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ANALYSIS OF STUDENTS' ABILITY LEVEL IN SENIOR SECONDARY SCHOOL CERTIFICATE EXAMINATION ECONOMICS MULTIPLE CHOICE TESTS (2012-2016) IN OGBOMOSO, OYO STATE

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Abstract

This study aimed at analyzing the ability level of students' in Senior Secondary School Certificate Economics Examination using Item Response Theory (IRT). Using descriptive survey type research design, two research questions and one hypothesis were generated for the study. The study population consists of all four thousand, seven hundred and thirty final year students of Senior Schools in Ogbomoso, Oyo State; out of which sample of one thousand and eighty students were selected using multi-stage sampling technique was drawn. The instruments used for data collection were WAEC, NECO and NABTEB multiple choice Economics papers which are standardized tests that are presumed to be accurate, reliable and valid. The data collected were analysed using Cronbach's Alpha method to ascertain the reliability of the test items to provide answers to research question one, descriptive statistics and WinGen IRT software package was used to provide answers to research question two, while the research hypothesis was tested using Analysis of Variance (ANOVA) statistics. The result shows that all three exams were reliable; however NECO had the highest reliability index of 0.69. Also, the result reveals that on the average, the examinees were of medium ability, but in 2012 to 2014, the mean abilities in NECO were higher than in WAEC Economics items, while that of WAEC in the same years were higher than those of NABTEB except for 2015 and 2016 where the ability levels of the examinees in NABTEB were found to be higher than that of WAEC; even though that of the NECO remains the highest of them all. Moreover, the study indicates that there is no significant difference in the ability levels of students.

in 2012 to 2016 multiple-choice Economics items based on WAEC, NECO and NABTEB standardized examinations (p-values of .85, .26, .14, .64 and .44). Recommended were given in line with the obtained results.

Key words: Construct, Students' ability, Achievement Test, Item Response Theory.

Introduction

Education being a tool for human capital development in every society remains a weapon for transmitting skills, knowledge and attitudes for the survival of people in the changing world. Kumar and Ahmad (n.d.) defined education as the development of individual according to his needs and demands of the society, of which he is an integral part. Similarly, National Council of Educational Research and Training (2014) defined education as the aggregate of all the processes by which a person develops his/her abilities, attitudes and other forms of behaviour of practical values in the society in which he/she lives; the social process by which people are subjected to the influence of selected and controlled environment (especially that of the school), so that they may obtain social competence and optimum individual development. As such, education seeks to develop the innate or the inner potentialities of humans.

Having exposed learners to knowledge in the cognitive, affective and psychomotor domains of learning, they must be subjected to various measures to assess the extent of which learning objectives are attained. This could be in form of test or non-test stimuli. The analysis of such scores obtained could be used to infer from such test to infer the presence or absence of desired traits or behaviours derived from behavioural objectives. These traits are generally referred to as educational constructs. A construct could be regarded as identified, that needs to be measured. According to Karlinger, (1973) and Peltoni (2002), constructs are mental abstractions or characteristics used to express the ideas, people, organisations, events and/or objects/things which form issues of different interests. Therefore, constructs are a way of breaking down concept to realities, helping to explain the different components of these concepts, as well as measure intended outcomes or behaviour (Lærd, 2012). As such, measurement of educational construct is the process of obtaining a numerical description of the degree to which an individual possesses a particular characteristic which points to student's ability. Student's ability in various subjects reflects what students have learned. Secondary school education in Nigeria refers to the three years that comes immediately after basic education.

Some of the broad aims of secondary education, as stipulated in the National Policy on Education (Federal Government of Nigeria, 2013) are to diversify its curriculum to cater for difference in talents, opportunities and roles possessed by or open to students after their secondary school education and inspire its students with a desire for achievement and self-improvement both at school and in late life among others. Economics is a social science, and like any science subject, the reasoning procedure in Economics is methodological, analytic and systematic, and these abilities can be ascertained through assessment.

In order to assess and ascertain students' ability especially in Economics, tests and examinations are forms of educational measurement aimed at assessing the progress made after students are exposed to three years of secondary education in Economics. Therefore, assessing students in schools is an integral part of educational exercise with which educational goals becomes quantifiable. Tests are common assessment instruments, which could be regarded as set of tasks, treatment or situation designed to elicit performance of the students with a view to determining or drawing inference about their specific abilities or other attributes (Abiri, 2006). There are different types of tests; however, a characteristic of achievement test is accomplished through the analysis of construct representation.

Tests have become the commonly used instrument for assessing underlying constructs at both small and large-scale levels. There is therefore, the need to constantly improve the test items so that they can achieve their desired purposes. Analyzing tests items requires that each item of the tests is properly reviewed via psychometric techniques so that the effectiveness of each item in measuring underlying test constructs popularly approached using Item Response Theory (IRT). The basic concepts of IRT rest upon the individual items of a test rather than upon some aggregate of the item responses such as a test score as practiced with CTT and the theory is popularized by its growing use by major educational tests; such as the Scholastic Aptitude Test (SAT) and Graduate Record Examination (GRE), owing to its significantly improved measurement accuracy and reliability (Pelton, 2002). The basics of determining the psychometric properties of test are validity and reliability on which other properties such as difficulty and discrimination rest on. According to Newton (2013), two of the most important types of problems in measurement are those connected with the determination of what a test measures, and of how consistently it measures. The first point is to validity while the second is to reliability. Gottfredson (2004) stresses that item analyses are intended to assess and improve the test

education, where psychometricians use it for developing and designing exams, maintaining banks of items for exams, and equating the difficulties of items for successive versions of exams (for example, to allow comparisons between results over time).

According to Gregory (2015), when a test is being developed with the IRT framework, the psychometrician posits a single dimension of skill or underlying trait on which all of the test items rely, to some extent, for their correct response. Each test is hypothesized to have a certain amount of latent trait or construct being measured. Thornton (2002) reiterated that IRT also provides a framework under which dichotomous and poloytomous responses to items can be modeled under a specific set of assumptions. Examples of measurable constructs are ability, achievement, reinforcement, intelligence, reputation, motivation, mental acuity, anxiety, creativity, prejudice, verbal proficiency, spatial memory, mathematical reasoning, manipulative skill or fine-motor skill just to mention a few; with which attainment of stated behavioral objectives in the learning domains they belong to are implicitly measured using standardized test. Standardized tests for Nigerian secondary schools are conducted by WAEC, NECO and NABTEB. Considering the assumed equivalence of these examinations, this study aimed carrying out the analysis of the ability level of students in Senior Secondary Certificate Examination Economics using IRT techniques which occupies the place of the two in one purpose of this paper while providing answers to the following research questions as well as corresponding hypothesis:

Research Questions

1. What are the reliability indexes of WAEC, NECO, and NABTEB Economics multiple-choice items conducted in 2011/2012, 2012/2013, 2013/2014, 2014/2015 to 2015/2016 academic session in Ogbomosho?
2. What are the ability levels of students that are exposed to WAEC, NECO and NABTEB Economics multiple-choice items in 2011/2012, 2012/2013, 2013/2014, 2014/2015 to 2015/2016 academic session in Ogbomosho?

Research Hypothesis

H₀₁: There are no significant differences in the ability levels of students that are exposed to WAEC, NECO and NABTEB Economics multiple-choice items in 2011/2012, 2012/2013, 2013/2014, 2014/2015 to 2015/2016 academic session in Ogbomosho.

Methodology

The research design adopted for this study was a descriptive survey type. This design is appropriate for the study because it aims at describing the reliability as well as ability level of students of WAEC, NECO and NABTEB multiple choice economics tests items as a test characteristic. The population for the study consisted of four thousand, seven hundred and thirty (4,730) students of Senior Schools in Ogbomosho, Oyo State, Nigeria. The target population was the final year students in the three Local Governments Areas in Ogbomosho i.e. Ogbomosho South, Ogbomosho North and Surulere Local Governments. In Ogbomosho South there are 16 public and 26 private schools, in Ogbomosho North there are 16 public and 34 private schools while in Surulere Local Government Area 22 public and 9 private schools were found (Oyo State Ministry of Education, 2016).

The researcher employed the use of multi-stage sampling technique in the selection of respondents at different stages. In the first sampling stage, stratified random technique was used to stratify schools into public (50) and private (69) schools. Then a simple random sampling technique (deep hart method) was used to select 18 private and 18 public schools from each stratum to make a total of 36 schools in the three sampled LGAs in Ogbomosho. Also, 30 students who offer Economics were randomly selected using simple random sampling technique for the study, in all the sampled students were 1,080. This study was carried out among final year students for the 2017/2018 academic session. This group was targeted because the students they are expected to have covered large percentage of SSCE Economics curriculum.

The instruments used for data collection were the adapted WAEC, NECO and NABTEB past multiple-choice Economics for the academic sessions 2011/2012, 2012/2013, 2013/2014, 2014/2015 to 2015/2016. These instruments are standardized tests which are presumed to be accurate, reliable and valid. The students' responses to each of the item were dichotomously scored right/wrong and the total for each of the questions was added together to obtain the grand total. Cronbach's Alpha test on internal consistency was carried out to ascertain the reliability of the test items to provide answers to research question one using Statistical Package for Social Sciences (SPSS) while the ability index of each student who responded to the test items parameters were generated to provide answers to research question two using WinGen IRT software package and descriptive statistics. Research hypothesis were tested using Analysis of Variance (ANOVA) statistics.

Results

Data were collected from 1,080 SS3 Economics students. The reliability of WAEC, NECO and NABTEB multiple-choice Economics items was determined by employing Cronbach's Alpha test of internal consistency reliability to answer research question one using SPSS 20.0. while students' abilities (theta) were generated and analysed to provide answers to research questions two using WinGen IRT software package. Research hypotheses postulated in this study were also tested using analysis of variance (ANOVA).

Research Question One: *What are the reliability levels of the 2011 to 2016 WAEC, NECO, and NABTEB Economics objective items?*

The reliability quality criterion was determined following the recommendations of Nunnally and Bernstein (1994) which suggests reliability is acceptable if it is 0.70 (70% of variance reliable) and Abiri (2006) which suggests that it is acceptable if it is 0.67, to interpret the reliability obtained. The reliability obtained was then summarized and presented in Table 1.

Table 1: Reliability Index of 2012-2016 WAEC, NECO and NABTEB Multiple-choice Economics Items

Years	Examination Type (Reliability Indexes)		
	WAEC	NECO	NABTEB
2011/2012	0.83	0.76	0.62
2012/2013	0.83	0.83	0.75
2013/2014	0.58	0.72	0.68
2014/2015	0.50	0.63	0.67
2015/2016	0.53	0.50	0.60
Average Reliability Index	0.65	0.69	0.66

As shown on Table 1, from year 2012 to 2016, WAEC Economics items had reliability indexes of 0.83, 0.83 0.58, 0.50, and 0.53 respectively; NECO had reliability indexes of 0.76, 0.83, 0.72, 0.63, and 0.50 respectively while NABTEB had reliability indexes of 0.62, 0.75, 0.68, 0.67 and 0.60 respectively. The average reliability index for WAEC, NECO and NABTEB Economics items were 0.65, 0.69 and 0.66 respectively. This shows that generally, all the three exams are reliable; however, NECO Economics items had the highest average reliability index and so adjudged as the more reliable of the other two exams.

Research Question Two: *What are the ability levels of students in 2011-2016 WAEC, NECO and NABTEB multiple-choice Economics items?*

The theta (ability) index of each student who responded to the tests items was generated. Under Item Response Theory (IRT), ability levels range from -3 to +3. The statistics of students' abilities estimates are summarized in Table 2.

Table 2: Statistics of Respondents' Ability Estimates (Theta) in 2011-2016 WAEC, NECO and NABTEB Multiple-Choice Economics Items

Years	Examination Type					
	WAEC Mean	SD	NECO Mean	SD	NABTEB Mean	SD
2012	0.13	1.22	0.16	1.07	0.11	0.88
2013	0.22	0.83	0.34	1.23	0.11	1.08
2014	0.16	0.74	0.20	0.88	0.08	0.95
2015	0.03	1.01	0.14	1.00	0.10	0.85
2016	0.08	0.80	0.16	1.10	0.13	1.08

Table 2 shows the summary of estimated abilities of the students who responded to the tests items. Ability levels of 1080 examinees in WAEC, NECO and NABTEB multiple-choice Economics items were estimated. The mean abilities (theta) of the examinees in WAEC 2011-2016 were found to be 0.14, 0.13, 0.22, 0.16, 0.03, and 0.08 respectively; the mean abilities (theta) of the examinees in NECO 2011-2016 were found to be 0.16, 0.16, 0.34, 0.20, 0.14, 0.16 respectively while that of the NABTEB 2011-2016 were found to be 0.10, 0.11, 0.11, 0.08, 0.10, and 0.13 respectively. This shows that on the average, the examinees sampled (SS3 students) were of medium ability, but in 2011-2014, the mean abilities in NECO were higher than in WAEC Economics items, while that of WAEC in those same years were higher than those of NABTEB. Meanwhile, for 2015 and 2016, the ability levels of the examinees in NABTEB Economics items were found to be higher than that of WAEC even though that of the NECO remains the highest of them all.

H_{01} : *There are no significant differences in the ability levels of students in 2012 – 2016 standardized Economics objective items based on examination type (WAEC, NECO and NABTEB) in Ogbomosho.*

Table 3: ANOVA Summary Table on Students' Ability Levels on the basis of Exam Type (WAEC, NECO and NABTEB)

Source	Sum of Squares	Df	Mean Square	F	P-Value	Decision
2011/2012	.105	2	.052	.158	.854	Do not Reject
Between Groups						
Within Groups	52.150	157	.332			
Total	52.255	159				
2012/2013	1.016	2	.508	1.350	.262	Do not Reject
Between Groups						
Within Groups	59.070	157	.376			
Total	60.086	159				
2013/2014						Do not Reject
Between Groups	1.317	2	.659	1.951	.146	
Within Groups	52.995	157	.338			
Total	54.312	159				
2014/2015						Do not Reject
Between Groups	.259	2	.130	.442	.644	
Within Groups	46.045	157	.293			
Total	46.304	159				
2015/2016						Do not Reject
Between Groups	.254	2	.127	.443	.643	
Within Groups	45.084	157	.287			
Total	45.338	159				

As shown in Table 3, the F-value are (.16, 1.35, 1.95, .44 and .44) with p-values of (.85, .26, .14, .64 and .44). Since the p-values are greater than 0.05 alpha level of significance, therefore, the null hypothesis three is not rejected. This implies that there is no significant difference in the ability levels of students in 2011-2016 multiple-choice Economics items based on WAEC, NECO and NABTEB standardized examinations.

Discussion of Findings

The reliability levels of the 2011 to 2016 WAEC, NECO, and NABTEB Economics objective items are okay however, NECO Economics items had the highest average reliability index and so adjudged as the more reliable of the other two exams. This finding is against the finding of Olatunji (2007) that WAEC items are more reliable than NECO items. This could be as a result of improvement in test construction over the years in the part of NECO. Also, Olatunji (2007) use one year while the present study covers the period of five years.

Findings of the study showed that examinees sampled (SS3 students) were of medium ability level across the different examinations except for year

2011-2014 with the mean abilities in NECO being higher than in WAEC Economics items, while that of WAEC in those same years were higher than those of NABTEB. Meanwhile, for 2015 and 2016, the ability levels of the examinees in NABTEB Economics items were found to be higher than that of WAEC even though that of the NECO remains the highest of them all. On the average, the examinees sampled (SS3 students) were of medium ability, but in 2011-2014, the mean abilities in NECO were higher than in WAEC Economics items, while that of WAEC in those same years were higher than those of NABTEB. This finding is in line with the findings of Olatunji (2015) who reported that the examinees are not different in proficiency levels in WAEC, NECO and NABTEB Economics. This findings deviates from that of Unodiaku (2013) who reported differences in ability level based on gender where boys achieved higher than their female counterparts.

There is no significant difference in the ability levels of students in 2011-2016 multiple-choice Economics items based on WAEC, NECO and NABTEB standardized examinations. Though, earlier studies by Bello and Abimbola (1997) revealed that the Nigeria educational system, classrooms are generally composed of students of different academic ability levels, the non-significance recorded in this study could be as a results of efforts put in by examination bodies in developing standardized examinations in the country while establishing National examination. This finding is in line with that conducted by Organisation for Economic Co-operation and Development (OECD) (2013), who reported that the 1999 structural reforms in the concerned countries helped reduce the differences in ability grouping between schools and helped improve the performance of the lowest-achieving students.

Conclusion

All the three examinations were reliability while Item Response Theory (IRT) analysis should be integrated into the construction of WAEC, NECO and NABTEB multiple-choice items so as to place examinees on the correct ability level in test administration.

Recommendations

Based on the findings of the study, the following recommendations are made:

1. WAEC and NABTEB examination bodies should improve on their reliability level of their items while NECO should not also rest on their oars
2. The students should put in more efforts in their studies to ensure above average performance in Economics.

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