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AN ASSESSMENT OF SCIENCE TEACHERS' UTILIZATION OF THE KNOWLEDGE OF TEST CONSTRUCTION PROCEDURE IN MULTIPLE CHOICE OBJECTIVE TESTS IN SECONDARY SCHOOLS IN YALA LGA, CROSS RIVER STATE

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ABSTRACT: *The aim of this study was to assess the extent of utilization of the knowledge of test construction procedure in setting Multiple Choice Objective Tests by science teachers in secondary schools in Yala Local Government Area of Cross River State. To achieve this, the descriptive survey research design was used in which a purposeful sample of 87 Chemistry teachers was selected from amongst the 213 science teachers in the area. The instrument used for the study was a well validated and fixed response questionnaire designed by the researchers tagged Test Construction and Utilization Procedure Questionnaire (TCUPQ) having a total of forty items designed on a four point interval scale with a Cronbach alpha co-efficient of 0.82. Data obtained from the subjects were analysed using the means and standard deviations. The results showed that science teachers studied utilize their knowledge of test construction procedures effectively in setting objective tests; however, they do not subject the students to pre-test before the main test is carried out. It was recommended amongst others that science teachers be sponsored to attend assessment practice workshops and also be encouraged to give pre-tests before the main test in schools.*

KEYWORDS: test, utilization, construction, procedure, assessment.

INTRODUCTION

Nigeria is a developing country. Aer, Ador and Opie (2018) stated that the under development of Nigeria did not stem only from the mental and economic colonization by the west but also as a result of poor patronage and ineffective STM education. Lip services paid to STM education in Nigeria does not translate to reality in progress in Science and Technology. More money is budgeted for STM education than the actual implementation. Emphasis is laid on STM education but in reality what happens not up to expectations.

The essence of STM education is to share scientific ideas and methods, technological skills and attitudes with people not considered as part of the STM community. The aim is to increase scientific ideals such as critical thinking and evaluation; develop scientific skills, attitudes and innovative ideas to solve society's problems. This can only be achieved with science teachers' having the capability and competence to deliver the requisite science

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curriculum and the students' readiness to develop the much needed scientific and technological attitude to receive such instructions.

Teachers' capability and competence in classroom instructions are in diverse ways. There is the competence in classroom management, competence in instructional delivery, competence in assessment and evaluation and so on. In science, characterized by systematicity and objectivity, teachers' competence is highly needed for effective teaching, transmission and assessment of scientific ideas. However, one critical area that is often ignored is teachers' competence in assessment of students' learning. The only way the teacher can be sure that learning has taken place is through assessment and evaluation.

A faulty assessment gives rise to a faulty impression of the learned outcomes. This is quite dangerous as classroom decisions are, most times, based on assessment outcomes. Not every assessment instrument qualifies to elicit the need data for assessment of learned behaviours. That is, not every assessment instrument is a valid instrument to be dependent on and not every graduate or teacher has the requisite skills and competence to design and use assessment instrument to obtain the desired learned experience. The knowledge and utilization of assessment instruments are keys to competence in assessment.

Studies have shown that the competence of teachers, especially in assessment, affect the quality of the test constructed (Darling-Hammond in Inko-Tariah & Okon, 2019, Chan in Inko-Tariah & Okon, 2019). Marso Figge in Amoako and Ankomah (2019) showed that all stakeholders in the school system needed quality training in skills in test construction in order to prepare valid assessment instrument. Graduating from higher schools does not qualify for competence in assessment skills. Being a classroom teacher and conducting assessments does not generate the skills needed for constructing valid assessment tools.

In another dimension, Quansa and Amoako (2018) in their study showed that high school teachers demonstrated evidence of high limitations on test construction skills. Elsewhere in Nigeria, Ololube (2008) in his research on the competences of professional teachers in test construction concluded that professionally trained teachers have the likelihood to use different evaluation tools concretely, which may not be true for non-professional teachers. Thus high school teachers, professional and non professional teachers do show some limitations on competences in the construction and usage of test construction procedure.

Furthermore, Magno in Amoako and Ankomah (2019), studying the test construction profile of profession teacher-made test showed that there was no significant difference in the knowledge test construction in relation to the number of years of experience. Thus neither the status nor number of years of experience of a teacher qualities one for knowledge of test construction procedure, but the needed skills in construction. In the same dimension, Eni, Arikpo,Ashang and Opie (2020), in their study of the assessment practices of lecturers in a higher institution in Nigeria, showed that there was a remarkable abuse of show of

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incompetency in test item development among the lecturers. While most of them constructed test items in line with the course objectives and content, however none of them constructed the test across the three domains of learning.

In the circumstance of poor quality science outcomes in Nigeria, the declining performance of students in Sciences, and the near lack-lustre-interest in science subjects and scientific activities, it is expedient to assess the extent to which teachers of science construct and utilize the very instrument that helps them obtain feedback in their quest to impact on the students and improve on the quality of science in Nigeria. One of the commonest means of assessing learning is through testing. The test, as an instrument must be valid and reliable so as to report exactly about the learner. Often times, the process of construction and ascertaining the psychometric properties of the test instruments are ignored by teachers thus making the test instrument not really dependable and valid for usage, yet most decisions by teachers in the system are based on the test. The most commonly constructed, used and sometimes abused by classroom teachers, among the test types, is the Multiple Objective Choice Test (MCOT). MCOT is classified as a teacher-made test.

Since the ability to assess students is demanded by the teachers, one would expect teachers to acquire appropriate skills in test construction especially in MCOT, which is commonly used. Izard (2005) observed that most teacher-made tests could only assess the lower level process in the Bloom's taxonomy of educational objectives. To guide teachers on test construction procedure, Joshua (2005) itemized the following steps as the test instruction procedure (i) specifying the purpose of the test (ii) developing a test blueprint (iii) developing test items (iv) selection of items (v) preparing test instructions (vi) assembling the test (vii) administering the test (viii) preparing marking scheme (ix) scoring the test (x) interpreting the test results (xi) appraising the test items (item analysis) (xii) revising the test items based on results of item analysis.

The relevance of teachers following this procedure to set valid tests cannot be overemphasized. The outcome of any valid test reflects the traits or learned experiences acquired in the learning environment. Its however intriguing that after series of tests in the school system some students are still found performing poorly in the expected learning outcomes. Eni, et al (2020) acknowledged that students who failed in classroom assessment sometimes do so not because they are dull but sometimes because of teachers' incompetence in test item development. A faulty test instrument developed by teachers produces a faulty report of the status of knowledge of the students.

The knowledge and utilization of test construction procedure is another dimension that could be explored to evaluate the teachers on what is happening in the school system. Such dimension of evaluation seems to be relatively new in measures of competence and as it affects science teachers in Nigeria. This study therefore is aimed at assessing science teachers' knowledge and utilization of test construction procedure in secondary schools in

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Yala Local Government Area. The focus of the study is science teachers in public and private secondary schools in Yala LGA, Cross River State.

Objective of the study
The aim of this study is to assess the extent of utilization of the knowledge of test construction procedure by science teachers in Multiple Choice Objective Test (MCOT) in Yala Local Government Area, Cross River State.

Objective of the Study: Specially, the study intends to:
Examine the extent to which science teachers utilize the knowledge of test construction procedure in MCOT in meeting the needs of classroom assessment.

Research Question:
To what extent do science (chemistry) teachers utilize their knowledge of test construction procedure?

METHODOLOGY

Design
The design used in this study is the descriptive survey inferential research design

Area of the study
The area of the study is Yala Local Government Area. The study area is located at latitude 6.50'N and longitude 8.25^0E, occupying 878sq.mls in the Northern part of Cross River State Nigeria. It is in the Guinea savannah, bounded by Benue State to the North, Obubra LGA of Cross River to the South, Ebonyi State to the west and Ogoja and Bekwarra LGAs, Cross River to the East. It has a population of approximately four hundred thousand inhabitants with the natives speaking the Yala, Yache and Ukelle languages. The people are predominantly farmers with yams, cassava, rice and salt mining as their major occupations. They are many primary, secondary and tertiary institutions in Yala with some dating back to the colonial eras. They have rich culture among which is the popular New Yam festival always holding on the 30^{th} of August every year.

Population of the study
The population of this study is 213 science teachers in Yala LGA, CRS. Specifically, the target population is made up of 87 Chemistry teachers in 87 public and private schools in Yala LGA.

Sample and sampling technique
The sample size for this study was made up of 87 Chemistry teachers purposefully selected from all the public and private schools that offer Sciences in the study area.

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Instrumentation
The instrument used for the study was the fixed response questionnaire designed by the researchers tagged Test Construction and Utilization Procedure Questionnaire (TCUPQ) having a total of forty items designed on a four point interval scale and with a Cronbach alpha co-efficient of 0.82.

Method of administration of instrument
The researchers personally visited the schools during the first term of the 2019/2020 academic session (November, 2020) and administered the instrument on the Chemistry teacher of each school. Where, there were more than one Chemistry teacher, priority was given to the most senior teacher to respond to the questionnaire items. Thereafter the instrument was retrieved. It took a total of two weeks to achieve the administration of the instrument.

Coding and data analysis
Items analysis was adopted as the analytical approach using means and standard deviations. Since the responses were on a four point scale, Strongly Agree was assigned 4 points, Agree was 3 points, Disagree was 2 points and Strongly Disagree was 1 point. The mean response and the associated standard deviations were used. The critical point of 2.50 points, the mean of a four point scale, was used for decision making.

FINDINGS

Research Question 1: To what extent do science teachers utilize the knowledge of test construction? To answer this research question, the science teachers' utilization of knowledge of test construction will be understood in four (4) contexts;

a. developing test specifications;
b. selecting appropriate item types;
c. preparing relevant test items and;
d. assembling the test.

The means and standard deviations were used for item analysis. Table provides the general descriptive for items in the instrument while Tables 2-5, provide the dimensions of these analyses.

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Table 1: Summary of means and standard deviations of respondents of Science teachers' utilization of the knowledge of test construction

S/N	ITEM	MEAN	SD	DECISION
1	State the purpose of the test	3.10	1.03	Agree
2	Write content framework	3.20	1.04	Agree
3	Write testing time available and the needs for breaks.	3.12	0.96	Agree
4	Outline number of items per content area	3.01	1.03	Agree
5	Give item format appropriate for the purpose of the test	2.99	1.14	Agree
6	Write items for the test	3.17	1.04	Agree
7	Preliminary administration of the test	1.60	0.74	Disagree
8	Checking the reliability of the final test	3.10	1.02	Agree
9	Checking the validity of the final test	3.13	0.99	Agree
10	Preparation of the test manual and reproduction of the test	3.18	0.95	Agree
11	Arrange items in order of difficulty, so that test takers begin with relatively easy items to that of increasing difficulty.	3.02	1.03	Agree
12	Prepare items to measure correctly the differences among test-takers.	3.13	0.97	Agree
13	Revise items based on item indicators.	3.10	1.05	Agree
14	Estimate test item parameters	3.23	0.98	Agree
15	Select good items with high discriminatory abilities.	3.10	1.01	Agree
16	Outline formats for marking criteria.	3.02	1.01	Agree
17	Give criteria to assess task.	3.13	0.96	Agree
18	Give performance standards for each criterion.	3.10	1.1	Agree
19	Assign grades/marks to items.	3.11	1.06	Agree
20	Reflect/review marks allotted to items.	3.11	1.06	Agree

a. Developing test specification: A total of five (5) items (1-5) of part B on the instrument were used to elicit data for measuring science teachers' utilization of knowledge of developing test specifications. The result of the data analysis from the eighty seven (87) respondents in the study is presented on Table 2.

Table 2: Mean and standard deviations of science teachers' utilization of knowledge of developing test specifications

S/N	ITEM	MEAN	SD	DECISION
1	State the purpose of the test	3.10	1.03	Agree
2	Write content framework	3.20	1.04	Agree
3	Write testing time available and the needs for breaks.	3.12	0.96	Agree
4	Outline number of items per content area	3.01	1.03	Agree
5	Give item format appropriate for the purpose of the test	2.99	1.14	Agree
Grand Total		**3.08**	**1.04**	**Agree**

From table 2, science teachers in the study showed that they outline the content covered for the item before setting test form them (Mean = 3.10; SD = 1.03); they prepare a test blueprint as a guide in the test construction (Mean = 3.20; SD = 1.04); they consult previous tests and adapt questions from them (Mean = 3.12; SD = 0.96); they consult standard textbooks in the

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subject for guide (Mean = 3.01: SD = 1.03); they organize test items in a logical manner (Mean = 2.99; SD = 1.14).In summary, science teachers in the study showed that they utilize the knowledge of developing test specifications (Mean = 3.08; SD = 1.04).

b. Selecting appropriate item types: Five (5) items (6-10), also, on the instrument were used to obtain data for measuring science teachers' utilization of knowledge of selecting appropriate item types. The result of the data analysis from the eighty seven (87) respondents in the study is presented on table 3.

Table 3: **Means and standard deviations of science teachers' utilization of knowledge selecting appropriate** item types

S/N	ITEM	MEAN	SD	DECISION
6	Write items for the test	3.17	1.04	Agree
7	Preliminary administration of the test	1.60	0.74	Disagree
8	Checking the reliability of the final test	3.10	1.02	Agree
9	Checking the validity of the final test	3.13	0.99	Agree
10	Preparation of the test manual and reproduction of the test	3.18	0.95	Agree
Grand Total		**2.84**	**0.95**	**Agree**

From table 3, science teachers in the study showed that they give clear instructions to guide the test takers (Mean = 3.17; SD = 1.04); conversely, they do not administer preliminary or mock examination to testees before the real examination (Mean = 3.10; SD = 0.74). Again, they subject test items to item analysis (Mean = 3.10; SD = 1.02) and they keep a resource bank of questions that can be referred to when setting tests (Mean = 3.13; SD = 0.99); in addition, they set test with due regards to the time available for testing (Mean = 3.18; SD = 0.95). As a final point, science teachers in the study agreed that they utilize selecting appropriate item types (Mean 3.14; SD = 0.95).

b. Preparing relevant test items: A total of five (5) items (11-15) on the instrument were employed to obtain data for measuring science teachers' utilization of preparing relevant test items. The result of the data analysis from the eighty seven (87) respondents in the study is presented on Table 4.

Table 4: **Means and standard deviations of science teachers' utilization of knowledge preparing** relevant test items

S/N	ITEM	MEAN	SD	DECISION
11	Arrange items in order of difficulty, so that test takers begin with relatively easy items to that of increasing difficulty.	3.02	1.03	Agree
12	Prepare items to measure correctly the differences among test-takers.	3.13	0.97	Agree
13	Revise items based on item indicators.	3.10	1.05	Agree
14	Estimate test item parameters	3.23	0.98	Agree
15	Select good items with high discriminatory abilities.	3.10	1.01	Agree
GRAND TOTAL		**2.72**	**1.01**	**Agree**

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From Table 4, science teachers in the study showed that they add enough test items to cover all the requisite levels of cognitive domain (Mean = 3.02; SD = 1.03); they ascribe scores for each test item (Mean = 3.13; SD = 0.97); they ensure that the items are measuring the determined objectives (Mean = 3.10; SD = 1.05); they prepare marking guide while constructing the test (Mean = 3.23; SD = 0.98) and; they consider the age of learners during item writing (Mean = 3.10; SD = 1.01). In all, science teachers in the study agree that they utilize preparing relevant test items (Mean = 2.72; SD = 1.01).

b. Assembling the test: A collection of five (5) items (16-20) on the instrument were used to elicit data for measuring science teachers' utilization of assembling the test. The result of the data analysis from the eighty seven (87) respondents in the study is presented in table 5.

Table 5: Means and standard deviations of science teachers' utilization of knowledge of assembling the test

S/N	ITEM	MEAN	SD	DECISION
16	Outline formats for marking criteria.	3.02	1.01	Agree
17	Give criteria to assess task.	3.13	0.96	Agree
18	Give performance standards for each criterion.	3.10	1.10	Agree
19	Assign grades/marks to items.	2.92	1.13	Agree
20	Reflect/review marks allotted to items.	3.11	1.06	Agree
Grand Total		**3.10**	**1.05**	**Agree**

From table 5, science teachers in the study showed that they avoid gender stereotypes in the test items (Mean = 3.02; SD = 1.01); they add sufficient items to cover the appropriate instructional units (Mean = 3.13; SD = 0.96); they submit items for vetting to the head of department of any equally competent teacher (Mean = 3.10; SD = 1.1); they submit test meant for promotional examination for expert editing on time (Mean = 2.92; SD = 1.13); they avoid the use of clues in multiple choice questions (Mean = 3.11; SD = 1.06). Ultimately, science teachers in the study agree that they utilize their knowledge of assembling test items (Mean = 3.10; SD = 1.05).

DISCUSSIONS

The findings of this study showed that Science teachers in Yala Local Government Area of Cross River State utilize their knowledge of test construction procedure. They studied teachers utilize the knowledge of test construction procedure to a large extent, except that they do not administer preliminary tests. This is a good development for the teaching and learning of sciences in the area. Science, being a specialized, critical, objective and rigorous body of discipline requires teachers who are not only experts or professionals in their field but those with adequate knowledge of test construction and utilization procedure in order to understand the learners and carry them along in the teaching and learning environment. McMillian (2001), had stated that when teachers engage in assessment practices, it helps

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them to evaluate students' learning needs. It's true that teaching has not taken place if the learners have not learnt and the only way to acknowledge that learning has taking place is through assessment. Hence science teachers studied are on course on what is expected of them. However, students or test takers in schools who are not always subjected to pre-test will not be prepared to face the real examination as they lack practice. It is now pertinent to call on educational agencies/policymakers to fix a scheme that will enforce preliminary test, in order that science students and test takers are able to face the real examinations without anxiety.

Recommendations

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

1. Retraining programmes/workshops or in-house services by test experts on utilization of test construction procedures should be organized for science teachers in Yala Local Government Area.
2. Sponsorship of science teachers to attend assessment practice workshops should be encouraged.
3. Teachers should be encouraged to give pre-tests before the main test in schools in Yala LGA.

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