

## Standardization of Accounting Achievement Test for Senior Secondary Students

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### ABSTRACT

*This study developed and standardized a financial accounting achievement test for assessment of senior secondary school students in Imo State. The study was an instrumentation research. The development followed the classical test theory (CTT) tradition and norming was done through the use of T-distribution. The population of the study comprised 1564 senior school students (SSS) offering Accounting in public secondary schools. The sample for the study was 333 SS3 financial accounting students drawn through multi-stage sampling techniques involving simple random sampling, cluster sampling and non-proportional stratified random sampling techniques. The instrument used for data collection was a 200-items Accounting Achievement Test (AAT), covering all levels of the cognitive domain. The internal consistency of the instrument as determined from Kuder-Richardson formula 20 which yield a coefficient of 0.95. Seven research questions and four hypotheses guided the study. Research questions 1 was answered using Kuder-Richardson formula<sub>20</sub> while research questions 2 and 3 were answered using T-scores. Hypotheses 1 and 2 were tested with Z-test while Analysis of Variance (ANOVA) was used to test hypotheses 3 and 4. The results of the study revealed that the AAT is highly valid and reliable and could be used for assessing senior secondary students. The test characteristics of the developed instrument fall within the acceptable ranges of values. This suggests that the developed test instrument is valid and reliable enough to be used to assess students in senior secondary schools.*

**Keywords:** *Development, standardization, psychometric properties, accounting achievement test*

### INTRODUCTION

Education is the acquisition of knowledge and experience, the aggregate of all the process through which a person develops ability, attitude and other forms of behaviour with positive values in the society. Knowledge is the essence of human life and nothing enhances a man as education. It provides a sound foundation for successful life. By nature, every individual desires to be successful in the domain of his activities. But it has been generally seen that the ratio of being successful has been very low in spite of the fact that people get specific or specialized education and training. The common question is what is the cause of failure of students on large scale in the fields of accounting, commerce etc.? The answer may be that most secondary school teachers lack test construction skills for assessment of students. Osadebe (2014) observed that one of the greatest causes of students' failure in the senior secondary schools is that teachers after assuming to have covered the senior secondary certificate examination (SSCE) syllabus would resort to assessing students with unreliable achievement test. According to the author, most teachers hurriedly copy past questions papers to compose their summative achievement tests. As a result, teachers do not establish the validity and reliability indices for such tests.

The Federal Republic of Nigeria (FRN) (2014: p.17) states that “the broad goal of the secondary school education is to prepare individuals for: useful living within the society and higher education”. To achieve this objective, secondary school education in Nigeria has six years’ duration given in two stages- three years of junior secondary school followed by three years of senior secondary school. The curriculum designed for senior secondary school is broad based, aimed at broadening students’ knowledge and outlook. Subjects covered in senior secondary school are in three groups namely, core subjects, vocational and non-vocational subjects. One of the vocational subjects is financial accounting.

According to Hogget, Edwards and Medlin (2008), accounting is concerned with reporting general- purpose information to users external to an entity in order to help them make sound economic decisions about the entity’s performance and financial position. According to National examination council (NECO) (2004 p. 3), the objectives of studying accounting at senior secondary school are as follows:

- (i) To enable senior secondary school students appreciate the basic rules, functions and principles of accounting.
- (ii) To lay proper foundation for further study of accountancy and allied courses at higher level.
- (iii) to enable the students understand basic accounting principles, practice and their applications to modern business activities.

Accounting is an important subject in school curriculum. It is more closely related to one’s daily life as compared to other subjects. Financially accounting is considered to be essential for all vocational subjects, since financial reports/records are required in all. To achieve the above stated objectives, accounting teachers should as a matter of fact acquire the necessary test construction skills and know the processes of standardizing instruments for the assessment of students’. The West African Examination Council (WAEC) (2002) notes that one of the major constraints in achieving its objectives is the inability of teachers to develop the desired test items necessary for assessing the learners. According to Ubani as cited in Obidegwu (2008), the performance of learners depends to a large extent on the quality of training received by teachers in test construction. Okeke as cited in Obidegwu (2008) stated that, it is very necessary that educators should develop valid and reliable instruments which they use in the assessment of the learners. However, most teachers lack test construction skills and the standardized instruments do not also exist in good numbers for assessing students. Incidentally, Developments of Accounting Achievement Test (AAT), for assessment of students have not been given adequate attention in Nigeria.

Development of AAT is necessary in order to monitor areas of deficiencies of the students, when these areas are identified, appropriate and remedial steps would be taken towards solving their problems. A standardized test is any test that is administered and scored in a consistent manner to ensure legal defensibility ([www.a2zpsychology.com](http://www.a2zpsychology.com)). A standardized test is more valid and reliable than a teacher made test. Teacher made test are not valid and reliable tests for assessing students.

The use of poorly designed Achievement test is a major problem as it affects students’ interest and achievement in a particular subject (Osadebe, 2014). Onunkwo (2002) observes that most examiners find it easier to construct test items in the lower cognitive levels (knowledge and comprehension) than the higher cognitive levels (application, analysis, synthesis and evaluation) and this points to the fact that most of these examiners who are teachers in secondary schools have been constructing test that are not valid.

A non- standardized test is usually flexible in scope and format, with variation in difficulty and significance. Since these tests are usually developed by individual instructors, the format and difficulty of these tests may not be widely adopted by other instructors or institutions. As a result of the limitations of the teacher made tests (non-standardized test) such as lack of uniformity in scoring, unreliability of the tests, invalidity and problem of interpreting scores, there is the need for the use of standardized test. A standardized achievement test has a broad coverage of the content of the curriculum and reflects the levels of cognitive domain. It is valid, reliable and has a specified procedure of administering test and scoring responses to it. A standardized test usually has norms for comparison of scores.

Over the years, students' performances in ordinary level examinations in accounting have been poor. According to Ogunu (2000) poor performance of students especially in the public secondary schools have been attributed to many factors, among which are: lack of test construction skills by teachers, poor attitude of students towards the subject, inadequate qualified teachers, inadequate instructional facilities and equipment necessary for the teaching of Accounting. West African Examination Council (WAEC) (2012) analysis of percentage performance of candidates in twenty popular subjects in West African senior secondary certificate examination for 2010, 2011, and 2012 revealed 75.19%, 69.10% and 60.99% percentage failure respectively in Accounting. It is also evident from the report of the West African Examination Council (2002) that students' performance in Accounting is low. It has already been pointed out that poorly designed tests could make the students loose interest in a particular subject including Accounting (Osadebe, 2014). Similarly, Onunkwo as cited in Osadebe (2014) observed that most examiners find it easier to construct test items in the lower cognitive levels (knowledge and comprehension) than the higher cognitive levels (application, analysis, synthesis and evaluation) points to the fact that most of these examiners who are teachers have been constructing tests that are not highly valid. The problem of the study is as a result of the use of unreliable achievement test poorly designed by teachers and that of developing a valid and reliable instrument for assessing the achievement of senior secondary school students in Accounting.

The main purpose of the study is to construct and standardize a reliable achievement test in Accounting for students.

## **RESEARCH QUESTIONS**

The following research questions were formulated:

1. What is the reliability index of AAT?
2. What is the distribution of the performance scores of students in AAT transformed to T- scores?
3. What are the distributions of the performance scores of male and female students in AAT using the T-score?

## **HYPOTHESES**

The following hypotheses were tested at 0.05 level of significance:

1. There is no significant difference between the mean achievement scores of male and female students in AAT.
2. There is no significant difference between the mean achievement scores of students in the urban and rural located schools.
3. There are no significant differences among the mean achievement scores in AAT of the students from the six education zones of Imo State.
4. Distribution of students who showed mastery in FAAT is significantly independent of education zones in Imo State.



### Instrument used for Data Collection

Accounting Achievement test (AAT) was used for data collection. The researchers developed 200 items in all levels of the cognitive domain.

This was selected from the initial 213 items that were generated based on the Accounting Syllabus. The items of the instrument covered the entire Senior Secondary Accounting Curriculum. The AAT was developed by the researchers and the development followed the classical test theory (CTT) tradition and norming was done through the use of T-distribution. The items were drawn using table of specification based on the educational objectives of Bloom taxonomy of cognitive domain.

A detailed table of specification was used to specify the level of objectives as they relate to the content of accounting. Test blue-print was used to build content validity into the test and prevent the construction of biased test.

### Validity and Reliability of the Instrument

The face and content validation of the test items were conducted by three (3) experts. Two (2) in measurement and evaluation, and one (1) accounting teacher. Their recommendations in terms of levels of difficulty of each item, clarity of words and plausibility of the distracters were strictly adhered to. The constructed/draft instrument was administered to students who are not part of the sample. The pilot study involved 100 accounting students, selected from two rural and two urban schools. This was done to determine whether further refinement in the items were necessary and to establish initial reliability of the instrument. The reliability of the test instrument was determined through kuder Richardson formula ( $K-R_{20}$ ) and it was found to be 0.95. This helped to establish the internal consistency of the Accounting Achievement Test (AAT).

The final version of the AAT was administered to the sample excluding those who were used for reliability. The AAT was standardized using different norms. The norms were used to interpret students' raw scores. Percentile rank and norm scores (Z-scores/T-scores and staine) was established. Location norm (Urban/Rural), School type norms (Single girls, single boys and mixed) were also established.

### Method of Data Analysis

The scores of the students in the test formed the data for analyses. Research questions 1, was answered using Kuder Richardson formula<sup>20</sup> while research questions 2 and 3 were answered using frequency polygon of T-scores of the students in AAT. Hypotheses 1 and 2 were tested with z-test while Analysis of Variance (ANOVA) F-test was used to test hypotheses 3 and 4 at 0.05 level of significant.

## RESULTS

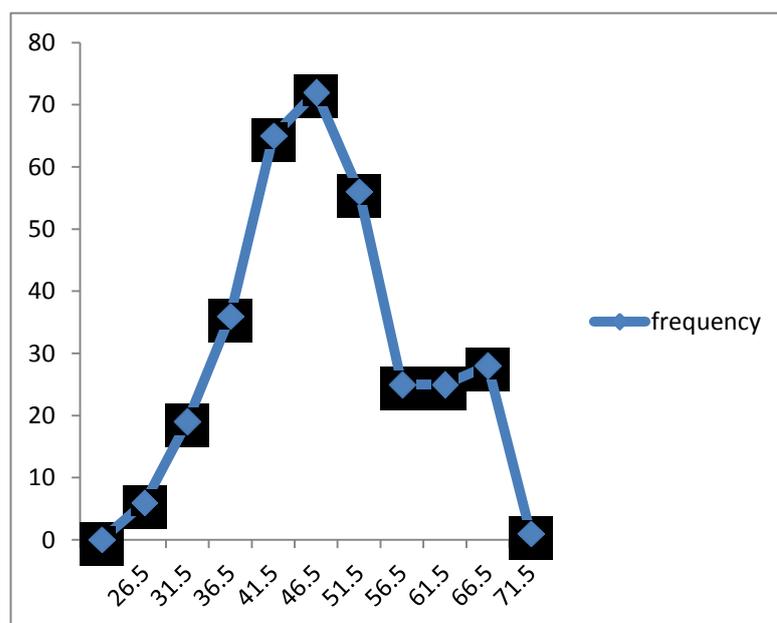
**Table 1. Reliability co-efficient of the AAT**

No. of Students	No. of Items	Mean	S	S <sup>2</sup>	R	SEM
333	200	71.68	30.19	911.5	0.95	6.7

Table 1 shows that the AAT is highly reliable with a reliability estimate of 0.95. This helped to establish the internal consistency of the AAT. Since the reliability co-efficient is high and the standard error of measurement is low (6.7) this confirmed that the Accounting Achievement Test is highly reliable. This further shows that the mean score of the students is 71.68 and a standard deviation of 30.19.

**Table 2. Distribution of students' performance scores in AAT using standard score**

T-Scores	Frequency	Lower Class Boundaries
27-3	16	26.5
32-36	19	31.5
37-41	36	36.5
42-46	65	41.5
47-51	72	46.5
52-56	56	51.5
57-61	25	56.5
62-66	25	61.5
67-71	28	66.5
72-76	1	71.5
$\Sigma F =$	333	



**Figure 1. Frequency polygon of T-scores of the students in AAT**

The graph of the student's performance scores in AAT using standard score indicates that no group performed above the group's/class average. Majority of the students are good in the subject tested. The result shows a normal distribution. The highest raw-score of 143 has a T-score of 74 while the lowest has a T-score of 27.

**Table 3. Performance of male and female students in AAT using T-Score**

T – scores (Male & female)	Lower Boundaries (male & female)	Freq. Males	Freq. Female
25-30	24.5	3	2
31-36	30.5	11	14
37-42	36.5	25	25
43-48	42.5	40	46
49-54	48.5	37	31
55-60	54.5	24	15
61-66	60.5	9	37
67-72	66.5	8	2
73-78	72.5	4	0
		$\Sigma F = 161$	$\Sigma F = 172$

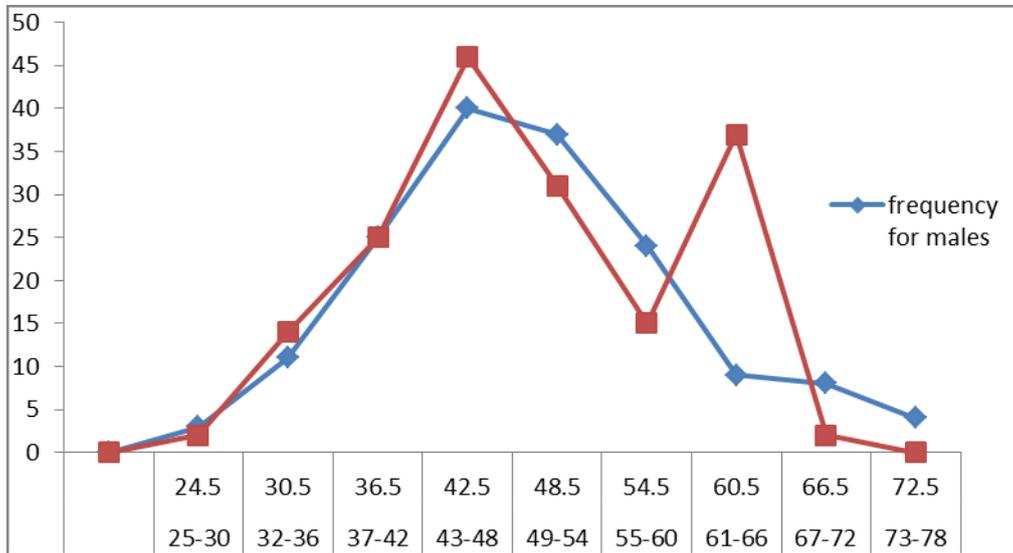


Figure 2. Frequency polygons of male and female student’s performances expressed as T-scores.

A close observation of table 3 and figure 2 reveals a normal distribution of the performance of male and female students in AAT. The curve (graph) is positively sloped which indicates good performance. The performance scores of male students in the financial accounting achievement test ranged from 2 to 143. For the female students, it ranged from 8 to 135 in AAT. The result from the above table also shows that there was a difference in the mean performance of male and female students. This result suggests that the test instrument is not gender biased.

**Table 4. Z-test results on mean achievement scores of male and female students in AAT.**

Gender	N	Mean	S	DF	Z <sub>cal</sub>	Z <sub>crit</sub>	Decision
Female	172	75.22	32.57	331	1.38	1.96	Accept H <sub>0</sub>
Male	161	70.66	27.56				

Z<sub>cal</sub> = 1.38

Z<sub>tab</sub> = Z (0.05) = 1.96

The calculated z-value is less than the critical z-value we accept the null hypothesis that the two mean do not differ. So the male's mean achievement scores do not differ significantly from the female's scores in the exercise. However, the mean of students in the test is higher with a lower standard deviation and this shows that they have a better performance.

**Table 5. Z-test results of performances of students in urban and rural located schools**

Location	N	Mean	SD	DF	Z <sub>cal</sub>	Z <sub>Crit</sub>	Decision
Urban	159	78.08	28.17	331	3.47	1.96	Sig.
Rural	174	67.53	31.38				

Significant Level  $P < 0.05$

Table 5 reveals that calculated Z-value = 3.47 at 0.05 is greater than table value (z-crit) = 1.96. Hence the null hypothesis is rejected. Therefore, there is significant different in the performance of students in AAT in terms of their location. The study shows that mean of student's performance in urban and rural areas are 78.08 and 67.53 respectively while the standard deviation is 28.17 and 31.38 respectively.

**Table 6. ANOVA Summary table of Performance scores in AAT of the students from the six Education zones of Imo State**

Sources of variation	SS	DF	MS	F-Ratio	F <sub>tab</sub>
Between groups	1673965.33	5	334793.07	94.371	2.21
Within Groups	1163623.25	327	3547.63		
Total	2837588.58	332			

$$F_{cal} = 94.371 \quad F_{tab} = F(5, 327, 0.05) = 2.21$$

Table 6 shows the F-value (94.371 at  $P < 0.05$ ) on the mean performance scores in AAT of the students in urban and rural located schools from the six education zones of Imo State are significant. Therefore, the null hypothesis that there are no significant differences among the mean performance scores in AAT of the students from the six zones of Imo State is rejected.

**Table 7. ANOVA Summary of distribution of students who showed mastery in AAT**

Sources of Variation	SS	DF	MS	F-Ratio	F <sub>tab</sub>	$\alpha$
Between Groups	21221.35	5	4244.27	5.090	2.21	0.05
Within Groups	272638.40	327	833.756			
Total	293859.75	332				

$$F_{cal} = 5.090 = f_{tab} = f(5, 327, 0.05) = 2.21$$

Table 7 shows that F-value stood at 5.090 at a  $p < 0.05$ . Therefore, the null hypothesis that the distribution of students who showed mastery in AAT is significantly independent of education zones in Imo State is rejected.

## DISCUSSION

In the process of establishing the quality of the test as a whole, the formula developed by Kuder-Richardson was used to compute the reliability of the test. The computed  $KR_{20}$  of 0.95 of the AAT which appear to be satisfactory indicate that this test is reasonably reliable instrument in producing consistent scores. Similarly, Lin, Tseng and Wu (1999) while doing item analysis on multiple choice test items in the Registered Nurse Licensure Exam reported a  $KR_{20}$  value range 0.86 to 0.94 in the analysis of internal consistency. This help to establish

the internal consistency of the Accounting Achievement Test. This result shows that the AAT is highly reliable and could be used for assessing senior secondary students when they fully cover the Accounting curriculum. The use of  $K-R_{20}$  in this study was appropriate as the items are scored dichotomously (Osadebe, 2013). The reliability estimate of this study (0.95) is appropriate as recommended by Wolansky and cited in Obidiegwu (2008) that the acceptable reliability index of critically refined test is generally in the range of 0.80 to 0.95. The Accounting Achievement Test is therefore a reliable instrument. This is in line with Thorndike as cited in Osadebe (2014) who pointed out that a measure is very reliable as presented by a low standard error of measurement.

Table II Indicates the standard scores (T-score) of the AAT. The result shows a normal distribution. The highest raw score of 143 has a T-score of 74 and the lowest has a T-score of 27. Hence, in the graph, a T-score of 74 means that the raw score of 143 which has it performed well. A student who obtained this score therefore performed within class average. The student is good in the subject tested. A T-score of 46 means that the raw score of 59 which has it performed below the mean (71.68). The student who obtained this score performed below the class average and he/she is poor in the subject tested.

The distribution of the performance of male and female students in AAT is positively sloped which indicates good performance. The distributions of the performance of male and female students in AAT shows that the male students have 70.66 as its mean and a standard deviation of 27.56 while the female students has the highest mean of 75.22 and a standard deviation of 32.67 which implies that the female students performed better than the male students. The performance of female students was higher on the developed test than the male students.

There was no significant difference in the mean achievement scores of male and female students in FAAT. Table IV also indicates that female students significantly performed ( $P < 0.05$ ) better than their male counterparts in AAT. This finding contradicts some existing research reports. Essien (2007) reported significant difference in which male students significantly achieved greater than their female counterparts in a test of geographic skills for senior secondary schools in Akwa Ibom State. While the findings of Nnachi as cited in Bomo (2007) conform to that of the present study in which female students achieved significantly higher than their male counterparts in science process skills.

The result of the second hypothesis also shows that calculated  $z$ - values is greater than the critical value ( $z_{cal} = 3.47 > z_{tab} = 1.96$ ) at Alpha level of 0.05 Significant. This means that there is significant difference between the performances of students in the urban and rural located schools. In line with the findings of this study, a significant difference in favour of urban students was reported by Bomo (2007), Agbo, Nnabuchi and Onyishi as cited in Essien (2007). According to these authors, students in the urban located schools performed significantly better than their counterparts in the rural areas. Also the result revealed that the location norm (urban) has the highest mean of 78.08 and standard deviation of 28.17 while the location norm (rural) has the lowest mean of 67.53 and a standard deviation of 31.38 which means that the students in the urban location performed better than those in the rural location.

The results of this study indicated that location norm has significant impact on the performance of students in the six education zones of Imo State. The  $F$ -value (94.371 at a  $P < 0.05$ ) on the mean performance scores in AAT of the students in urban and rural located schools from the six education zones of Imo State are significant. There is statistically significant difference among the students in the six education zones in terms of mastery in AAT, as the calculated  $F$ -ratio for sum of square interaction is greater than its tabulated  $f$ -

value under the appropriate degrees of freedom. Therefore, the general null hypothesis stated that the distribution of students who showed mastery in AAT is not significantly independent of education zones is rejected while the alternative hypothesis is upheld. Education zones and gender were found to be significantly influencing students' mastery in AAT. The proportion of male students who showed mastery of the financial accounting achievement test was significantly greater than the proportion of their female counterparts in the six education zone.

Boyle and Radocy as cited in Shafizan (2013), in their book highlighted the importance of conducting item analysis. They advocate that item analysis facilitates test developer in the process of test quality enhancement which typically involves assessment cycles of preserve, eliminate, improve or endorse particular item. Problematic items specifically items with ambiguous wording and wrongly keyed be reviewed based on the calculated difficulty index and discrimination coefficient values to improve the quality of the test. Content expert should be consulted to improve items identified as problematic in terms of language and content appropriateness.

## **CONCLUSIONS**

The result shows that the AAT is highly reliable and could be used for assessing senior secondary students when they fully cover the Financial Accounting curriculum. There is significant difference between the performances of students in the urban and rural located schools. Item analysis alleviates test developer in developing an ideal achievement test which functions as tools to evaluate learner's progress and instructional quality in teaching and learning among students in public schools. This study contributed to education under the research and development category, which is described as research that is directed at the development of effective products that can be used in schools. The results of the study show that the test characteristics of the developed instrument fall within the acceptable ranges of values. This suggests that the developed test instrument is valid and reliable enough to be used to assess students in senior secondary schools.

## **RECOMMENDATIONS**

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

1. AAT should be used for both formative and summative evaluation of students in senior secondary schools.
2. The test instrument should be used to prepare senior secondary school students for internal and external examinations
3. AAT could be used to obtain the profile of students as well as areas of deficiencies in Financial Accounting
4. AAT should be used by teachers and school administrators to assess senior secondary school student's achievement when they have covered the content areas of accounting curriculum.
5. Capacity building in Test construction should be organized for teachers by the government and school administrators.

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