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Demographic Characteristics and Differential Item Functioning of Economics Achievement Test in Plateau State, Nigeria

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Abstract. The study investigated the demographic characteristics of students and differential item functioning of economics achievement test items for SSII students in Plateau State, Nigeria. The motivation of the study was the persistent poor performance of students in external examinations in the subject which could be attributed to the quality of test items used by teachers in assessing students' achievement in the subject. Again, some of the test items used in assessing students function differentially based on students' gender, school location and school type, which have resulted in students with the same ability performing differently. Furthermore, the teachers use the same test items to measure secondary issues above primary issues. Again there are no existing developed tests in economics in the study area that can be used in assessing students in the subject within the study area. The research design used for the study was instrumentation and cross-sectional survey research designs. The population of the study consisted of all the 23712 SS2 economics students in Plateau State whereby a sample of 1454 SSII students were selected and used for the study. Multistage sampling technique was used to ensure that adequate number of students were selected from each zone, local government, schools and students. A sample of 134 schools made up of 74 private schools and 60 public schools with 68 from rural and 66 from urban; 720 males and 734 females were used for the study. The instrument for data collection was an Economics Achievement Test (EAT) developed and calibrated by the researcher. One research question and three hypotheses were formulated to guide the study. The research question was answered using the Kaiser-Meyer Olkim (kmo) and scree plot while the hypotheses were tested using structural equation modelling of the IRTPRO. The validity of the instrument was established using a test blue print and experts' judgments. The reliability of the instrument was estimated using Omega reliability procedure and coefficient of 0.83 was obtained for the EAT items. The results of the analysis revealed that some of the items functioned differently for the testees based on gender, school type and school location. It was recommended among others that teachers should determine the differential functioning of test items before using the tests for conducting continuous assessments on students.

Keywords: Demographic characteristics, Differential item functioning.

1. Introduction

Differential item functioning is one of the test development process that is used in test development to ensure that items in a test are free from bias. It is usually carried out to

determine if examinees of equal ability from different background such as students' gender, school type and school location have an unequal probability of answering an item correctly (Obinne & Amali, 2013) it is a condition where items in a test function differently for respondent with the same level of ability who are from different background. For example one could investigate whether a test functions differentially for male/female students, urban/rural schools and private/public schools. Hence, test-fairness is a moral imperative for both the makers and users of a test to make sure that test items do not function differently for test takers. However, studies have shown that some test items that functioned differently for respondents have been used in determining the ability of testees at different level.

1.1 Research Question

What are the dimensions underlying students' performance in the Economics Achievement Test?

1.2 Hypotheses

- The items of the economics achievement test will not functioned differentially based on students gender in Plateau State
- The items of the economics achievement test will not functioned differentially based on school location in Plateau State
- The items of the economics achievement test will not functioned differentially due to school type in Plateau State

2. Literature Review

2.1 Students Gender and Differential Item Functioning

Gender is a set of characteristics that distinguished between male and female (Bolarinwa, Hammed & Barrah, 2013). It is the biological and psychological characteristics that defined men and women. Okon and Archibong (2015) observed that it is a social attitude and opportunities associated with being male and female concerns about differential item functioning with respect to male and female have generated a considerable interest in the field of educational testing over the years. Differential item functioning have been among the contemporary issues in current academic debate all over the world. Differences in the way test items functioned based on gender is likely to contribute disparities in the allocation of cognitive roles in the world.

Similarly different studies have been conducted to investigate the presence or absence of DIF in test items with regards to gender with diverse findings. For instance, Ogbebor and Onuka (2013) in their study found that some NECO test items functioned differently based on students gender. Also Enetairo and Akoredo (2010) in their study found that some economics test items used by NECO in 2013 functioned differently based on students' gender. Furthermore Obinne and Amali (2014) found that biology questions paper used by West African Examination Council NECO functioned differently in favour of males.

On the contrary, Khairani and Nordin (2011) found that there was no evidence of DIF in test items that were used in assessing 14-year old students in mathematics. From the review, it is evident that some examinations contain items that functioned differentially against students' gender thereby enabling the items to measure different things for testees with same ability. However, most of the studies used WAEC and NECO questions papers or existing instrument while the present study seeks to develop an economics achievement test after which DIF was detected so as to see whether some items functioned differently for testees based on male or female. Hence, the need to conduct the present study.

2.2 School Type and Differential Item Functioning

Ownership of schools in Nigeria could be viewed from two categories of ownership of schools which could be public ownership and private ownership. According to Oderinde (2016) and Olubunmi (2016) schools that are established and run by government are called public schools while those established by

individuals, organisations and missionary bodies are referred to as private schools. Public schools are schools that are controlled by the federal, state or local government, while individual groups or missionary institutions control private schools. Researchers have not come to consensus over the way test items function in schools based on school type. While some found that differential items functioning exist, in test items that are developed for the purpose of assessment. Others found that there was no evidence of DIF in test items based on school type, for example Abedalaziz (2009) in his study in mathematics found that mathematics test items functioned differentially based on school type in favour of private schools. Agbebor and Onuka (2013) in their study in economics found that 10 items out of the 60 items that were used by NECO functioning differently based on school type.

Similarly, Nhuan (2016) in his study, found that history achievement test items used by National Examination Council Service NECS showed evidence of item bias in favour of school type. Again Ebesine (2016) in his study on culture and differential item functioning in National Council Senior School Certificate Mathematics Multiple-choice test items found that NECO 2012 multiple-choice test items function differentially based on school type in favour of public schools. Hence, the examination test items contain items that measures different things for testees of the same ability, but came from private and public schools. Furthermore Ageigbe and Afolabi (2014) in their study found that both mathematics and English test items had items that functioned differentially for respondents based on school type of public and private schools.

From the foregoing it is evident that test items that function differently based on school type have been used in assessing students in schools, hence, the need to investigate if the items in the EAT functioned differently based on school type and hence the need for the present study.

2.3 School Location and Differential Item Functioning

School location refers to where a school is sited. While some schools are sited in towns, and cities, others are sited in rural areas or villages. Esomonu (2002) states that urban areas are those with high population density, high variety and beautiful environment while rural areas are those with low population and subsistence mode of life. Hence, parents in rural areas are poor and less exposed than those in urban areas. Madu (2012) found that test items functioned differently for candidates from rural and urban schools. Therefore students of the same ability level performed differently in a test while Khairani and Nordin (2011) found that differential item functioning does not exist in a test that was used in assessing students. Ageigbe and Afolabi (2014) and Obesine (2016) in their separate studies found that test items developed by WAEC and NECO in mathematics contain items that functioned differently for students who had the same ability level but came from different schools classified by school location of urban and rural.

Again studies by Amuche and Fan (2016) on assessment of item bias using differential item functioning techniques, found that 10 items functional differentially for students who were of the same ability but are classified based on school location. While some researchers found that some tests items functioned differently for students from urban and rural schools, others found that DIF does not exist based on school location. From the foregoing, there is the need for teachers to investigate if test items used in conducting continuous assessment of students contain items that functioned differentially for testees who are of the same ability but classified by school location of urban and rural schools.

The review of literature shows that most of the studies that were conducted were in mathematics, English language and biology while the present study is in economics. Furthermore, the studies were conducted in Enugu State, Delta State and Taraba State while the present is in Plateau State. Similarly, must of the studies used WAEC and NECO examination papers while the present study developed and calibrated the Economics Achievement Test

(EAT) and therefore the need for the present study.

Available evidence from the review shows that some examination items that have been used in examining students have been found to be bias in favour of either male or female, private and public schools and urban and rural schools which have violate the principles of test fairness and therefore this study set out to investigate if the economics achievement test (EAT) contain items that are bias based on students demographic characteristics. The broad question to this study therefore is; to what extend do the test items functioned differently across the different subgroup classified by gender, school type and school location.

3. Methodology

The study used instrumentation and cross-sectional survey research designs. Instrumentation research design refers to the tool or means by which an investigator attempt to measure the variables or items of interest in a data collection process. It was used in developing and certifying the validity and reliability of the economics achievement test. Cross-sectional survey requires that data are collected once at a particular time from a sample for the purpose of describing the population using the sample at that particular time. Cross-sectional survey design was applied in collecting data using the economics achievement test from the sample schools based on subgroups of male, female, urban/rural and private/public schools. The designs were used because the study aims at development and calibration of an economics achievement test. The result obtained was generalized on the entire SSII students in the study area.

The population of the study consisted of all the 23712 SSII students in Plateau State made up of male and females, urban/rural and private/public schools while a sample of 1454 SSII students made up of 720 males and 734 females, 729 students drawn from urban and 725 from rural schools were used. The decision to use 1454 as a sample study is because adequate sample for item-response theory should not be less than 1000. Multistage sampling and proportional stratified sampling were used for the study. Multistage and proportional stratified samplings are sampling method in which different strata in a population are identified and which the number of elements are drawn from each strata proportionate to the relative number of elements in each stratum (Nwana, 2007). The instrument used for data collection was the economics achievement test developed and calibrated by the researcher.

The content validity of the EAT was established using table of specifications and the economic curriculum of SSII the validity of the instrument was further established by subjecting the instrument to expect judgment from economics education and research, measurement and evaluation. The reliability of the instrument was established using omega reliability procedure. Descriptive statistics was used in answering the research questions and structural equation modelling was used to test the hypotheses that were formulated to guide the study at 0.05 level of significance.

Research Question One: What are the dimensions underlying students' performance in the economics achievement test in Plateau State

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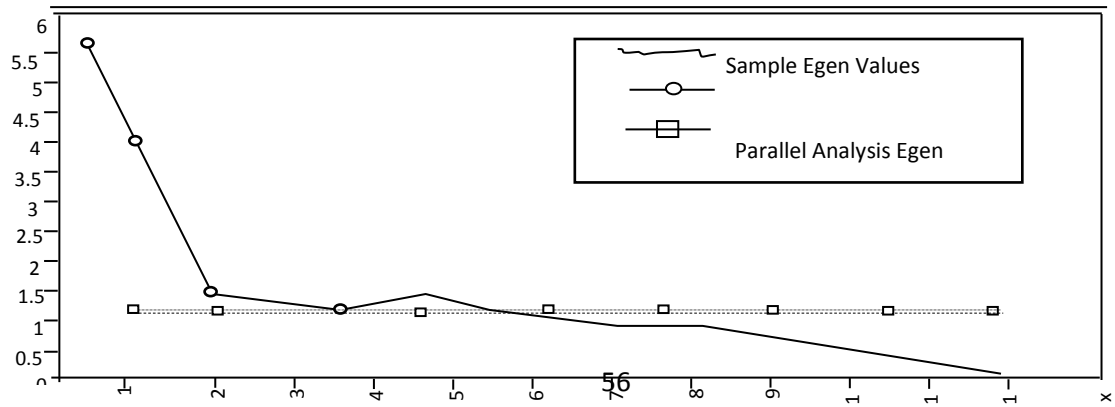

Figure 1: Result of Parallel Analysis of the Dichotomously Scored EAT Items

Figure 1 shows the results of the parallel analysis of the EAT items. From the Figure, it show that the EAT had three component within the sharp descent before Eigen values trail off. This result shows that there were three dimensions or trait underlying the dichotomously scored EAT items, therefore three dimension was used to calibrate the test items.

Hypotheses

Hypothesis One

The items of the EAT do not function differentially based on students' gender in Plateau State.

Table 1: Results of DIF Assessment of the EAT Items based on Students' Gender

Item		Estimate	S.E	Est./S.E	P-Value	Comment
	ON					
1	GEN	0.115	0.112	1.028	0.304	No DIF
	ON					
2	GEN	0.106	0.116	0.914	0.361	No DIF
	ON					
3	GEN	-0.003	0.124	0.024	0.981	No DIF
	ON					
4	GEN	-0.197	0.118	-1.677	0.094	No DIF
	ON					
5	GEN	-0.015	0.118	-0.127	0.899	No DIF
	ON					
6	GEN	0.079	0.114	0.699	0.485	No DIF
	ON					
7	GEN	-0.063	0.119	0.526	0.599	No DIF
	ON					
8	GEN	-0.088	0.120	0.731	0.465	No DIF
	ON					
9	GEN	-0.187	0.121	-1.549	0.121	No DIF
	ON					
10	GEN	0.104	0.118	0.847	0.397	No DIF
	ON					
11	GEN	0.067	0.127	0.53	0.596	No DIF
	ON					
12	GEN	0.162	0.135	1.20	0.23	No DIF
	ON					
13	GEN	0.241	0.126	1.917	0.055	No DIF
	ON					
14	GEN	-0.028	0.121	-0.232	0.817	No DIF
	ON					
15	GEN	-0.003	0.135	-0.019	0.985	No DIF
	ON					

16	GEN ON	0.128	0.129	0.995	0.320	No DIF
17	GEN ON	-0.074	0.119	-0.625	0.532	No DIF
18	GEN ON	0.062	0.123	0.503	0.615	No DIF
19	GEN ON	-0.084	0.118	-0.71	0.477	No DIF
20	GEN ON	0.068	0.127	0.534	0.593	No DIF
21	GEN ON	-0.143	0.122	-1.166	0.244	No DIF
Item		**Estimate**	**S.E**	**Est./S.E**	**P-Value**	**Comment**
22	GEN ON	-0.082	0.117	-0.702	0.483	No DIF
23	GEN ON	-0.069	0.124	-0.555	0.579	No DIF
24	GEN ON	0.078	0.118	0.661	0.509	No DIF
25	GEN ON	-0.16	0.12	-1.335	0.182	No DIF
26	GEN ON	0.189	0.13	1.458	0.145	No DIF
27	GEN ON	-0.203	0.114	-1.783	0.075	No DIF
28	GEN ON	0.132	0.121	1.091	0.275	No DIF
29	GEN ON	-0.003	0.118	-0.028	0.977	No DIF
30	GEN ON	-0.088	0.114	-0.77	0.441	No DIF
31	GEN ON	0.075	0.117	0.644	0.52	No DIF
32	GEN ON	-0.042	0.123	-0.341	0.733	No DIF
33	GEN ON	-0.064	0.121	-0.534	0.593	No DIF
34	GEN ON	0.111	0.117	0.942	0.346	No DIF
35	GEN ON	-0.014	0.115	-0.126	0.9	No DIF

36	GEN ON	-0.274	0.128	-2.135	0.033	DIF
37	GEN ON	-0.234	0.116	-2.019	0.043	DIF
38	GEN ON	0.011	0.127	0.088	0.93	No DIF
39	GEN ON	0.098	0.128	0.763	0.446	No DIF
40	GEN ON	0.071	0.114	0.617	0.537	No DIF
41	GEN ON	0.122	0.114	1.069	0.285	No DIF
42	GEN ON	0.125	0.118	1.055	0.292	No DIF
43	GEN ON	-0.047	0.115	-0.406	0.685	No DIF
44	GEN ON	-0.026	0.116	-0.222	0.824	No DIF
45	GEN ON	0.113	0.123	0.919	0.358	No DIF
46	GEN ON	0.017	0.115	0.153	0.879	No DIF
47	GEN ON	-0.107	0.113	-0.948	0.343	No DIF
48	GEN ON	0.102	0.114	0.892	0.373	No DIF
49	GEN ON	-0.082	0.124	-0.663	0.507	No DIF
50	GEN ON	0.101	0.118	0.854	0.393	No DIF
51	GEN ON	-0.016	0.125	-0.131	0.896	No DIF
52	GEN ON	-0.163	0.139	-1.17	0.242	No DIF
53	GEN ON	-0.003	0.12	-0.027	0.978	No DIF
54	GEN ON	-0.025	0.114	-0.219	0.827	No DIF
55	GEN ON	0.178	0.115	1.55	0.121	No DIF

56	GEN ON	-0.003	0.129	-0.022	0.983	No DIF
57	GEN ON	-0.121	0.124	-0.979	0.328	No DIF
58	GEN ON	0.129	0.135	0.956	0.339	No DIF
59	GEN ON	-0.098	0.119	-0.821	0.412	No DIF
60	GEN ON	0.054	0.118	0.457	0.647	No DIF
61	GEN ON	-0.045	0.149	-0.302	0.763	No DIF
62	GEN ON	0.13	0.12	1.08	0.28	No DIF
63	GEN ON	0.03	0.116	0.255	0.799	No DIF
64	GEN ON	-0.068	0.123	-0.549	0.583	No DIF
65	GEN ON	-0.237	0.126	-1.874	0.061	No DIF

The results of the analysis in Table 1 shows the assessment of the EAT. Structural equation modeling (SEM) with covariate was used. The analysis was done using MPLUS 7.4. The results show that item 36, 37 showed evidence of differential item functioning while there was no direct effect of the covariate on the remaining items which shows that the items did not display DIF at 0.05 level of significant. Hence, the two items that shows evidence of DIF were removed from the test.

Hypothesis Two: The items of the EAT do not functioned differentially for candidates based on secondary schools location in Plateau State.

Table 2: Results of DIF Assessment of the EAT Items Based on School Location

Item		Estimate	S.E	Est./S.E	P-Value	Comment
	ON					
1	LOC ON	0.672	0.116	5.798	0.542	No DIF
2	LOC ON	0.026	0.118	0.219	0.827	No DIF
3	LOC ON	0.074	0.126	0.589	0.556	No DIF
4	LOC ON	-0.071	0.119	-0.597	0.55	No DIF

5	LOC ON	-0.184	0.119	-1.55	0.121	No DIF
6	LOC ON	0.087	0.116	0.749	0.454	No DIF
7	LOC ON	0.179	0.122	1.462	0.144	No DIF
8	LOC ON	-0.184	0.121	-1.517	0.129	No DIF
9	LOC ON	-0.053	0.122	-0.431	0.666	No DIF
10	LOC ON	0.003	0.119	0.028	0.978	No DIF
11	LOC ON	0.158	0.13	1.212	0.226	No DIF
12	LOC ON	-0.003	0.137	-0.019	0.985	No DIF
13	LOC ON	0.294	0.13	2.259	0.524	No DIF
14	LOC ON	-0.055	0.123	-0.448	0.654	No DIF
15	LOC ON	0.066	0.137	0.477	0.633	No DIF
16	LOC ON	0.34	0.135	2.52	0.712	No DIF
17	LOC ON	-0.252	0.12	-2.091	0.437	No DIF
18	LOC ON	0.14	0.126	1.106	0.269	No DIF
19	LOC ON	-0.044	0.119	-0.367	0.713	No DIF
20	LOC ON	0.196	0.131	1.489	0.136	No DIF
21	LOC ON	-0.14	0.123	-1.131	0.258	No DIF
22	LOC ON	-0.082	0.118	-0.694	0.487	No DIF
23	LOC ON	-0.099	0.125	-0.791	0.429	No DIF
24	LOC ON	-0.008	0.12	-0.066	0.948	No DIF

25	LOC ON	0.089	0.122	0.728	0.467	No DIF
26	LOC ON	0.064	0.132	0.486	0.627	No DIF
27	LOC ON	-0.07	0.116	-0.602	0.547	No DIF
28	LOC ON	0.309	0.125	2.467	0.514	No DIF
29	LOC ON	0.055	0.121	0.453	0.65	No DIF
30	LOC ON	-0.211	0.115	-1.83	0.067	No DIF
31	LOC ON	-0.055	0.118	-0.467	0.64	No DIF
32	LOC ON	-0.023	0.125	-0.182	0.855	No DIF
33	LOC ON	0.151	0.124	1.222	0.222	No DIF
34	LOC ON	0.132	0.12	1.097	0.273	No DIF
35	LOC ON	0.13	0.117	1.109	0.267	No DIF
36	LOC ON	0.075	0.13	0.581	0.562	No DIF
37	LOC ON	-0.231	0.117	-1.971	0.449	No DIF
38	LOC ON	0.04	0.129	0.312	0.755	No DIF
39	LOC ON	-0.125	0.129	-0.967	0.333	No DIF
40	LOC ON	-0.033	0.116	-0.286	0.775	No DIF
41	LOC ON	-0.319	0.116	-2.759	0.006	DIF
42	LOC ON	0.099	0.121	0.813	0.416	No DIF
43	LOC ON	0.211	0.122	1.738	0.482	No DIF
44	LOC ON	-0.016	0.116	-0.142	0.887	No DIF

Item		**Estimate**	**S.E**	**Est./S.E**	**P-Value**	**Comment**
	ON					

45	LOC ON	-0.072	0.118	-0.613	0.54	No DIF
46	LOC ON	0.053	0.125	0.421	0.674	No DIF
47	LOC ON	-0.195	0.116	-1.684	0.092	No DIF
48	LOC ON	0.161	0.116	1.389	0.165	No DIF
49	LOC ON	-0.093	0.116	-0.804	0.421	No DIF
50	LOC ON	-0.03	0.126	-0.235	0.814	No DIF
51	LOC ON	-0.178	0.119	-1.491	0.136	No DIF
52	LOC ON	-0.146	0.126	-1.158	0.247	No DIF
53	LOC ON	0.157	0.143	1.099	0.272	No DIF
54	LOC ON	-0.05	0.121	-0.414	0.679	No DIF
55	LOC ON	-0.118	0.116	-1.023	0.306	No DIF
56	LOC ON	-0.117	0.116	-1.009	0.313	No DIF
57	LOC ON	-0.134	0.13	-1.032	0.302	No DIF
58	LOC ON	-0.045	0.125	-0.361	0.718	No DIF
59	LOC ON	0.315	0.142	2.221	0.026	DIF
60	LOC ON	0.108	0.121	0.894	0.371	No DIF
61	LOC ON	-0.138	0.119	-1.156	0.248	No DIF
62	LOC ON	0.231	0.112	0.754	0.321	No DIF
63	LOC ON	0.105	0.212	0.562	0.543	No DIF
64	LOC ON	0.324	0.421	0.647	0.326	No DIF
65	LOC ON	0.211	0.542	0532	0.432	No DIF

The results of the analysis in Table 2 shows the assessment of the EAT. Structural equation modelling (SEM) with covariate was used to assess DIF of the items based on school location at 0.05 level of significance. The result shows that item 41and 59 shows evidence of differential item functioning based on school location and there was no significant direct effect of the covariate on the remaining items which means that the remaining items did not display DIF based on school location. The items that show evidences of DIF were removed from the test.

Hypothesis Three: The items of the EAT do not functioned differentially for candidates based on school type in Plateau State.

Table 3: Results of DIF Assessment of the EAT Items Based on School Type

Item		Estimate	S.E	Est./S.E	P-Value	Comment
	ON					
1	LOC	0.672	0.116	5.798	0.445	No DIF
	ON					
2	LOC	0.026	0.118	0.219	0.827	No DIF
	ON					
3	LOC	0.074	0.126	0.589	0.556	No DIF
	ON					
4	LOC	-0.071	0.119	-0.597	0.55	No DIF
	ON					
5	LOC	-0.184	0.119	-1.55	0.121	No DIF
	ON					
6	LOC	0.087	0.116	0.749	0.454	No DIF
	ON					
7	LOC	0.179	0.122	1.462	0.144	No DIF
	ON					
8	LOC	-0.184	0.121	-1.517	0.129	No DIF
	ON					
9	LOC	-0.053	0.122	-0.431	0.666	No DIF
	ON					
10	LOC	0.003	0.119	0.028	0.978	No DIF
	ON					
11	LOC	0.158	0.13	1.212	0.226	No DIF
	ON					
12	LOC	-0.003	0.137	-0.019	0.985	No DIF
	ON					
13	LOC	0.294	0.13	2.259	0.524	No DIF
	ON					
14	LOC	-0.055	0.123	-0.448	0.654	No DIF
	ON					

15	LOC ON	0.066	0.137	0.477	0.633	No DIF
16	LOC ON	0.34	0.135	2.52	0.712	No DIF
17	LOC ON	-0.252	0.12	-2.091	0.437	No DIF
18	LOC ON	0.14	0.126	1.106	0.269	No DIF
19	LOC ON	-0.044	0.119	-0.367	0.713	No DIF
20	LOC ON	0.196	0.131	1.489	0.136	No DIF
21	LOC ON	-0.14	0.123	-1.131	0.258	No DIF
22	LOC ON	-0.082	0.118	-0.694	0.487	No DIF
23	LOC ON	-0.099	0.125	-0.791	0.429	No DIF
24	LOC ON	-0.008	0.12	-0.066	0.948	No DIF
25	LOC ON	0.089	0.122	0.728	0.467	No DIF
26	LOC ON	0.064	0.132	0.486	0.627	No DIF
27	LOC ON	-0.07	0.116	-0.602	0.547	No DIF
28	LOC ON	0.309	0.125	2.467	0.514	No DIF
29	LOC ON	0.055	0.121	0.453	0.65	No DIF
30	LOC ON	-0.211	0.115	-1.83	0.067	No DIF
31	LOC ON	-0.055	0.118	-0.467	0.64	No DIF
32	LOC ON	-0.023	0.125	-0.182	0.855	No DIF
33	LOC ON	0.151	0.124	1.222	0.222	No DIF
34	LOC ON	0.132	0.12	1.097	0.273	No DIF

35	LOC ON	0.13	0.117	1.109	0.267	No DIF
36	LOC ON	0.075	0.13	0.581	0.562	No DIF
37	LOC ON	-0.231	0.117	-1.971	0.449	No DIF
38	LOC ON	0.04	0.129	0.312	0.755	No DIF
39	LOC ON	-0.125	0.129	-0.967	0.333	No DIF
40	LOC ON	-0.033	0.116	-0.286	0.775	No DIF
41	LOC ON	-0.319	0.116	-2.759	0.006	DIF
42	LOC ON	0.099	0.121	0.813	0.416	No DIF
43	LOC ON	0.211	0.122	1.738	0.482	No DIF
44	LOC ON	-0.016	0.116	-0.142	0.887	No DIF
45	LOC ON	-0.072	0.118	-0.613	0.54	No DIF
46	LOC ON	0.053	0.125	0.421	0.674	No DIF
47	LOC ON	-0.195	0.116	-1.684	0.092	No DIF
48	LOC ON	0.161	0.116	1.389	0.165	No DIF
49	LOC ON	-0.093	0.116	-0.804	0.421	No DIF
50	LOC ON	-0.03	0.126	-0.235	0.814	No DIF
51	LOC ON	-0.178	0.119	-1.491	0.136	No DIF
52	LOC ON	-0.146	0.126	-1.158	0.247	No DIF
53	LOC ON	0.157	0.143	1.099	0.272	No DIF
54	LOC ON	-0.05	0.121	-0.414	0.679	No DIF
55	LOC ON	-0.118	0.116	-1.023	0.306	No DIF

	ON					
56	LOC	-0.117	0.116	-1.009	0.313	No DIF
	ON					
57	LOC	-0.134	0.13	-1.032	0.302	No DIF
	ON					
58	LOC	-0.045	0.125	-0.361	0.718	No DIF
	ON					
59	LOC	0.315	0.142	2.221	0.026	DIF
	ON					
60	LOC	0.108	0.121	0.894	0.371	No DIF
	ON					
61	LOC	-0.138	0.119	-1.156	0.248	No DIF
	ON					
62	LOC	0.233	0.432	0.512	0.543	No DIF
	ON					
63	LOC	0.211	0.115	0.006	0.063	No DIF No DIF
64	LOC	0.332	0.117	0.100	0.526	No DIF
65	LOC	0.245	0.302	0.435	0.534	No DIF

The result of the analysis in Table 3 shows the assessment of the EAT. Structural equation modelling (SEM) with covariate was used to assess DIF based on school type at 0.05 level of significance. The results showed that items 41 and 59 show evidence of DIF based on school type because the items had p-value that is less than 0.05 at o.05 level of significance and there was no significant direct effect of the covariate on the remaining items which means that the other items did not display DIF because the items had p-value that is equal or higher than 0.05.

4. Discussion of Findings

The need for teachers to use test items that do not function differently for testees of the same ability is an important component in teaching and learning. The results of the analysis showed that the EAT data had three Eigen value that were respectively greater than the Eigen value of the mean at 95^{th} percentile of the randomly general data. This result showed that there were three dimensions or trait underlying EAT. Therefore multidimensional procedure was used in calibrating the test item. This is in agreement with the findings by Ackerman (2013) that a test that has more than one dimension should be calibrated using multidimensional method of analysis. Structure equation modelling with covariate was used to test for differential item functioning of the EAT. The findings shows that items 36 and 37 showed evidence of DIF based on students' gender at 0.05 level of significance this findings is in conformity with the findings by Abedalaziz (2009), Madu (2012) and Ogbebor and Onuka (2013) who find that there was the presence of DIF in WAEC questions that were used in conducting certificate examination of students in 2010 based on students gender but the findings is contrary to the study conducted by Ndifon (2014) and Adedoyin and Makabi (2014) who found that there was no evidence of DIF in junior secondary school certificate mathematics examination in southern educational zones, Cross River State. The findings further showed that item 41 and 59 showed evidence of DIF based on school type at 0.05 level of significance. The findings is in agreement with the findings of Ajeigbe and Afolabi (2014) who found that test items for qualifying examination

for senior secondary school students in Osun State and junior secondary school certificate mathematics examination in southern educational zone of Cross River State function differently for students who had the same ability but who were differentiated based on school type at 0.05 level of significance.

The findings further show that item 41 and 59 show evidence of DIF based on school location because the items had p-value that is less than 0.05 at 0.05 level of significance. This also confirm the findings by Madu (2014) who found that mathematics test items used in conducting WAECSSEE were found to display evidence of differential item functioning with respect to school location.

5. Conclusion

Based on the findings of the study, it was concluded that teachers need to determine the differential item functioning of test items before using the test items in examining students. This is to avoid using items that functioned differently for testees of the same ability but who are classified based on gender school type and school location.

6. Recommendations

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

- Teachers should investigate for DIF of test items before using the test items in conducting continuous assessment of students in schools.
- Software for DIF should be made available to teachers to enable the teachers use the software in detecting items that functioned differently for testees from different background.
- Teachers should be trained on how to determine differential item functioning of test items that are developed by the teachers.
- Teachers should be sensitized on the need to know that test that are developed for use in conducting continuous assessment of students could be multidimensional or unidimensional in nature.

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