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UNIDIMENSIONALITY OF BASIC EDUCATION CERTIFICATE EXAMINATION IN NIGERIA: A CASE STUDY OF NATIONAL EXAMINATIONS COUNCIL.

By

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Abstract

This study examined the extent to which NECO BECE 2012 Mathematics items comply with the assumption of Unidimensionality. It also examined whether Cronbach's alpha, Eigenvalue/ScreePlot and Factor analysis methods agree in measuring unidimensionality. This study adopted the descriptive survey research design. The population of the study consisted 1,257 Junior Secondary School Three students (JSS 3) of Federal Government Colleges in South-Western Nigeria. The sample comprised 920 respondents selected from the through stratified sampling technique. The 2012 NECO BECE Mathematics Paper I was adopted for data collection. A reliability coefficient of 0.92 was obtained. The findings showed that 2012 NECO BECE Mathematics Paper I comply with the assumption of unidimensionality. Also, all the three methods agreed in measuring unidimensionality. It study concluded that 2012 NECO BECE Mathematics Multiple-choice test items (Paper I) measured single construct which indicated evidence of unidimensionality. It therefore recommended that examination bodies should ensure that the test items used by them are analyzed using IRT models and comply with the assumption of unidimensionality.

Keywords: Unidimensionality, Basic Education Certificate Examination, National Examinations Council

Introduction

Providing evidence of validity is essential to the use of educational and psychological tests. This evidence is not only for obtaining a meaningful basis of test scores but also for knowing social consequences of score used (Messick, 1995). Several researchers have indicated the importance of providing validity evidence using the assessment of test dimensionality, especially in the development, evaluation, and maintenance of large-scale tests (e.g., Nunnally & Bernstein, 1994; Tate, 2002). For example, the assessment of test dimensionality provides empirical evidence to examine the internal structures of tests underlying the responses to a set of items. This kind of evidence relates to the substantive aspect of validity indicated by Messick (1989).

A test is developed for a specific purpose with a theoretical structure. This underlying test structure must be examined and confirmed. Assessing dimensionality helps to identify the construct defined by the test developer, and to examine how well the test measures the underlying structure or dimension (Akinboboye, 2015). In other words, the test developer can use the assessment of dimensionality to identify what domains are measured and the relationships between those domains.

Furthermore, confirmation of the internal structure provided information that can be used to make a decision concerning what scores should be reported or what setting cut scores can be made based on the test structures. This information supplied evidence of

the structural aspects of validity. When the dimensions are distinguishable, reporting subscore is appropriate; when there is only one dominant dimension, one total score is reported (Haladyna, 2004). For instance, a mathematics test measures algebra and geometry. If the information of dimensionality is clearly presented in two dimensions in terms of algebra and geometry, then it is appropriate to report two subscores for algebra and geometry respectively. If the assessment of dimensionality shows only one dimension, reporting a total score for mathematics is preferable.

Additionally, any information regarding the internal test structure could be the foundation of either “homogeneous” items in the classical test theory (CTT), or the “unidimensionality assumption” in item response theory (IRT; Tate, 2003). Moreover, for accountability and diagnosis purposes it is well known that most item response theory (IRT) models require the assumption of unidimensionality. According to Lord and Novick (1968), dimensionality is defined as the total number of abilities required to satisfy the assumption of local independence. If there is only one ability affecting the responses of a set of items to meet the assumption of local independence, then that set is referred to as a unidimensional set. The ability which the test is intended to measure (i.e., the ability common to all items) will be referred to as the dominant ability, and abilities unique to or influencing responses to few items will be referred to as minor abilities.

Given that item responses are multiply determined, it is intuitively clear that, in order to satisfy the assumption of unidimensionality, it is required that a given test measure a single dominant ability. If unidimensionality is not met, summarizing students' performances through a single score, (Michela et al, 2012) on the basis of a unidimensional IRT model, may be misleading as test items indeed measure more than one ability. Many researchers today make use of IRT models to analyze their test items without verifying if the applications of such are in line with the assumption of the theoretical framework (Dibu, 2012). The invariant property of the item parameters makes it possible for it to rely solely on the unidimensional assumption, which lends indirect support to the assumption of local independence (Mellenbergh, 1994).

Dibu (2012) argue that the violation of the unidimensionality requirement has been a problem in estimating item parameters and affects the likelihood function used for parameter estimation (De Ayala, 1992). Methods for assessing the unidimensionality of a set of test items range from the commonly used measures of internal consistency (Green, Lissitz, & Mulaik, 1977), to the uses of eigenvalue plots and related statistics (Lord & Novick, 1968).

In 1999, Universal Basic Education Programme was introduced with emphasises on the need for every Nigerian youth to avail him/herself of the first nine years of compulsory formal education. With the adoption and implementation of this programme, the Nigerian child takes his first major certificate examination at the end of this nine years of education (i.e. Junior School Certificate Examination), while each state of the federation and the Federal Capital Territory (FCT) conducts the BECE for its candidate, NECO conducts the BECE for Federal Unity Colleges, Armed Forces Secondary Schools and other Federal establishments operating Secondary schools. Private Secondary schools also take part in the NECO BECE provided they are permitted by their state Ministries of Education (<http://www.mynecoexams.com/ourexaminations.html?bece>). The junior secondary school which is the main area of focus of this study has its objectives both prevocational and academic in nature. In specific terms, the objectives of JSS are to:

- (a) inspire the students with a desire for self-improvement and achievement of excellence;
- (b) raise a generation of people who can think for themselves, respect the views and feelings of others, respect dignity of labour, appreciate those values specified under our broad national goals and live as good citizens; and

- (c) provide technical knowledge and vocational skills necessary for agricultural, industrial, commercial and economic development.

In addition, the students who complete Junior Secondary School are to be streamed into; (a) the senior secondary school; (b) the technical college; (c) in out-of-schools vocational training centers; and (d) apprenticeship scheme. Also, the results of a final test or examination will determine the academic ability, aptitude and vocational interest of the students to ensure appropriate placement. The subjects taught at JSS are such that will enable the students to acquire further knowledge and skills (FGN, 2004). Twenty two subjects (such as Mathematics, English-Language, Intergrated Science, Introductory Technology, Social Studies, Yoruba, Fine-Art, and so on) are administered at the NECO BECE level.

A candidate is expected to sit for a minimum of ten subjects and a maximum of thirteen. A candidate is deemed to have passed the BECE if he/she has passed in six subjects including English Language and Mathematics. The grading system is as follow: A=Distinction, C=Credit, P=Pass, F=Fail (<http://www.mynecoexams.com/ourexaminations.html?bece>). This means that a good performance in Mathematics is a requisite for all students. In view of this, the questions for the final examinations, therefore, must measure a single construct and not multidimensional. Aiken (1997) argued that postmortem procedure exists for exam. This means that item analysis should be carried out even after examination. Since the decision made on the basis of BECE test results (such as selection, classification, admission and grading) are so important, there should be some types of quality control checks.

Item analysis includes using statistical techniques to examine the examinee or text takers' performance on the items. One important part of the item analysis is to examine unidimensionality of the items.

The main purpose of this study is to determine the unity of three methods of determining item unidimensionality and to examine if the approaches are behaving the same way. Secondly, the study intends to find out if the NECO BECE 2012 Mathematics items comply with the assumption of unidimensionality, as an approach towards removal of errors in assessment and ascertaining the reliability of assessment instrument.

Research Questions

- (i) To what extent do the NECO BECE 2012 Mathematics items comply with assumption of unidimensionality?
- (ii) Do Cronbach's alpha, Eigenvalue/ScreePlot and Factor analysis methods agree in measuring unidimensionality?

Methodology

This study made use of descriptive survey design. Descriptive research involves the events that have already taken place and are related to a present condition.

The population for this study consists of all the eighteen (18) Federal Government Colleges (FGC) in the South Western States of Nigeria. There are four (4) FGC in Lagos State, each of Ogun, Ondo, Osun, and Ekiti States has three (3) FGC respectively, while Oyo State has two (2). There are 7 single-sex schools (i.e. one boys-only and six girls-only) and 11 co-educational schools. These Federal Government Colleges are comparable in terms of ownership, funding, admission policy and selection procedures which also employs and pays the staff.

The total population of the students was 27,530. The target population for this study consists of Junior Secondary School three (JSS3) students. This group was chosen because the students have covered a major part of the junior school certificate syllabus.

Proportionate stratified random sampling technique was used for sample

selection. It is a technique applied when the population is heterogeneous. It is dictated by stratified population that is population that is divisible into different strata or levels. The population is first divided into mutually exclusive subgroups. Then each subgroup is randomly but proportionately sampled to reflect the proportion from the total or original population. It ensures greater representativeness of the sample relative to the population and guarantees that minority constituents of the population are represented in the sample.

A total of Six (6) FGC was selected for this study (i.e. three from single-sex schools and three from co-educational schools), one from each state of South Western States of Nigeria. This enabled fair representation of the six (6) states in the sampled population. Firstly, since there is one boys-only school, it was sampled among the three (3) single-sex schools by purposive sampling technique. Secondly, one-third ($1/3$) of the six (6) girls-only schools was sampled through simple random sampling technique. In the third category that is co-educational schools, 3/11 of the schools were sampled through dip hat method of simple random sampling technique.

The instrument that was employed in this study was BECE multiple-choice objective test items in Mathematics for the year 2012 (paper 1). The items were developed, moderated, validated and used by NECO for BECE in the year 2012. The student's responses were scored in binary format by assigning 1 to correct options and 0 to incorrect options. This is so because Factor analysis accepts data only in numerical forms. Data analysis was carried out using SPSS 20.0. To test the 2012 NECO BECE Mathematics for unidimensionality, the researchers considered to use three testing methods to measure unidimensionality.

Results

Research Question 1: *To what extent does the 2012 NECO BECE Mathematics items comply with assumption of Unidimensionality?*

In order to answer this research question, three methods of testing for unidimensionality were employed. They were Cronbach's Alpha test, Eigenvalue/ScreePlot test and Factor Matrix test.

Cronbach's Alpha Test

Table 1: Cronbach's Alpha showing Reliability statistics

N	Cronbach's Alpha	No. of Items
920	.892	60

Table 2: Item-Total Statistics for 2012 NECO BECE Mathematics Multiple-choice test item

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Item 1	26.80	111.420	.078	.	.892
Item 2	27.02	109.462	.231	.	.892
Item 3	27.40	109.704	.180	.	.892
Item 4	27.29	109.729	.170	.	.892
Item 5	27.41	109.899	.163	.	.892
Item 6	27.39	108.945	.255	.	.891
Item 7	27.29	108.433	.296	.	.891
Item 8	27.52	109.880	.189	.	.892
Item 9	27.36	109.456	.201	.	.892
Item 10	27.43	109.495	.207	.	.892
Item 11	27.35	108.235	.320	.	.891
Item 12	27.43	108.803	.278	.	.891
Item 13	27.32	109.137	.229	.	.892
Item 14	27.50	109.656	.206	.	.892
Item 15	27.50	109.256	.251	.	.891
Item 16	27.37	107.892	.358	.	.890
Item 17	27.43	108.835	.274	.	.891
Item 18	27.25	107.425	.394	.	.890
Item 19	27.33	107.998	.342	.	.890
Item 20	27.14	109.129	.237	.	.892
Item 21	27.42	108.031	.355	.	.890
Item 22	27.40	107.532	.401	.	.890
Item 23	27.16	107.412	.406	.	.890
Item 24	27.22	107.301	.408	.	.890
Item 25	27.38	108.223	.326	.	.891
Item 26	27.17	108.347	.310	.	.891
Item 27	27.26	107.869	.351	.	.890
Item 28	27.35	107.511	.393	.	.890
Item 29	27.29	107.376	.400	.	.890
Item 30	27.40	107.585	.395	.	.890
Item 31	27.38	107.347	.413	.	.890
Item 32	27.00	109.347	.251	.	.891
Item 33	27.37	107.887	.358	.	.890
Item 34	27.12	107.460	.410	.	.890
Item 35	27.21	107.733	.366	.	.890
Item 36	26.95	109.665	.237	.	.891
Item 37	27.01	109.191	.267	.	.891
Item 38	27.05	108.755	.298	.	.891
Item 39	27.31	107.016	.436	.	.889
Item 40	27.38	107.892	.359	.	.890
Item 41	27.41	108.977	.255	.	.891
Item 42	27.41	108.382	.317	.	.891
Item 43	27.27	107.930	.345	.	.890
Item 44	27.22	108.271	.313	.	.891
Item 45	27.25	106.712	.465	.	.889
Item 46	27.38	107.426	.406	.	.890
Item 47	27.36	107.121	.433	.	.889
Item 48	27.34	107.373	.404	.	.890
Item 49	27.48	107.460	.439	.	.889
Item 50	27.27	107.910	.347	.	.890
Item 51	27.22	107.914	.348	.	.890
Item 52	27.42	108.661	.289	.	.891
Item 53	27.34	107.962	.346	.	.890
Item 54	27.36	107.807	.364	.	.890
Item 55	27.31	107.333	.405	.	.890
Item 56	27.30	107.476	.390	.	.890
Item 57	27.32	107.177	.421	.	.889
Item 58	27.33	106.967	.443	.	.889
Item 59	27.47	107.723	.405	.	.890
Item 60	27.29	107.056	.431	.	.889

The value in the column labeled alpha if item is Deleted are the values of the overall alpha if that item is not included in the calculation,. As such, they reflect the change in Cronbach's Alpha that would be seen if a particular item was deleted. The overall

Cronbach's Alpha was 0.892 as shown in Table 2, and so all values in the column were around that same value.

To establish the presence of unidimensionality, the value of the alpha should be greater than the bench mark of 0.7 to measure the assumption of unidimensionality (Ojerinde, Popoola, Ojo & Onyeneho, 2012). Cronbach's Alpha can be viewed as the correlation between this test or scale and all other possible tests or scale containing the same number of items which could be constructed from a hypothetical universe of items that measure the characteristics of interest (Dibu, 2012). Alpha ranges from 0 to 1 since it can be interpreted as correlation coefficient. These can be interpreted to mean a high internal consistency which indicates unidimensionality showing that the 2012 NECO BECE Mathematics items complied with unidimensionality assumption.

Eigenvalue and ScreePlot Test

The data collected for this study was also subjected to factor analysis with each item treated as a variable. Factor analysis was conducted in order to determine the eigenvalues of the 2012 NECO BECE Mathematics items. Principal Component was used as extraction method with option to display the Scree plot for eigenvalues greater than 2. Starting with the original data matrix and using multiple correlation as the estimates of communalities, principal factor were extracted after interacting of communalities. Each factor with an eigenvalue greater than 2 (two) was retained for rotation. This eigenvalue cut-off was made so high because of the status of the NECO BECE as an high stake examinations. This automatically produces the plot of the eigenvalue.

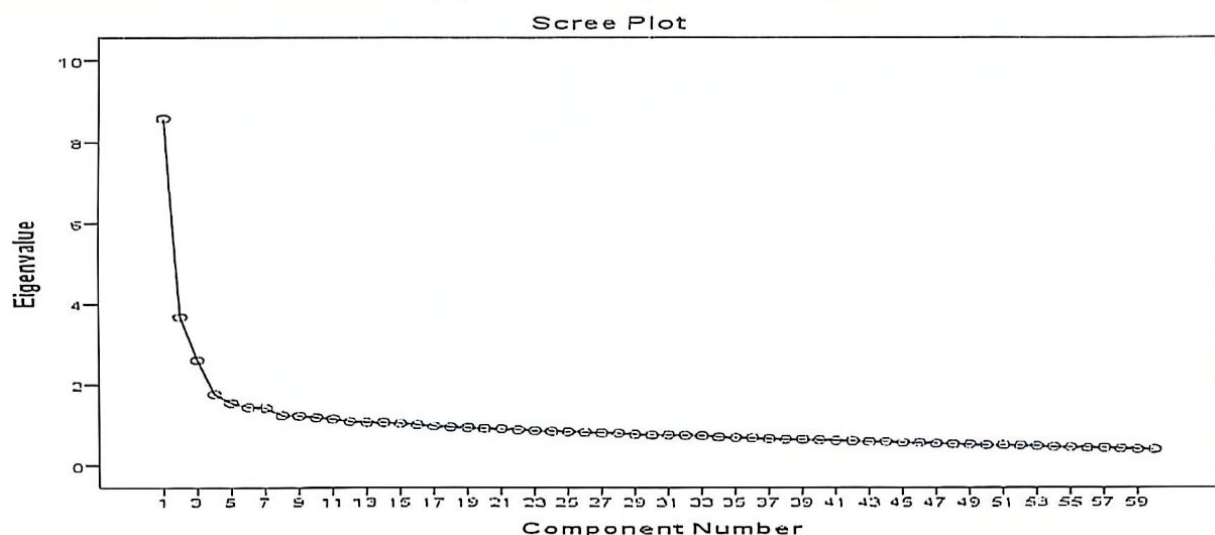


Figure 2: Scree Plot for examining the unidimensionality of the items in 2012 NECO BECE Mathematics paper 1

Items may be considered unidimensional if the eigenvalues of the first factor generated is large compared to the second factor, and the eigenvalues of the remaining factors are all about the same. For the items in 2012, the factor analysis gave one distinct factor as can be seen in scree plot in Figure 2. It should be noted that in 2012 items the first factor which has an eigenvalue of 14.283 accounted for 9.709% of the observed variance. It would be preferable if more variance was accounted for by the first factor. However, Wiberg (2004) quoting Hambleton (2004) stated that it is not uncommon to have this type of situation and as long as there is one factor with distinctly larger eigenvalue, it is possible to assume that there is unidimensionality in the test.

There are actually three factors in NECO 2012 BECE items with relevant eigenvalues above 2 and together they account for 24.734% of the total variance explained. The result of this eigenvalues test approach as shown in the figure 2 revealed

that the 2012 NECO BECE Mathematics test items complied with the assumption of unidimensionality.

The Factor Loading Test

Table 3: Factor Matrix of 2012 NECO BECE Mathematics Multiple-choice test (Paper I)

Factor Matrix ^a			
	Factor		
	1	2	3
Item 45	.518		
Item 60	.497		
Item 58	.488		
Item 57	.484		
Item 47	.475		
Item 39	.473		
Item 49	.470		
Item 55	.458		
Item 59	.456		
Item 48	.455		
Item 34	.452		
Item 46	.450		
Item 56	.445		
Item 31	.436		
Item 23	.430		
Item 30	.419		
Item 28	.418		
Item 29	.417		
Item 24	.416		
Item 51	.416		
Item 54	.415		
Item 22	.409		
Item 35	.401		
Item 53	.395		
Item 18	.394		
Item 33	.389		
Item 50	.389		
Item 40	.387		
Item 43	.377		
Item 21	.359		
Item 27	.355		
Item 44	.352		
Item 16	.350		
Item 38	.344		
Item 19	.340		
Item 42	.340		
Item 25	.330		
Item 26	.324		
Item 52	.316		
Item 32	.285		
Item 41	.280		
Item 17	.268		
Item 20	.243		
Item 15	.238		
Item 2	.229		
Item 1			
Item 7		.446	
Item 6		.371	
Item 12		.361	
Item 9		.348	
Item 13		.338	
Item 10		.321	
Item 11		.318	
Item 5		.317	
Item 8		.304	
Item 14		.297	
Item 4		.279	
Item 3		.270	
Item 36	.292		
Item 37	.324		

Extraction Method: Principal Axis Factoring.

a. 3 factors extracted. 3 iterations required.

Table 3 shows the factor matrix of 2012 NECO BECE Mathematics multiple-choice test items (Paper I). It can be seen that almost all the items were loaded in the first factor. 48 items were loaded on factor 1, while 12 items loaded on factor 2. According to McBride and Weiss, (1974). Unidimensionality is indicated if the first factor loading for all items are significant and have the same sign + or -

Discussion of Findings

The concept of unidimensionality is of utmost importance in any attempt to make measurements. Unidimensionality assumption must be satisfied in order for any reasonable estimate of parameters to be achieved. For any IRT, the dimension underlying a test has to be ascertained and precedes further analysis of any kind. It is important that a test that purports to measure certain ability level is not in form contaminated by other abilities displayed by the examinees taking the test. In a study by Wiberg (2004), a high Cronbach alpha coefficient was used to indicate unidimensionality. Reckase (1991) is of the opinion that items may be considered uni-dimensional if the eigenvalues of the first factor generated is large compared to the second factor, and the eigenvalues of the remaining factors are all about the same. Wiberg (2004) stated that as long as there is one factor with distinctly larger eigenvalue, it is possible to assume that there is unidimensionality in the test. The findings corroborated that of Ajeigbe and Afolabi (2014) who observed that 2008 Mathematics and English Language Multiple-choice items were unidimensional. Therefore, 2012 NECO BECE Mathematics Multiple-choice test items (Paper I) complied with the assumption of unidimensionality.

Conclusion and Recommendations

It can be concluded that 2012 NECO BECE Mathematics Multiple-choice test items (Paper I) measured single construct which indicated evidence of unidimensionality. Also the three (3) methods used in measuring unidimensionality in this study are all working in unison. It therefore recommended that examination bodies should ensure that the test items used by them are analyzed using IRT models and in addition to satisfy all necessary conditions should comply with the assumption of unidimensionality.

References

- Akinboboye, J.T. (2015). Detection of differential item functioning in 2012 and 2013 basic education certificate examination mathematics multiple choice tests. Unpublished Ph.D. Thesis University of Ilorin.
- Ajeigbe, T. O. & Afolabi, E. R. I. (2014). Assessing unidimensionality and differential item functioning in qualifying examinations for senior secondary school students, Osun State, Nigeria. *World Journal of Education*. Vol.4 (4). 31-37.
- Aiken, L. R (1997) *Psychological testing of assessment* (a tradition) Boston, MA; Allyn and Bacon Inc.
- Federal Government of Nigeria (2004). *National policy of education (4th ed.)* Yaba, Lagos: NERDC Press.
- De Ayala, R.J.D (1992). The influence of dimensionality on cat ability estimation. *Educational Psychological Measurement*, 52, 512-528.
- Haladyna, T. M. (2004). Developing and validating multiple-choice test items. Mahwah, NJ: Lawrence Erlbaum.
- Novick, M. R. (1968). Statistical theories of mental test scores. Rading, MA: Addison-Wesley.
- Mellenbergh, G. J. (1989). Item bias and item response theory. *International Journal of Educational Research*, 13, 127-143.
- Messick, S. (1989). Validity. In R.L., Linn(Ed.), *Educational Measurement* (3rd ed.), pp.

- 13-103. New York: American Council on Education/Macmillan.
- Messick, S. (1995). Validation of psychological assessment: Validation of inferences from person's responses and performances as scientific inquiry into score meanings. *American Psychologist*, 50, 741-749.
- Nunnally, J. C. & Bernstein, I. H. (1994). *Psychometric theory* (3rd ed.) New York: McGraw-Hill.
- Reckase, M. D. & McKinley, R. L. (1991). The discriminating power of items that measure more than one dimensions. *Applied Psychological Measurement*, 15, 361-373.
- Ojerinde, D., Kunmi, P., Francis, O. & Patrick, O. (2012). *Introduction to item response theory, parameter models, estimation and application*. Abuja: Marvelous Mike Press Ltd.
- Tate, R. (2003). A comparison of selected empirical methods for assessing the structure of response to test items. *Applied Psychological Measurement*, 27(3), 159-203.
- Tate, R. (2002). Test dimensionality. In G. Tindal & T. M. Haladyna (Eds.), *Large-Scale Assessment programs for all students: Validity, technical adequacy, and implementation* (pp. 181-211). New Jersey: Lawrence Erlbaum.
- Wiberg, M. (2004). Classical test theory versus item response theory. An evaluation of the theory of test in the Sweden driving-license test. Retrieved from www.umcl.se 12/02/15.