Innovations

Assessment of Test Development Skills of Secondary School Physics Teachers in Delta Central Senatorial District

Igabari, Queen (Ph.D) and Okagbare Freedom.

Department of Guidance and Counselling, Faculty of Education, Delta State University, Abraka, Nigeria

Corresponding Author: **Igabari, Queen (Ph.D)**

Abstract

This study assessed the test development skills of Secondary Schools Physics teachers in Delta Central Senatorial District. Three research questions answered. Descriptive survey research design was adopted for the study. The sample of this study consists of 57 teachers which constitutes 10% of the entire population. Data was collected with a structured interview guide designed by the researcher. A reliability coefficient of 0.89 was obtained for the items on the interview guide. The researcher personally visited the various sampled secondary schools and interviewed the selected Physics teachers using the structured interview guide designed for the study. Teacher responses were recorded in line with respond format in the interview guide. Quantitative data collected was subjected to data analysis procedure and the research questions were answered using mean and standard deviation. The major findings of the study included; planning skills, items writing skills, item analysis, items composition skills, validity and reliability skills, marking and scoring skills, printing and administration skill are the skills. They are the skills possessed by secondary school physics teachers in development of test items in Delta Central Senatorial District. They also possess item writing skills to large extent and item analysis skills to great extent. Based on the findings of this study it was recommended among others that Seminars on test development skills and procedures should be encouraged in secondary school to further enhance the incorporation of innovation in test development.

Introduction

Education is regarded as the key to success in an individual and national development, as a result, it is given special attention by the society, politicians and other stakeholders in their attempt to promote societal norms, national philosophy, and vision. It is because of the essential role accredited to education that a substantial portion of the national resource is allocated for it. In many school systems around the world, testing is the preferred means of evaluation. Tests are quantitative measures of student performance and some can be used to compare students to other students and measure improvement over time. There are generally two types of tests used to evaluate the teaching and learning process in Nigeria education system (Osadebe, 2018): standardized tests (prepared by publishing companies, formal testing agencies, and universities), and teacher-made tests (prepared by the teacher within a school system).

According to Osadebe 2018 standardized tests are tests that are set and pre-tested with a group of the same level as the one that will take the tests and they come to the teacher ready-made. The tests have explicit instruction for uniform administration and they are written at the same time across the country. The teacher-made test is important because it enable administrators, parents, and community leaders know what is happening and how prepared students are for external examination. Kinyua and

Okunya (2014) stated that teacher-made tests are expected to prepare students for better academic performance in standardized test usually conducted by various examination bodies such as West African Examinations Council (WAEC), the National Examination Council (NECO) among others. In contexts where students take a standardized test such as national examinations for entry into tertiary learning institutions, the more effective the teacher made test becomes.

This means that the effectiveness of a teacher-made test can largely predict the outcome of the standardized test (Kinyua&Okunya, 2014). Unfortunately, studies and reviews on the impact of teachers made tests on students' performance in the standardized test have not been very positive. This may be as a result of not apply the needed testing skills in test development by classroom teachers.The development of valid and reliable tests demands a special knowledge and attention (test development skills). When a teacher put items together to form or develop a test, it is said to be a teacher made test and it is poorly prepared according to measurement experts. But when an expert develops a valid and reliable test, it is called a standardized test. Osadebe (2014) however noted that a teacher can develop a test if well guided because the problem among teachers in developing test item is a major issue in the global trend of education that requires special urgent attention. However, teachers should consult an expert in test development before using a test (Osadebe, 2012). Thus, non-standardized and standardized tests could be produced by experts because the development and standardization of test are special areas for those who have the background (Osadebe, 2018).

Teacher-made-test, which is part of student evaluation process, required in-depth knowledge and necessary skills in order to efficiently plan and develops good classroom tests. Good tests does not just exist, they are created to exist (Joshua, 2015). They are usually developed using some stipulated skills. A good testing involves writing appropriate test items, good test instructions and good skill in putting the item together in different ways to achieve the expected format and purpose (Joshua, 2015). The test skills that should be possessed by teachers when developing classroom tests or standardized tests are as follows according to Osadebe (2013), to includes; planning, item writing, item analysis, composition of item, reliability, printing and administration, marking, scoring and test manual.

The systematic planning of the test requires identifying the instructional and behavioral objectives to be measured, identifying the content areas for the study, deciding on the test format and table of specification which help to establish high content validity (Osadebe, 2014). The test blue-print or table of specification is a two –way grid table that shows the relationship between the cognitive levels and the topics (contents) of instruction which is fundamental in test item construction. It helps the teacher align objectives, instruction and assessment in test item writing, the number of items to be written should guided by the table of specification. The table of specifications is a vertically and horizontally drawn to determine the content areas and behavioral objectives for item writings. The items that survived the item analysis were selected.

Ede, Agah, Okeke and Onisoman (2021) believes that test item writing construction is the development of items which ensure that examination appropriately measures the skills, knowledge, and ability of the test takers.After knowing the item to develop using the table of specification the items are subjected to Item analysis. Hamafyelto, Hamman-Tukur and Hamafyelto (2015) revealed in their studies that Item analysis skill is one of the important skills for quality classroom-based test construction. According to Edjere (2021), item analysis skill helps to determine the difficulty level, discriminatory index and check guessing in an item.

The composition of test is in line with Osadebe (2012), recommended that an Achievement Test may be composed in ascending order (preparing items or questions according to how the topics were taught), descending (setting questions starting from the last topic), and randomization (randomly selecting questions from the pool of items). It is advisable to use order of ascending because the researcher considered achievement in order of teaching and learning. As soon as a test is valid, reliable and composed into the required number of questions, the next stage is printing. The complete test is printed

for use. This will be accompanied by the test manual that guides the users of the test. At this stage the test is keep in a safe place for use. In spite of the importance test development plays in developing a good test Ikoro (2016) noted that secondary school teachers lack these skills. Most classroom teachers spend relatively little time in developing essay or short-answer test for assessing learning outcome in secondary schools.

The need for teachers to construct good test in assessing their students have been underscored in literature (Hamafyelto, 2015). According to Quansah Amoaka (2018), in a study of attitude of senior high school (SHS) teachers towards test construction revealed that teachers have negative attitude towards test construction. This may have contributed to the poor construction of questions among them as indicated especially in Physics. (Akpokiniovo, 2022). It is likely that teachers have the knowledge about test construction but their attitude prevents them from utilizing the knowledge. Quansah and Amoaka (2018) opined that most Ghanaian teachers had limited skills for test construction. In another study carried out by Buabeng, Atingane and Amoaka (2019) observed that another reason why teachers find it difficult to construct test is the fact that teachers are going through many challenges when developing tests for classroom. Test development is seen as a rigorous task if teachers are to do it effectively

Lack of test development skills by teachers might result in a false assessment of students' performance. Ede et al (2021) carried out an empirical study on effective behavioral active engagement training on test item construction skills among primary school teachers in Nigeria and concluded that experiment is efficacious in the improvement of test item construction skills among teachers in Nigeria. This implies that teachers who are expose to the experiment performed better in test item construction. It may be either that the teachers' pre-service training did not prepare them adequately for test development due to little emphasis on assessment during their professional development (Stiggins in Joshua, 2015) or that most of the teachers failed to acquire test development skills needed for quality test item generations while in training. Frank, Isaac and Francis (2019) reviewed a study on teachers' test construction skills of senior high schools in the cape coast metropolis. From the findings of the study, the result revealed that the teachers have limited skills in test construction of end-of-term examination.

This necessitated the need to assess the test development skills of teachers in secondary schools. Surprisingly, there seems to be a paucity of empirical study in Delta central senatorial district. The problem of this study is set to assess the test development skills of secondary school teachers in Delta central senatorial district of Delta State.

Research Questions

The following research questions will guide the study.
- What are the skills possessed by secondary school physics teachers in Delta Central Senatorial District in development of test items?
- To what extent do physics teachers possess Item writing skills in Delta Central Senatorial District require in development of test items?
- To what extent do physics teachers possess Item analysis skills in Delta Central Senatorial District require in development of test items?

Methods

The design employed descriptive survey research design. This design involved the systematic collection of data from a target population using a structured interview method. The design also allowed the use of interview to generate data for the study.

The population of this study consists of 570 physics teachers in all the Government owned secondary schools in Delta Central Senatorial Districts of Delta State. There are 188 senior secondary schools in Delta central senatorial district at the time of this study (Ministry of Education, Primary and Secondary, Asaba 2020). According to this report, there are 290 male physics teachers and 280 female physics teachers and 100 schools located in the rural area while 88 schools are located in the urban areas.The sample for this study consists of 57 physics teachers which constitutes 10% of the entire population.

Proportionate stratified sampling procedure was employed in selecting the sample for the study. The stratification was based on sex (male and female) and school location (urban and rural) nine (9) schools which constitute 10% of the entire schools in rural area was selected and ten (10) schools which constitute 10% of the entire schools in urban area was selected making a total of 19 schools that were selected.

The validity of the instrument was established by three (3) experts in measurement and evaluation from the department of guidance and counselling. These experts assessed the instruments for appropriateness and suitability of the study. The content and construct validity of the instrument was done using factor analysis. The instrument was administered to 57 secondary school teachers from Delta North Senatorial District and the data obtained was subject to factor analysis. Factor analysis showed that the interview instrument yielded a total Cumulative variance of 79.43 %. On the other hand, the construct validity was estimated with the rotated factor loadings matrix which ranged between .49 and .94.

To test for the reliability of the instrument test retest method was used. Using the test retest method 57 physics teachers were selected from 19 schools in Delta North Senatorial District. The teachers were interviewed and re-interviewed after interval of three weeks. The results of the two separate interviewed were compared with the Pearson Product Moment Correlation Coefficient (PPMCC) and reliability coefficient of 0.89 was obtained for the interview guide. The reliability was carried out to establish the stability of the instrument over time.

The researcher personally visited the various sampled schools and interviewed the physics teachers using the structured interview guide designed for the study. Their response was recorded in line with respond format in the interview guide. Quantitative data collected through the structured interview were subjected to data analysis procedure. Thereafter research questions were answered using descriptive statistic such as mean and standard deviation in Statistical Packages for Social Sciences (SPSS) software version 20. Since the interview response format was based on four-point scale for positive statements. The decision rule was that any statement having a mean score of 2.50 and above stood for skill possessed by the physic teacher while the mean score rating below 2.50 stood for skill lacked by the physics teacher.

Results

Research Question One: what are the skills possessed by secondary school Physics teachers in Delta Central Senatorial District in development of test items?

Table 1: Mean Rating of Responses on the Skills Possessed by Secondary School Physics Teachers in Test Development.

1	Interview Giude	N	Mean ($\overline{X}$)	Std. Deviation	Decision
	A. Planning Skills				
1.	How often do you outline the contents covered for the term before setting test from them?	57	2.70	.89	Skilled
2.	How often do you use the behavioral objectives in your lesson notes in writing test items?	57	2.91	.99	Skilled
3.	How often do you take instructional objectives into consideration in test development?	57	2.82	.87	Skilled
4.	How often do you prepare a table of specification as a guide in test development?	57	2.89	.92	Skilled
5.	How often do you take students abilities into	57	2.65	.88	Skilled

		N	Mean	SD	Remark
	consideration in test development?				
	Grand Mean for Planning Skill ($\overline{X}$)		2.80	0.91	Skilled
B.	**Items Writing Skill**				
6.	Would you say blooms cognitive objectives are necessary in writing test items?	57	2.53	.78	Skilled
7.	How necessary is it to consult standard textbooks in the subject for guide in item writing?	57	2.68	.74	Skilled
8.	Would you say it is necessary to keep resource bank of questions that can be referred to when setting test?	57	2.53	.87	Skilled
9.	Would you say it is necessary to avoid too long questions or phrase in item writing?	57	2.84	.80	Skilled
	Grand Mean for Items Writing Skill ($\overline{X}$)		2.64	0.80	Skilled
C.	**Item Analysis skill**				
10.	How important do you consider item analysis in test item development?	57	2.53	.73	Skilled
11.	How important is the computation of discrimination indices in test development?	57	2.96	.96	Skilled
12.	How would you react to the statement that difficulty index should be established for your test items?	57	2.70	.75	Skilled
	Grand Mean for Item Analysis Skill ($\overline{X}$)		2.73	0.82	
D.	**Validity and Reliability Skills**				
13.	How often do you carry out validity and reliability in test items writing?	57	2.65	.85	Skilled
14.	How often do you submit test items to your colleagues for vetting before producing the final copy?	57	2.86	.71	Skilled
15.	How often do your test yield measures of internal consistency?	57	2.93	.73	Skilled
	Grand Mean for Validity and Reliability Skills ($\overline{X}$)		2.82	0.76	
E.	**Marking and Items Composition Skills**				
16.	Do you need to assemble your test items in such a way that there will be rapport between the testee and the test?	57	2.39	.56	Not Skilled
17.	How well do you consider time availability as a factor during test items writing?	57	2.61	.67	Skilled
18.	How well do you organize test items in a logical manner?	57	2.82	.71	Skilled
	Grand Mean for Marking and Items Composition Skills ($\overline{X}$)		2.61	0.65	
F.	**Marking and Scoring Skills**				
19.	How would you value the knowledge of scoring and marking of test scores?	57	2.70	.78	Skilled
20.	Would you say that you give test scores sincerely during scoring?	57	2.58	.75	Skilled

21.	Do you often prepare a marking guide while developing the test?	57	3.14	.87	Skilled
	Grand Mean for Marking and Scoring Skill ($\overline{X}$)		2.81	0.80	
G.	**Printing and Administration Skills**				
22.	How often do you consider the environment as conducive enough for test takers during administration?	57	3.07	.86	Skilled
23.	Do your test items clear enough to stimulate silence in a test?	57	3.00	.68	Skilled
24.	Do your test items have enough copies to go round the students?	57	2.81	.79	Skilled
	Grand Mean for Printing and Administration Skill ($\overline{X}$)		2.96	0.78	

Bench mark mean: 2.50

Table 1 clearly highlighted the grand mean of the test development skills covered by the study. Printing and administration skills ranked highest among teachers ($\overline{X}$=2.96), followed by item composition skill ($\overline{X}$=2.82); marking and scoring skills ($\overline{X}$=2.81), planning skills ($\overline{X}$=2.80),item analysis skill ($\overline{X}$=2.73); item writing skill ($\overline{X}$=2.64) and validity and reliability skills($\overline{X}$=2.61). Each variable has grand mean greater than the bench mark mean of 2.50. This implies that printing and administration, item composition, marking and scoring, planning, item analysis, item writing and validity and reliability skills are the skills in Delta Central Senatorial District possessed by secondary school physics teachers in development of test items.

Research Question Two: To what extent does physics teachers' possess Item writing skills in Delta Central Senatorial District required for development of test items?

Table 3: Mean Responses on the Extent to which Secondary school physics Teachers Possess Items Writing Skill in Test Development

Interview Statement	N	Mean	Std. Deviation	Decision
1. Teachers' perception on the necessity of blooms cognitive objectives in test item writing	57	2.53	0.78	Skilled
2. Teachers' perception on the necessity of consulting standard textbooks in the subject for guide in item writing	57	2.68	0.74	Skilled
3. Teachers' perception on the necessity of keep resource bank of questions that can be referred to when setting test	57	2.53	0.87	Skilled
4. Teachers' perception on the necessity of avoiding too long questions or phrase in item writing	57	2.84	0.80	Skilled
Grand mean	57	2.64	0.80	

Bench mark mean: 2.50

Table 3 clearly highlight the mean of items writing skill possess by secondary physics teachers in test development skills covered by the study. According to the interview data gather in Table 4.3 physics teachers consider blooms cognitive objectives in test item writing to be necessary($\overline{X}$=2.53), they equally said that it is necessary to consult standard textbooks in the subject for guide in item writing($\overline{X}$=2.68), they also said that it is necessary to keep resource bank of questions that can be referred to when setting

test($\overline{X}$=2.53). The physics teachers further said that it is necessary to avoid too long questions or phrase in item writing($\overline{X}$=2.84).

Generally, the grand means of 2.64 is higher than the bench mark means of 2.50. This therefore implies that physics teachers possess item writing skill in Delta Central Senatorial District required for development of test items to a large extent.

Research Question Three: what extent does physics teachers possess item analysis skill in Delta Central Senatorial District require for development of test items?

Table 4: Mean Responses on the Extent to which Secondary school physics Teachers Possess Item Analysis Skill in Test Development.

S/N .Interview Statement	N	Mean	Std. Deviation	Decision
5. Teacher perception of the important of item analysis in test item development	57	2.53	0.73	Important
6. The important of computing discrimination indices in test development	57	2.96	0.96	Very important
7. Important of establishing difficulty index in test item development	57	2.70	0.75	Very important
Grand mean	57	2.73	0.82	Great extent

Bench Mark Mean: 2.50

Table 4 clearly highlighted the mean of items analysis skill possess by secondary physics teachers in test development skills covered by the study. According to the interview data gather in Table 4.4 the grand means of 2.73 is greater than the bench mark mean of 2.50. Physics Teachers' consider item analysis of test item to be important in test development, they also consider computing discrimination indices to be very important, refine their test items for validity purpose, they equally consider establishing of difficulty index in test item development to be important. This implies that physics teachers possess Item analysis skills in Delta Central Senatorial District require for development of test items to a large extent.

Discussion of Findings

Analysis of data relating to the first research question shows that Planning Skills, Items Writing Skills, Item Analysis, Items Composition Skills, Validity and Reliability Skills, Marking and Scoring Skills and Printing and Administration Skill are the skills possessed by secondary school physics teachers in development of test items in Delta Central Senatorial District. This finding disagrees with that of Quansah, Amoako & Ankomah (2018) who revealed that the teachers have limited skills in the construction of end-of-term examination. This finding is also in disagreement with Ikoro (2016) who noted that secondary school teachers lack these skills stating that most classroom teachers spend relatively little time in developing essay or short-answer test for assessing learning outcome in secondary schools.

Analysis of data relating to the second research question show that physics teachers possess test Item writing skills require for test items development to great extent. This finding agrees with that of Ede, Agah, Okeke and Onisoman (2021) which reveal that test item writing construction is the development of items which ensure that examination appropriately measures the skills, knowledge, and ability of the test takers.

Analysis of data relating to the third research question shows that physics teachers possess Item analysis skills require for test items development to great extent. This finding agrees with that of Hamafyelto, Hamman-Tukur and Hamafyelto (2015) who stated that Item analysis skill is one of the important skills for quality classroom-based test construction.

Conclusion

In line with the findings of this study, it could be concluded that test development skills in terms of planning, items writing, item analysis, items composition, validity and reliability, marking and scoring, and printing and administration skills among physics teachers in Delta Central Senatorial District is high to great extent.

Recommendations

- Experts in test development from Colleges of Education and University should organize workshops where physics teachers will practically demonstrate the level of skills they claim to have.
- Seminars on test development procedures should also be encouraged in secondary schools to enhance the incorporation of new innovation in test development.
- The teaching of the test development during teaching professional training should be increase from current level of two (2) units to four (4) units. This will create room for practice among teachers in training.
- The more qualified physics teachers should provide mentorship for their colleagues who are less qualified field
- There is a greater need for schools to maintain test items banks in physics where teachers with fewer skills in test development can draw for the purpose of teaching.

References

1. Agu, N. N., Onyekuba, C.O &Anyichie, A.C. (2013). Measuring teachers' competencies in constructing classroom-based tests in Nigerian secondary schools: Need for a test construction skill inventory.Educational Research and Reviews8(8), 431-439.
2. Akpokiniovo, S.R. (2022). Effects of self-instruction and guided inquiry teaching strategies on secondary school physics students' achievement' Rivers State University Journal of Education. 25(1), 156-165
3. Buabeng, Atingane, &Amoako, (2021).Practices, challenges and perceived influence of classroom assessment on mathematics. International Journal of Assessment Tools in Education 6(3): 476-486.
4. Ede et al (2021). Effect of cognitive behavioral active engagement training on test item construction skills among primary school teachers in Nigeria: Implication for educational policy makers. Medicine 100: (36), 40-46
5. Edjere, D. O. (2021). Development and validation of achievement test for Delta and Edo Secondary Schools. A thesis submitted to Faculty of Education at Delta State University, Abraka, Nigeria.
6. Hamafyelto,R.S. (2015). Assessment of commerce teachers competence in test construction and test quality among secondary school teachers in Maiduguri metropolis.Unpublished Independent Study, Department of Education, University of Maiduguri
7. 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,
8. Ikoro, I.S. (2016). Performance level of teachers in test development skills: imperative for improving school-based cognitive assessment. International Journal of Advanced Research and publications. 1, 1-16.
9. Joshua, M.T. (2015). Fundamental of tests and measurement in education. University of Calabar; university printing press Calabar.
10. Kinyua, O. &Okunya, L.(2014). Validity and reliability of teacher-made tests: Case study of year 11 physics in Nyahururu District of Kenya. African Educational Research Journal. 2(2), 61-71.

11. Osadebe, P.U. (2013). Teachers' assessment of learning classroom learning outcomes. *Journal of Education and Practice* 5(15), 15-21.

12. Osadebe, P. U. (2014). Construction of Economics Achievement Test for Assessment of Students. *World Journal of Education*, 4 (2), 58-64

13. Osadebe, P. U. (2018). Test items fairness for assessment of male and female students' achievement in economics. *International Journal of Current Advanced Research*, 7(5), 12632-12636.

14. Osadebe, P.U. (2012) Procedures for construction, validation and standardization of test. A Seminar PaperPresented at Delta State University, Abraka.

15. Quansah, F., Ankomah, F., &Amoaka, I. (2018). Teachers Test Construction Skills in Senior High Schools in Ghana: Document Analysis. *International Journal of Assessment Tools in Education*, 6(1),