ANALYSIS OF DIFFERENTIAL ITEM FUNCTIONING OF NATIONAL EXAMINATIONS COUNCIL AGRICULTURAL SCIENCE MULTIPLE CHOICE TEST ITEMS IN SOUTH EAST, NIGERIA

Adekunle Thomas OLUTOLA, Ph.D.,
Department of Educational Psychology and Counselling,
Faculty of Education
Federal University Dutsin-Ma, Katsina State
aolutola@fudutsinma.edu.ng

Kelechi Joshua Princewill IHECHU, Ph.D.,
Department of Educational Psychology and Counselling,
Faculty of Education
Federal University Dutsin-Ma, Katsina State
kjpihechu@fudutsinma.edu.ng

Abstract: *The study examined the differential item functioning of National Examinations Council (NECO) Agricultural Science multiple choice test items (2015-2017) in South East Zone. The study adopted descriptive survey research design and ex-Post-Facto research design. Two null hypotheses were formulated and test in the study. The population of the study consisted of 10, 194 Agricultural Science students. Sample size of 728 Agricultural Science Senior Secondary School students (SSS III) were proportionately drawn from the 72 selected secondary schools that constituted the sample size of the study. A multi-stage sampling technique was used for the study. The instrument used for data collection was NECO paper III questions constructed in 2015-2017.The instrument was re-validated by experts in Educational Measurement and Evaluation and Agricultural Extension Education. The data obtained was analysed using Kuder Richardson Formular 20 with reliability indices of 0.76. Data obtained for the study were analyzed using the Scheuneman modified Chi-square statistic to analyze all the research questions and chi-square statistic was employed in testing the null hypotheses. Results showed that that Agricultural Science multiple-choice test items used in NECO 2015-2017, contain test items that significantly*

functioned differentially for testees on the basis of gender and that there was no significant difference between male and female students on the percentage of items which functioned differentially in the 2015-2017 NECO Agricultural Science multiple choice test examination. It was thus recommended among others that test experts and developers should consider the use of Scheuneman modified chi-square in determining differential item functioning.

Introduction

Agriculture is the production of food, feed, fibre and other goods by the systematic growing and harvesting of plants and rearing of animals. Agriculture is at the heart of our daily life, vital to the economy and society. Agricultural sector plays a strategic role in the process of economic development of a country. It has already made a significant contribution to the economic prosperity of advanced countries and its role in the economic development of less developed 2 countries especially Nigeria is of importance. Much emphasis is placed on the teaching of Agricultural Science especially at the Secondary School level because of its classification as a vocational subject in the National Policy on Education (FRN, 2013).

Several strategies are used in the teaching and learning of Agricultural Science. Some of these strategies as put by Eze (2012) are the use of field trips for teaching of Agricultural Science, demonstration and practical Agricultural Science teaching and provision of adequate text books to students. In addition to these strategies, seminar and workshops have been organized by several bodies such as Science Teachers' Association of Nigeria in the use of modern teaching strategies in teaching Agricultural Science at secondary school level of education (Ikwuakam, 2008). Despite different strategies recommended for promoting teaching and learning Agricultural Science in secondary schools, the performance of students is not encouraging.

The available evidence, however, revealed that, out of 16,200 candidates who sat for the National Examinations Council (NECO) examinations in Agricultural Science in 2014/2015, only 17% of these numbers respectively, had credit level pass. In 2015/2016, a total of 41,080 candidates sat for Agricultural Science, only 13% had credit level pass respectively. In 2016/2017, a total of 17,984 candidates sat

for Agricultural Science, only 15% had credit level pass respectively (NECO Chief Examiner Report, 2017; State Statistics Unit of National Examinations Council, Umuahia, 2017).

The persistence of poor performance in Agricultural Science may be attributed to the use of non-valid and unreliable instrument which may be biased against some of the group of examinees with equal ability (Ojerinde, Popoola & Onyeneho, 2012). Therefore, test items used for examination should be fair to the examinees irrespective of the groups, management, supervision, class size and so on, but if the test items used for examination favour particular groups of examinees and disfavour their counterpart of equal ability, it implies that there are presence of differential item functioning (DIF). According to Ihechu (2019), a test item is described as differentially functioning when the probability of correct response is not the same for all examinees of a given ability irrespective of their group membership. Therefore, DIF arises when two groups of equal ability levels are not equally able to correctly answer an item (Queensoap & Orluwene, 2019).

Many research findings in Nigeria have shown that there are always differences in the performance between examinee from gender and school location (Njoku, 2006; Okpala, 2010, Olutola, 2011, Okeke, 2016, Olutola, 2016a, Olutola, Ihechu & Nuraddeen, 2022).

Gender is the range of physical, mental, and behavioral characteristics pertaining to, and differentiating between, masculinity and femininity. Obinne and Amali (2014) revealed that there was a significant difference in the differential item functioning of items in the Biology examinations of NECO and WAEC. Similarly, Adedoyin (2010), in his study investigated gender biased items in public examinations, and found that out of 16 items that fitted the 3PL item response theory statistical analysis, 5 items were gender biased. Madu (2012) revealed that items significantly function differentially by gender for male and female examinees in 39 items and 11 items did not exhibit DIF. School location (urban/rural) in which a child finds himself/herself goes a long way to determine one's academic achievement in life.

Moreover, Olutola, Ihechu and Nuraddeen (2022) reported no significant difference between male and female students on the percentage of items which functioned differentially in the 2020 Basic Education Certificate Examination (BECE) mathematics multiple choice test examination. The result of their finding also showed that mathematics multiple-choice test items used in BECE 2020 examinations, contain test items that significantly functioned differentially for testees on the basis of school location. In addition, Mokabi and Adedoyin, (2014) reported on the existence of differential item functioning between urban and rural school students. Inyang

(2014) reported that rural students performed better than their urban counterparts. In addition, Olutola (2016b) revealed the calculated t-value of 6.89 which is significant at 0.05 alpha level. The result also showed that urban students' had a higher mean of (24.92) and higher standard deviation (11.80) than the mean (20.59) and standard deviation (9.89) for the rural students'. These results indicate that students from urban schools performed better than students' from rural schools in NECO SSCE multiple choice Biology test. Therefore the present study examined whether there are differences in the performance of males and females students in Agricultural Science external examinations within their school location.

Statement of the Problem

A test is supposed to measure examinees ability or other traits of interest irrespective of certain factors such as gender, ethnicity, geographical location and school types. In other words, a test item by standards is supposed to be invariant in nature. This view is in line with IRT position on test items. This is not always the case for psychometricians who have often found some test items to have interactions with the characteristics of the sample (examinee). Differential item functioning is of a particular concern to tests of Agricultural Science subject in students' academic achievement.

There is the need for research in identification of DIF in test items used in measurement of Achievement in Agricultural Science. This study therefore, assessed test items that are biased in respect to gender and school location in Agricultural Science of National Examinations Council multiple choice test items for 2015-2017 in South East Zone, Nigeria.

Purpose of the Study

The purpose of the study was to assess test items that are biased in respect to gender and school location in Agricultural Science of National Examinations Council multiple choice test items for 2015-2017 in South East, Nigeria. Specifically, the study sought to find out:

-1 percentage of items in the 2015-2017 NECO Agricultural Science multiple choice test items functioned differentially by gender.

-2 percentage of items in the 2015-2017 NECO Agricultural Science multiple choice test items functioned differentially by school location.

Research Questions

The study sought to provide answers to the following research questions.

1. What percentage of items in the 2015-2017NECO Agricultural Science multiple choice test items functioned differentially by gender?

2. What percentage of items in the 2015-2017NECO Agricultural Science multiple choice test items functioned differentially by school location?

Hypotheses
The following hypotheses were formulated to guide the study
1. There is no significant difference between male and female students on the percentage of items which functioned differentially in the 2015-2017 NECO Agricultural Science multiple choice test examination.

2. There is no significant difference between urban and rural students on the percentage of items which functioned differentially in the 2015-2017 NECO Agricultural Science multiple choice test examination.

Methodology
The study adopted Descriptive Survey research design and Ex-Post-Facto research design. The population of the study is 10, 194 Agricultural Science students which includes 5043 males and 5151 females. A multi-stage sampling technique was used for the study.
Based on Krejcie and Morgan's (1971) formula for determining sample size from a known population, a total sample size of 728 Agricultural Science Senior Secondary School students (SSS III) were proportionately drawn from the 72 selected secondary schools that constituted the sample size of the study. This consists of 325 private secondary school Agricultural Science students and 403 public secondary schools Agricultural Science students from Abia, Enugu and Imo state. A multi-stage sampling technique was used for the study. The instrument used for data collection was NECO Agricultural Science multiple choice test items (paper III) conducted in 2015-2017 academic sessions. The instrument was re-validated by three experts, two from Measurement and Evaluation and one from the Department of Agricultural Extension Education; all from Michael Okpara University of Agriculture, Umudike. The instrument was administered once in the area that was not part of the sample. The data obtained was analysed using Kuder Richardson Formular 20 with reliability indices of 0.76. Data obtained for the study were analyzed using the Scheuneman modified Chi-square statistic to answer all the research questions and chi-square test statistic was employed in testing the null hypotheses at 0.05 level of significant.

Results

The alphabet on Chi-square value of DIF reflected the group of gender favoured. It was obtained by attaching alphabet f to DIF in favour of females and alphabet m if the item revealed DIF in favour of the males, only when the Chi-square value was greater than 9.49 critical values. Also, the alphabet on Chi-square value of DIF reflected the group of school location favoured. It was obtained by attaching alphabet r to DIF in favour of rural and alphabet u if the item revealed DIF in favour of the urban, only when the Chi-square value was greater than 9.49 critical values.

Research Question 1

What percentage of items in the 2015-2017NECO Agricultural Science multiple choice test items functioned differentially by gender?

ITEMS	2015 $x2$	2016 $x2$	2017 $x2$
1	2.59	.91	3.36
2	5.21	2.59	7.22
3	14.09**m	1.55	1.55
4	4.52	10.38*f	8.38
5	1.12	2.47	2.47
6	2.56	4.06	4.06
7	6.06	7.53	7.53
8	4.65	5.68	5.68
9	4.05	8.01	8.01
10	2.90	7.53	10.16*f
11	3.08	4.38	4.38
12	15.38**m	6.17	6.17
13	2.21	2.16	2.16
14	2.88	10.16*m	7.53
15	0.72	7.58	7.58
16	2.22	4.66	4.66
17	3.96	7.92	7.92
18	1.17	6.09	6.09
19	3.66	7.27	7.27
20	4.48	5.74	5.74
21	9.52*f	7.01	7.01
22	8.04	1.15	1.15
23	6.87	6.28	6.28
24	3.51	1.45	1.45
25	6.33	2.30	2.30
26	3.52	1.10	1.10
27	18.22**f	.80	.80
28	4.29	3.10	3.10
29	3.67	6.26	6.26
30	5.74	.60	11.02*m
31	2.42	3.98	3.98
32	12.98*m	4.86	4.99
33	2.11	2.49	1.69
34	5.12	5.29	14.41**f
35	7.10	1.38	3.55
36	11.49*f	3.06	3.72
37	4.71	4.65	3.00
38	2.52	4.38	4.59

39	2.34	3.47	12.61*m
40	5.66	4.27	3.54
41	2.97	3.79	7.08
42	2.31	1.85	2.83
43	2.80	1.50	.68
44	3.37	3.51	2.98
45	2.58	9.54*f	4.03
46	13.34**m	4.71	2.26
47	0.81	2.98	2.58
48	1.22	3.59	1.08
49	0.89	3.01	5.81
50	2.67	2.73	6.84
51	1.13	6.48	5.58
52	5.55	8.25	1.71
53	11.80*f	15.60**m	2.13
54	5.50	2.36	2.87
55	4.78	.47	2.53
56	1.91	.97	2.04
57	13.93**f	3.82	12.45*f
58	1.44	4.39	3.71
59	3.64	4.34	2.86
60	4.56	3.10	2.67

Table 1: Scheuneman Chi-square Gender differential Item Functioning Indices for May/June NECO Agricultural Science Multiple-Choice Test Items used in 2015, 2016 and 2017 respectively.

From Table 1, it can be seen that nine items representing 15% in 2015 NECO Agricultural Science multiple choice test items significantly function differentially for testees on the basis of gender, while four items representing 7% significantly function differently for testees on the basis of gender in similar test used in 2016 examination and five items representing 8% in 2017 functioned differentially by gender. The above result shows that NECO Agricultural Science multiple-choice test items used in 2015-2017 examinations contain test items that significantly functioned differentially for testees on the basis of gender. Generally, the Scheuneman modified Chi-square comparing NECO 2015-2017 Agricultural Science multiple-choice test items for female and male flagged 18 items with significantly differential items functioning ($p < .05$) DIF. It was revealed that, 10 items out of 18 items representing 56% in NECO 2015-2017, that displayed DIF favoured female while 8 items out of 18 items representing 44% were in favour of male.

Hypothesis 1
There is no significant difference between male and female students on the percentage of items which functioned differentially in the 2015-2017 NECO Agricultural Science multiple choice test examination.

Gender		Percentage		Item favoured due	Df		Chi-square		Sig.(2-tailed)

		to DIF			
Male		44		8(9)	
Female	56	10(9)	1	0.222	0.432
Total		100		18	

Table 2: Chi-square Summary of 2015-2017 NECO Agricultural Science Differential items Functioning in Favour of Male and Female Students.

Data in Table 2 shows that the chi-square calculated value of 0.222 is less than the tabulated chi-square value of 3.84 when tested at 0.05 level of significance with 1 degree of freedom. Therefore, the null hypothesis which states that 'there is no significant difference between male and female students on the percentage of items which functioned differentially in the 2015-2017 NECO Agricultural Science multiple choice test examination is thereby uphold. It implies that there is no significant difference between male and female students on the percentage of items which functioned differentially in the 2015-2017 NECO Agricultural Science multiple choice test examination.

Research Question 2
What percentage of items in the 2015-2017NECO Agricultural Science multiple choice test items functioned differentially by school location?

ITEMS	2015 $\chi 2$	2016 $\chi 2$	2017 $\chi 2$
1	14.64**u	9.96*u	4.83
2	6.25	5.19	4.73
3	2.58	1.22	17.19**u
4	8.67	5.34	6.15
5	14.78**u	5.83	8.02
6	17.23**r	12.66*r	4.67
7	0.75	1.29	2.48
8	6.98	5.58	15.94**u
9	2.19	17.05**u	3.27
10	16.78**u	6.65	17.53**u
11	3.16	13.38*u	6.42
12	7.35	6.48	6.18
13	11.14*u	4.67	8.13
14	2.26	3.17	2.43
15	8.28	13.08*r	14.48**u
16	10.88*r	6.83	8.13
17	5.45	3.17	3.07
18	6.71	5.16	6.35
19	4.54	7.75	10.85*r
20	19.15**r	4.79	5.64
21	12.48*r	3.68	3.27
22	17.13**u	5.47	13.50**u
23	12.70*r	4.33	5.93
24	15.74**u	3.71	8.24
25	7.03	3.42	3.58
26	16.23**u	5.17	11.01*r

27	18.19**u	4.73	6.63
28	19.42**u	6.24	5.35
29	11.98*r	7.05	11.58*r
30	6.19	1.99	4.79
31	9.89*r	17.56**u	5.91
32	8.16	3.66	5.41
33	18.60**u	10.90*u	3.45
34	12.59*r	5.80	3.82
35	15.81**u	3.86	4.18
36	8.54	4.38	6.72
37	10.45*r	4.33	4.65
38	1.95	3.79	8.96
39	4.56	5.92	17.09**u
40	7.64	3.41	4.22
41	16.13**u	10.39*u	3.05
42	9.60*u	1.90	2.07
43	11.96*r	2.70	3.56
44	8.30	7.54	1.25
45	5.67	4.46	11.77*r
46	17.46**u	3.14	1.56
47	3.06	17.83**u	4.44
48	10.50*r	6.67	2.70
49	4.96	4.96	6.09
50	15.52**u	4.54	4.52
51	13.25*r	3.25	5.25
52	8.18	1.92	3.47
53	2.67	2.67	5.97
54	12.84*u	2.50	17.31**u
55	3.73	4.73	2.66
56	3.12	5.77	4.33
57	4.56	8.36	8.23
58	1.71	1.75	1.74
59	3.10	11.38*r	1.55
60	4.46	3.84	11.99*r

Table 3: Scheuneman Chi-square School Location Differential Item Functioning Indices for May/June NECO Agricultural Science Multiple Choice Test Items used in 2015, 2016 and 2017 respectively

Data in Table 3 reveals that a total of 28 test items representing 46% of Agricultural Science multiple choice test items used in NECO examination in 2015 differentially functioned forcandidates from urban and rural areas. In 2016 examination, 10 items or 17% showed evidence of differential item functioning for testees from urban and rural areas, while 12 items or 20% showed evidence of differential item functioning for testees from urban and rural areas in 2017. The above result shows that Agricultural Science multiple-choice test items used in NECO 2015-2017 examinations, contain test items that significantly functioned differentially for testees on the basis of school location.
Generally, the Scheuneman modified Chi-square comparing NECO 2015-2017 Agricultural Science multiple choice test items for rural and urban flagged 50 items with significantly differential item functioning

($p < .05$). It was revealed that, 20 items out of 50 items representing 40% in NECO 2015-2017, that displayed DIF favoured students in rural areas while 30 items out of 50 items representing 60% were in favour of students' from urban areas.

Hypothesis 2
There is no significant difference between urban and rural students on the percentage of items which functioned differentially in the 2015-2017 NECO Agricultural Science multiple choice test examination.

School Location	Percentage	Item favoured due to DIF	Df	Chi-square	Sig.(2-tailed)
Rural		40		20 (25)	
Urban	60	30 (25)	1	2.001	0.242
Total		100		50	

Table 4: Chi-square Summary of 2015-2017 NECO Agricultural Science Differential Items Functioning in Favour of Rural and Urban Students

Data in Table 4 shows that the chi-square calculated value of 2.001is less than the tabulated chi-square value of 3.84 when tested at 0.05 level of significance with 1 degree of freedom. Therefore, the null hypothesis which states that 'there is no significant difference between urban and rural students on the percentage of items which functioned differentially in the 2015-2017 NECO Agricultural Science multiple choice test examination is thereby uphold. It implies that there is no significant difference between urban and rural students on the percentage of items which functioned differentially in the 2015-2017 NECO Agricultural Science multiple choice test examination.

Discussion of Findings
The study showed that Agricultural Science multiple-choice test items used in NECO 2015-2017, contain test items that significantly functioned differentially for testees on the basis of gender. It was revealed that, 10 items out of 18 items representing 56% in NECO 2015-2017, that displayed DIF favoured female while 8 items out of 18 items representing 44% were in favour of male. The correspondent hypothesis revealed that there is no significant difference between the male and female students on the percentage of items which functioned differentially in the 2015-2017 NECO Agricultural Science multiple choice test examination. The finding of this study is similar to the finding of Obinne and Amali (2014) who revealed that there was a significant difference in the differential item functioning of items in the Biology examinations of NECO and WAEC. The finding of this study

agrees with the findings of Adedoyin (2010), who in his study investigated gender biased items in public examinations, and found that out of 16 items that fitted the 3PL item response theory statistical analysis, 5 items were gender biased. The finding of this study also did not agree with the findings of Madu (2012) who revealed that items significantly function differentially by gender for male and female examinees in 39 items and 11 items did not exhibit DIF. The finding of this study also agree with the findings of Olutola, Ihechu and Nuraddeen (2022) who revealed no significant difference between male and female students on the percentage of items which functioned differentially in the 2020 Basic Education Certificate Examination (BECE) mathematics multiple choice test examination.

The study showed that Agricultural Science multiple-choice test items used in NECO contain test items that significantly functioned differentially for testees on the basis of school location. It was revealed that, 20 items out of 50 items representing 40% in NECO 2015-2017, that displayed DIF favoured students in rural areas while 30 items out of 50 items representing 60% were in favour of students' from urban areas. The correspondents' hypothesis revealed that there is no significant difference between the urban and rural students on the percentage of items which functioned differentially in the 2015-2017 NECO Agricultural Science multiple choice test examination. This finding agrees with Schmitt (2008) who reported that mathematical and verbal component of Scholastic Aptitude Test (SAT) measured different things for American white test takers from urban and rural settlements. This study is in agreement with the findings of Mokabi and Adedoyin, (2014) who have reported on the existence of differential item functioning between urban and rural school students. However, the study disagrees with the findings of Inyang 2014 who reported that rural students performed better than their urban counterparts. The reason for rural students to out-performed urban students could be due to their interpersonal ties with their community which provides a conducive learning environment, more so, rural schools have small population, so their small class size creates room for a higher teacher-to-student ratio which is known to be beneficial to learning which enhances good performances. Another reason could be that the urban students did not have adequate coverage of their syllabus in those areas that the items were set. So, in effect, there is no hard and fast rule about the influence of location. This notwithstanding, there is still need to maintain non-bias in test items.

Conclusion

Differential Item Functioning is an issue that must be properly addressed in examinations and tests designed for heterogeneous groups. It is obvious that threat in the validity of test items has been created. Such threats could influence or introduce traits irrelevant to the construct of interest. This could jeopardize classification of subgroup of candidates test scores negatively. The study investigated the Differential Item Functioning of National Examinations Council (NECO) Agricultural Science multiple choice test items (2015-2017) in South East Zone of Nigeria. From the finding it was concluded that Agricultural Science multiple-choice test items used in NECO 2015-2017, contain test items that significantly functioned differentially for testees on the basis of gender. Such items measured different things for testees of the same subject matter ability from male and female testees and that there is no significant difference in the percentage of the number of items functioned differentially by gender in favour of males and those in favour of females in the 2015-2017 NECO Agricultural Science multiple choice test examination, it was also concluded that school location was the greatest influence on differential item functioning. This is because majority of the items showed evidence of school location differential item functioning and that significant difference does not exist in the percentage of the number of items functioning differentially by school location in favour of rural and those in favour of urban in the 2015-2017 NECO Agricultural Science multiple choice test examination. Therefore, test developers, ministry of education and examination bodies should ensure that items are free from differential item functioning (DIF).

Recommendations
On the basis of the findings and conclusion, the following recommendations are made:
i. Test experts and developers should consider the use of Scheuneman modified chi-square in determining differential item functioning. This approach provides an intuitive and flexible methodology for detecting DIF.
ii. Examination bodies should organize training for item developers on the construction of valid, reliable and fair test especially in the area of DIF. In addition, items flagging DIF should be revised, modified or eliminated from the test.

References
Adedoyin, O. O. (2010). Using IRT approach to detect gender biased items in public examinations. A case study of Botswana junior

certificate examination in mathematics. *Academic Journal, 5(7) 385-399.*

Eze, B. (2012). Effects of school-type and sex on secondary school students' perception of the environment of the science laboratory. *African journal of educational research. 172, 63-68.*

Federal Republic of Nigeria (2013). *National Policy on Education.* Lagos. NERDC Press.

Ihechu, K.J.P. (2019). Differential Item Functioning of National Examination Council (NECO) and National Business and Technical Examination Board (NABTED) Agricultural Science multiple choice test items (2015-2017) in South East zone of Nigeria. *Unpublished Dissertation*, College of Education, Michael Okpara University of Agriculture, Umudike.

Ikwuakam, O.T. (2008). *facilitating the teaching of science in secondary schools: the role of improvised teaching aids.* Ibadan: Heinemann Educational Books

Inyang, S. N. (2014). Analysis of item difficulty and students' performance in 2002 junior secondary school mathematics test. *An "unpublished M.Ed thesis".* Faculty of Education, University of Calabar.

Madu, B. C. (2012). Analysis of gender-related differential item functioning in mathematics multiple choice items administered by WAEC. *Journal of Education and Practice. 3: 222-228.*

Mokobi, T. & Adedoyin O. O. (2014). Identifying location biased items in the 2010 Botswana junior certificate examination mathematics paper one using the item response characteristics curves. *International Review of Social Sciences and Humanities, 7(2), 63-82.*

NECO Chief Examiner Report (2017). *National Examinations Council (NECO) Chief Examiners Report, National Examination Council*, Minna Niger, Nigeria.

National Examinations Council (2017). *State Statistics Unit.* Umuahia.

Njoku, Z.C. (2006). The Removal of Gender Biases from Science and Technology Curriculum Contents and Instructional Approaches would eliminate the Gender Differences in Achievement and Interest of Girls and Boys at Primary School Levels. *Journal of Science Teachers Association of Nigeria, 40(1&2), 11-20.*

Obinne, A.D.E., & Amali, A.O. (2014). Differential Item Functioning: The Implication for Educational Testing in Nigeria. *International Review of Social Sciences and Humanities 7(1), 52-65.*

Ojerinde, D., Popoola, K., & Onyeneho, P. (2012). A comparison between classical test theory and item response theory:

Experience from 2011 pre-test in the Agricultural Science paper of the unified tertiary matriculation examination (UTME). *Journal of Educational Assessment in Africa, 7, 173 - 191.*

Okeke, F. N. (2016). Women and leadership in higher education; facing international challenges and maximizing opportunities. *Association of Common Wealth University Bulletin, 147, 14-17.*

Okpala, P. J. (2010). *No child left behind and the transformation of federal education policy, 1965-2005.* Lawrence, KS: University Press of Kansas.

Olutola, A.T. (2011). *Analysis of Item Parameters of Senior School Certificate Multiple Choice Tests in Biology in Ekiti State, Nigeria*. Doctor of Philosophy (Ph.D) Thesis, University of Ilorin, Ilorin, Nigeria.

Olutola, A.T. (2016a). School Location and Gender as Predictors of Students' Performance in WASSCE Multiple Choice Test in Biology. *Liceo Journal of Higher Education Research,* 12 (1), 1-16.

Olutola, A.T. (2016b). Assessing Students' Performance in Senior School Certificate Multiple Choice Tests in Biology. I*ssues and Ideas in Education,* 4(1), Pp. 11-20.

Olutola, A. T.; Ihechu, K. J. P. and Nuraddeen, Y. G. (2022). Assessment of Differential Item Functioning of Basic Education Certificate Examination Mathematics Multiple Choice Items. *Ilorin Journal of Education (IJE),* 42 (1), 88 - 94.

Queensoap, M. & Orluwene, G. W. (2017). Examining Differential Item Functioning in a Chemistry Achievement Test for Students in Nigeria. *International Journal of Education and Evaluation.* 3 (7), 49-57.