

Comparison of 2017 West Africa Examination Council (WAEC) and National Examination Council (NECO) Senior Secondary School Certificate Examination Mathematics Questions

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Abstract

This study compared 2017 WAEC and NECO SSCE Mathematics questions. The comparison covered the various levels of the cognitive domain of Bloom's taxonomy of educational objectives – knowledge, comprehension, application, analysis, synthesis and evaluation. The population of the study was 174 WAEC and NECO SSCE May/June objective and theory test items for Mathematics. There was no need for sampling since the population was manageable. Percentage was used in answering the research questions while Chi-Square was used in testing the hypotheses. This study found that there is no association among the items of the packages from the different examining bodies (WAEC and NECO) and the distribution of 2017 SSCE Mathematics multiple choice and theory questions across the various levels of the cognitive domains. Hence, it was recommended that the authorities of West African Examination Council and National Examination Council ensure that subsequent SSCE Mathematics questions are appropriately distributed across the various levels of cognitive domain.

Key Words: *cognitive domain, Bloom's Taxonomy, SSCE Mathematics questions.*

Introduction

The West African Examinations Council (WAEC) was established through ordinance No 40 of 1951 in 1952 (Okoye and Nwafor, 2009) with the sole responsibility of determining the examinations required in the public interest in West Africa, which are conducting examinations and awarding certificates that are equivalent to those of examining authorities in the United Kingdom. In Nigeria, the Council was solely responsible for conducting examinations for Nigerian students who had completed their secondary school education and wish to sit for the West African Schools Certificate, Teachers' Grade II Certificate, Royal Society of Arts (RSA), National Business Certificate or the National Technical Certificate examinations (Dibu-Ojerinde and Faleye, 2006).

From 1952 to 1968, WAEC performed its duties well without much criticism. Criticisms started becoming louder in 1967 as a result of massive failure plus other variables, which made the country Nigeria to hold a national conference in 1969. The conference held in 1969 heralded the development of yet another curriculum different from the one Nigerians were used to prior to independence. This curriculum conference was a turning point in the curriculum development history of Nigeria, mathematics inclusive. The outcome of this conference was what gave birth to a new curriculum which comprises some part of the pre-independence curriculum and some new aspects (like Modern Mathematics Curriculum) were introduced (Anibueze, 2015). Anibueze (2015) stated that the WAEC adopted the new curriculum in 1974 but the 1974 results were very poor.

However, from 1970s, some issues appeared to be getting too much for WAEC to handle such as timely release of results, massive failure, uncontrollable population explosion of candidates, overloading of works, cases of leakage of examination papers and increased rate of examination malpractice (Kolawole, 2007; Okoye and Nwafor, 2009). The massive leakage of question papers in 1977 was the climax which led the Federal Government of Nigeria to set up the Sogbetan Commission of Inquiry to investigate the situation. It was as a result of these that made the Federal Government of Nigeria to establish National Technical Examination Board (NABTEB) for technical and business subjects, National Teachers Institute (NTI) for teachers Grade two certificate examination and National Examinations Council (NECO) for Senior Secondary school Certificate Examination These were established based on the Sogbetan Commission's recommendation to the Federal Government of Nigeria in April 1999. The Sogbetan Commission's recommendation also brought about the transformation of the National Board for Educational Measurement (NBEM) that was established under degree no 69 of August 1993.

Among all these examination bodies set up by the Federal Government of Nigeria, National Examination Council (NECO) had the highest number of criticisms (Peters, 2012), while some scholars were in support of the establishment of NECO, others were against it. Famakinwa (2009) revealed that NECO was an attempt to bridge the educational gap between the different geographical sections of the country. National Examinations Council (2003) revealed that its arrival was an opportunity for choice of examination body for candidates to patronize. Ahmed (2014) however augured that NECO had standard quality of question papers set and grades when compared to Broom's principles of evaluating students which, according to him, has made NECO to be superior to WAEC.

Others scholars contradicted these assertion. Kolawole (2002) stated that NECO does not have the capacity to conduct reliable examinations that could command widespread national and international respect and acceptability. DailyTrust (August 1, 2002) stated that the future of Nigerian secondary education is in jeopardy in the hands of NECO and those charged with scrutinizing the ability of the body to shoulder the enormous responsibility of final secondary school examinations. According to DailyTrust (August 1, 2002), the NECO examiners that set questions are themselves unqualified as is reflected in the substandard questions arranged to award grades, which according to Obioma and Salau (2007), has made WAEC results to have greater predictive power than the NECO results. Daniel (2005) stated that NECO was inferior in terms of quality of question papers set and credibility of grades awarded to candidates.

According to Peters (2012), the substandard nature of NECO made the some federal universities from 2002 to 2012 to have rejected NECO results. Ahmed (2014) stated that NECO questions from 2011 to 2014 were of higher standard than that of WAEC. Dibu-Ojerinde and Faleye (2005) stated that there was no difference between NECO and WAEC, when they were compared. Hence, there is need to solve these controversies especially to determine if NECO had more standard mathematics questions than WAEC. This is because most of the scholars' criticisms are on the reliability and validity of Senior Secondary School Certificate Examination (SSCE) questions. Therefore, this study compared 2017 WAEC and NECO SSCE Mathematics questions. The comparison covered the various levels of the cognitive domain of Bloom's taxonomy of educational objectives – knowledge, comprehension, application, analysis, synthesis and evaluation.

Research Questions

1. What levels of the cognitive domain do 2017 WAEC and NECO SSCE mathematics multiple choice questions cover?
2. What levels of the cognitive domain do 2017 WAEC and NECO SSCE mathematics essay questions cover?

Hypotheses

The following null hypotheses guided the study and were tested at 0.05 levels of significances.

Ho 1: There is no significant relationship between the examining bodies (WAEC and NECO) in the distribution of 2017 SSCE Mathematics multiple choice questions across the various levels of the cognitive domains.

Ho 2: There is no significant relationship between the examining bodies (WAEC and NECO) in the distribution of 2017 SSCE Mathematics theory questions across the various levels of the cognitive domains.

Research Method

The study was a comparative content analysis of evaluative research because it was aimed at comparing the extent to which the 2017 WAEC and NECO SSCE Mathematics questions were distributed across the expected levels of the cognitive domain. The population of the study was 174 (60 test-items for NECO and 50 test-items for WAEC) May/June objective test items and 64 (34 for WAEC and 30 for NECO) theory items. There was no need for sampling since the population was manageable. The questions were administered to one (1) Measurement and Evaluation expert, one Mathematics lecturer in the Department of Science and Computer Education, Enugu State University of Science and Technology that are in the rank of senior lecturers and level 16 Government Technical College (GTC) mathematics teachers. These experts were requested to classify each question according to the level of the cognitive domain it belonged. All the experts had mathematics background since knowledge in the subject area was very important in the classification.

The 2017 SSCE multiple choice questions had 60 test-items for NECO and 50 test-items for WAEC. In the theory section, questions with none subsection were treated as individual question. Also, any question that had sub-sections with alphabetical labeling (such as a, b, c, d, e ...), the sub-sections were treated as an individual item while the question with subsections that had Roman numeral labeling (like i, ii, iii ...) was all together treated as one individual item. This gave a total of 64 (34 for WAEC and 30 for NECO) theory items. After the experts had indicated the levels, the researchers noted the levels assigned to each by the three experts.

Any level assigned to a question by two or three of the experts were regarded as the level for that question, but in any case where the three experts assigned different levels to a particular item, the researcher took decision on what level it should belong. Such cases were very few. Having identified the levels assigned to various item, the researchers took count of the number of questions that were asked at the various levels. In testing the hypothesis, the chi-square statistical technique was used. This was appropriate because the information handled were frequencies. For the research question, the percentage was used for analysis.

Results:

Research Question 1

What levels of the cognitive domain do 2017 WAEC and NECO SSCE mathematics multiple

choice questions cover?

Table 1: Number and Percentage Level of 2017 WAEC and NECO SSCE Mathematics Multiple Choice Questions at each Level of the Cognitive Domain.

Examination	Knowledge	Comprehension	Application	Analysis	Synthesis	Evaluation	Total
WASSCE	3 (6%)	8 (16%)	16 (32%)	5 (10%)	10 (20%)	8 (16%)	50
NECO	3(5%)	11 (18%)	26 (43%)	10 (17%)	7 (12%)	3 (5%)	60

Table 1 showed the number and percentage level of 2017 WAEC and NECO SSCE Mathematics Multiple Choice Questions Set at each Level of the Cognitive Domain. From the table, it was discovered that the majority of questions of the 2017 WAEC and NECO SSCE Mathematics Multiple Choice questions centered on Application which were at 32% and 43% of the number of multiple choice questions respectively whereas the least number of questions centered on Knowledge at 6% and 5% respectively.

Research Question 2

What levels of the cognitive domain do 2017 WAEC and NECO SSCE mathematics theory questions cover?

Table 2: Number and Percentage Level of 2017 WAEC and NECO SSCE Mathematics Theory Questions at each Level of the Cognitive Domain.

Examination	Knowledge	Comprehension	Application	Analysis	Synthesis	Evaluation	Total
WASSCE	0 (0%)	0 (0%)	9 (26%)	5 (15%)	11 (33%)	9 (26%)	34
NECO	0(0%)	1 (3%)	13 (43%)	8 (27%)	5 (17%)	3 (10%)	30

Table 2 showed the number and percentage level of 2017 WAEC and NECO SSCE Mathematics Theory Questions at each Level of the Cognitive Domain. From the table, it was discovered that the majority of the questions of the 2017 WAEC and NECO SSCE Mathematics Multiple Choice questions centered on the Synthesis and Application respectively of the Cognitive Domain which are at 33% and 43% respectively whereas there was no question that centered on Knowledge. In WASSCE, there was also no question centered on Comprehension.

Testing of Null Hypotheses:

The following null hypotheses were tested at 0.05 levels of significance

HO₁: There is no association between the examining bodies (WAEC and NECO) in the distribution of 2017 SSCE Mathematics multiple choice questions across the various levels of the cognitive domains.

Table 3: Chi-Square (X^2) Analysis of determining if there was association between the examining bodies (WAEC and NECO) and the distribution of 2017 SSCE Mathematics multiple choice questions across the various levels of the cognitive domains

Examination Body	K	C	A	An	S	E	$N_{\bar{x}}$	α	df	X_{cal}	X_{crit}	Decision
WASSCE	3(2.73)	8(8.64)	16(19.09)	5(6.82)	10(7.73)	8(5)	50	0.05	5	7.81	11.07	Not Rejected
NECO	3(3.27)	11(10.36)	26(22.91)	10(8.18)	7(9.27)	3(6)	60					
Total	6	19	42	15	17	11	110					

Table 3 showed the Chi-Square (X^2) Analysis of determining if there was association between the examining bodies (WAEC and NECO) and the distribution of 2017 SSCE Mathematics multiple choice questions across the various levels of the cognitive domains. The table revealed that the null hypothesis was not rejected because the calculated X_{cal} (7.81) was less than the table value (11.07), which implied that there was no association between the examining bodies (WAEC and NECO) and the distribution of 2017 SSCE Mathematics multiple choice questions across the various levels of the cognitive domains.

HO₂: There is no association between the examining bodies (WAEC and NECO) in the distribution of 2017 SSCE Mathematics theory questions across the various levels of the cognitive domains.

Table 4: Chi-Square (X^2) Analysis of determining if there was association between the examining bodies (WAEC and NECO) and the distribution of 2017 SSCE Mathematics theory questions across the various levels of the cognitive domains

Examination Body	K	C	A	An	S	E	$N_{\bar{x}}$	α	Df	X_{cal}	X_{crit}	Decision
WASSCE	0(0.00)	0(0.00)	9(11.69)	5(6.91)	11(8.85)	9(6.38)	34	0.05	5	7.71	11.07	Accepted
NECO	0(0.00)	1(0.47)	13(10.31)	8(6.09)	5(7.50)	3(5.63)	30					
Total	0	1	22	13	16	12	64					

Table 4 showed the Chi-Square (X^2) Analysis of determining if there was association between the examining bodies (WAEC and NECO) and the distribution of 2017 SSCE Mathematics theory questions across the various levels of the cognitive domains. The table revealed that the null hypothesis was accepted because the calculated X_{cal} (7.71) was less than the table value (11.07), which implied that there was no association between the examining bodies (WAEC and NECO) and the distribution of 2017 SSCE Mathematics theory questions across the various levels of the cognitive domains.

Major Findings:

The followings are the major findings:

1. 2017 NECO SSCE questions are more normally distributed across the levels of cognitive domain than WAEC.
2. There was no association between the examining bodies (WAEC and NECO) and the distribution of 2017 SSCE Mathematics multiple choice and theory questions across the various levels of the cognitive domains.
3. NECO set less number of questions in essay and more number of questions in

multiple choice questions than WAEC.

Discussion of the Findings

Table 3 showed the Chi-Square (X^2) Analysis of determining if there was association between the examining bodies (WAEC and NECO) and the distribution of 2017 SSCE Mathematics multiple choice questions across the various levels of the cognitive domains. The table revealed that the null hypothesis was accepted, which implied that there was no association between the examining bodies (WAEC and NECO) and the distribution of 2017 SSCE Mathematics multiple choice questions across the various levels of the cognitive domains. This revealed that there was no correlation between 2017 WAEC SSCE Mathematics multiple choice questions and 2017 NECO SSCE Mathematics multiple choice questions. This finding is in consonance with the finding of table 1. Table 1 showed the number and percentage level of 2017 WAEC and NECO SSCE Mathematics Multiple Choice Questions Set at each Level of the Cognitive Domain.

From the table 1, it was discovered the majority of the questions of the 2017 WAEC and NECO SSCE Mathematics Multiple Choice questions centered on Application of the Cognitive Domain but however the percentage rate difference is at 11%. At WAEC, 6% of the number of multiple choice questions centered on Knowledge but at NECO, it was at 5%, difference of 1%. At WAEC, 16% of the number of multiple choice questions centered on Comprehension but at NECO, it was at 18%, difference of 2%. At WAEC, 10% of the number of multiple choice questions centered on Analysis but at NECO, it was at 17%, difference of 7%. At WAEC, 20% of the number of multiple choice questions centered on Synthesis but at NECO, it was at 12%, difference of 8%. At WAEC, 16% of the number of multiple choice questions centered on Evaluation but at NECO, it was at 5%, difference of 11%.

From the statistics, it was discovered that 2017 NECO multiple choice questions were in line with Ahmed (2014)'s assertion that NECO had standard quality of question papers set and grades when compared to Broom's principles of evaluating students, which has made NECO to be superior to WAEC. This is because the percentage allocation of 2017 NECO multiple choice questions were normally distributed, which is not the same with WAEC. At WAEC, more multiple choice questions were at Synthesis (20%), followed by Evaluation and Comprehension (both at 16%), followed by Analysis at 10% and the least is Knowledge at 6%. This revelation is supported by Daniel (2005) who revealed that it was because NECO questions are more normally distributed than WAEC across the various different cognitive domains that made people to view NECO questions as being inferior in terms of quality of question papers set. This study also discovered that WAEC set less number of questions compared with WAEC.

Also, table 4 showed the Chi-Square (X^2) Analysis of determining if there was association between the examining bodies (WAEC and NECO) and the distribution of 2017 SSCE Mathematics theory questions across the various levels of the cognitive domains. The table revealed that the null hypothesis was accepted, which implied that there was no association between the examining bodies (WAEC and NECO) and the distribution of 2017 SSCE Mathematics theory questions across the various levels of the cognitive domains. This revealed that there was no correlation between 2017 WAEC SSCE Mathematics theory questions and 2017 NECO SSCE Mathematics theory questions. This finding is in consonance with the finding of table 2. Table 2 showed the number and percentage level of 2017 WAEC and NECO SSCE Mathematics theory Questions Set at each Level of the

Cognitive Domain.

From the table 2, it was discovered the majority of the questions of the 2017 WAEC and NECO SSCE Mathematics Multiple Choice questions centered on Application of the Cognitive Domain but the percentage rate difference is at 17%. In WAEC, 15% of the number of theory questions centered on Analysis but in NECO, it was at 27%, difference of 12%. In WAEC, 33% of the number of theory questions centered on Synthesis but in NECO, it was at 17%, difference of 16%. At WAEC, 26% of the number of theory questions centered on Evaluation but at NECO, it was at 10%, difference of 16%. The difference between the two examining bodies in 2017 SSCE question across the level of cognitive paper is so wide except at Knowledge which is the same for both examining bodies.

Finally, it was discovered that 2017 NECO theory questions were in line with Ahmed (2014)'s assertion that NECO had standard quality of question papers set and grades when compared to Broom's principles of evaluating students, which has made NECO to be superior to WAEC. This is because the percentage allocation of 2017 NECO multiple choice questions were normally distributed, which is not the same with WAEC. At WAEC, more multiple choice questions were at Synthesis (33%), followed by Evaluation and Application (both at 26%), followed by Analysis at 15% and the least is Knowledge at 6%. This revelation is supported by Daniel (2005) who revealed that it was because NECO questions are more normally distributed than WAEC across the various different cognitive domains that made people to view NECO questions as being inferior in terms of quality of question papers set. This study also discovered that WAEC set more number of questions compared with WAEC, which is in line with Okoye and Nwafor (2009)'s finding.

Conclusion

This study compared 2017 WAEC and NECO SSCE Mathematics questions. The comparison covered the various levels of the cognitive domain of Bloom's taxonomy of educational objectives – knowledge, comprehension, application, analysis, synthesis and evaluation. This study discovered that there is no association between the examining bodies (WAEC and NECO) and the distribution of 2017 SSCE Mathematics multiple choice and theory questions across the various levels of the cognitive domains.

Recommendations

1. The authorities of West African Examination Council should ensure that subsequent SSCE Mathematics questions are normally distributed across the various domains of cognitive domain.
2. Persons with 2017 NECO certificate shouldn't be discriminated. This is because the 2017 NECO SSCE mathematics are more valid and more normally distributed than the WAEC.
3. Students should develop more interest in sitting for the NECO examinations since NECO questions were found to be more standard than WAEC.
4. Mathematics teachers and school authorities should encourage the students to prepare adequately for NECO examinations.
5. Parents should encourage their children to put more efforts in studying to reduce the high rate of failure in the two examinations.

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