview of Test Development and Construction;
- Test Theories (Classical Test Theory & Item Response Theory)
- Concept and Types of Teacher-Made Tests;
- Taxonomy of Test Development and Construction
- Test Construction Steps (Objectives & Essay Tests);
- Item Writing and Review;
- Administering and Marking of Tests (Objectives & Essay Tests)
- Item Analysis; and
- Validity, Reliability and Dimensionality.

Practically, the treatment (experiment) lasted for 6 months (two terms), while 1 month was used to conduct impact assessment with a view of identifying inadequacy, acceptable and test items to retain, modify, reconstruct or discard.

### **Appointment and Training of Research Assistants**

The researchers recruited and train 20 Research Assistants who were graduates residing within the five Educational Zones in Jigawa state. These Research Assistants were trained to assist in distributing the training manuals and collecting the questionnaire as well as in arranging the venues for the treatment. They were well-trained for four hours at interval of two times a week for three weeks prior to the start of the study. Specifically, accurate explanation on the objectives and goals of the research as well as ensuring confidentiality of information provided by participants and avoiding undue interference with the participants' decisions during the course of the experiment was duly given to them. Research Assistant took two days prior to the administration of the instruments so that they would be maximally make use of what they have been trained for. They actively engaged in the conduct of the study and handsomely

remunerated at the end of the field work which lasted for 6 months and an extra month for impact assessment making 7 months altogether.

### Procedure for Data Collection

Before the commencement of the study, permission was obtained from the Jigawa State Ministry of Education, the Local Inspector of Education (LIE) of the LGA and from the respective school authorities. Also, informed consent was obtained from the participating teachers. Data collection was done in two phases. The first phase took place prior the training of the teachers in Test Development, Construction, and Item Writing, while the second phase was after the training (post-test data). The experiment (training programme) utilized the following training methods to deliver the contents: (i) Lectures; (ii) Demonstrations; (iii) Case Study Analyses; (iv) Provocative Discourse; (v) Individual/Group Assignments; and (vi) Course Embedded Assignments and Activities/Exercises. Afterwards, the copies of research instruments were personally administered to the participants with the aid of the Research Assistants. The participants were taken into confidence during the research, as the research was implemented for six (6) months and 1 month for impact assessment.

### Ethical Clearance

Applications were made to the Jigawa Ministry of Education, Science and Technology (MOEST), Dutse, to conduct all phases of the work and ethical clearance was received for data collection, supported by research training for teams. Ethical issues were kept under review at whole team training meetings, which took place prior each phase of data collection. At these meetings, a range of ethical issues associated with the conduct of the study were discussed in detail especially as part of training for the Research Assistants recruited for the purpose of this study.

### Method of Data Analysis

The mean ( $\bar{x}$ ) and standard deviation for the pretest and posttest assessment measures were first computed before using One-Way Analysis of Variance (ANOVA) and Fisher's Protected t-test statistics to test hypotheses in the study. Specifically, all hypotheses were tested at 0.05 level of significance.

### Results

**Table 1: Mean ( $\bar{x}$ ) Scores and Standard Deviations of Teachers' Test Construction and Item Writing Competencies**

Variables	Test Development & Construction			Item Writing			Control		
	N	$\bar{x}$	SD	N	$\bar{x}$	SD	N	$\bar{x}$	SD
Pre-test	150	23.56	2.42	150	23.56	2.63	100	23.51	2.21
Post-test	150	34.66	5.84	150	32.19	5.81	100	30.34	4.95

Table 1 showed the mean scores ( $\bar{x}$ ) for the three groups on the pretest, that is before the experiment or treatment. A comparison of the mean ( $\bar{x}$ ) scores revealed that there were no statistically significant differences between the groups prior to treatment. This confirmed that the groups were essentially equivalent and had no basic test development, construction and item writing competencies. Further, Table 1 indicated the post-test mean ( $\bar{x}$ ) scores for the three groups. A comparison of the mean scores ( $\bar{x}$ ) showed that there was a positive statistically significant effect of training on teachers' test development/construction and item writing competencies. This means that training (treatment) improved teachers' prowess and competence on test development and construction skill as well as item writing skill.

### Testing and Interpretation of Hypotheses

**Hypothesis One:** The hypothesis which speculates that there is no significant effect of treatment on teachers' test development, construction, and item writing competence in Senior Secondary Schools in

Jigawa state. One-Way Analysis of Variance (ANOVA) statistics was used to analyse the data. The results of the analysis are presented in Table 2.

**Table 2: One -Way Analysis of Variance (ANOVA) on Effect of Treatment on Teachers' Test Development, Construction, and Item Writing Competencies**

Sources of Variation	Sum of Squares	Df	Mean Sum of Squares	F-ratio	p-value
Between Groups	198.75	2	99.38	13.73	p<0.05
Within Groups (Error)	2756.39	381	7.24		
Total	2955.14	383			

**\*Significant; df = 2 (381), critical F = 3.02**

Table 2 revealed that a calculated F-value of 13.73 is greater than the critical F-value of 3.02 given 2 and 381 degrees of freedom at 0.05 level of significance. Consequently, the null hypothesis was disconfirmed. This implies that there is a significant effect of treatment on teachers' test development, construction, and item writing competence in Senior Secondary Schools in Jigawa state. Further analysis of data, using Fisher's Protected t-test technique which enable pair-wise comparison of group means ( $\bar{x}$ ) shows that teachers who undergone training in test construction and development exhibited prowess for test construction and development than teachers who received treatment on item writing ( $t = 3.68$ ;  $df = 298$ ; Critical  $t = 1.650$ ;  $p < 0.05$ ) or those untrained (Control) group on test construction and development and item writing ( $t = 2.90$ ;  $df = 248$ ; Critical  $t = 1.652$ ;  $p < 0.05$ ). also, when teachers who received treatment on item writing were compared with those untrained group on item writing only, they displayed better competency in item writing ( $t = 3.91$ ;  $df = 248$ ; Critical  $t = 1.652$ ;  $p < 0.05$ ).

**Hypothesis Two:** The second hypothesis postulated that there is no significant effect of treatment on teachers' knowledge of basic concepts and procedures in test development, construction, and item writing in Senior Secondary Schools in Jigawa state. One-Way Analysis of Variance (ANOVA) statistics was used to analyse the data. The results of the analysis are presented in Table 3.

**Table 3: One -Way Analysis of Variance (ANOVA) on Effect of Treatment on Teachers' Knowledge of Basic Concepts and Procedures in Test Development, Construction, and Item Writing Competencies**

Sources of Variation	Sum of Squares	Df	Mean Sum of Squares	F-ratio	p-value
Between Groups	205.08	2	102.54	14.95	p<0.05
Within Groups (Error)	2614.73	381	6.86		
Total	2819.81	383			

**\*Significant; df = 2 (381), critical F = 3.02**

Table 3 showed that a calculated F-value of 14.95 is greater than the critical F-value of 3.02 given 2 and 381 degrees of freedom at 0.05 level of significance. Consequently, the null hypothesis was disconfirmed. This implies that there is a significant effect of treatment on teachers' knowledge of basic concepts and procedures in test development, construction, and item writing in Senior Secondary Schools in Jigawa state. Further analysis of data to determine the trend of the difference using the Fisher's Protected t-test technique where pair-wise comparison of group means ( $\bar{x}$ ) was done. The result reveals that teachers who received treatment on knowledge of basic concepts and procedures in test construction and development significantly manifested higher knowledge for test construction and development than teachers who

received treatment on item writing only ( $t = 2.89$ ;  $df = 298$ ; Critical  $t = 1.650$ ;  $p < 0.05$ ) or those untrained (Control) group on basic concepts and procedures in test construction and development and item writing ( $t = 2.41$ ;  $df = 248$ ; Critical  $t = 1.652$ ;  $p < 0.05$ ). Also, when teachers who received treatment on knowledge of basic concepts and procedures in test construction and development and item writing were compared with those untrained group only, they exhibited greater competence in knowledge of basic concepts and procedures in test construction and development and item writing ( $t = 2.25$ ;  $df = 398$ ; Critical  $t = 1.649$ ;  $p < 0.05$ ).

**Hypothesis Three:** The third hypothesis stated that there is no significant effect of treatment on teachers' competence on test analysis and interpretation of test scores for effective classroom learning. One-Way Analysis of Variance (ANOVA) statistics was used to analyse the data. The results of the analysis are presented in Table 4.

**Table 4: One -Way Analysis of Variance (ANOVA) on Effect of Treatment on Teachers' Competence on Test Analysis and Interpretation of Test Scores for Effective Classroom Learning**

Sources of Variation	Sum of Squares	Df	Mean Sum of Squares	F-ratio	p-value
Between Groups	201.92	2	100.96	14.32	p<0.05
Within Groups (Error)	2685.56	381	7.05		
Total	2887.48	383			

\*Significant;  $df = 2$  (381), critical  $F = 3.02$

Table 4 indicated that a calculated F-value of 14.32 is greater than the critical F-value of 3.02 given 2 and 381 degrees of freedom at 0.05 level of significance. Consequently, the null hypothesis was disconfirmed. This implies that there is a significant effect of treatment on teachers' competence on test analysis and interpretation of test scores for effective classroom learning. Further analysis of data to determine the trend of the difference using the Fisher's Protected t-test technique where pair-wise comparison of group means ( $\bar{x}$ ) was done. The result reveals that teachers who received treatment on test analysis and interpretation of test scores for effective classroom learning significantly manifested higher competence on test analysis and interpretation of test scores for effective classroom learning than teachers who received treatment on item writing only ( $t = 3.72$ ;  $df = 298$ ; Critical  $t = 1.650$ ;  $p < 0.05$ ) or those untrained (Control) group on test analysis and interpretation of test scores for effective classroom learning ( $t = 2.63$ ;  $df = 248$ ; Critical  $t = 1.652$ ;  $p < 0.05$ ). Also, when teachers who received treatment on test analysis and interpretation of test scores for effective classroom learning were compared with those untrained group only, they exhibited greater competence on test analysis and interpretation of test scores for effective classroom learning ( $t = 2.87$ ;  $df = 398$ ; Critical  $t = 1.649$ ;  $p < 0.05$ ).

### Discussion of Findings

The main objective of this study was to investigate test development, construction, and item writing competencies of teachers in Senior Secondary Schools in Jigawa state. Hence, the first hypothesis which had speculated that there is no significant effect of treatment on teachers' test development, construction, and item writing competence in Senior Secondary Schools in Jigawa state was disconfirmed on the basis of the findings of this study. The implication of this result there existed a significant effect of treatment on teachers' test development, construction, and item writing competence in Senior Secondary Schools in Jigawa state.

This finding agrees with those of Ali and Ibrahim (2022), Amani et al. (2021), and Quansah et al. (2019), who discovered in their separate findings that teachers lack competence in content representativeness, relevance of the test, reliability, and fairness of the assessment tasks as evaluated. Specifically, Amani et

al. (2021) reported a significant relationship between secondary school teachers' competences, awareness of skills and procedures for constructing quality classroom tests in Tanzania. He added that the majority of the teachers lacked competences for preparing quality classroom tests, particularly on the use of Table of Specifications and test-item analysis. They found a significant relationship between secondary school teachers' competences, awareness of skills and procedures for constructing quality classroom tests in Tanzania. Further, the finding is in confirmed the findings of Hamafyelto et al. (2015), which reported a significant relationship between competence of commerce teachers' test construction in public and privately-owned Senior Secondary Schools in Borno State, Nigeria. There were significant relationships between teachers of commerce competence and content validity, the areas of teachers' competence in constructing examination questions were low.

The second hypothesis did postulate that there is no significant effect of treatment on teachers' knowledge of basic concepts and procedures in test development, construction, and item writing in Senior Secondary Schools in Jigawa state. As a result of the calculated F-value of 14.95 which is greater than the critical F-value of 3.02 given 2 and 381 degrees of freedom at 0.05 level of significance, the null hypothesis was disconfirmed. This implies that there is a significant effect of treatment on teachers' knowledge of basic concepts and procedures in test development, construction, and item writing in Senior Secondary Schools in Jigawa state. This finding is in consonant with Ali and Ibrahim (2022), which had alluded to a significant effect of treatment on subject and vocational teachers' knowledge of basic test development and construction skills in Junior Secondary Schools in Jigawa state. In fact, Ali and Ibrahim reported that subject teachers gained more as they were more affected statistically significantly higher in their knowledge of basic test development and construction skills than the vocational teachers in Junior Secondary Schools in Jigawa state. This finding supports earlier study by Ibrahim (2018) who found a significant effect of the treatment on the teachers' skills in evaluation techniques of cognitive, affective and psychomotor domains of learning in public schools. Likewise, Kazuko (2010) revealed that participant-teachers possessed mathematical knowledge skill in written mathematical modeling tests.

The hypothesis three which speculated that there is no significant effect of treatment on teachers' competence on test analysis and interpretation of test scores for effective classroom learning was disconfirmed. The implication of this result is that there is a significant effect of treatment on teachers' competence on test analysis and interpretation of test scores for effective classroom learning. This finding supports earlier study by Ali and Ibrahim (2022), who reported that there was a significant effect of treatment on subject and vocational teachers' skills in item and test analysis in Junior Secondary Schools in Jigawa state. Further, they revealed that subject teachers gained more as they were more affected statistically significantly higher in their skills in item and test analysis than the vocational teachers in Junior Secondary Schools in Jigawa state. Every classroom teacher is expected to possess and apply requisite skills in construction of good items for class assessments. A good test item must be both valid and reliable. A test is valid if it is suitable for the intended purpose. On the other hand, a test is reliable if it measures what it is supposed to measure consistently under all conditions (Ibrahim, 2016). Teachers today, perhaps more than ever before, have a need to be knowledgeable consumers of test information, constructors of assessments and protocols, and even teachers about testing (Rudner & Schafer, 2012).

### **Conclusion**

On the basis of the findings for this study, it is concluded that there was a significant effect of treatment on teachers' test development, construction, and item writing competence in Senior Secondary Schools in Jigawa state. Also, there existed a significant effect of treatment on teachers' knowledge of basic concepts and procedures in test development, construction, and item writing in Senior Secondary Schools in Jigawa state. It is also concluded that a significant effect of treatment on teachers' competence on test analysis and interpretation of test scores for effective classroom learning existed. In fact, teachers who received treatment on test analysis and interpretation of test scores for effective classroom learning significantly exhibited higher competence on test analysis and interpretation of test scores for effective

classroom learning than teachers who received treatment on item writing only or those untrained (Control) group on test analysis and interpretation of test scores for effective classroom learning.

### Recommendations

Based on the findings of this study, the following recommendations were made:

1. Teachers need to possess the relevant test construction and development skills to be able to deliver quality assessment of students in their various subjects' area of specializations.
2. Teachers should make the assessment as the main professional key, and take this as part of a blueprint in teaching and learning.
3. There is an urgent need to strengthening teacher education in view of competence-based test and item writing skills enhancement amongst secondary school teachers.
4. The school administrators and the Ministry of Education should emphasize regular in-service teacher professional development in the area of assessment and evaluation for all teachers in secondary schools in the country.

### Acknowledgements

The is paper was originally prepared as Institution Based Research (IBR) for the Tertiary Education Trust Fund (TETFund), which was recommended by the Chairman, University Research Committee (URC) to TETFund and approved by the Commission. The authors are grateful to the Chairman, URC, Professor Lawal Sani Taura, who is the Vice Chancellor, Sule Lamido University Kafin Hausa, Jigawa State, Nigeria. Also, we are grateful to TETFund for making available the Research Grant as soon as the Proposal was submitted. We also thank Jigawa State Ministry of Education, Science and Technology (MOEST), teachers, and other education staff of the Ministry for their useful comments especially on the earlier version of our work. Any errors in this study are entirely ours!

### References

- Adediwura, A. A. (2012). Development of standardized achievement tests. In E.R.I. & O.O. Dibu-Ojerinde (Eds.), *Educational test & measurement* (191-210). Obafemi Awolowo University Press.
- Afolabi, E.R.I. (2012). Test score contaminants. In E.R.I. & O.O. Dibu-Ojerinde (Eds.), *Educational test & measurement* (pp. 172-191). Obafemi Awolowo University Press.
- Ali, A.A. (2019). *Basic research skills in education*. Orient Printing and Publishing.
- Ali, A. T. & Ibrahim, A. (2022). Enhancing test development and item writing skills of subject and vocational teachers in government-owned junior secondary schools in Jigawa state, Nigeria. *Journal of Teaching and Teacher Education*, 11(1), 1-12.
- Amani, J., Kitta, S., Kapinga, O.S., & Mbiliny, C. (2021). Secondary school teachers' knowledge on procedures for constructing quality classroom tests in Tanzania. *Universitepark Bulten*, 10(1): 40-54. www.unibulletin.com
- Amedahe, F. K., (2019). *Testing practices in secondary schools in the Central Region of Ghana*. Unpublished Master's thesis, University of Cape Coast, Cape Coast.
- Campbell, D., & Stanley, J. (1963). Experimental and quasi-experimental designs for research. In N. L. Gage (Eds.), *Handbook of research on teaching* (pp. 1-76). Rand McNally.
- Cohen, L., Manion, L., & Morrison, K. (2018). *Research Methods in Education*. Routledge.
- Crooker, L., & Algina, J. (2018). Introduction to classical and modern test theory. Ohio: Cengage Learning Press.
- Ebinye, P.O. (2011). Problems of testing under the continuous assessment programme. *Journal of Qualitative Education*, 4(1), 12-19.
- Esomonu, N.P. (2012). Assessment of non-cognitive behaviours in secondary schools for national development. In R. C. Ebenebe & L.R. Akudolu (Eds.). *Education for national development and integration* (pp. 83-93). John Best Publishing.

- Faleye, B. A. (2012). Uses of tests. In E.R.I. & O.O. Dibu-Ojerinde (Eds.), *Educational test & measurement* (pp. 21-30). Obafemi Awolowo University Press.
- Hamafyelto, R.S., Hamman-Tukur, A., & Hamafyelto, S.S (2015). Assessing teacher competence in test construction and content validity of teacher made examination questions in commerce in Borno State, Nigeria. *Education*, 5(5), 123-128. DOI: 10.5923/j.edu.20150505.01
- Ibrahim, A. (2022). Education quality assurance in the new normal era: A perspective on the implementation of technology-enhanced-assessments in Nigerian universities. In O. Olukolade & A. Oni (Eds.), *Book of reading* (pp.121-134). Higher Education Research and Policy Network (HERPNET). [www.herpnet.org.ng](http://www.herpnet.org.ng).
- Ibrahim, A. (2018). Improving assessment and evaluation skills of public-school teachers in Jigawa State, Nigeria. *Journal of Education and Practice*, 9(11), 22-32. [www.iiste.org](http://www.iiste.org)
- Ibrahim, A. (2016). Measuring differential frequency of option response patterns in four-five options multiple-choice test item among undergraduate students in Nigeria. *IOSR Journal of Research & Method in Education (IOSR-JRME)*, 6(2), 42-48.
- Kazuko, W. (2018). Assessing teachers' testing skills in Elt and enhancing their professional development through distance learning on the net. *Turkish Online Journal of Distance Education*, 5(1), 113-125.
- Leighton, J. P., & Gokiert, R. J. (2015). *The cognitive effect of test item features*. <http://www.education.ualberta.ca/educ/psych/crame/files/NCMEfinal>
- Ololube, N.P. (2018). Evaluation competencies of professional and non-professional teachers in Nigeria. *Studies in Educational Evaluation*, 34(1), 44-51.
- Onyechere, I. (2018). New face of examination malpractice among Nigerian youths. *The Guardian Newspaper* online. [www.theguardiannigeria](http://www.theguardiannigeria)
- Paulson, T.U. (2013). *The study of teaching*. Holt, Rinehart and Winston Inc.
- Quansah, F., Amoako, I., & Ankomah, F. (2019). Teachers' test construction skills in senior high schools in Ghana: Document Analysis. *International Journal of Assessment Tools in Education*, 6(1), 1-8.
- Rudner, L.M., & Schafer, W.D. (2002). *What teachers need to know about assessment?* National Education Association.
- Sidhu, K.S. (2012). *New approaches to measurement and evaluation*. Sterling Publishers Private Limited.
- Silker, R.T. (2003). *Teachers and tests*. Basil Blackwell.
- Tamakloe, E. K., & Amedahe, F. K. (2019). Principles and methods of teaching. Black Mask
- Ujah, E.U. (2020). *Development and validation of an introductory technology achievement test*. Unpublished M.Ed. Thesis, University of Nigeria, Nsukka.