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An Evaluation of Practical Science Curriculum Implementation in Rural Secondary Schools in Rivers North East Senatorial District, Rivers State

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Abstract
The study investigated the implementation of the practical science curriculum in rural secondary schools in Rivers North East Senatorial District, Rivers State. Six research questions guided the study. The study adopted descriptive survey design. The population of the study was 133 schools. Forty-five (45) senior secondary schools were sampled through stratified random sampling and simple random sampling techniques. The instruments used for data collection were checklist for biology, chemistry and physics laboratory resources. Simple percentage was used to answer the six research questions. Results revealed that practical science curriculum is not fully implemented as is required. Based on the findings it was recommended among others that Government should equip the schools' laboratories with necessary resources for effective implementation of the practical science curriculum.

Keywords: Evaluation, Practical Science, Curriculum Implementation, Secondary Schools.

Introduction

Technological inventions are of frequent occurrence. These inventions and innovations are products of scientific thoughts and points to the fact that a sound science educational system serves as the bedrock of human development and progress. This is evident in nation like America, Britain, Japan, China and others which according to Nnoli (2015) and Vikoo (2015) are the most powerful and productive nations because of their involvement in science and technology. Science teaching and learning involves practical activities. It is these Practical activities that will enable students acquire profound knowledge of subject, develop essential skills and cultivate a scientific attitude which will help them develop critical thinking ability, think scientifically, become creative in thought, analyze and evaluate scientific and technological information and use that information in solving problems, become self- reliant and contribute towards the development of the society. Adeyemi (2008) in his experimental work observed that students learn better through practical activities through the use of material resources. Nwagbo (2008) emphasized that the use of practical approaches be a rule rather than an option if we must produce students that would be able to acquire the necessary knowledge, skills and competencies needed to meet the scientific and technological demand of the nation. In recognition of these facts the Federal Republic of Nigeria (FRN, 2008) through the National Policy on Education reflected this in the objectives of education by inculcating in the child the spirit of enquiry and creativity through the exploration of nature and the environment, laying a sound basis for scientific and reflective thinking, inculcating values and raising individuals who can think independently and rationally.

Curriculum has been defined in many different ways by experts, Duru (2011) stated that the curriculum is the means through which the objectives of education based on the aspirations and needs of the society are achieved. Maduewesi (1987), defined curriculum as the sum total of what the student learns at school and what the teachers do at school from the day the students are admitted to when they leave. The science (Biology, Chemistry and Physics) practical as part of the subjects in the school curriculum is meant to be carried out in the laboratory with the use of material resources. Schools offering these subjects must be equipped with laboratories and adequate laboratory resources which will help students carry out hands-on activities. Furthermore there is need for adequate supply of teachers as well as laboratory support staff to assist teachers during practical classes. There seem to be

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an urban-rural divide in the distribution of resources. (both human and physical resources) as revealed by Asebioma (2012) and Mgbomo (2013) which could deter the effective implementation/delivery of the practical science curriculum in rural secondary schools.

Statement of problem

Practical aspect of science enhances students understanding of what is taught in the theory. Students' performance in both theory and practical Science in Senior School Certificate Examination (SSCE) conducted by the West African Examination Council and Nigeria Examination Council has not been encouraging. The students' performance shows that they have difficulty with the science subjects (Biology Chemistry and Physics) which shows that the practical science is not effectively taught, in other words students are not adequately exposed to practical activities in the subjects. The problem may even be more serious in rural schools considering the urban-rural divide. The findings of the study and solutions to identified problems will help improve the teaching and learning of the subjects.

Objectives of the Study

The study was designed to:

i. determine availability of laboratories in the schools
ii. ascertain if Biology, Chemistry and Physics laboratory resources are available in the schools;
iii. determine the percentage of schools that have the required laboratory resources ;
iv. determine if there is adequate supply of science teachers;
v. examine the availability of laboratory support staff in the schools;
vi. find out the class size.

Research Questions

i. What is the availability of science laboratories?
ii. What is the availability of laboratory resources in the schools?
iii. What is the percentage of schools that have the required laboratory resources?
iv. What is the availability of teachers for the teaching of the subjects?
v. What is the availability of laboratory support staff?
vi. What is the class size in the schools.?

Methodology

The design adopted for the study is descriptive survey design. This is because the study collected data on the availability of laboratories and also on the availability of laboratory and human resources for the teaching and learning of the science subjects as at the particular time of the study. The population of the study comprised all the public senior secondary schools in rural areas of Rivers North East Senatorial District, Rivers State. The District has 133 rural schools (Source: Rivers State Senior Secondary Schools Board Planning, Research and Statistics Unit, April, 2023). The researchers sampled a total of forty –five schools from thirteen Local Government Areas from the Senatorial District. The technique adopted was stratified random sampling. Three instruments namely, Biology laboratory resource checklist, Chemistry resource checklist and Physics resource checklist were used for the study. The instruments listed the resources for the teachers to indicate the availability. The validity of the checklist was determined, by Biology, Chemistry and Physics laboratory technologists for Biology laboratory checklist, Chemistry laboratory checklist and Physics laboratory checklist respectively. The reliability of the checklist was r = 0. 79, r = 0. 82 r = 0.76 for Biology, Chemistry and Physics respectively and were obtained through coefficient alpha by Cronbach. The instruments were administered by the researchers and by students on teaching practice. Data obtained were analyzed using frequency counts and percentages.

Results

Research Question 1: What is the availability of science laboratories in the schools?

Table 1: Percentage analysis of the availability of Biology, Chemistry and Physics laboratory.

Laboratory	Number of schools with laboratory	Percentage %	Number of schools without laboratory	Percentage %	Total
Biology	40		5	11.1	45
Chemistry	40	88.9	5	11.1	45

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Physics	40	88.9	5	11.1	45

Table 1: shows that 40 schools representing 88.9 percent have Biology, Chemistry and Physics laboratory while 5 schools representing 11.1 percent do not have laboratories. The result is that majority of the schools have laboratories for practical classes in Biology, Chemistry and Physics.

Research Question 2: What is the availability of laboratory resources in the schools?

Table 2: Number of Schools with Biology, Chemistry and Physics laboratory Resources

S/N	RESOURCE	Biology Number of schools	Chemistry Number of schools	Physics Number of schools
1.	Acetone	2		
2.	Alcohol	18		
3.	Ammeter	-		26
4.	Aquarium	2	-	-
5.	Beaker	13	16	**40**
6.	Beam balance	-	-	**7**
7.	Benedict solution	8	-	-
8.	Bunsen burner	25	41	**-**
9.	Burette	2	16	**-**
10.	Calorimeter	-	-	15
11.	Celsius thermometer	-	-	25
12.	Clamps	2	33	30
13.	Concave &Convex lenses	-	-	**30**
14.	Concave & Convex mirror	-	-	15
15.	Conical flasks	43	``	**-**
16.	Connecting wire	-	-	**35**
17.	Constantine wire	-	-	**35**
18.	Copper vessels	-	-	15
19.	Cover slips	29	-	-
20.	Crocodile clip	-	-	**32**
21.	Crystal violet	5	-	**-**
22.	Dessicator	16	-	-
23.	Drawing board	-	-	22
24.	Dropping pipette	31	-	**-**
25.	Fehling solution	25	-	**-**
26.	Filter paper	17	32	-
27.	Flat bottom flask	-	5	-
28.	Formaldehyde	6	-	**-**
29.	Funnels	17	32	-
30.	Galvanometer	-	-	30
31.	Gas line	31	31	**-**
32.	Hanger(20 & 50)g			25
33.	Hand lens	8	-	**-**
34.	HCL	5	18	**-**
35.	Iodine	18	-	**-**
36.	Knife edge	-	-	30
37.	Lens	-	-	**8**
38.	Litmus paper	-	5	-
39.	Magnesium sulphate	-	10	**-**
40.	Masses(10,20,50&100)g			26
41.	Meter Rule			**42**
42.	Methyl orange		34	

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43.	Micrometer screw quage				7
44.	Mirror stand	-			**7**
45.	Models	10		-	**-**
46.	Nichrome wire	-		-	**5**
47.	Nitric acid	18		22	-
48.	Optical pins	-		-	**28**
49.	Oven			41	-
50.	Pendulum bulb				42
51.	Petri dish	5		-	-
52.	Phenolphthalein			35	
53.	Plain mirrors	-		-	**10**
54.	Potassium hydroxide			16	
55.	Potassium carbonate			12	
56.	Potentiometer	-			**26**
57.	Reagent bottles			38	
58.	Safranin	4			
59.	Sodium carbonate			22	
60.	Sonometer	-		-	8
61.	Specimen bottles	26		-	-
62.	Spring balance	-		-	**37**
63.	Spring	-		-	**32**
64.	Starch solution	32		-	**-**
65.	Sudan III	2		-	**-**
66.	Sulphuric acid	28		20	**-**
67.	Test tube brushes	-		28	**-**
68.	Test tube racks	5		10	**-**
69.	Triangular glass prism	-		-	**30**
70.	Troughs	14		-	**-**
71.	Turning fork	-		-	**28**
72.	Venier caliper	-		-	**20**
73.	Voltmeter	-		-	**23**
74.	Wash bottles	-		5	**-**
75.	Watch glasses	-		38	**-**
76.	Wire guaze	-		43	
77.	Weighing balance	5		6	**-**
78.	Wooden wall hanger-		-	40	**-**

The result in table 2 revealed that laboratory resources for the teaching of Biology, Chemistry, and Physics as indicated by the checklists as part of recommendation by West Africa Examination Council (1999), only 8 schools had 13 (30%), 17 schools had 16 (43.2%) and 19 schools had 29 (64%) in Biology, Chemistry and Physics laboratory respectively in the schools sampled. The result shows that majority of the items which includes beakers, burettes, hand lenses, petri dishes, measuring cylinders, weighing balance to mention a few were not available in the remaining schools.

Research Question 3: What is the percentage of schools with Biology Chemistry and Physics Laboratory Resources?

Table 3 Percentage Analysis on the schools with Biology, Chemistry and Physics Laboratory Resources.

Items	**Biology Number of schools**	**%**	**Chemistry Number of schools**	**%**	**Physics Number of schools**	**%**
Glass wares	20	43.3	20	43.6	34	76
Apparatuses	18	39.6	25	556	24	53.5
Reagent	12	26.1	23	51.6	10	22.2
Model	10	22.2	Not on	Checklist	Not applicable	

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Table 2 shows that glass wares were available in up to 76 percent of the Physics laboratories but only 43.3 percent and 43.6 percent for Biology and Chemistry respectively. Apparatuses were available, in 39.6 percent, 55.6 percent and 53.5 percent of schools for Biology Chemistry, and Physics laboratories respectively. Reagent were recorded in 26.1 percent of schools for Biology, 51.6 percent for Chemistry and 22.2 percent for Physics. Models were obtainable in 22.2 percent of Biology laboratories, not on Chemistry checklist and not applicable to Physics. The result is that generally, the percentage of schools that have the resources indicated on the checklists is just moderate (44.6%).

Research Question 4: What is the availability of teachers for the teaching of the subjects?

Table 4: Percentage analysis of availability of teachers

Subject Areas	Schools with teachers	%	Schools without teachers	%	Total number of teachers
Biology	44	97.8	1	2.2	83
Chemistry	43	95.6	2	4.4	64
Physics	44	97.8	1	2.2	48

Table 4 indicates that 44 schools representing 97.8 percent of the schools have Biology teachers who were eighty three (83) in number, 43 schools representing 95.6 percent of the schools have Chemistry teachers who were sixty-four (64) in number and 44 schools representing 97.8 percent have physics teachers with a total number of forty-Eight (48) teachers. The table also shows that 2.2 percent, 4.4 percent and another 2.2 percent of schools lack Biology, Chemistry and Physics teachers respectively. The table further shows that majority of the schools have just one teacher per subject.

Research Question 5: What is the availability of laboratory support staff?

Table 5: Percentage analysis of availability of laboratory support staff.

Subject Areas	Schools with laboratory staff	%	School without Laboratory staff	%	Total number of Laboratory staff available
Biology	2	4.4	43	95.6	2
Chemistry	1	2.2	44	97.8	1
Physics	-	0.0	45	100	-

Table 5 shows that 2 schools representing 4.4 percent of schools have biology laboratory support staff, 1 school representing 2.2 percent have chemistry laboratory support staff while Physics has none. The result is that there is hardly laboratory support staff.

Research Questions 6: What is the class size in the schools?

Table 6: Percentage analysis of class size in the schools

Subject Area	Schools with large class size (80^{+}/Percentage %)		Schools with small class size/Percentage %		Total number of schools
Biology	28	62.2	17	37.8	45
Chemistry	13	28.9	32	71.1	45
Physics	_	0.0	45	100	45

Table 6 indicates that 28 schools representing 62.2 percent have large class size for biology while 17 school representing 37.8 percent have small class size. For chemistry 13 schools representing 28.9 percent have large class while 32 resenting 71.1 percent have small class, while physics classes were generally small. The result is that only for biology that majority of the schools have large classes.

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Discussion

The result in table 1 revealed that most of the schools have laboratories but few did not have. Concerning the laboratory resources the findings are that most of the resources indicated on the checklist as part of list of resources recommended by WAEC (1999) for use in the three laboratories are lacking, also the schools that did not have the resources were more in number. Only glass wares were available in a greater percentage of the schools and only in physics laboratories. The present findings is consistent with that of Adebisi et al (2017); Etubon and Udoh (2020); Mudulla (2012); Mulaayonge and Park (2017); Nnoli (2016); and Pareek (2019) who found out that science laboratories were poorly furnished. The findings also revealed that there was shortage of teachers and laboratory support staff. This present finding agrees with that of Bello (2015) that there were no sufficient laboratory staff. Furthermore, the findings indicated that most of the schools have large classes for Biology. This finding is also consistent with that of Abba et. al (2017) and Yelkpieri et. al (2012) that the schools had large class size. The challenges in the teaching of practical science will have negative effects on students grasping science content and acquiring relevant skills as well as affect their performances. The situation could make students shy away from pursuing science related careers and will debar the nation in realizing her dream for technological advancement,

Conclusion

From the results of the study it is concluded that practical science curriculum delivery/implementation is not fully done. Some schools do not have laboratory, the laboratories are poorly furnished and teachers and laboratory staff are not adequately supplied. It is evident from the results that the students are not learning science but learning about science and this will lead Nigeria nowhere if she has to break through technologically.

Recommendations

1. The State and local Government authority should build laboratories where there is none.
2. The existing laboratories should be properly equipped.
3. There should be posting of enough teachers and laboratory support staff to the rural schools.

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