Original Research Article

Discrimination and Difficulty Indices of Senior Secondary Certificate Examination Multiple Choice Physics Questions from 2016 – 2018 in Rivers State

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Abstract: This study investigated the Discrimination and Difficulty Indices of Senior Secondary Certificate Examination (SSCE) Multiple Choice Physics Questions from 2016–2018 in Rivers State. The study made use of ex-post facto research design and was guided by two research questions. Sample for the study comprised of 330 SSCE Multiple Choice Physics Questions of WAEC and NECO between 2014–2018, having a total of 550 multiple choice items. In the course of determining the psychometric properties of the tests, simple random sampling technique was used to compose a sample of 692 SS3 physics students from eight (8) secondary schools in five (5) Local Government Areas, out of a population of all the 42,865 Senior Secondary three (SS3) students in Public Secondary Schools in Rives State during 2018/2019 academic session. From this sample of 692 SS3 physics students, only 665 students, representing 96.1%, took part in all the tests. Instruments utilized for data collection in the study were past SSCE Multiple Choice Physics Question Papers of WAEC and NECO of 2016–2018 which were already validated by the two Examination Bodies. Data from the study were analyzed by the use of formulae for carrying out item analyses which were used to determine the Discrimination and Difficulty Indices of the tests. Findings from the study revealed that all the instruments in the years studied, had good Discrimination and Difficulty Indices, but WAEC SSCE Multiple Choice Physics Test Items had higher Discrimination Indices than NECO SSCE Multiple Choice Physics Items for the same years studied. Findings from the study also revealed that SSCE Multiple Choice Physics items of WAEC for the years 2016 – 2018 studied are more difficult than SSCE Multiple Choice Physics Test Items of NECO of the same years. Based on the findings, recommendations were made.
Keywords: Discrimination Difficulty Indices Physics Questions.

INTRODUCTION

The term "physics" was derived from the Latin word "physica" which means "natural thing" According to Collins (online) English Dictionary (2018), physics is the scientific study of forces such as heat, light, sound, pressure, gravity and electricity and the way they affect objects. Muhammad (2018) defined physics as the study of the properties of matter, energy and their mutual relationship. Physics as a branch of the pure science plays a major

role in Science Education. It is a compulsory subject for secondary school science students due to it's wide applications to science based courses which they may likely want to study at the Higher Institutions of learning, such as Medical Sciences, Engineering, Computer Science, Information and Communications Technology (ICT), Geology and mining, Oil and Gas Studies, Space Research, Physics Education etc. This wide applications of physics to these varieties of science based courses, therefore, renders physics as a subject in which every science student must achieve a pass at credit level in such external examinations such as those conducted by West African Examinations Council (WAEC) and National Examinations Council (NECO). The Federal Government of Nigeria in recognizing the Huge role of physics as one of the fundamental subjects for Science and Technology Development of the country, clearly stated in the National Curriculum, Federal Republic of Nigeria (2004, p. 33) that "a greater proportion of University Education shall be devoted to science and technology". This is obviously an effort on the part of the government to encourage the study of physics and other fundamental subjects for Science and Technology Development of the Country such as Chemistry and Biology. Inspite of this effort of the government, the downward, trend in the academic performance of secondary school students over the years in these science subjects, especially physics, has not reversed to any appreciable extent. Science Teachers Association of Nigeria STAN (2008) reported that there is a steady lowering in the percentage passes of students both in internal and external examinations such as those conducted by West African Examinations Council (WAEC) and National Examinations Council (NECO). The consistent low performance of students in science subjects in Public Examinations in Nigeria, is corroborated by WAEC press release of years 2000 – 2010 cited in Chidozie (2014), revealing more than half of the entire candidates as having failed the Examinations in Biology for the ten (10) years period.

In a recent study on students' academic performance in science, Olabisi (2010) observed that less than twenty (20) percent of students who enrolled for and wrote the West African Senior Secondary Certificate Examination (WASSCE) in 2009 scored five (5) credits in their five (5) core subjects including English Language and mathematics. He noted that the worst affected among the science subjects is physics.

The poor trend in Science Education in Nigeria which is the bedrock of Science and Technology Development, and consequently, the bedrock of socio-economic development of the country, is the basis of several studies carried out by

other researchers on the psychometric properties (Validity, Reliability, Item Discrimination, Item Difficulty and Distracter Indices) of the various instruments used to test candidates' performance in all the subjects, by the various Examination Bodies such as West African Examinations Council (WAEC), National Examinations Council (NECO), National Business and Technical Education Board (NABTEB), Joint Admissions and Matriculations Board (JAMB) etc. These poor performances of students in the sciences have been attributed to several factors. For instance, Adewumi in Nwaogazie (2013) is of the view that lack of qualified science teachers is a contributor to the low-academic achievement while Onunkwo (2002) attributed it to factors inherent in the test items. On the other hand, it had been observed that the performance of candidates/students in the Examinations conducted by WAEC and NECO varies from year – to – year. That sometimes, performance in NECO seems to be better than that of WAEC. This incongruity in the performance of candidates/students in the examinations conducted by the two examination bodies had led to the general speculations that questions in examinations conducted by WAEC are more difficult than those of NECO. This believe does not have any empirical backing. Based on these unproven speculations, the researchers were therefore motivated to undertake the study on Discrimination and Difficulty Indices of Senior Secondary Certificate Examination Multiple Choice Physics Questions from 2016 – 2018 in Rivers State.

According to Rasch (2004), item discrimination is the extent to which success on an item corresponds to success on the whole test. According to him, since all items in a test are intended to co-operate to generate an overall test scores, any item with negative or zero discrimination undermines the test. He further added that positive item discrimination is generally productive unless it is so high that the item merely repeats the information provided by other items in the test. Iweka (2014) is of the view that if a test is given to a large group of people, the Discrimination Power of an item can be measured by comparing the number of people with high test scores (i.e. those in the upper group) who answered the item correctly with the number of people with low-scores (i.e. lower group) who answered same item correctly.

Item difficulty of a test is the level of difficulty or easiness of the test (Nkwocha, 2004). In the words of Anastasi and Urbina (2010), it is customary to arrange test items in order of difficulty, so that test takers begin with relatively easy items and proceed to items of increasing difficulty. This arrangement according to them, gives the test takers confidence in approaching the test and also reduces

the likelihood of their wasting much time on items beyond their ability to the neglect of easier items they can correctly answer. Item difficulty can also be defined as the percentage of test takers who attempted and answered a test item correctly. A good knowledge of the concept of item difficulty is very important because it enables test developers, testers, examiners or examination bodies to know when an item is too easy or too hard. If test items are either too easy or too hard, all the test takers will either pass or fail the test, thereby leading to a lowering of the reliability of such a test, because it will not allow for discrimination or differentiation between students/testees/examinees/candidates who do not. Such as situation disallows the assignment of grades to students, since it placed all students on the same level of scores.

Statement of the Problem

The researchers observed that secondary school students in Rivers State perform better in Senior Secondary Certificate Examinations (SSCE) Physics conducted by National Examinations Council (NECO) than the Senior Secondary Certificate Examinations (SSCE) Physics conducted by West African Examinations Council (WAEC). The researchers also observed that a lot of people took down on the Senior Secondary Certificate Examinations (SSCE) results of NECO generally, including physics, as against SSCE results of WAEC which is widely held in high esteem. The observed discrepancy in the performance of students in physics examinations conducted by these two examination bodies whose standards are expected to be the same, therefore, raised some questions about the *Discrimination* and *Difficulty* indices of the tests conducted the two examination bodies. The problem of this study therefore, was to investigate the Discrimination and Difficulty Indices of Senior Secondary Certificate Examination (SSCE) Multiple Choice Physics Questions of WAEC and NECO from 2016 – 2018 in Rivers State.

Aim and Objectives of the Study

The aim of this study was to determine the Discrimination and Difficulty Indices of Senior Secondary Certificate Examinations (SSCE) Multiple Choice Physics Questions of WAEC and NECO from 2016 – 2018 in Rivers State. In more specific terms, the objectives of this study were to:
(1)   Find out the Discrimination Indices of SSCE Multiple Choice Physics Questions of WAEC and NECO from 2016 – 2018 in Rivers State.
(2)   Find out the Difficulty Indices of SSCE Multiple Choice Physics Questions of WAEC and NECO from 2016 – 2018 in Rivers State.

Research Questions

The following research questions were answered in an attempt to arrive at the findings of the study:
1.   What are the Discrimination Indices of SSCE Multiple Choice Physics Questions of WAEC and NECO from 2016 – 2018 in Rivers State?
2.   What are the Difficulty Indices of SSCE Multiple Choice Physics Questions of WAEC and NECO from 2016 – 2018 in Rivers State?

METHODOLOGY

Research design for the study was ex-post facto. According to Simon and Goes (2013), ex-post facto means "from what is done afterwards" Simon and Goes are of the view that ex-post facto research design is ideal for carrying out social research when it is either not possible or acceptable to manipulate the characteristics of human subjects or participants in a research. Again, that ex-post facto is a substitute for true experimental research and can be used to test hypotheses on cause-and-effect.

Nwankwo (2013 p. 85) posits that ex-post facto design is a research design that involves collecting and analyzing data about some variables retrospectively, or about variables which are already in place without manipulating any of them, in order to find out how some of them influence or are related to other variables. The population of the study was derived from the item banks of West African Examinations Council (WAEC) and National Examinations Council (NECO) Senior School Certificate Examinations (SSCE) Multiple Choice Physics Questions from 2014 – 2018 having a total of 550 multiple choice items.

However, the Discrimination and Difficulty Indices of the SSCE questions for the years studied, were determined using the population of all the 42,865 Senior Secondary three (SS3) students in Public Secondary Schools in Rivers State in 2018/2019 academic session, while the sample consisted of 692 SS3 physics students who were Senior Secondary School Certificate Examinations (SSCE) candidates of WAEC and NECO in the 2018/2019 academic session. Simple Random Sampling Technique was used to compose the sample of students from eight (8) Secondary Schools purposively selected from five (5) out of the twenty three (23) Local Government Areas in Rivers State. Out of this sample of 692, only 665 physics students took part in all the tests, thus representing 96.1% of the sample. The two sets of instruments utilized for data collection were West African Examinations Council (WAEC) and National Examinations Council (NECO) Senior School Certificate Examination

(SSCE) Multiple Choice Physics Questions of May/June/July of the years 2016 – 2018 which had already been validated by the two examination bodies and whose reliability coefficients had also been carried out by West African Examinations Council (WAEC) and National Examinations Council (NECO) respectively, before they were administered to the candidates who wrote these examinations in the years 2016 – 2018 studied. In addition to this, discrimination and difficulty indices of SSCE Multiple Choice Physics Questions administered to candidates by these examination bodies, was the focus of the present study.

Copies of a pair of the instruments for data collection, WAEC Physics Questions of 2016 tagged (WPQ1) and NECO Physics Questions 2016 tagged (NPQ1), WAEC physics questions of 2017 tagged (WPQ2) and NECO Physics Questions 2017 tagged (NPQ2) as well as WAEC Physics Questions 2018 tagged (NPQ3) and NECO Physics Questions tagged (NPQ3) respectively, were administered to the students to respond to, for the same 1 hour, 15 minutes duration per instrument/questions paper as well as under very similar examination conditions as allowed by West African Examinations Council (WAEC) and National Examinations Council (NECO) respectively.

The researchers administered a total of 4,152 WAEC and NECO SSCE physics Past Question papers over a period of three (3) weeks, out of which only 3,900 copies were duly answered and returned, giving a return rate of 96.1%. They were assisted in this arduous task by the services of three (3) trained research assistants to ensure that the instruments were properly administered and adequately retrieved after being responded to. At the end of each set of tests, the scripts were retrieved, marked and scored based on WAEC and NECO SSCE physics marking guides for the years 2016 – 2018.

The date generated were analyzed by the use of formulae for carrying out item analyses which were used to determine the Discrimination and Difficulty Indices of the tests.

RESULTS
The following results were obtained

Research Questions
1. What are the Discrimination Indices of SSCE Multiple Choice Physics Questions of WAEC and NECO from 2016 – 2018 in Rivers State?

Table-1a: Discrimination Indices of SSCE Multiple Choice Physics of WAEC 2016

Items	Discrimination Index	Remarks	Items	Discrimination Index	Remarks
1	0.681	Good	31	0.477	Good
2	0.454	Good	32	0.636	Good
3	0.500	Good	33	0.557	Good
4	0.590	Good	34	0.345	Good
5	0.636	Good	35	0.600	Good
6	0.363	Good	36	0.318	Good
7	0.186	Poor	37	0.409	Good
8	0.463	Good	38	0.254	Marginal
9	0.405	Good	39	0.386	Good
10	0.475	Good	40	0.181	Poor
11	0.563	Good	41	0.729	Good
12	0.681	Good	42	0.250	Marginal
13	0.727	Good	43	0.563	Good
14	0.463	Good	44	0.472	Good
15	0.472	Good	45	0.450	Good
16	0.250	Marginal	46	0.163	Poor
17	0.509	Good	47	0.445	Good
18	0.295	Marginal	48	0.665	Good
19	0.409	Good	49	0.636	Good
20	0.386	Good	50	0.545	Good
21	0.168	Poor			
22	0.477	Good			
23	0.581	Good			
24	0.590	Good			
25	0.545	Good			
26	0.540	Good			
27	0.545	Good			
28	0.418	Good			
29	0.568	Good			
30	0.572	Good			

Table 1a indicated that for WAEC physics questions (WPQ) 2016, four (4) items discriminated poorly. These are items 7, 21, 40 and 46. The table also indicated that for (4) items were marginal, which implies that these items could be reviewed and tried out again. These are items 16, 18, 38 and 42. The remaining 42 items were good discriminators.

These were items 1, 2, 3, 4, 5, 6, 8, 9, 10, 11, 12, 13, 14, 15, 17, 19, 20, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 39, 41, 43, 44, 45, 47, 48, 49 and 50.

Table 1b: Discrimination Indices of SSCE Multiple Choice Physics Questions of WAEC 2017

Items	Discrimination Index	Remarks	Items	Discrimination Index	Remarks
1	0.477	Good	31	0.141	Poor
2	0.636	Good	32	-0.056	Bad
3	0.490	Good	33	0.513	Good
4	0.660	Good	34	0.584	Good
5	0.545	Good	35	0.556	Good
6	0.205	Marginal	36	0.473	Good
7	0.409	Good	37	0.409	Good
8	0.500	Good	38	0.505	Good
9	0.527	Good	39	0.409	Good
10	0.445	Good	40	0.287	Marginal
11	0.432	Good	41	0.527	Good
12	0.568	Good	42	0.652	Good
13	0.468	Good	43	0.548	Good
14	0.490	Good	44	0.197	Poor
15	0.616	Good	45	0.439	Good
16	0.591	Good	46	0.452	Good
17	0.480	Good	47	0.412	Good
18	0.387	Good	48	0.566	Good
19	0.348	Good	49	0.480	Good
20	0.477	Good	50	0.176	Poor
21	0.620	Good			
22	0.391	Good			
23	0.513	Good			
24	0.437	Good			
25	0.520	Good			
26	0.441	Good			
27	0.627	Good			
28	0.588	Good			
29	0.523	Good			
30	0.606	Good			

Table 1b Indicated that for WAEC Physics Question (WPQ) 2017, 3 items discriminated poorly. These are items 31, 44 and 50. The table also indicated that 2 items were marginal, which implies that these items could be reviewed and tried out again. These are items 6 and 40. Table 1b also revealed that one item was totally bad because it had a negative coefficient value, which implied that it discriminated in the wrong direction. This is item 32. The remaining 44 items were good discriminators. These are items 1, 2, 3, 4, 5, 7, 8, 9, 10, 11,12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 33, 34, 35, 36, 37, 38, 39, 41, 42, 43, 45, 46, 47,48 and 49.

Table-1c: Discrimination Indices of SSCE Multiple Choice Physics Questions of WAEC 2018

Items	Discrimination Index	Remarks	Items	Discrimination Index	Remarks
1	0.568	Good	31	0.490	Good
2	0.500	Good	32	0.660	Good
3	0.277	Marginal	33	0.477	Good
4	0.340	Good	34	0.462	Good
5	0.409	Good	35	0.488	Good
6	0.313	Good	36	0.505	Good
7	0.300	Good	37	0.269	Marginal
8	0.340	Good	38	-0.089	Bad
9	0.227	Marginal	39	0.584	Good
10	0.454	Good	40	0.505	Good
11	0.165	Poor	41	0.487	Good
12	0.318	Good	42	-0.105	Bad
13	0.364	Good	43	0.652	Good
14	0.409	Good	44	0.609	Good
15	0.477	Good	45	0.509	Good
16	0.545	Good	46	0.520	Good
17	0.636	Good	47	0.631	Good
18	0.268	Marginal	48	0.387	Good
19	0.364	Good	49	0.185	Poor
20	0.318	Good	50	0.487	Good
21	0.422	Good			
22	0.460	Good			
23	0.636	Good			
24	0.682	Good			
25	0.468	Good			
26	0.590	Good			
27	0.568	Good			
28	0.382	Good			
29	0.450	Good			
30	0.364	Good			

Table1c indicated that for WAEC physics questions (WPQ) 2018, 2 items discriminated poorly. These are items 11 and 49. Table 1c also revealed that 4 items were marginal, which implies that these items could be reviewed and tried out again. These are items 3, 9, 18 and 37. The table also indicated that 2 items were completely bad, because they had negative coefficient values, which implies that they discriminated in the wrong direction. These are items 38 and 42. The remaining 42 items were good discriminators. These are items 1, 2, 4, 5, 6, 7, 8, 10, 12, 13, 14, 15, 16, 17, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 39, 40, 41, 43, 44, 45, 46, 47, 48 and 50.

Table -1d: Discrimination Indices of SSCE Multiple Choice Physics Questions of NECO 2016

Items	Discrimination Index	Remark	Items	Discrimination Index	Remark
1	0.543	Good	31	0.254	Marginal
2	0.659	Good	32	0.178	Poor
3	0.570	Good	33	0.568	Good
4	0.432	Good	34	0.681	Good
5	0.341	Good	35	0.659	Good
6	0.450	Good	36	0.340	Good
7	0.246	Marginal	37	0.272	Marginal
8	0.705	Good	38	0.295	Marginal
9	0.586	Good	39	0.400	Good
10	0.5277	Good	40	0.318	Good
11	0.409	Good	41	0.500	Good
12	0.654	Good	42	0.431	Good
13	0.258	Marginal	43	0.727	Good
14	0.568	Good	44	0.490	Good
15	0.295	Marginal	45	−0.034	Bad
16	0.250	Marginal	46	0.590	Bad

Items	Discrimination Index	Remark	Items	Discrimination Index	Remark
17	0.136	Poor	47	0.659	Bad
18	0.436	Good	48	0.181	Poor
19	0.454	Good	49	0.545	Good
20	0.568	Good	50	0.284	Marginal
21	0.500	Good	51	0.818	Good
22	0.477	Good	52	0.176	Poor
23	−0.052	Bad	53	0.168	Poor
24	0.527	Good	54	0.254	Marginal
25	0.681	Good	55	0.348	Good
26	0.590	Good	56	−0.048	Bad
27	0.148	Poor	57	0.431	Good
28	0.318	Good	58	0.568	Good
29	0.340	Good	59	0.109	Poor
30	0.482	Good	60	0.113	Poor

Table 1d: When compared to the discrimination Indices of WAEC physics questions (WPQ) 2016, table 4.3b indicated that for NECO physics questions (NPQ) 2016, 8 items discriminated poorly. These are items 17, 27, 32, 48, 52, 53, 59 and 60. The table also indicated that 9 items were marginal, which implies that they could be reviewed and tried out again. These items are 7, 13, 15, 16, 31, 27, 38, 50 and 54.

Table 1d also revealed that 3 items were completely bad because they had negative coefficient values, which implies that they discriminated in the wrong direction. These are items 23, 45 and 56. The remaining 40 items were good discriminators. They are 1, 2, 3, 4, 5, 6, 8, 9, 10, 11, 12, 14, 18, 19, 20, 21, 22, 24, 25, 26, 28, 29, 30, 33, 34, 35, 36, 39, 40, 41, 42, 43, 44, 46, 47, 49, 51, 55, 57 and 58.

Table-1e: Discrimination Indices of SSCE Multiple Choice Physics Questions of NECO 2017

Item	Discrimination Index	Remark	Item	Discrimination Index	Remark
1	0.625	Good	31	0.462	Good
2	0.394	Good	32	0.509	Good
3	0.584	Good	33	0.412	Good
4	0.763	Good	34	0.613	Good
5	0.477	Good	35	0.527	Good
6	0.559	Good	36	0.480	Good
7	0.289	Marginal	37	0.186	Poor
8	0.620	Good	38	0.323	Good
9	0.269	Marginal	39	0.160	Poor
10	0.505	Good	40	0.273	Marginal
11	0.631	Good	41	0.301	Good
12	0.441	Good	42	0.450	Good
13	0.448	Good	43	0.337	Good
14	0.591	Good	44	0.273	Marginal
15	0.452	Good	45	0.280	Marginal
16	0.559	Good	46	0.208	Marginal
17	0.548	Good	47	0.169	Poor
18	0.487	Good	48	0.484	Good
19	0.631	Good	49	0.323	Good
20	0.652	Good	50	0.470	Good
21	0.470	Good	51	0.358	Good
22	0.552	Good	52	0.391	Good
23	0.434	Good	53	0.520	Good
24	0.409	Good	54	-0.106	Bad
25	0.466	Good	55	0.552	Good
26	0.509	Good	56	0.419	Good
27	0.730	Good	57	-0.125	Bad
28	0.581	Good	58	0.244	Marginal
29	0.480	Good	59	0.262	Marginal
30	0.177	Poor	60	0.459	Good

Table 1e: When compared to the discrimination indices of WAEC physics question (WPQ) 2017, table 1e indicated that for NECO physics questions (NPQ) 2017, 4 items discriminated poorly. These items are 30, 37, 39 and 47. Table 1e also indicated that 8 items were marginal, which implies that these items could be reviewed and tried out again. These items are 7, 9, 40, 44, 45, 46, 58 and 59. The table also revealed that 2 items were totally bad because they had negative coefficient values, which implies that they discriminated in the wrong direction. These are items 54 and 57. The remaining 46 items were good discriminators. They are: 1, 2, 3, 4, 5, 6, 8, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 31, 32, 33, 34, 35, 36, 38, 41, 42, 43, 48, 49, 50, 51, 52, 53, 55, 56 and 60.

Table-1f: Discrimination Indices of SSCE Multiple Choice Physics Questions of NECO 2018

Item	Determination Index	Remark	Item	Determination Index	Remark
1	0.636	Good	31	0.527	Good
2	0.509	Good	32	0.613	Good
3	0.387	Good	33	0.412	Good
4	0.673	Good	34	0.434	Good
5	0.332	Good	35	0.552	Good
6	0.511	Good	36	0.563	Good
7	0.522	Good	37	0.437	Good
8	0.656	Good	38	0.179	Poor
9	0.613	Good	39	0.434	Good
10	0.505	Good	40	-0.108	Bad
11	0.309	Good	41	0.352	Good
12	0.548	Good	42	0.552	Good
13	0.434	Good	43	0.315	Good
14	0.602	Good	44	0.484	Good
15	0.566	Good	45	0.480	Good
16	0.638	Good	46	0.530	Good
17	0.487	Good	47	0.319	Good
18	0.273	Marginal	48	0.108	Bad
19	0.190	Poor	49	0.534	Bad
20	0.301	Good	50	0.280	Marginal
21	0.380	Good	51	0.358	Good
22	0.523	Good	52	0.208	Marginal
23	0.703	Good	53	0.280	Marginal
24	0.667	Good	54	-0.86	Bad
25	0.570	Good	55	0.254	Marginal
26	0.462	Good	56	0.511	Good
27	0.584	Good	57	0.432	Good
28	0.498	Good	58	-0.98	Bad
29	0.455	Good	59	-0.087	Bad
30	0.189	Poor	60	0.520	Good

Table 1f indicated that for NECO physics questions (NPQ) 2018, 3 items discriminated poorly. These are items 19, 30 and 38. Table 1f also showed that 5 items were marginal. This implies that these items could be reviewed and tried out again. These are items 18, 50, 52, 53 and 55. The table also revealed that 5 items were totally bad, because they had negative coefficient values, an indication that they discriminated ion the wrong direction. These are items 40, 54, 58 and 59. The remaining 47 items were good discriminators. These are items 1, 2, 4, 5, 6, 7, 8, 10, 11, 12, 13, 14, 15, 16, 17, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 39, 40, 41, 42, 43, 44, 45, 46, 47, 49, 50, 56, 57 and 60.

2. What are the Difficulty Indices of SSCE Multiple Choice Physics Questions of WAEC and NECO from 2016 – 2018 in Rivers State?

Table-2a: Difficulty Indices of SSCE Multiple Choice Physics Questions of WAEC 2016

Items	Difficulty Index	Remarks	Items	Difficulty Index	Remarks
1.	0.445	Adequate	31	0.681	Adequate
2.	0.431	Adequate	32	0.465	Adequate
3.	0.500	Adequate	33	0.727	Adequate
4.	0.386	Difficult	34	0.450	Adequate
5.	0.636	Difficult	35	0.838	Adequate
6.	0.454	Difficult	36	0.454	Adequate
7.	0.436	Difficult	37	0.477	Adequate
8.	0.681	Adequate	38	0.659	Adequate
9.	0.590	Adequate	39	0.427	Adequate
10.	0.522	Adequate	40	0.431	Adequate
11.	0.677	Adequate	41	0.363	Difficult
12.	0.410	Adequate	42	0.659	Adequate
13.	0.318	Difficult	43	0.469	Adequate
14.	0.316	Difficult	44	0.454	Adequate
15.	0.522	Adequate	45	0.485	Adequate
16.	0.507	Adequate	46	0.295	Difficult
17.	0.450	Adequate	47	0.177	Difficult
18.	0.363	Difficult	48	0.477	Adequate
19.	0.402	Adequate	49	0.472	Adequate
20.	0.359	Difficult	50	0.770	Adequate
21.	0.377	Difficult			
22.	0.314	Difficult			
23.	0.818	Adequate			
24.	0.609	Adequate			
25.	0.709	Adequate			
26.	0.438	Adequate			
27.	0.340	Difficult			
28.	0.427	Adequate			
29.	0.188	Difficult			
30.	0.705	Adequate			

Table 2a showed that for WAEC physics questions (WPQ) 2016, 12 out of 50 items were very difficult; hence they were not adequate for SS 3 students based on this criterion. These items are 4, 5, 6, 7, 13, 14, 18, 20, 21, 22, 27, 29, 41, 46 and 47. Table 2a also revealed that the remaining 38 items were considered adequate to be included in the test based on their difficulty indices. These are items 1, 2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 15, 16, 17, 19, 23, 24, 25, 26, 28, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 42, 43, 44, 45, 48, 49 and 50.

Table-2b: Difficulty Indices of SSCE Multiple Choice Physics Question of WAEC 2017

Items	Difficulty Index	Remarks	Items	Difficulty Index	Remarks
1	0.826	Adequate	31	0.772	Adequate
2	0.727	Adequate	32	0.654	Adequate
3	0.636	Adequate	33	0.677	Adequate
4	0.545	Adequate	34	0.820	Adequate
5	0.625	Adequate	35	0.832	Adequate
6	0.431	Adequate	36	0.543	Adequate
7	0.409	Adequate	37	0.838	Adequate
8	0.454	Adequate	38	0.586	Adequate
9	0.659	Adequate	39	0.790	Adequate
10	0.500	Adequate	40	0.340	Difficult
11	0.364	Difficult	41	0.900	Adequate
12	0.450	Adequate	42	0.700	Adequate
13	0.677	Adequate	43	0.659	Adequate
14	0.727	Adequate	44	0.700	Adequate
15	0.682	Adequate	45	0.654	Adequate

Items	Difficulty Index	Remarks	Items	Difficulty Index	Remarks
16	0.341	Difficult	46	0.636	Adequate
17	0.432	Adequate	47	0.570	Adequate
18	0.736	Adequate	48	0.227	Difficult
19	0.705	Adequate	49	0.180	Difficult
20	0.654	Adequate	50	0.160	Difficult
21	0.591	Adequate			
22	0.568	Adequate			
23	0.700	Adequate			
24	0.686	Adequate			
25	0.254	Difficult			
26	0.500	Adequate			
27	0.590	Adequate			
28	0.357	Difficult			
29	0.365	Difficult			
30	0.382	Difficult			

Table 2b showed that for WAEC physics questions WPQ (2017) 10 items out of 50 items were very difficult, hence they were not adequate for SS 3 students based on the established criterion. These items are 11, 16, 25, 28, 29, 30, 40, 48, 49, and 50. Table 2b also revealed that the remaining 40 items were adequate to be included in the test based on their difficulty indices. These items are: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 13, 14, 15, 17, 18, 19, 20, 21, 22, 23, 24, 26, 27, 31, 32, 33, 34, 35, 36, 37, 38, 39, 41, 42, 43, 44, 45, 46, and 47.

Table-2c: Difficulty Indices of SSCE Multiple Choice Physics Questions of WAEC 2018

Items	Difficulty Index	Remarks	Items	Difficulty Index	Remarks
1	0.783	Adequate	31	0.363	Difficult
2	0.681	Adequate	32	0.450	Adequate
3	0.654	Adequate	33	0.818	Adequate
4	0.602	Adequate	34	0.568	Adequate
5	0.616	Adequate	35	0.654	Adequate
6	0.477	Adequate	36	0.700	Adequate
7	0.439	Adequate	37	0.654	Adequate
8	0.434	Adequate	38	0.686	Adequate
9	0.640	Adequate	39	0.432	Adequate
10	0.547	Adequate	40	0.450	Adequate
11	0.599	Adequate	41	0.500	Adequate
12	0.489	Adequate	42	0.659	Adequate
13	0.435	Adequate	43	0.409	Adequate
14	0.769	Adequate	44	0.431	Adequate
15	0.750	Adequate	45	0.315	Difficulty
16	0.563	Adequate	46	0.167	Difficulty
17	0.731	Adequate	47	0.346	Difficulty
18	0.602	Adequate	48	0.314	Difficulty
19	0.701	Adequate	49	0.590	Adequate
20	0.409	Adequate	50	0.769	Adequate
21	0.495	Adequate			
22	0.296	Difficult			
23	0.590	Adequate			
24	0.719	Adequate			
25	0.599	Adequate			
26	0.705	Adequate			
27	0.756	Adequate			
28	0.363	Difficult			
29	0.272	Difficult			
30	0.507	Adequate			

Table 2c indicated that for WAEC physics questions (WPQ) 2018, 8 out of 50 items were very difficult; hence they were not adequate for candidates based on this criterion. These items are 22, 27, 28, 29, 45, 46, 47 and 48. The remaining 42 items were therefore, considered adequate to be included in the test based on their difficulty indices. These are: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 15, 16, 17, 18, 19, 20, 21, 23, 24, 25, 26, 27, 30, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 49 and 50.

Table-2d: Difficulty Indices of SSCE Multiple Choice Physics Questions of NECO 2016

Items	Difficulty Index	Remarks	Items	Difficulty Index	Remarks
1	0.705	Adequate	31	0.818	Adequate
2	0.654	Adequate	32	0.450	Adequate
3	0.500	Adequate	33	0.522	Adequate
4	0.832	Adequate	34	0.636	Adequate
5	0.727	Adequate	35	0.507	Adequate
6	0.677	Adequate	36	0.500	Adequate
7	0.756	Adequate	37	0.509	Adequate
8	0.677	Adequate	38	0.427	Adequate
9	0.341	Difficult	39	0.700	Adequate
10	0.432	Adequate	40	0.790	Adequate
11	0.464	Adequate	41	0.795	Adequate
12	0.790	Adequate	42	0.527	Adequate
13	0.586	Adequate	43	0.727	Adequate
14	0.838	Adequate	44	0.482	Adequate
15	0.832	Adequate	45	0.205	Difficult
16	0.820	Adequate	46	0.543	Adequate
17	0.772	Adequate	47	0.636	Adequate
18	0.682	Adequate	48	0.570	Adequate
19	0.657	Adequate	49	0.227	Difficult
20	0.677	Adequate	50	0.700	Adequate
21	0.227	Difficult	51	0.165	Difficult
22	0.570	Adequate	52	0.659	Adequate
23	0.591	Adequate	53	0.432	Adequate
24	0.686	Adequate	54	0.160	Difficult
25	0.654	Adequate	55	0.586	Adequate
26	0.705	Adequate	56	0.154	Difficult
27	0.659	Adequate	57	0.431	Adequate
28	0.625	Adequate	58	0.591	Adequate
29	0.568	Adequate	59	0.659	Adequate
30	0.342	Difficult	60	0.450	Adequate

Table 2d indicated that for NECO physics questions (NPQ) 2016, 8 items out of 60 items were very difficult, hence they were not adequate for SS 3 students based on this criterion. These items are 9, 21, 30, 45, 49, 51, 54 and 56. The table also showed that the remaining 52 items were considered adequate to be included in the test based on their difficulty indices. These items are: 1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 22, 23, 24, 25, 26, 27, 28, 29, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 46, 47, 48, 50, 52, 53, 55, 57, 58, 59 and 60.

Table-2e: Difficulty Indices of SSCE Multiple Choice Physics Questions of NECO 2017

Items	Difficulty Index	Remarks	Items	Difficulty Index	Remarks
1	0.677	Adequate	31	0.409	Adequate
2	0.538	Adequate	32	0.780	Adequate
3	0.600	Adequate	33	0.769	Adequate
4	0.538	Adequate	34	0.599	Adequate
5	0.489	Adequate	35	0.600	Adequate
6	0.181	Difficult	36	0.599	Adequate
7	0.435	Adequate	37	0.547	Adequate
8	0.769	Adequate	38	0.547	Adequate

Items	Difficulty Index	Remarks	Items	Difficulty Index	Remarks
9	0.780	Adequate	39	0.685	Adequate
10	0.563	Adequate	40	0.920	Easy
11	0.731	Adequate	41	0.167	Difficult
12	0.599	Adequate	42	0.458	Adequate
13	0.602	Adequate	43	0.525	Adequate
14	0.530	Adequate	44	0.630	Adequate
15	0.464	Adequate	45	0.760	Adequate
16	0.475	Adequate	46	0.712	Adequate
17	0.498	Adequate	47	0.602	Adequate
18	0.547	Adequate	48	0.676	Adequate
19	0.579	Adequate	49	0.668	Adequate
20	0.728	Adequate	50	0.676	Adequate
21	0.545	Adequate	51	0.937	Easy
22	0.720	Adequate	52	0.600	Adequate
23	0.586	Adequate	53	0.780	Adequate
24	0.314	Difficult	54	0.740	Adequate
25	0.590	Adequate	55	0.590	Adequate
26	0.477	Adequate	56	0.591	Adequate
27	0.299	Difficult	57	0.775	Adequate
28	0.530	Adequate	58	0.267	Difficult
29	0.516	Adequate	59	0.482	Adequate
30	0.640	Adequate	60	0.340	Difficult

Table 2e: When compared to the difficulty indices of WAEC SSCE physics questions (WPQ) 20917, table 2e indicated that for NECO physics questions (NPQ) 2017, 6 out of 60 items were very difficult; hence they were not adequate to be included in the test items for the candidates based on this criterion. These items are: 6, 24, 27, 41, 58 and 60. The table also showed that items 40 and 51 were too easy based on their very high values of difficulty indices. Hence the items were not adequate to be included in the test. The remaining 52 items were therefore, considered adequate to be included in the test based on their difficulty indices. These are items 1, 2, 3, 4, 5, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 25, 26, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 42, 43, 44, 45, 46, 47, 48, 49, 50, 52, 53, 54, 55, 56, 57 and 59.

Table-2f: Difficulty Indices of SSCE Multiple Choice Physics Questions of NECO 2018

Items	Difficulty Index	Remarks	Items	Difficulty Index	Remarks
1	0.731	Adequate	31	0.591	Adequate
2	0.599	Adequate	32	0.470	Adequate
3	0.409	Adequate	33	0.504	Adequate
4	0.495	Adequate	34	0.783	Adequate
5	0.850	Adequate	35	0.795	Adequate
6	0.435	Adequate	36	0.865	Adequate
7	0.602	Adequate	37	0.620	Adequate
8	0.568	Adequate	38	0.500	Adequate
9	0.856	Adequate	39	0.535	Adequate
10	0.705	Adequate	40	0.609	Adequate
11	0.579	Adequate	41	0.565	Adequate
12	0.495	Adequate	42	0.573	Adequate
13	0.701	Adequate	43	0.643	Adequate
14	0.315	Difficult	44	0.565	Adequate
15	0.640	Adequate	45	0.600	Adequate
16	0.477	Adequate	46	0.641	Adequate
17	0.599	Adequate	47	0.344	Difficult
18	0.599	Adequate	48	0.294	Difficult
19	0.654	Adequate	49	0.213	Difficult
20	0.659	Adequate	50	0.504	Adequate
21	0.431	Adequate	51	0.591	Adequate

Items	Difficulty Index	Remarks	Items	Difficulty Index	Remarks
22	0.565	Adequate	52	0.427	Adequate
23	0.686	Adequate	53	0.403	Adequate
24	0.590	Adequate	54	0.695	Adequate
25	0.869	Adequate	55	0.590	Adequate
26	0.700	Adequate	56	0.319	Difficult
27	0.654	Adequate	57	0.292	Difficult
28	0.568	Adequate	58	0.543	Adequate
29	0.419	Adequate	59	0.435	Adequate
30	0.577	Adequate	60	0.579	Adequate

Table 2f: When compared to the difficulty indices of WAEC physics questions (WPQ) 2018, table 2f revealed that for NECO physics questions (NPQ) 2018, 6 out of 60 items were very difficult; hence they were not adequate to be included for the candidates based on this criterion. These items are: 14, 47, 48, 49, 56 and 57. The remaining 54 items were therefore, considered adequate to be included in the test based on their difficulty indices. These are items: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 50, 51, 52, 53, 54, 55, 58, 59 and 60.

CONCLUSION

SSCE Multiple Choice Physics Questions of WAEC and NECO in the years 2016 – 2018 studied had good discrimination Indices and thus indicating that the items discriminated well.

SSCE Multiple Choice Physics Questions of WAEC in the years 2016 – 2018 studied had higher difficult indices than NECO SSCE Multiple Choice Physics Questions. The findings also revealed that out of the 150 WAEC SSCE Multiple Choice Physics Items for the years 2016 – 2018 studied, 33 items (i.e. 22%) were difficult while out of 180 NECO SSCE Multiple Choice Physics Items for the same years 2016 – 2018 studied, 19 items (10.5%) in all, were difficult. Therefore, for the years 2016 – 2018 studied, WAEC SSCE Multiple Choice Physics items were more difficult than NECO SSCE Multiple Choice Physics Items.

RECOMMENDATIONS

1. Other Examiners and public Examination Bodies such as the West African Examinations Council (WAEC) and National Examinations Council (NECO), Joint Admissions and Matriculation Board (JAMB) etc should consistently involve specialists in the field of Test, Measurement and Evaluation, otherwise known as Psychometricians, in the arduous task of test construction. This is to ensure that test items in Examinations administered to candidates are not above their ability levels.

2. The consistent involvement of Test, Measurement and Evaluation Experts in Test construction at all levels by all Examiners will regularly ensure High Discrimination Indices in all the items in various Examinations. This will in turn assist candidates to easily choose the right option as distinct from distracters in Multiple Choice Items during any Examination.

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