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Measured Identification And Remediation Of Students' Weakness In Nigerian Senior Secondary School Physics Curriculum

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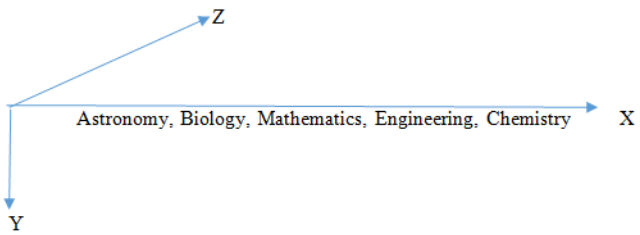
Abstract: ***The study identified and measured students' weakness in the senior secondary school Physics curriculum. The study adopted the descriptive survey design. 543 Physics students in Ondo metropolis of Ondo State, Nigeria, were involved in the study. This included 279 male Physics students and 264 female Physics students. A researcher's designed questionnaire consisting of the themes in the senior secondary school Physics curriculum was used to obtain data for the study. Five research questions were raised and answered using descriptive statistics. Also, the only null hypothesis formulated was tested for acceptance or rejection at 0.05 level of significant using t-test. Findings from the study showed that senior school Physics students experience some levels of weakness in the senior secondary school Physics curriculum especially under theme 6 (Physics in Technology). Findings also revealed that there was no significant difference in the weakness experienced by male and female Physics students in the senior secondary school Physics curriculum. Some of the recommendations made include: the encouragement of Physics teachers to teach the contents where Physics students experience weakness using more appropriate teaching methods; the allocation of more periods to the teaching of the contents where physics students experience weakness; and the organisation of in-service training, seminars and workshops for practicing Physics teachers in order to improve their professional competencies.***

Keywords: Measured, Identification, Remediation, Senior Secondary School Physics Curriculum

I. INTRODUCTION

Physics is a fulcrum subject among the sciences that requires special attention because of its relationship to other science subjects. Several researchers have stressed the importance of physics to the scientific development of the nation, especially for a country like Nigeria (Clark & Elen, 2006; Omosewo, 2009; Erinosho, 2013). Omosewo (2012) argued that the study of Physics offer students an opportunity to think critically, reason analytically and to acquire the spirit of enquiry. Physics is a subject taught at the senior secondary school level of the Nigerian educational system. Its importance cannot be overemphasized in the area of science and technology. Omosewo (2012) opined that physics is closely related to other sciences such as Astronomy, Biology, Mathematics, Engineering, Chemistry, Psychology, Literature and Philosophy.



Source: Omosewo (2012). Why dread the science of the universe

Allotey (2005) recognized Physics as an integrated discipline which concerns itself with other disciplines that seems to be uniquely associated with manpower development. This would be found to be true because of the prominent role physics plays to the training of engineers, technicians, medical practitioners, pharmacist and agricultural officers (Omiola,

Enuwa, Awoyemi & Bada, 2012). The National Policy on Education (NERDC, 2013) placed greater effort on the practical application of the knowledge necessary for future development and for the building of a technological oriented nation. This made physics to be recognized as a compulsory subject under the field of science and mathematics. This must have informed the reform in the senior secondary school physics curriculum. The inclusion of theme VI – Physics in Technology, is geared towards reducing the abstract nature of some topics in physics thereby making the knowledge of physics real and concrete. Table 1 shows the classification of the old and new senior secondary physics curriculum.

	Old Physics Curriculum	New Physics Curriculum
Theme 1	Interaction of Matter, Space and Time	Interaction of Matter, Space and Time
Theme 2	Conservation Principles	Conservation Principles
Theme 3	Waves	Waves
Theme 4	Fields	Waves – Motion Without Material Transfer
Theme 5	Quanta	Energy Quantization and Duality of Matter
Theme 6	-	Physics in Technology

Table 1: Classification of Old and New Senior Secondary School Physics Curriculum

The specific objectives to be achieved by the senior secondary school physics curriculum as stated by the Nigerian Educational Research and Development Council (NERDC, 2013) include to:

- ✓ provide basic literacy of physics for functional living in the society;
- ✓ acquire basic concepts and principles of physics as preparation for further studies;
- ✓ acquire essential scientific skills and attitudes as preparation for technological application of physics; and
- ✓ stimulate and enhance creativity.

In order to achieve these objectives at the senior secondary school level, various methods and approaches should be employed to seeing that students not just understand physics concepts but can also apply physics concepts to real life situation.

Despite the importance embedded in learning physics and the effort of researches to improving the quality of its teaching and learning at the senior secondary school level, enrolment and performance of students is still unsatisfactory. A review of student's enrolment and performance in physics over a period of five years (Table 2) showed that the enrolment of students in physics is low when compared to the enrolment of students in chemistry.

Year	Chemistry			Physics		
	Total Enrolled	Credit Pass (A1–C6)	% Pass	Total Enrolled	Credit Pass (A –C6)	% Pass
2010	465,634	263,059	50.70	463,755	237,756	51.27
2011	565,692	280,250	49.54	563,161	360,096	63.94
2012	627,302	270,570	43.13	624,658	429,415	68.74
2013	639,296	462,517	72.34	637,023	297,988	46.77
2014	636,268	397,649	62.47	635,729	386,270	60.76
2015	658,650	458,547	69.61	657,850	391,114	59.45
2016	667,131	546,733	81.95	666,830	508,367	76.23

Source: Statistics Section, WAEC Office, Yaba, Lagos 2016

Table 2: Enrolment and performance in May/June WASSCE in Chemistry and Physics in Nigeria: 2010 – 2016

Table 2 also showed that despite the good performance of students in Physics with the exception of the year 2013, the best performance of students in physics (76.23%) is not as high as the best performance of students in chemistry (81.95%). Several studies have reported the believe that, many students sees physics as a difficult subject (Omosewo, 2012; Erinosho, 2013). This may be due to the fact that physics students consider some topics to be more difficult than others hence, this might just be responsible for the relative low enrolment and considerable low performance experienced in the subject.

II. STATEMENT OF THE PROBLEM

The enrolment and performance of Nigerian senior secondary school students in physics have not been excellent especially in the last five years under review. This would not favour Nigeria's strive towards scientific and technological development. This situation have also been a concern to educational agencies such as the West African Examinations Council (WEAC) and the National Examinations Council (NECO). This particular problem would also prevent the nation from having the required numbers of professionals such as medical doctors, engineers, pilots, scientist and technologist to mention a few. Many researches carried out on the factors responsible for the poor performance of students in physics include poor use of instructional materials and lack of qualified teacher (Ogunleye, 2000; Ogunleye & Babajide, 2011).

III. LITERATURE REVIEW

Several studies have been carried out by researchers on the investigation of difficult topics in the senior secondary school curriculum (Onwioduokit, 1996; Obafemi & Onwioduokit, 2013; Akanni, 2015). In the research conducted by Onwioduokit (1996) on the difficult concepts in physics as experienced by senior school physics students in Akwa-Ibom State, he found out that difficult concepts included concepts of waves, light waves, sound waves, pressure, electricity, magnetism and nuclear physics. He also went further to analysis that out of the 124 concepts in the senior secondary physics curriculum, 68 physics concepts were averagely difficult while 28 physics concepts were very difficult leaving only 28 physics concepts as easy physics concepts physics concepts. Obafemi and Onwioduokit (2013) carried out a study on the identification of difficult concepts on senior secondary school two (SS2) physics curriculum in River State, Nigeria.

The participants consisted of 600 students and 24 physics teachers who were randomly selected for the study. The researchers used physics concept checklist for the students (PCCS) and Physics Concept Checklist for the teachers (PCCT) to gather data for their study. Findings from the study showed that 50% of the physics concepts in senior secondary school two (SSS 2) physics curriculum were considered difficult or very difficult by the students while 44% of the same physics concepts were considered difficult by the teachers. The researchers also found out that there was a relationship between the response of the students and teachers

as seven of the concepts that were considered difficult or very difficult by the students were also considered difficult or very difficult by the teachers.

In the research carried out by Onwioduokit (1996) on the difficult concepts in physics as experienced senior secondary school physics students in Akwa-Ibom, he discovered that difficult concepts include concepts of waves, light waves, sound waves pressure, electricity, magnetism and nuclear physics. The researcher also went further to analyses that out of the one hundred and twenty four (124) concepts in the senior secondary school physics curriculum, sixty eight (68) physics concepts were averagely difficult while twenty eight (28) physics concepts were very difficult leaving only twenty eight (28) physics concepts as easy.

RESEARCH QUESTIONS

- ✓ What are the weaknesses in the senior secondary school physics curriculum?
- ✓ What are the weaknesses experienced by male physics students in the senior secondary school physics curriculum?
- ✓ What are the weaknesses experienced by female physics students in the senior secondary school physics curriculum?
- ✓ Is there significant difference in the weakness experienced by male and female physics students in the senior secondary school physics curriculum?
- ✓ What ways can the weaknesses experienced in the senior secondary school physics curriculum be overcomed?

RESEARCH HYPOTHESIS

There is no significant difference in the weakness experienced by male and female physics students in the senior school physics curriculum.

IV. METHODOLOGY

The study was a descriptive study of the survey type. Simple random sampling techniques was used to select 542 senior secondary school year III physics students from twelve senior secondary schools in Ondo metropolis. Out of this number, six of the senior secondary schools were mixed schools while the remaining six schools are single schools (3 male only and 3 female only). A total number of 279 males and 264 females took part in the study. The students have been learning physics for almost three years hence, it is assumed that they have covered all the topics in the senior secondary school physics curriculum.

The physics teachers in all the schools are first degree university graduates with professional qualification in the field of education. The instrument used for the study was a researcher designed questionnaire on the level of difficulty experienced by physics students in the senior secondary school physics curriculum. The instrument was titled 'Contents in the Senior Secondary Physics Curriculum'. Physics students were asked to react to each of the topics indicating the level of difficulty weather it is Very Difficult (VD), Difficult (D), Very Easy (VE), Easy (E) or Undecided (UD).

The validity of the questionnaire was obtained by given its sample to two senior secondary school physics teachers who have been examiners in the subject with the West African Examinations Council (WAEC) for a period of 10 years for face and content validation. Copies of the questionnaire was also given to two experts in the field of Physics Education, Department of Science Education, University of Ilorin, Ilorin, Nigeria for face and content validation. The reliability of the instrument was obtained by correlating the perception of the responses of senior secondary III students in a non-partaking senior secondary school over a period of four weeks. A reliability coefficient of 0.73 was obtained.

V. PROCEDURE FOR DATA COLLECTION

The researchers took permission from the constituted authorities in the twelve senior secondary schools who took part in the study. The Physics teachers in each of the senior secondary schools assisted in distributing the questionnaire to the students. The students reacted to the contents in the senior secondary school Physics curriculum immediately by ticking their choice. The questionnaire was immediately retrieved by the researchers for onward analysis.

VI. RESULTS

Research Question 1: What are the weaknesses in the senior secondary school physics curriculum?

S/N	CONTENTS	E	% of E	D	% of D	UD	% of UD
	Theme 1						
1	Fundamental & Derived Quantities and Units	534	98.4	9	1.6	-	-
2	Position, Distance & Displacement	519	95.6	12	2.2	12	2.2
3	Time	525	96.2	15	2.8	03	1.0
4	Motion	525	96.6	12	2.2	06	1.2
5	Speed and Velocity	489	90.1	45	8.3	09	1.6
6	Rectilinear Acceleration	414	76.3	99	18.2	30	5.5
7	Scalers and Vectors	462	84.6	78	14.4	03	1.0
8	Equation of Uniformly accelerated Motion	435	80.2	99	18.2	09	1.6
9	Equilibrium of Forces	426	78.0	114	21.0	03	1.0
10	Projectiles	423	77.8	99	18.2	21	4.0
11	Simple Harmonic Motion	384	70.6	135	25.0	24	4.4
	Average		**85.9**		**12.0**		**2.1**
	Theme 2 Conservation Principles						
1	Work, Energy and Power	528	97.2	15	2.8	-	-
2	Heat Energy	483	88.5	57	10.5	03	1.0
3	Electric Charges	444	81.7	81	15.0	18	3.3
4	Linear Momentum	416	76.6	96	17.7	31	5.7
5	Mechanical Energy	492	90.7	42	7.7	09	1.6
6	Gas Laws	420	77.3	78	14.4	45	8.3
7	Energy and Society	402	74.1	11.1	20.4	30	5.5
8	Conversion of Energy	435	80.1	88	16.2	30	3.7
	Average		**83.4**		**10.9**		**5.7**
	Theme 3 Wave Motion						
1	Production & Propagation of Waves	414	76.0	108	20.0	21	4.0
2	Types of Waves	483	88.9	54	10.0	06	1.1
3	Properties of Waves	492	90.6	45	8.3	06	1.1
4	Light Waves	450	82.8	81	15.0	12	2.2
5	Sound Waves	462	85.1	69	12.7	12	2.2
6	Human Eye	375	69.0	135	24.9	33	6.1
7	Application of Sound Waves	399	73.4	123	22.6	21	4.0
8	Electromagnetic Waves	444	75.0	114	21.0	21	4.0
	Average		**81.0**		**16.7**		**2.3**
	Theme 4 Fields						
1	Description & Property of Fields	408	75.3	114	21.0	21	3.7
2	Gravitational Field	462	85.1	72	13.3	09	1.6
3	Electric Field	465	85.6	72	13.3	06	1.1
4	Magnetic Field	468	86.3	66	12.1	09	1.6
5	Electromagnetic Field	420	77.4	99	18.2	24	4.4
6	Simple a. c. Circuit	369	67.9	141	26.0	33	6.1
	Average		**80.0**		**17.3**		**2.7**

	Theme 5 Energy Quantization						
1	Particulate Nature of Matter	435	80.1	78	14.4	30	5.5
2	Fluids at Rest and in Motion	363	66.9	132	24.3	48	8.8
3	Molecular Theory of Matter	441	81.3	66	12.1	36	6.6
4	Models of the Atom	357	65.8	120	22.1	66	12.1
5	Nucleus	339	62.5	138	25.4	66	12.1
6	Energy Quantization	273	50.3	228	42.0	42	7.7
7	Duality of Matter	267	49.3	235	43.2	41	4.5
	Average		**65.1**		**26.5**		**8.8**
	Theme 6 Physics in Technology						
1	Units of Matter	441	81.3	66	12.1	36	6.6
2	Electrical Continuity Testing	285	52.5	227	41.8	31	5.7
3	Solar Collector	324	59.7	183	33.7	36	6.6
4	Application of Lenses & Plane Mirrors	300	55.3	210	38.6	33	6.1
5	Musical Instruments	348	64.3	174	32.0	21	3.7
6	Battery	384	70.7	132	24.3	27	5.0
7	Electroplating	351	64.6	168	31.0	24	4.4
8	Applications of Electromagnetic Field	381	70.2	144	26.5	18	3.3
9	Transmission System	303	55.8	186	34.2	54	10.0
10	Uses of Machines	399	73.4	108	20.0	36	6.6
11	Repairs & Maintenance of Machines	393	72.4	126	23.2	24	4.4
12	Dams & Energy Production	282	51.9	207	38.1	54	10.0
13	Rockets and Satellite	222	41.0	252	46.3	69	12.7
14	Niger-SAT 1	141	26.0	366	67.4	39	6.6
15	NICOM-SAT 1	129	23.7	390	71.9	24	4.4
	Average		**57.4**		**36.1**		**6.5**

Table 3: Analysis of the weaknesses experienced by Physics students in the senior secondary school Physics Curriculum

Table 3 shows the analyses of the weaknesses experienced by Physics students in the senior secondary school Physics curriculum. The table revealed that the least weakness was experienced under theme 2 of the curriculum with an average percentage difficulty level of 10.9% followed by theme 1, theme 3, theme 4, theme 5 and theme 6 with an average percentage difficulty levels of 12.0%, 16.7%, 17.3%, 26.1% and 36.1% respectively. This shows that Physics students experience the highest difficulty level under theme 6 of the senior secondary school Physics curriculum. Also in table 3, the content that has the highest difficulty level of weakness (NICOM-SAT 1) was recorded under theme 6 (Physics in Technology) with an average difficulty level of 71.9% while the least content level of weakness (Description and property of fields) was recorded under theme 1 (Interaction of Matter).

RESEARCH QUESTION 2: What are the weaknesses experienced by male Physics students in the Senior Secondary school Physics curriculum?

S/N	CONTENTS	E	% of E	D	% of D	UD	UD of %
	Theme 1						
1	Fundamental & Derived Quantities and Units	276	98.9	03	1.1	-	-
2	Position, Distance & Displacement	258	92.5	12	4.3	09	3.2
3	Time	267	95.7	09	3.2	03	1.1
4	Motion	264	94.6	09	3.2	06	2.2
5	Speed and Velocity	240	86.1	30	10.7	09	3.2
6	Rectilinear Acceleration	207	74.2	57	20.4	15	5.4
7	Scalers and Vectors	222	79.6	57	20.4	-	-
8	Equation of Uniformly accelerated Motion	213	76.4	57	20.4	09	3.2
9	Equilibrium of Forces	222	79.6	54	19.3	03	1.1
10	Projectiles	207	74.3	54	19.3	18	6.4
11	Simple Harmonic Motion	189	67.7	78	28.0	12	4.3
	Average		**83.4**		**13.6**		**3.0**
	Theme 2 Conservation Principles						
1	Work, Energy and Power	270	96.8	09	3.2	-	-
2	Heat Energy	240	86.1	36	12.8	03	1.1
3	Electric Charges	228	81.8	42	15.0	09	3.2
4	Linear Momentum	225	80.7	42	15.0	12	4.3
5	Mechanical Energy	243	87.1	30	10.7	06	2.2
6	Gas Laws	207	74.2	48	17.2	24	8.6
7	Energy and Society	198	71.3	65	23.3	15	5.4
8	Conversion of Energy	219	78.5	45	16.1	15	5.4
	Average		**82.0**		**14.3**		**3.7**
	`Theme 3 Wave Motion						
1	Production & Propagation of Waves	204	73.1	63	22.6	12	4.3
2	Types of Waves	246	88.2	30	10.7	03	1.1
3	Properties of Waves	243	87.1	33	11.8	03	1.1
4	Light Waves	234	83.8	39	14.0	06	2.2
5	Sound Waves	240	86.0	36	12.9	03	1.1
6	Human Eye	186	66.6	75	27.0	18	6.4
7	Application of Sound Waves	195	70.0	69	24.6	15	5.4
8	Electromagnetic Waves	216	77.5	42	15.0	21	7.5
	Average		**79.1**		**17.2**		**3.7**

	Theme 4 Fields						
1	Description & Property of Fields	198	71.1	69	24.6	12	4.3
2	Gravitational Field	222	79.5	51	18.3	06	2.2
3	Electric Field	234	83.9	42	15.0	03	1.1
4	Magnetic Field	237	85.0	33	11.8	09	3.2
5	Electromagnetic Field	207	74.2	51	18.3	21	7.5
6	Simple a. c. Circuit	180	64.5	78	28.0	21	7.5
	Average		**76.3**		**19.3**		**4.4**
	Theme 5 Energy Quantization						
1	Particulate Nature of Matter	213	76.4	48	17.2	18	6.4
2	Fluids at Rest and in Motion	183	66.0	66	23.6	30	10.4
3	Molecular Theory of Matter	222	79.5	36	13.0	21	7.5
4	Models of the Atom	180	64.5	66	23.5	33	12.0
5	Nucleus	183	66.0	75	26.5	21	7.5
6	Energy Quantization	150	53.8	87	31.2	42	15.0
7	Duality of Matter	142	51.0	96	34.3	41	14.7
	Average		**65.2**		**24.3**		**10.5**
	Theme 6 Physics in Technology						
1	Units of Matter	219	78.5	39	14.0	21	7.5
2	Electrical Continuity Testing	150	53.8	118	42.2	11	4.0
3	Solar Collector	159	57.1	104	37.2	16	5.7
4	Application of Lenses & Plane Mirrors	168	60.2	92	33.0	19	6.8
5	Musical Instruments	198	71.1	71	25.3	10	3.6
6	Battery	198	71.1	170	60.9	11	4.0
7	Electroplating	186	66.6	80	29.0	13	4.4
8	Applications of Electromagnetic Field	177	63.4	92	33.0	10	3.6
9	Transmission System	162	58.0	81	29.2	36	12.8
10	Uses of Machines	207	74.2	48	17.2	24	8.6
11	Repairs & Maintenance of Machines	198	71.1	68	24.2	13	4.7
12	Dams & Energy Production	162	58.1	86	30.8	31	11.1
13	Rockets and Satellite	120	43.0	120	43.0	39	14.0
14	Niger-SAT 1	81	29.9	179	64.1	25	9.0
15	NICOM-SAT 1	72	25.4	197	71.0	10	3.6
	Average		**58.7**		**36.9**		**4.4**

Table 4: Analysis of the weakness experienced by male Physics students in the senior secondary school Physics Curriculum

Table 4 showed the analysis of the weakness experienced by male physics students in the senior secondary school physics curriculum. The least weakness was experienced under theme 1 (Interaction of Matter) with an average difficulty level of 13.6%. This is closely followed by theme 2, theme 3, theme 4, theme 5 and theme 6 with average difficulty levels of 14.3%, 17.2%, 19.3%, 24.3% and 36.9% respectively. The result from table 4 showed that theme 6 (Physics in Technology) has the highest level of weakness as experienced by senior secondary school physics students. Again, table 4 showed that by content, the highest level of weakness was recorded under Rockets and Satellite. This may be due to the fact that many physics teachers do not teach the concept well as a result of their low competencies more so that theme 6 was the last theme that was included into the senior secondary school physics curriculum during the last curriculum review.

RESEARCH QUESTION 3: What are the weaknesses experienced by female Physics students in the Senior Secondary school Physics curriculum?

S/N	CONTENTS	E	% of E	D	% of D	UD	%
	Theme 1						
1	Fundamental & Derived Quantities and Units	258	97.7	06	2.3	-	-
2	Position, Distance & Displacement	261	98.7	-	-	-	-
3	Time	258	97.7	06	2.3	-	-
4	Motion	261	98.7	03	1.3	-	-
5	Speed and Velocity	249	94.1	15	5.9	-	-
6	Rectilinear Acceleration	207	78.3	42	15.8	15	5.9
7	Scalers and Vectors	240	90.7	21	8.0	03	1.3
8	Equation of Uniformly accelerated Motion	222	84.2	42	15.8	-	-
9	Equilibrium of Forces	204	77.3	60	22.7	-	-
10	Projectiles	216	81.7	45	17.0	03	1.3
11	Simple Harmonic Motion	195	74.0	57	21.5	12	4.5
	Average		**88.7**		**10.2**		**1.1**
	Theme 2 Conservation Principles						
1	Work, Energy and Power	258	97.7	06	2.3	-	-
2	Heat Energy	243	92.0	21	8.0	-	-
3	Electric Charges	216	81.9	39	14.7	09	3.4
4	Linear Momentum	191	72.4	54	20.4	19	7.2
5	Mechanical Energy	249	94.2	12	4.5	03	1.3
6	Gas Laws	213	80.7	30	11.3	21	8.0
7	Energy and Society	204	77.1	45	17.0	15	5.9
8	Conversion of Energy	216	76.2	33	12.5	30	11.3
	Average		**84.9**		**11.4**		**3.7**

	Theme 3 Wave Motion						
1	Production & Propagation of Waves	210	65.6	45	17.0	09	3.4
2	Types of Waves	237	89.6	24	9.1	03	1.3
3	Properties of Waves	249	94.2	12	4.5	03	1.3
4	Light Waves	216	81.9	42	15.8	06	2.3
5	Sound Waves	222	84.1	33	12.5	09	3.4
6	Human Eye	189	71.4	60	22.7	15	5.9
7	Application of Sound Waves	204	77.3	54	20.4	06	2.3
8	Electromagnetic Waves	228	86.4	36	13.6	-	-
	Average		**83.0**		**14.4**		**2.6**
	Theme 4 Fields						
1	Description & Property of Fields	210	65.6	45	17.0	09	3.4
2	Gravitational Field	240	90.7	21	8.0	03	1.3
3	Electric Field	231	87.4	30	11.3	03	1.3
4	Magnetic Field	231	87.5	33	12.5	-	-
5	Electromagnetic Field	213	80.6	48	18.1	03	1.3
6	Simple a. c. Circuit	189	71.7	63	23.8	12	4.5
	Average		**83.0**		**15.2**		**1.8**
	Theme 5 Energy Quantization						
1	Particulate Nature of Matter	222	84.2	30	11.3	12	4.5
2	Fluids at Rest and in Motion	180	68.2	66	25.0	18	6.8
3	Molecular Theory of Matter	219	82.8	30	11.3	15	5.9
4	Models of the Atom	177	67.1	54	20.4	33	12.5
5	Nucleus	156	59.2	63	23.8	45	17.0
6	Energy Quantization	123	30.9	141	53.3	42	15.8
7	Duality of Matter	126	47.5	139	52.5	-	-
	Average		**65.2**		**28.4**		**6.4**
	Theme 6 Physics in Technology						
1	Units of Matter	222	83.9	27	10.2	15	5.9
2	Electrical Continuity Testing	135	51.2	109	41.2	20	7.6
3	Solar Collector	165	62.4	79	30.0	20	7.6
4	Application of Lenses & Plane Mirrors	132	50.1	118	44.6	14	5.3
5	Musical Instruments	150	55.8	103	40.0	11	4.2
6	Battery	186	70.5	62	23.4	16	6.1
7	Electroplating	165	62.5	88	33.3	11	4.2
8	Applications of Electromagnetic Field	204	77.3	52	19.7	08	3.0
9	Transmission System	141	46.5	105	39.7	18	6.8
10	Uses of Machines	195	74.0	57	21.5	12	4.5
11	Repairs & Maintenance of Machines	196	74.3	57	21.5	11	4.2
12	Dams & Energy Production	120	45.6	121	45.7	23	8.7
13	Rockets and Satellite	102	38.7	132	50.0	30	11.3
14	Niger-SAT 1	60	22.8	193	73.0	11	4.2
15	NICOM-SAT 1	57	21.7	193	73.0	14	5.3
	Average		**56.5**		**37.9**		**5.6**

Table 5: Analysis of the weakness experienced by female Physics students in the senior secondary school Physics Curriculum

The result on table 5 showed the weakness experienced by female physics students in the senior secondary school physics curriculum. The highest weakness was experienced under theme 6 (Physics in Technology) with an average difficulty level of 37.9% followed by theme 5, theme 4, theme 3, theme 2, and theme 1 with average difficulty levels of 28.4%, 15.2%, 14.4%, 11.4% and 10.2% respectively. Also, table 5 revealed that the content where female physics students experienced the highest level of weakness was in Niger-SAT 1 and NICOM-SAT 1. This may be due to the inability of the physics teachers to teach the concepts very well.

RESEARCH QUESTION 4: Is there difference in the weakness(es) experienced by male and female physics students in the senior secondary school physics curriculum?

	N	X	Mean Gain
Male	279	58.8	
			5.1
Female	264	53.7	

Table 6: Compressed Weakness(es) Experienced by Male and Female Physics Students Based on Themes

Table 6 showed the compressed mean of the responses of the weakness(es) experienced by male and female students in the senior secondary school physics curriculum. The table shows that the male physics students had an average weakness level of 58.5 while the female physics students have an average weakness level of 53.7 in the senior secondary school physics curriculum. This shows a mean gain of 5.1 in favour of the female physics students. Hence, the female physics students experienced less weakness(es) when compared to their male physics counterparts in the senior secondary school physics curriculum.

HYPOTHESIS 1: There is no significant difference in the weakness(es) experienced by male and female physics students in the senior secondary school physics curriculum.

	N	X	df	t-cal	t-cri	Significant
Male	6	58.8	11	0.3143	2.223	
Female	6	53.7				

Table 7: t-test Analysis of Students Weakness(es) Experienced by Male and Female Physics Students Based on Theme

Table 7 shows the analysis of students weakness(es) experienced by male and female physics students in the senior secondary school physics curriculum based on the six themes. It shows that the t-calculated value was 0.3143 while the t-critical value was 2.223. Since the calculated value of 0.3142 is less than the t-critical value of 2.233 at 0.05 level of significance, it shows that there is no significant difference in the weakness(es) experienced by male and female physics students. Hence, the null hypothesis is hereby accepted.

RESEARCH QUESTION 5: What ways can the weakness(es) experienced by the physics students in the senior secondary school physics curriculum be overcomed?

S/N	Statements	Agree	% of Agree	Disagree	% of Disagree
1	The use of more effective teaching methods by the physics teachers	521	96.0	22	4.0
2	Students should develop positive attitude towards the study of physics.	487	90.0	56	10.0
3	Frequent conduction of physics practical.	533	98.0	10	2.0
4	Encouraging improvisation of unavailable or inadequate physics equipment.	372	69.0	171	31.0
5	Provision of well equipped physics laboratory and teaching materials	513	94.0	30	6.0
6	Students should attend physics classes regularly and punctually.	477	88.0	66	12.0
7	The physics teacher should use gesture and concrete examples while teaching.	508	93.0	35	7.0
8	Recruitment of professionally trained and competent physics teachers.	538	99.0	05	1.0

Table 8: Remediation to Physics Students' Weakness(es) in the Senior Secondary School Physics Curriculum

Table 8 shows the ways by which physics students weakness(es) in the senior secondary school physics curriculum can be overcomed. 96% of the respondents opined that the use of more effective teaching methods by the teachers could greatly improve students weakness(es) in the subject while only 4% of the respondents disagreed with the statement. Also, 90% of the respondents agreed that physics students should develop positive attitude towards the study of physics while 10% of the respondents disagreed with the statement.

The conduction of physics practicals was also supported by 98% of the total respondents while 2%of the respondents do not agree with the statement. 69% of the total respondents agreed that the encouragement of improvisation of unavailable physics equipment could help in overcoming the weakness(es) experienced by physics students in the senior secondary school physics curriculum while 31% of the respondents do not support the opinion. The provision of well equipped physics laboratory and teaching materials was supported by 94% of the respondents. This was however not supported by 6% of the respondents. 88% of the respondents agreed that regular attendance during physics classes could help better students grades while 12% of the respondents do not agree with the statement. 93% of the respondents opined that the use of gesture and concrete examples could make students learn better thus, reducing students weakness(es) in the subject

while 7% of the respondents did not agree with the statement. 99% of the respondents agreed that the recruitment of professionally trained and competent physics teachers could reduce the weakness(es) experienced by physics students in the senior secondary school physics curriculum while 1% of the respondents do not agree with the statement.

VII. DISCUSSION OF FINDINGS

The data presented in Table 3 provided answer to research question one. Finding revealed that the highest weakness was experienced in theme 6, followed by theme 5, theme 4, theme 3, theme 2 and theme 1. This also confirmed that physics students experienced a level of weakness in the senior secondary school physics curriculum. This finding is similar to the finding of Onwioduokit (1996) and Obafemi & Onwioduokit (2013) who found out that 50% of the physics concepts in the senior secondary school physics curriculum were perceived difficult. The analysis in Table 4 provided answer to research question two.

Findings from the table revealed that male Physics students experience the highest weakness in theme 6 (Physics in Technology) followed by theme 5, theme 4, theme 3, theme 2 and theme 1. The analysis in Table 5 provided answer to research question three. The result from the table showed that female Physics students experience the highest weakness in theme 6, followed by theme 5, theme 4, theme 3, theme 2 and theme 1. This is similar to the progression of weakness experience by their male counterparts. The analysis in Table 6 provided answer to research question four. Findings from it showed that the female Physics students experienced less weakness when compared to their male counterparts in the senior secondary school Physics curriculum. This showed that there is difference in the weakness experienced by male and female physics students in the senior secondary school Physics curriculum. In other to test if the difference was significant, Table 7 showed the t-test analysis of the weakness experienced by male and female Physics students based on the themes in the senior secondary school Physics curriculum. The result from Table 7 showed that there was no significant difference in the weakness experienced by male and female Physics students.

The analysis in Table 8 provided answer to research question five. It showed that some of the ways by which Physics students weakness in the senior secondary school Physics curriculum, can be remediated include; the recruitment of professionally trained Physics teachers, frequent conduction of Physics practicals, the use of more effective teaching methods, provision of a well equipped Physics laboratory and teaching materials, the use of gesture and concrete examples by the teacher while teaching, the development of a positive attitude towards Physics on the parts of the students, regular and punctual attendance of students during Physics lessons and the encouragement of improvisation of unavailable or inadequate Physics equipment.

VIII. IMPLICATION

The findings of this study have some educational implications for Physics teachers, school administrators and curriculum planners. The finding of this study calls the attention of Physics teachers to the grey areas physics students are currently experiencing weakness in the senior secondary school Physics curriculum, in order to find lasting solutions to it. The findings of this study calls the attention of school administrators to those areas Physics students are experiencing weakness in order to assist in taken frantic efforts in seeing that those grey areas are carefully and systematically remediated, so that the performance of Physics students could improve in external examinations thus, bettering the grades of the students in the school.

The findings of the study calls the attention of curriculum planners in the field of Physics Education to the grey areas where students currently experience weakness in the senior secondary school Physics curriculum. Hence, curriculum planners and teacher training institutions like the Faculties of Education and the Colleges of Education, could expedite more actions to seeing that the curriculum of the teacher training institutions be reviewed so as to make the would-be Physics teachers to be more grinded in the teaching of the content areas where Physics students are currently experiencing weakness.

IX. CONCLUSION

The study identified, measured and found out possible solutions to the weakness experienced by Physics students in the senior secondary school Physics curriculum. The study showed that Physics students experience weakness in some contents, especially in theme 6 which was the theme that was newly introduced during the last review of the senior secondary school Physics curriculum by the Nigerian Educational Research and Development Council (NERDC). The study also found out that there was no significant difference in the weakness experience by male and female Physics students in the senior secondary school Physics curriculum. The study found out some possible ways of remediating the weakness experienced by the students.

X. RECOMMENDATION

Based on the findings of this research, the following were recommended

- ✓ Physics teachers should endeavour to teach the contents where students experience weakness using more appropriate teaching methods and strategies;
- ✓ Physics teachers should allocate more time or periods to the teaching of the contents wher students experience weakness;
- ✓ School administrators should allow practicing Physics teachers to go for in-service training, seminars and workshops, so as to improve their professional skills in the discharge of their duties; and

- ✓ Curriculum planners and teacher training institutions should develop and emphasize the teaching of senior secondary school Physics contents while teaching would-be teachers in their institutions.

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