EVALUATION OF ITEM DIFFICULTY PARAMETERS OF SENIOR SECONDARY SCHOOL GEOGRAPHY MOCK EXAMINATIONS IN FEDERAL CAPITAL TERRITORY, ABUJA

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Abstract
This study assessed the 2021 and 2022 item difficulty parameters of Senior Secondary School Geography Mock Examinations in Federal Capital Territory, Abuja. The study adopted Expost facto research design. The populations of the study consist of 2,456 students in 2020 / 2021 and 2,828 students in 2021 / 2022 academic session. Multistage sampling procedures that includes stratified, proportionate and simple random samplings were used to select a sample of 1,576 and 1,552. FCT was stratified along the existing six Area Councils. Two research questions guided the study. The instruments for data collection in this study were the 2021 and 2022 Senior Secondary School three Geography Mock Examination questions papers. Item Response Theory analysis of responses of students was used to answer research questions one and two. Item difficulty parameters were analyzed with 4.22 X-calibre version window software. Result of the analysis show that the instruments have low difficulty indices. The implication of this is that Mock examinations cannot be widely used to predict final examinations and admit candidates into tertiary institutions. It was recommended that training and retraining of staff to build the capacity of teachers with relevant skills in test construction.

Keywords: Evaluation, Item Difficulty Parameters, Geography Mock Examination.

Introduction

The National Policy on Education (NPE) of 2013 defined senior secondary education as post-basic education, career development and supported education as an instrument per excellence for realizing national advancement. The Senior Secondary Education Curriculum (SSEC) is supposed to cover such knowledge and skills that are necessary for the attainment of the philosophy and objectives of senior secondary education. Geography as a subject is offered at the Senior Secondary School (SSS) level in Nigerian educational system. Geography is the study of places and the relationships between people and their environments. Geography is divided into two main parts namely: Physical geography and Human geography. Each of this division has a part to play in the life of an individual and of the nation at large. The study of physical geography for instance helps the individual student to know the earth and other planets (the solar system), identify and explain the effects of climatic

factors such as latitude, altitude and relief, planetary wind and pressure, distance from the sea and ocean currents on weather and climate of a place. It also helps people to explain the influence of different climatic types (hot, temperate, cold and desert) on various human activities. The teaching of Physical Geography also gives the student a concrete knowledge of causes of climatic change such as greenhouse effect, ozone layer depletion (global warming), Chrolo-Floro Carbon gases (CFC), gas emission and gas flaring.

Physical Geography also creates awareness for students on the consequences of climatic change on humans beings such as increase in temperatures, melting of ice caps, desertification, cancer and eye cataracts, the emergence of new diseases such as lassa fever, bird flu, ebola, extinction of some plants and animals among others can help to predict climate and prepare for adjustment in all its ramifications (Federal Ministry of Education, 2012). It makes individual students to be aware of processes that affect them locally in the environment and at the communities at large, these renders Geography as an exciting and relevant subject in the school curriculum.

The students' performance in Geography Mock Examination does not correspond with that of the external examinations. In 2015 - 2020, the candidates that passed Senior Secondary Geography Mock Examination within the grade bracket of A1 – C6 ranged between 80 - 85% while only 15 - 20% scored within the range of D7 – F9. In 2012, out of the 2,689 candidates sat for SSCE NECO Geography Examinations in Abuja, 1,466 (54.5%) candidates passed at credit level and above while 271 (%) scored between D7 – E8 and 952 students failed the subject. In 2015, 1,736 students sat for SSCE WAEC Geography examination, 985 students credited the subject, 202 students fell within the range of D7 – E8 while 549 failed. In 2016, 1602 sat for Geography examination, 783 passed at credit level and above, 213 scored between D7 – E8 while 606 students failed the subject, in 2017, 1,443 sat for SSCE WAEC Geography examination, 747 students scored between A1 – C6, 532 students scored within the range of D7 – E8 while 164 students failed. More so in 2018, out of 2,414 students that sat for the examination, 802 credited the subject, 800 students passed within the range of D7 – E8 while 812 failed the subject. Between 2011 and 2018, the percentage of students that failed in public examination ranged between 54 - 63%. This analysis reveals that students' performance in either the WASSCE Geography or SSCE Geography conducted by NECO does not correspond with students' performance in Geography mock examination. Given this state of performance of students in the SSCE Geography, the question that comes to mind is what could be responsible for this trend? Osadebe (2013) observed that most Geography teachers are not good in constructing test in their subject area. As a result, the teachers may use low quality achievement tests to prepare students for external examinations such as West African Examinations Council (WAEC) and National Examinations Council (NECO). In the same vein, Onunkwo (2008) and Odiagbe (2017) observed that most examiners find it easier to construct test items in the lower cognitive levels (knowledge and comprehension) than the higher cognitive levels (application, analysis, synthesis and evaluation) and do not make use of the table of specifications.

The researchers adduced that the mock examinations are developed and validated by secondary school teachers while WAEC AND NECO examinations are standardized tests. Years back, mock examinations have been used widely to predict final examinations and admit candidates into tertiary institutions in Nigeria universities and colleges (Adesoji, 2008 & Joshua, 2014). However, now the tertiary institutions do not admit candidates based on their mock examination results in Nigeria probably because the mock examination results have been found to be unreliable. This situation calls for an urgent need to assess the quality of geography mock test items in FCT, Abuja especially in the light of modern measurement techniques.

However, a lot of work has been done in assessing factors influencing performance of students in Geography examinations and other subjects but studies on item difficulty parameters of Senior Secondary School Geography Mock Examinations has not been carried out. For instance, Yakubu (2014) found that teacher's attitude and relationship with students, students' attitude to work and peer group influence combined to affect performance in Geography while Ajibo (2015) and Oluyori (2016) found that teacher's knowledge and academic competence in testing / assessment also influence students' performance in Geography. Furthermore, Abidoye (2012) observed that factors such as non - availability of teaching aids, use of unqualified teachers, broadness of the syllabus and lack of syllabus completion do influence students' performance in Geography. Again, Ebisemiju in Yakubu (2014) found that factors such as absence of field work, lack of suitable textbooks, defective and outdated teaching methods, parents' education level, extracurricular activities and peer influence affected students' performance in Geography.

The Geography Mock Examination like other achievement tests is expected to possess some qualities for it to achieve the desired objectives as stated in the curriculum. These qualities include content validity, model data fit, reliability, difficulty, discrimination and guessing parameters, objectivity and usability and they can be determined using either Classical Test Theory (CTT) or Item Response Theory (IRT) framework. Item Response Theory (IRT) is a modern mental test theory that is designed for measuring and analyzing students' abilities and other variables. The IRT parameters include item information, test information, difficulty, discrimination and guessing parameters.

The expected contribution of Geography to national growth and development as contained in the aim and objectives of national curriculum review of 2012 are enormous. The objectives consist of the need to attain the Sustainable Development Goals (SDGs) and the critical target of National Economic Empowerment and Development Goals (NEEDS), but as important as the knowledge of Geography is to national growth and development, students' performance in public examinations at the secondary school level in F.C.T, Abuja is consistently poor. Conversely, these students who fail the national examinations are

seen largely to pass their mock examinations. For instance, data from the Statistical Unit, Education Resource Centre shows that between 2011 to 2018 the number of students that passed Senior Secondary Geography Mock Examinations at credit level and above was 9,431, constituting 80% while 2,349 failed, constituting 20%, whereas their corresponding performance in external examination was below their achievement in mock examination (FCT Education Resource Centre, 2017).

Performances of students' in F.C.T Geography SSCE WAEC and SSCE NECO did not measure up with the Senior Secondary Geography Mock Examination performance record of 80%. There is a big disparity between the performances of students' in SSS Geography mock examination to their performances in external / public examination. The performance of Geography candidates in SSCE WAEC and NECO is poor and discouraging and if timely adequate corrective measure on the construction and standardization of Secondary School Geography Mock test items is not put in place, students' performance in the subject may likely drop further in public examinations. Consequent upon this trend, only small number of candidates are qualified to study courses at tertiary level that are Geography related such as Climatology, Population geography, Environmental and Resource Management, Urban and regional planning to mention a few. It is therefore the desires of the Researchers to assess the difficulty index of Senior Secondary School Geography Mock Examinations in Federal Capital Territory, Abuja, Nigeria in order to generate data that will help to reposition the mock examinations. Specifically, the study intends to determine:

1. the difficulty index of 2021 Senior Secondary School Geography Mock Examinations in the Federal Capital Territory, Abuja.
2. the difficulty index of 2022 Senior Secondary School Geography Mock Examinations in the Federal Capital Territory, Abuja.

Research Questions

The following Research Questions were raised to guide this study:

1. What is the difficulty index of 2021 Senior Secondary School Geography Mock Examinations in Federal Capital Territory, Abuja?
2. What is the difficulty index of 2022 Senior Secondary School Geography Mock Examinations in Federal Capital Territory, Abuja?

Methodology

Ex- post facto research design was used for this study. The design was chosen because the 2021 and 2022 Geography mock examination have already been written and scored; the researchers carried out a validation of the instrument without any manipulation. The population of the study was 2,456 and 2,828 students which consisted of all the 2021 and 2022 SS3 Geography student scripts. Multistage sampling procedures that includes stratified, proportionate and simple random samplings were used to select a sample of 1,576 and 1,552. The Instruments used for

data collection in this study are the Geography Mock Examination, (48 and 49 multiple choice items marked answer scripts were calibrated, items 38 and 50 was removed in the year 2022 because it has zero valid responses and item 50 was not included for the year 2021 because it has no variance), marking guides for 2021 and 2022 and a Proforma for entering data. Item difficulty parameters were analyzed with 4.22 X-calibre version window software of Item Response Theory. To ensure the validity of the instruments, the judgment of two experts each in the area of Measurement and Evaluation and Geography Education was sought, they affirmed that the instrument was the one administered by FCT Education Resource Centre in 2021 and 2022 Senior Secondary Schools Mock Examination.

Results

Research Question One: What is the difficulty index of 2021 Senior Secondary School Geography Mock Examinations in Federal Capital Territory, Abuja?

Table 1: 2021 Item Parameters for All Calibrated Items

Seq.	Item ID	P	R	A	B	C	Flag(s)
1	1	0.125	0.127	1.726	3.727	0.149	K, Hb
2	2	0.121	0.096	1.703	3.727	0.146	K, Hb
3	3	0.159	0.117	1.529	3.311	0.177	K, Hb
4	4	0.249	-0.002	1.268	2.679	0.262	
5	5	0.400	-0.029	0.532	1.760	0.278	
6	6	0.215	0.016	1.056	2.135	0.197	
7	7	0.063	0.106	1.488	3.418	0.102	K, F, Hb
8	8	0.272	-0.009	0.864	1.930	0.225	
9	9	0.103	0.083	1.523	3.039	0.130	K, Hb
10	10	0.599	-0.085	0.618	-0.039	0.257	Lb
11	11	0.101	0.157	1.443	3.361	0.130	K, F, Hb
12	12	0.293	0.106	1.354	2.989	0.287	K, Hc
13	13	0.196	0.180	1.381	3.294	0.204	K, Hb
14	14	0.173	0.079	1.347	3.265	0.186	K, Hb
15	15	0.036	0.095	1.490	3.392	0.082	K, F, Hb
16	16	0.671	-0.209	0.906	-0.474	0.243	Lb
17	17	0.048	0.108	1.707	2.721	0.090	K, F
18	18	0.149	0.095	1.420	2.985	0.167	K
19	19	0.403	0.044	0.585	1.534	0.270	Hc
20	20	0.195	0.017	1.404	3.177	0.204	K, Hb
21	21	0.067	0.107	1.554	3.008	0.104	K, F, Hb
22	22	0.051	0.025	1.474	3.351	0.094	K, F, Hb
23	23	0.161	0.093	1.624	2.513	0.173	K
24	24	0.335	-0.009	1.205	2.935	0.320	K, Hc
25	25	0.204	0.120	1.061	2.287	0.193	
26	26	0.190	0.101	1.335	2.919	0.199	K
27	27	0.103	0.083	1.876	2.248	0.126	K
28	28	0.132	0.011	1.367	3.031	0.153	K, Hb
29	29	0.088	0.065	1.420	3.322	0.120	K, Hb
30	30	0.806	-0.104	0.548	-1.523	0.252	Hc
31	31	0.201	0.063	1.296	3.212	0.209	K, Hb
32	32	0.158	0.179	1.585	2.537	0.172	K
33	33	0.059	0.026	1.670	2.760	0.097	K, F
34	34	0.428	0.064	0.724	1.126	0.276	Hc
35	35	0.173	0.055	1.339	3.238	0.188	K, Hb
36	36	0.181	0.121	1.336	2.954	0.192	K
37	37	0.103	0.032	1.376	3.246	0.132	K, Hb
38	38	0.174	0.065	1.522	2.394	0.182	K
39	39	0.060	0.120	2.167	2.318	0.096	K, F
40	40	0.114	0.043	2.055	2.350	0.136	K, F
41	41	0.104	0.166	2.042	2.236	0.127	K, F
42	42	0.180	0.095	1.792	2.257	0.187	K
43	43	0.140	0.045	1.645	2.541	0.158	K
44	44	0.233	-0.017	1.229	3.118	0.236	K, Hb
45	45	0.024	0.174	1.795	2.752	0.074	K, F
46	46	0.518	-0.188	0.565	0.396	0.237	
47	47	0.295	-0.031	0.867	1.904	0.243	
48	48	0.372	0.129	0.773	2.031	0.310	Hc
49	49	0.100	0.068	1.575	2.639	0.127	K

Item difficulty parameter 'b' of 2021 Senior Secondary School Geography Mock Examinations in Federal Capital Territory, Abuja shows the values of difficulty parameter 'b' for all calibrated items. Table 1 shows there are 2 (4.1%) items that fall below the minimum acceptable bound of -3.0 difficulty parameter. There are 18 (38.7%) items that are above the maximum acceptable bound of 3.0 difficulty parameter. 29 (59.18%) items lie within the acceptable difficulty parameter bound.

Table 2: 2021 Frequency Distribution for difficulty Parameters“b”

Range	Frequency
-4.0 to -3.6	0
-3.6 to -3.2	0
-3.2 to -2.8	0
-2.8 to -2.4	0
-2.4 to -2.0	0
-2.0 to -1.6	0
-1.6 to -1.2	0
-1.2 to -0.8	3
-0.8 to -0.4	0
-0.4 to 0.0	1
0.0 to 0.4	2
0.4 to 0.8	0
0.8 to 1.2	0
1.2 to 1.6	1
1.6 to 2.0	6
2.0 to 2.4	4
2.4 to 2.8	5
2.8 to 3.2	20
3.2 to 3.6	5
3.6 to 4.0	2

Figure 1: 2021 Histogram of the item difficulty Parameters “b”

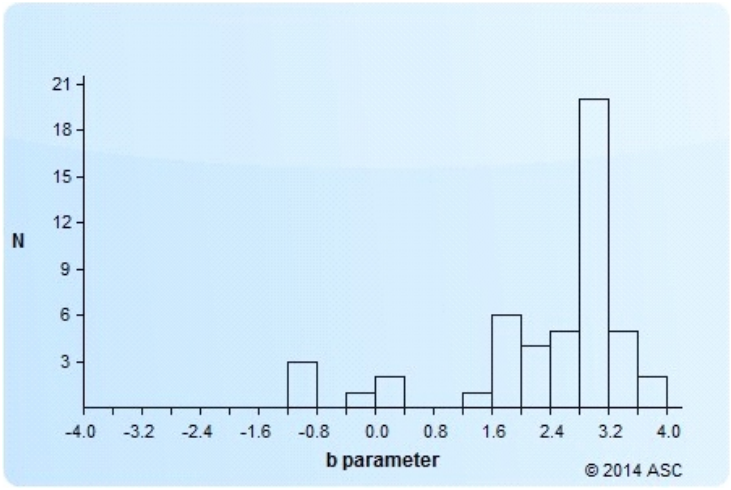
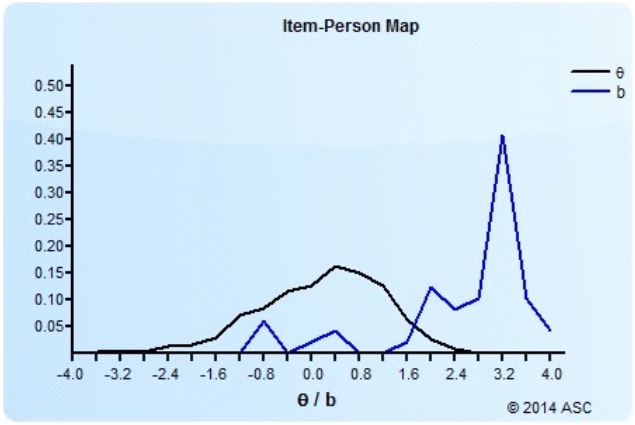


Figure 2: 2021item difficulty parameter "b" by Theta



The Figure 2 shows that the ability of the students which is theta was above the difficulty of the test from theta range – 4.0 to + 2.4, what this means is that test items was very easy for the students at this range. At theta = 1.9, the difficulty index of the test intercepted the theta /ability of the students, that means the theta / ability of the students equals the difficulty of the test items. From theta 1.95 – 4.0, the difficulty of the test was above the ability of the students. At this level, there was no interaction between the difficulty parameter 'b' of the test items and the ability of the students.

Research Question Two: What is the difficulty index of 2022 Senior Secondary School Geography Mock Examinations in Federal Capital Territory, Abuja?

Table 3:2022 Item Parameters for All Calibrated Items

Seq.	Item ID	P	R	A	B	C	Flag(s)
1	1	0.353	0.076	0.584	1.772	0.223	
2	2	0.403	-0.034	0.696	1.571	0.280	Hc
3	3	0.129	-0.096	1.295	3.584	0.157	K, Hb
4	4	0.856	-0.050	0.793	-1.375	0.251	Lb,Hc
5	5	0.111	0.012	1.828	2.781	0.137	K, F
6	6	0.098	0.095	1.607	3.295	0.128	K, Hb
7	7	0.115	0.042	1.791	2.767	0.140	K
8	8	0.067	0.048	1.828	2.737	0.103	K, F
9	9	0.122	0.054	1.787	2.711	0.144	K
10	10	0.038	0.050	1.923	2.782	0.084	K, F
11	11	0.130	0.049	1.507	3.112	0.152	K, Hb
13	13	0.353	-0.011	1.028	1.387	0.254	Hc
14	14	0.539	-0.035	1.504	0.415	0.294	Hc
15	15	0.126	0.015	1.740	2.731	0.148	K
16	16	0.141	0.045	1.474	3.113	0.160	K, Hb
17	17	0.239	-0.010	1.236	1.686	0.195	
18	18	0.049	0.093	1.851	2.812	0.091	K, F
19	19	0.438	-0.074	1.566	2.883	0.409	K, F, Hc
20	20	0.292	0.030	1.433	3.034	0.284	K, Hb, Hc
21	21	0.030	0.021	1.637	3.240	0.079	K, F, Hb
22	22	0.250	-0.002	1.229	1.583	0.195	
23	23	0.170	0.043	1.572	3.241	0.184	K, F, Hb
24	24	0.334	-0.029	1.605	2.692	0.319	K, F, Hc
25	25	0.112	-0.052	1.568	3.240	0.138	K, Hb
26	26	0.100	0.020	1.819	2.884	0.129	K, F
27	27	0.057	0.088	1.844	2.850	0.098	K, F
28	28	0.025	0.081	1.632	3.270	0.076	K, F, Hb
29	29	0.562	0.063	0.341	0.765	0.277	La, Hc
30	30	0.261	-0.017	1.521	3.165	0.259	K, F, Hb, Hc
31	31	0.179	-0.111	1.550	3.212	0.191	K, F, Hb
32	32	0.291	-0.069	1.368	2.445	0.276	K, Hc
33	33	0.604	-0.112	0.897	0.014	0.240	Lb
34	34	0.099	0.052	1.553	3.148	0.128	K, F, Hb
35	35	0.165	0.059	1.418	2.440	0.172	K
36	36	0.141	-0.055	1.683	2.693	0.159	K, F
37	37	0.106	-0.040	1.549	3.200	0.133	K, Hb
38	38	0.261	0.099	1.240	2.145	0.240	K
40	40	0.129	0.007	1.590	3.223	0.152	K, F, Hb
41	41	0.090	-0.045	1.612	3.188	0.122	K, F, Hb
42	42	0.824	-0.018	1.175	-0.938	0.247	Lb
43	43	0.416	0.061	0.538	2.050	0.304	K, Hc
44	44	0.184	-0.028	1.690	2.832	0.194	K
45	45	0.334	-0.052	1.849	0.889	0.204	F
46	46	0.048	0.026	1.638	3.288	0.092	K, F, Hb
47	47	0.776	-0.005	0.894	-0.806	0.247	Lb
48	48	0.173	0.004	1.652	2.717	0.186	K
49	49	0.741	-0.108	0.719	-0.800	0.245	Lb

Item difficulty parameter “b” of 2022 Senior Secondary School Geography Mock Examinations in Federal Capital Territory, Abuja shows that, values of b parameter

for the result shows that From the table below, there are 5 (10.2%) items that fall below the minimum acceptable bound of -3.0 difficulty parameter. There are 16 (32.65%) items that are above the maximum acceptable bound of 3.0 difficulty parameter. 27 (55.10%) items lie within the acceptable difficulty parameter bound.

Table 4: 2022 *Frequency Distribution for the item Parameters 'b'*

Range	Frequency
-4.0 to -3.6	0
-3.6 to -3.2	0
-3.2 to -2.8	0
-2.8 to -2.4	0
-2.4 to -2.0	0
-2.0 to -1.6	0
-1.6 to -1.2	1
-1.2 to -0.8	2
-0.8 to -0.4	1
-0.4 to 0.0	0
0.0 to 0.4	1
0.4 to 0.8	2
0.8 to 1.2	1
1.2 to 1.6	3
1.6 to 2.0	2
2.0 to 2.4	2
2.4 to 2.8	11
2.8 to 3.2	11
3.2 to 3.6	10
3.6 to 4.0	0

Figure 3: 2022 Histogram of the Item difficulty *Parameters 'b'*

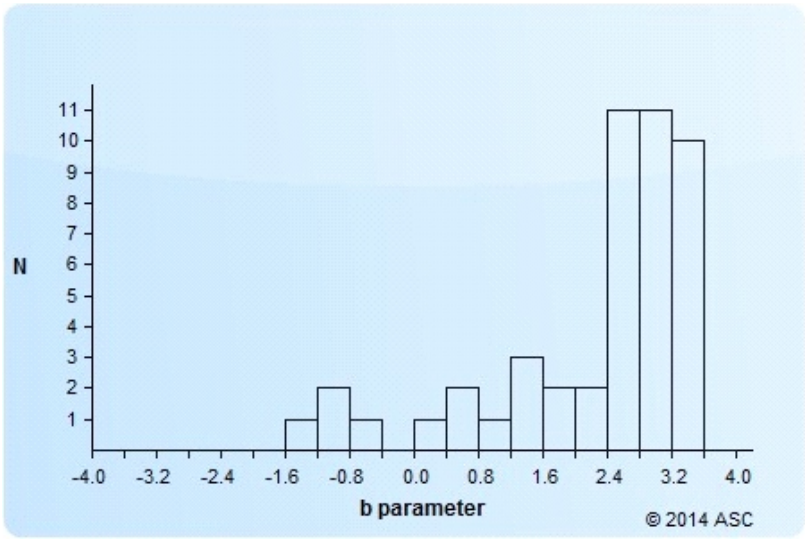
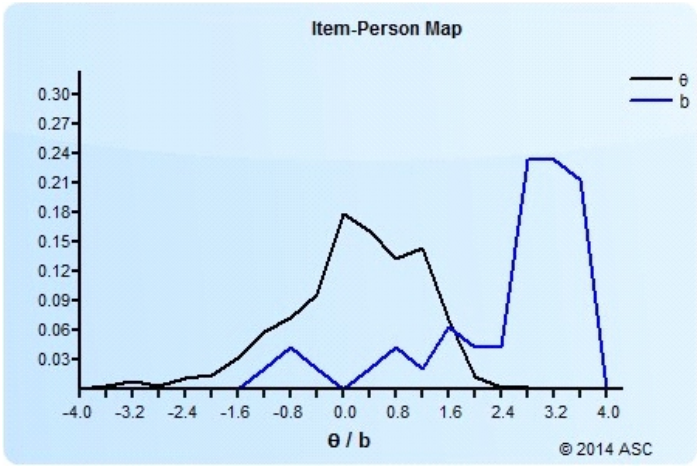


Figure 4: 2022 item difficulty indices “b” by Theta



From the Figure 4 above, the theta (ability) of the students was quite above the difficulty index of the test items from theta range -4 to 2.0 whereas the difficulty of the test was slightly above the theta of the students at 2.1 to 4.0. The range at which the test items are simple is more than the range at which it can be considered difficult.

Discussion of Findings

This study revealed that the instruments have low difficulty indices. This finding of low difficulty index is in agreement with Ebuta and Effa (2015) who

observed that 50 items mathematics multiple choice items developed by the Crossriver State Ministry of Education and administered in the state senior secondary school mock examination in 2014, had low difficulty indices ranging from 0.18 and 0.88. Also, this shows that the sample consists of different ability groups. This is also in agreement with the position of literature (Onunkwo, 2008, Nenty, 2010 Joshua, 2014; Ojerinde, Popoola, Ojo & Onyecho, 2012. The difficulty of the test items was low, and so, the test as a measurement device cannot be said to be of good quality. The implication of this finding is that the low difficulty index of the test could lead to over estimation of the students ability when they come in contact with test items in external examination bodies like WAEC and NECO, it becomes a problem as their true ability will disappoint them. Adonu (2015) reported a contrary view, their report show that items for the year 2011 had estimate that ranges from – 1.29 (the easiest) to 1.47 (the most difficult). The mean of the estimate distribution is 0.00 which suggest desirable difficulty indices since both the positive and negative range are close to 0.00 and the standard deviation is low 0.84. It suggests a fair balance between difficult and moderately easy items. What this means is that Mock examinations cannot be widely used to predict final examinations and admit candidates into tertiary institutions in Nigeria (Adesoji, 2008 & Joshua, 2014). More so, tertiary institutions cannot admit candidates based on mock examination results in Nigeria because the mock examination results have been found to be of low difficulty index.

Conclusion

The expected contribution of Geography to national growth and development as contained in the aim and objectives of national curriculum review of 2012 are enormous and cannot be over emphasized. Following the findings of the study, it was revealed that the values of item difficulty parameter 'b' that lie within and above the maximum acceptable bound of 3.0 are few. It shows that the ability of the students which is theta on majority of the items was above the difficulty of the test. The mock examination results have been found to be of low difficulty index. Much effort must be put in place in test construction so that adequate number of candidates will be qualified to study courses at tertiary level that are Geography related to solve geographically related problems.

Recommendations

From the findings, the following recommendations are made:

1. Seminars should be organized by the authority concerned to sensitize and expose teachers to the theory and concepts of table of specification.
2. The authority of secondary schools should ensure that subject teachers make use of table of specification when developing test items.

3. Measurement and evaluation experts should be employed in the schools to guide teachers on test constructions.
4. Training and retraining of staff are recommended to build the capacity of teachers with relevant knowledge in test constructions.

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