

Analysis of Psychometric Properties of Business Studies Junior Secondary Certificate Examination in Plateau State, Nigeria

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Abstract

The study investigated psychometric properties of Junior School Certificate Business Studies Examination conducted in Plateau State, Nigeria in 2011. The scripts of junior secondary students who sat for the examination in 2011 constituted the population of the study. Probability proportionate to size (PPS) sampling technique was used, particularly the cluster sampling for selection of the sample for the study. The marked answer scripts of the students were used as instruments for data collection. Classical test theory of measurement was used as a model for determining the difficulty, discrimination and distracter indices of the items. Kuder-Richardson K-R20 formula was used for determining the reliability coefficient of the items. The findings show that some items have moderate difficulty, discriminated well between the upper and lower ability groups of examinees. The findings further reveal that the examination has low content validity but has reliability coefficient of 0.74, which was moderate. It was concluded that the items were not properly generated and arranged. It is therefore recommended that Education Resource Centre, responsible for the conduct of the examination in the State, should improve the quality of the examination by engaging measurement experts in the test development process to enhance its psychometric properties.

KEYWORDS: Business studies, psychometric properties, examination

Introduction

Business Studies is a discipline which is taught in the Junior Secondary Schools in Nigeria. It comprises the teaching or knowledge of shorthand, typewriting (key-boarding) and book-keeping. It is the study of the activities involved in running a business especially the financial and management aspects. The subject is geared towards helping students to develop the basic understanding of the Nigerian business system and its role in the economic society of the country. It provides students with the ability and skills to be gainfully employed upon completion of their programme as well as prepare them for setting up their small business as entrepreneurs. The subject inculcates into students, at an early age, those worthwhile values as value orientation, employment generation and wealth creation that are required if an entrepreneur and workers in the business environments are to succeed. This is the basis for the incorporation of business studies programme in the educational system right from the Junior Secondary School for a gradual skill development and competency (Okorie as cited in Atakpa, 2011).

The general objectives of business studies as provided by the Business Studies Curriculum (2007, p iv) therefore are to provide the orientation and basic skills with which to start an occupation for those who may not have opportunity for further training, provide basic skills for personal use now and in future, prepare students for further training in Business Studies, relate the knowledge and skills to the national

economy, and develop basic skills in office occupations. The content area of key-boarding, shorthand and book-keeping when acquired ensures the acquisition of skills for productive work. It is in line with this that Lamax (as cited in Gimba, 1988) pointed out that business studies is the education for vocational preparation in business. It is therefore seen as an occupational education for professional position as accountants, marketing personnel, general management and finance personnel, production and secretarial positions. Business studies train students to be self-reliant and also self-employed. Based on this, students are introduced into the modern methods of teaching business studies, with the use of computers. It is the training that gives an occupational identity to students, thereby preparing them for entry into and advancement in business jobs Ulinfun (as cited in Ogunmayi, 2008). Hence, the need for business studies as a means of skill development cannot be over-emphasised.

Over the years, Junior Secondary Certificate Examination (JSCE) is being conducted for students in Junior Secondary III classes by Education Resource Centre (ERC) in Plateau State. It is the basis for their achievement and placement into the senior school classes in the State. The 6-3-3-4 system of education, which introduced JSCE, was scheduled to come into effect by September, 1982 in Nigeria. By 1987, all the states in the federation were between the second and fifth year of implementing the new system of education (Igwe, 1988). The JSCE programme started in Plateau State in 1987. This introduces the use of continuous assessment which replaces the one-short system of assessment.

Business studies examinations are conducted in two phases, namely practical and theoretical components of the examination. The theory comprises multiple-choice questions in section 'A' and essay questions in section 'B'. The examination is conducted at the end of the three years of Junior Secondary School. The performance of the students in this examination in recent time is not encouraging. In 2007, 47.91% of 3890 candidates that registered for the examination obtained grades 'A' to 'C', while 43.68% got grades 'P' to 'F' and 8.41% of the candidates were absent from the examination. In 2008, 11.08% of 4989 students that registered for the examination earned grades 'A' to 'C', 82.22% got grades 'P' to 'F', while 6.70% of the students were absent from the examination. Similar trend in performance was observed from 2009 to 2011. Hence, the need for establishing the psychometric properties of the test items to determine the quality of the items to rule out the possibility of nature of test items being a contributing factor to persistent high failure rate in the subject.

Psychometrics is defined by Salters-Pednault (2011) as a field of study concerned with the theory and techniques of psychological measurement, which includes the measurement of knowledge, abilities, attitudes, personality traits and educational measurement. It is primarily concerned with the construction and validation of measurement instruments such as questionnaires, tests, and personality assessments. Psychometrics deals with two major tasks, which include; the construction of instruments and the procedures for measurement, and the development and refinement of theoretical approaches to measurement. This work is hinged on classical test theory (CTT) of measurement, which assumes that each individual has a true score which would be obtained if there are no errors in measurement. At the item level, CTT does not invoke a complex theoretical model to relate an examinee's ability to success on a particular item. Instead, it considers a pool of examinees and empirically examines their success rate on an item, which is known as the p-value of the item or item difficulty (Fan, 1998). The central model of CTT is that, observed scores are composed of the true score and error score, denoted as $X = T + E$. Where

X = Observed score, T = True score and E = Error score. CTT considers a pool of examinees, irrespective of test items and is also sample dependent. It focuses on the examination of item facility (difficulty), discrimination and the effectiveness of distracters. These are the basis for using CTT in this study.

The relevance of determining the psychometric properties in instrument development process has been stressed (Salters-Pednault, 2011; Ugodulunwa, 2008, Popoola, 2004). Important psychometric properties are difficulty, discrimination and distracter indices observed in test items, based on the performance of candidates responding to the items. Difficulty index shows the proportion of students that got an item right in both the upper and lower ability groups of testees (Ugodulunwa, 2008; Popoola, 2004; Ugodulunwa & Ugwuanyi, 1999). Discrimination index shows how an item discriminates between the upper and the lower ability group of students, while distracter index shows how the incorrect options distract the lower ability groups from selecting the correct answer.

Given the importance attached to business studies, performance of students has become a matter of concern because of the possibility that students will no longer be self-employed and self-reliant when they leave school. They will also be unable to study business-related subjects like Economics, Accounting, Marketing and Management at the tertiary level of education. It is the poor performance of students in Business studies in recent times that prompted the researchers to undertake the analysis of psychometric properties of business studies items to determine the nature of the items and their adequacy for use in Junior School Certificate Business Studies Examination. In order to achieve this objective, research questions that focused on content validity and reliability, difficulty, discrimination and distracter indices of the examination conducted in 2011 were answered.

Materials and Methods

The population consisted of the 43055 answer scripts of examinees who wrote the 2011 Junior School Certificate Business Studies Examination in Plateau State. Seven Local Government Areas, which represent 41% of the population, were selected as sample of the study. Only a random sample of 500 answer scripts was used for the study. The answer scripts were randomly selected from Education Resource Centre, Jos, Plateau State, Nigeria. Having arranged the performance of the students in order of magnitude, 27% (135 scripts) of the upper ability group and 27% (135 scripts) of the lower ability group were sorted making the number of scripts used for item analysis to be 270. The researchers used probability proportionate to size, particularly the cluster sampling technique in selecting the seven LGAs for the study.

Content validity of the items of 2011 JSCE Business studies was determined by the researchers, using the syllabus and the items on the question paper to determine the level of deviations of the items from the curriculum, and a table of specifications. The researchers prepared the table of specifications, which was used to make comparison to the items on the question paper. The difficulty indices of the items were determined by the researchers by finding the proportion of students in the item analysis group who scored each item right. Items with difficulty indices of less than 0.30 were considered difficult items, whereas items with difficulty indices of more than 0.80 were considered easy items. Therefore, difficulty indices that lie within the range of 0.30 to 0.80 are considered to be of moderate and adequate difficulty.

The discrimination indices of the items were determined by finding the difference between number of high scoring students and low scoring students over half of number used for item analysis, who score an item correctly. Discrimination indices

that have negative values from -1 through 0 to 0.19 indices were considered to be poor items, which need to either be removed or revised, indices of 0.2 – 0.29 were considered to be acceptable items, indices of 0.3 – 0.39 were considered good items, while indices of 0.4 and above were considered excellent items as suggested in literature (Ugodulunwa & Ugwuanyi 1999; Matlock-Hetzel, 1997; Mitra, Nagaraja, Ponnudurai & Judson, 2009). The difficulty and discrimination indices of the essay items were determined by dichotomizing the scores with underlying normal distribution. The passed marks (5-10) were scored as 1, while the failed marks (0-4) were scored as 0. The effectiveness of distracters was determined. The distracter indices that were positive were considered not effective, whereas those indices that were negative were considered effective. The reliability of the items was established using Kuder-Richardson K-R20, developed by Kuder and Richardson in 1973, since the items involved in this study were scored dichotomously.

Results and Discussion

The content validity of the Junior School Certificate Business Studies Examination was low. The comparison of the various items and the respective topics shows that the respective topics of JSS 1-3 were duly covered in picking the items for the Business Studies Examination. However, there were deviations that were observed in setting the items, when the observed test blue print of Business studies course content and that of the question paper were compared. The respective table of specifications based on observation of JSCE Business studies course content and that observed based on JSC 2011 Business studies examination shows the deviations. The content validity of the 2011 examination was therefore considered to be low. This was determined by the comparison of the table of specifications based on JSC Business studies course content and table of specifications based on items on the question paper. This result is worrisome in view of the observation by Varma (2011) that items of low content validity are bad items which reduce the reliability of the test and also confuse students during test-taking process.

The difficulty indices of the items in Table 1 show that 84.13% of the 63 items have moderate difficulty level, while 9.52% and 6.35% were easy and difficult, respectively. This result is good because items of moderate difficulty tend to do better job of discriminating between students and work together to provide higher test reliability as noted in Item Difficulty (2012). Nonetheless, the fact remains that the low content validity established for the examination is an issue that requires further investigation in order to improve its content validity during instrument development process.

Table 1

Range of Difficulty Indices of 2011 Business Studies Examination

Item difficulty range	Items		Level of difficulty
	N	%	
Less than 0.30	4	6.35	Difficult
0.3 to 0.80	53	84.13	Moderate
0.81 to 1.00	6	9.52	Easy
Total	63	100	

The result of the discrimination indices shown in Table 2 reveals that 57.14% of the 63 items have excellent discrimination, 15.87% are good, while 6.35% are acceptable and 20.64% are poor. This shows that some of the items did not

discriminate adequately. The items that could not discriminate adequately also have implication for future examination in the subject using the 2011 items. Here, the items cannot give the true picture of the abilities of the students. This shows that some of the examinees will only embark on guessing in order to pass the examination.

Table 2
Range of Discrimination Indices of 2011 Business Studies Examination

Item discrimination range	Items		Level of discrimination
	N	%	
0.40 to 1.00	36	57.14	Excellent
0.30 to 0.39	10	15.87	Good
0.2 to 0.29	4	6.35	Acceptable
-1.00 to 0.19	13	20.64	Poor
Total	63	100	

Although, there were moderate difficulty and discrimination indices in some of the items of 2011 Business Studies Examination, there are instances of items with moderate difficulty, but low discrimination; easy items with adequate discrimination; difficult items with negative discrimination. This problem could be explained by the views of Matlock-Hetzel (1997) and Professional Testing (2012) that negative discrimination index is most likely to occur when an item covers complex material written in such a way that it is possible to select the correct response without any real understanding of what is being assessed.

The results of the analysis of distracter effectiveness in Table 3 reveal that 71.67% of the 60 objective test items used in the 2011 examination have negative distracter indices and were considered to be effective, while 28.33% of them are positive and were considered ineffective. It is evident that some of the options distracted students in the high ability group that need to be reviewed for effectiveness in attracting the low ability students as expected in item analysis using classical test theoretical model.

Table 3
Effectiveness Distracter Indices of 2011 Business Studies Examination

Distracter effectiveness	Items	
	N	%
Effective (negative indices)	43	71.67
Ineffective (positive indices)	17	28.33
Total	60	

The reliability of the JSC 2011 Business studies was 0.74 which was considered to be moderate. The moderate reliability coefficient indicates that the items of the examination are internally consistent in measuring the topics that were assessed at a moderate level. The moderate reliability of internal consistency is expected in view of the low content validity of the examination. This is corroborated by Varma's view (2011) that the low content validity of the items usually tampers with the reliability of the items, making the items to be considered as poor items. Some of the probable factors for these are either that the items were not trial tested, or were generated without the involvement of test experts. Items could have also been

generated without the consideration for their difficulty, discrimination and distracter indices.

Conclusion

This study investigated psychometric properties of the 2011 Junior Secondary Certificate Business Studies Examination, conducted in Plateau State, Nigeria. The study was considered relevant because of persistent failure in the examination, which poses a threat to development of entrepreneurial skills of students at the upper basic level of education in Nigeria. Although many of the items were of moderate levels of difficulty and discrimination, the finding that the curriculum was not adequately covered in the examination, requires a review of the test development process and involvement of test and measurement experts to correct this anomaly. It is by so doing that the results of the examination in the subject can be considered as a valid measure of students' knowledge and skills in the subject, which are required for self-reliance.

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