

ASSESSMENT OF NEEDED BIOLOGY MATERIAL RESOURCES FOR SUSTAINABLE EDUCATIONAL GOALS IN IMO STATE SECONDARY SCHOOLS

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Abstract

The study focused on the needed Biology material resources for effective implementation of Senior Secondary Biology Curriculum and sustenance of educational goals in Imo State public secondary schools. Guided by three research questions and three hypotheses, the researchers adopted descriptive survey design. Multistage, proportionate and random sampling techniques were used to draw 94 biology teachers from a population of 306 Biology teachers in Imo State. A validated researchers' developed rating scale tagged: "Rating Scale of the Needed Material Resources for Effective Implementation of Biology Senior Secondary Curriculum and Sustenance of Educational Goals" was used to collect data. The instrument has reliability coefficients that range from 0.72 to 0.86 for the internal consistency of the three clusters. Mean and standard deviation were used to answer the research questions while t-test of proportions was used to test the three hypotheses at 0.05 significance levels. Findings revealed that half of the infrastructural facilities and more than half of the laboratory consumables and equipment are needed in schools for effective implementation of the Senior Secondary Biology Curriculum and sustenance of educational goals. Recommendations were made which among others include that government should take proactive step to provide the needed materials.

Key Words: Assessment, Need, Educational Goals, Biology Material Resources

Introduction

In the recent past, the Nigerian Educational Research and Development Council (NERDC) reviewed/restructured the old Senior Secondary School Curriculum (SSSC) in line with the acceptable global best practices (Rufai, 2010). This was done primarily to enable the nation, achieve the Millennium Development Goals (MDG), the international goals of Education for All (EFA) as well as the home grown National Economic Empowerment and Development Strategy (NEEDS) goals which comprise three main objectives: poverty reduction employment, generation and wealth generation (Federal Ministry of Education, 2008). These emerging needs of the nation have translated into goals which are encapsulated in the national educational goals as presented in the National Policy on Education (NPE). According

to Federal Republic of Nigeria (FRN, 2013:2) in her NPE, one of the goals of education is the development of appropriate skills, mental, physical and social abilities and competencies to empower the individual to live in and contribute positively to the society.

Educational goals have been defined as the broad statements that describe the competencies, skills and attributes that students should possess upon completion of a course or programme (Simon Eraser University, 2009). Secondary School Biology Curriculum (SSBC) is one of the SSSC which was developed to contribute to the realization of the desired national educational goals as presented in the NPE (FRN, 2013:2). For instance, the objectives of SSBC are that students should acquire: adequate laboratory and field skills in Biology; meaningful and relevant knowledge in Biology; ability to apply scientific knowledge to everyday life in matter of personal and community health and agriculture; and reasonable and functional scientific attitude (FME, 2009:1). The important aspect of the SSBC is its activity-based feature. For every topic there are outlined teachers' performance activities and the corresponding students' performance activities. Another important feature is that the designers strongly recommend and stressed the use of field studies, guided discovery, laboratory techniques and skills along with conceptual thinking for the teaching of SSBC.

Based on the foregoing it is evidently clear that huge materials: reagents and consumables; equipment/apparatus; biological/botanical garden, running water system, electricity to power modern equipments, infrastructural facilities among others for effective implementation of the curriculum as designed and realization of the objective of the curriculum. It is only when the objectives are achieved that the study of Biology could be said to be making meaningful contribution to the achievement and sustenance of the educational goals in the country.

For the past six years the Imo State Government introduced free education policy, students enrollment has being on steady increase without commensurate provision of the required resources for effective teaching. The government usually provides few science materials for schools based on the content of "WAEC Subject Teacher Practical Instruction Papers". This clearly demonstrates that effort are focused on passing exam instead of implementing the curriculum as designed which will lead to the realization of the objective and good students performance in exams. Under this situation some schools end up getting what they have already which they don't need and not getting what they need for successful implementation of curriculum because of lack of proper assessment of what is needed before provision. The outcomes of some empirical studies tend to support this indirectly. Ekwonye (2010) found that the extent of availability of basic materials for the teaching of Mathematics in Owerri, Imo State was alarmingly low while Onyilo & Ebele (2012) found that instructional materials for teaching of Integrated Science (now Basic Science and Technology) was inadequate. However, whether the present study will provide similar result or not, the researchers are of firm believe that without proper assessment and adequate provision of the needed materials, the biology curriculum

will not be effectively implemented and hence achievement and sustenance of educational goals will be a mirage

Davidson (2005 as cited in Eguzo, 2014) defined need as something without which unsatisfactory functioning occurs while need assessment involves gathering appropriate and sufficient data which inform the process of developing an effective product that will address the group need. Also Paulette (1981) as cited in Eguzo (2014) defined need as the measurable discrepancy existing between a present state of affairs and a desired state of affairs as assorted by an owner of need or an authority of need. In other words, the needed Biology material resources are those necessary materials for effective instructional delivery that are either not available in schools at all or they are available but in short supply in relation to students population. The degree of need of each of the necessary Biology materials depends on its level of insufficiency for effective instructional delivery. The higher the insufficiency the higher the need and vice versa. Assessment of the needed Biology material resources is the systematic collection of data with the aim of ascertaining the needed materials for effective implementation the SSBC so as to achieve and sustain the educational goals especially in Imo State.

Problem Statement

Despite the indispensable role of Biology in realizing and sustaining the national educational goals, it is disheartening to observe that the desired attention in providing all the necessary Biology materials for effective instructional delivery appeared not to have been given. It is not alien to see biology teachers at the eve of WASSCE going to neighbouring schools to borrow one item or the other to ensure that students sit for the practical examination. Most times Biology teachers have no other option than going to market a day or two days to the exam when the little given by the government could not go anywhere. In such situation, they end up buying little at very expensive price because of excessive demand and in some occasion adulterated items which have infiltrated the market are bought unknowingly to the teachers. These points to the fact that there could be some materials needed not just for WASSSCE but also for effective implementation of the SSBC so as to achieve the stated objectives of SSBC and through this way contribute to the achievement and substantiality of the educational goals. Hence could the extent to which Biological infrastructural facilities, Biology laboratory consumables and equipments are needed be determined?

Research Questions

The following research questions guided the study.

1. To what extent are the Biology infrastructural facilities needed for effective implementation of SSBC and in sustaining educational goals?
2. To what extent are the Biology laboratory consumables needed for effective implementation SSBC and in sustaining educational goals?
3. To what extent are the Biology laboratory equipments/instruments for effective implementation of the SSBC and in sustaining educational goals?

Hypotheses

The following hypotheses were tested at 0.05 significance levels.

1. The proportion of the needed Biology infrastructural facilities in schools for teaching of SSBC is not significantly greater than the expected average proportion of 0.5.
2. The proportion of the needed Biology laboratory consumables in schools for teaching of SSBC is not significantly greater than the expected average proportion of 0.5.
3. The proportion of the needed Biology laboratory equipments/instruments in schools for teaching of SSBC is not significantly greater than the expected average proportion of 0.5.

Method

The study adopted descriptive survey. The population of the study comprises 306 public Secondary School Biology teachers in 273 public Secondary Schools in Imo State (Secondary Education Management Board (2016). Multistage proportionate cluster random sampling technique was used to draw a sample size of 94 Biology teachers. The instrument of data collection is a researchers' developed rating scale tagged "Rating Scale of the Needed Biology Material Resources for Effective Implementation of SSBC and Sustenance of Educational Goals. The instrument consists of three clusters: A, B, and C. Cluster A, B, and C measure Biology infrastructural facilities, laboratory consumables and equipments/instruments respectively. They are structure in a four point scale of Very Highly Needed (VHN), (4-Point), Highly Needed (HN) (3-Point) Lowly Needed (LN) (2-Point) and Very Lowly Needed (VLN) (1-Point). The instrument was validated by two Educational Measurement and Evaluation experts and two Biology specialists. The reliability coefficients of internal consistency for cluster A, B and C are 0.72, 0.86 and 0.82 respectively using Cronbach alpha statistics while Pearson product Moment Correlation Coefficient statistics was used through test retest method to determine the reliability of temporal stability of the instrument as 0.85. Mean and standard deviations are used to answer the research questions while t-test statistics was used to test the hypotheses at 0.05 significance levels. Both items and respondents were used as units of data analysis. If the calculated mean of each item is approximate 4, 3, 2 or 1 to the nearest whole number it then implies that the item is very highly needed, highly needed, lowly needed or very lowly needed respectively. Item mean value of 2.5 and above means that such item is needed while of less than 2.5 means not needed. If the t-calculated value is less than the tabulated value the hypothesis is accepted, but if otherwise it is rejected.

Results

Table 1: Extent Biology Infrastructural Facilities are Needed for Effective Implementation of SSBC and Sustenance of Educational Goals

S/N	Items	\bar{X}	S	Dec
1	Biological/Botanical garden	3.80	0.20	VHN
2	Aguarium	4.00	0.00	VHN
3	Biology laboratory	1.56	0.78	LN
4	Classrooms	1.20	0.30	VLN
5	Darkrooms	3.40	0.32	HN
6	Biology laboratory store	3.22	0.65	HN
7	Biology laboratory preparatory room	1.35	0.56	VLN
8	Laboratory workshop	3.54	0.36	VHN
9	Good sources of water	3.60	0.65	VHN
10	Toilet facilities	3.28	0.12	HN
11	Libraries	2.52	0.63	HN
12	Animal house	3.00	0.00	HN
13	Good source of electricity	3.51	0.75	LN
14	Adequate seats for teachers and students	1.95	0.71	LN
15	Adequate tables for teachers and students	1.95	0.71	LN
16.	Cupboards	1.96	0.23	LN

Table 1 showed the mean and standard deviation values of each of the items and division taken. Each of the items with serial numbers: 1, 2, 5, 6, 8, 9, 10, 11, 12 and 13 obtain mean value that is greater than 2.5 hence they are needed. Also the proportion of the needed infrastructural facilities is 0.605 (ie 10/16).While other obtain mean value of less than 2.5 which means that schools could manage the ones they have for optimum result.

Table2: Summary of t-test of Hypothesis Three (H_{01})

Category of proportion	P	Q	t-cal.	SL	Df	t-tab.	Dec.
Observation (P_1)	0.625	0.5	0.437	0.71	0.05	30	1.697
Average/Expected (P_2)	0.500	63					H_{03} is Accepted

Table2 shows the summary of the t-test of hypothesis three. The table among others shows the t- calculated value (0.71) and the t- tabulated value of 1.697 at 0.05 significance levels is less than the t- tabulated value the research hypothesis three is accepted. This means that the half or 0.5 proportions of the biology infrastructural facilities are needed for effective implementation of the NBC.

Table 3 Extent Biology Laboratory Consumables for Effective Implementation of the SSBC and Sustenance of Educational Goals

S/N	Items	\bar{X}	S	Dec
1	Sodium hydroxide	3.40	0.69	HN
2	Potassium hydroxide	3.31	0.66	HN
3	Lime water	3.30	0.75	HN
4	Hydrochloric acid	3.00	0.90	HN
5	Nitrate V acid	3.15	0.95	HN
6	P ^H indicator	3.15	0.87	HN
7	Cobalt chloride paper	3.04	0.67	HN
8	Anhydrous copper (II) tetraoxosulphate VI	3.25	0.91	HN
9	Fehlings solution (A & B)	1.35	0.46	VLN
10	Iodine solution	1.32	0.60	VLN
11	Benedicts solution	2.14	0.65	LN
12	Millions reagent	2.40	0.62	LN
13	Osmic acid	2.13	0.64	LN
14	Forms of sugar: glucose, sucrose, carbohydrate	2.18	0.60	LN
15	Red oil/vegetable oil	2.40	0.59	LN
16	Glowing sphint	3.54	0.74	HN
17	Plasticine	1.20	0.51	VLN
18	Eosine Ink/red	2.44	0.62	LN
19	Potassuimtetraoxomangamate VII (KMNO ₄)	3.35	0.72	HN
20	Methylated spirit	1.36	0.85	VLN
21	Vaseline	2.40	0.62	LN
22	Bleach	2.20	0.53	LN
23	Distilled water	3.20	0.62	HN

Table 3 showed the mean, standard deviation and decisions taken. From the table 12 items obtain mean value or equal to 2.5 hence are needed while 11 of them obtained mean value of less than 2.5 which means mat schools have reasonable opportunity of them for effective implementation of SSBC. This means that the proportion of items needed for effective implementation of SSBC is 0.522 (ie 12/23).

Table 4: Summary of t- test of Hypothesis Two (Ho₂)

Category of proportion	Proport ion (P)	P	Q	t-cal.	SL	Df	t-tab.	Dec.
Observation (P ₁)	0.522	0.511	0.489	0.149	0.05	44	1.684	Ho₂ is Accepted
Average/ Expected (P ₂)	0.500							

Table 4 showed among others the t- calculated value (0.149) and the t- tabulated value of 1.684 at 0.05 significance levels and 44 degrees of freedom. Since the t- calculated value is less than the t- tabulated value the research hypothesis four

is accepted. This means that half different of types of biology laboratory consumables are needed for effective implementation of the NBC.

Table 5 Extent Biology Laboratory Equipments/Instruments for Effective Implementation of SSBC and Sustenance of Educational Goals

S/N	Items	\bar{X}	S	DEC.
1.	Photographs	1.40	0.67	VLN
2.	Charts	1.50	0.86	LN
3.	Models	3.20	0.72	HN
4.	Handlens	3.60	0.56	VHN
5.	Microscope slides & cover	3.71	0.69	VHN
6.	Dissection Kit	3.65	0.72	VHN
7.	Forceps	3.64	0.78	VHN
8.	Petri Dish	2.86	0.66	HN
9.	Conical flask, round bottom flask	1.91	0.72	LN
10.	Microscope	4.00	0.00	VHN
11.	Breakers of various volumes	1.86	0.42	LN
12.	Hemostats	3.86	0.78	VHN
13.	Photometer	3.79	0.82	VHN
14.	Photometer	3.80	0.62	VHN
15.	Thermometer	3.56	0.86	VHN
16.	Wind vane	2.86	0.56	HN
17.	Anemometer	3.76	0.48	VHN
18.	Hygrometer	3.56	0.51	VHN
19.	Barometer	3.60	0.53	VHN
20.	Rain gauge	2.74	0.82	HN
21.	Sweep/Insect net	2.87	0.72	HN
22.	Plankton net	2.80	0.67	HN
23.	Wet and dry hydrometer	2.68	0.65	HN
24.	Pooter	3.70	0.42	VHN
25.	soil Auger	3.28	0.62	HN
26.	white Disc	3.80	0.41	VHN
27.	Float	2.06	0.74	LN
28.	Meter rule	1.85	0.41	LN
29.	Quadrat	3.30	0.48	HN
30.	Vacuum flask	3.45	0.56	HN
31.	Freshly preserved snake	2.40	0.66	LN
32.	Freshly preserved crab	3.40	0.72	HN
33.	Freshly preserved foods/frogs	2.35	0.82	LN
34.	Freshly preserved insects	2.20	0.84	LN
35.	Freshly preserved fish	2.89	0.79	HN
36.	Freshly preserved lizard	2.17	0.82	LN
37.	Mammalian Bones	2.36	0.82	LN

38.	Auxanometer	3.61	0.63	VHN
39.	Films on Ecology	3.89	0.42	VHN
40.	Fish Traps	3.72	0.48	VHN
41.	Shovel/spades	2.20	0.56	LN
42.	Trowels	3.26	0.68	HN
43.	Test tubes, boiling tubes	2.87	0.77	HN
44.	Test tubes holders and rags	2.80	0.63	HN
45.	Thistle funnels	2.12	0.61	LN
46.	Bell jars	3.25	0.82	HN
47.	Retort stands	2.20	0.64	LN
48.	Bunsen Burner/source of heat	3.41	0.67	HN

Table 5 showed the mean, standard deviations and decision taken for each item based on the value of the mean. 35. Items being a proportion of 0.729 (i.e 35/48) obtain mean value of value of above or equal to 2.5 hence are needed for effective implementation of 8SBC while 13 items obtain mean value of less than 2.5 which means that they are not needed (i.e they are adequately available for implementing the SSBC as designed).

Table 6: Summary of t- test of Hypothesis Three (H_0_3)

Category of Proportion	Proportions (P)	P	Q	t-cal.	SL	DF	t-tab.	Dec.
Observation (P_1) Average/Expected (P_2)	0.723 0.05	0.612	0.388	2.218	0.05	92	1.986	H_0_5 Rejected

Table 6 showed among others the t- calculated value (2.218) and t- tabulated value of 1.986 at 0.05 significance levels at 92 degrees of freedom. The hypothesis three is rejected as seen in the table (decision) because the t- calculated is greater than the t- tabulated value. This implies that more than half or more than average proportion (0.5) of the biology laboratory equipment/instruments for the effective implementation of the SSBC are needed.

Discussion of Results

Findings show that: half of the Biology infrastructural facilities, more than half of the required laboratory biology consumables and equipment/instruments are needed for effective implementation of SSBC as designed. This finding is very revealing to those saddled with the responsibilities of providing the required Biology materials. The results have shown those necessary Biology material resources that are needed primarily because they are either not available or available but in short supply in relation to students population and hence needed for the effective implementation of the SSBC as designed and sustenance of educational goals in Imo State. This finding is in tandem with the findings of Ekwonye (2010) who found that the

availability of the basic materials for teaching of Mathematics in Imo State was alarmingly low. The findings of the present study have some serious implications to all and sundry who believed and hoped that education will immensely contribute to achievement and sustenance of the goals of education as presented in NPE. This is because the findings imply that those topics and sub-topics that should be taught with the needed materials will not be taught as designed. In other words many areas of the SSBC will not be implemented as designed, hence hindering the realization of the objectives of SSBC and to a large extent making the achievement and sustenance of the educational goals unrealizable. Under this situation, lesson becomes more theoretical than practical/activity based as designed. It is not out of place to see students passing external examinations. This is because teachers are under pressure to ensure this happens, hence they adopt some other strategies such as drilling of students on past question papers and on the contents of SSBC. The teachers' major focus centers greatly on how to assist students pass external exams rather than adopting the recommended teaching methods and skills in the implementation of the SSBC as designed. Hence, making the realization of the objectives of the SSBC which include that students should acquire: adequate laboratory and field skills in Biology; meaningful and relevant knowledge in Biology; ability to apply scientific knowledge to everyday life in matter of personal and community health and agriculture; and reasonable and functional scientific attitude unachievable. It therefore becomes necessary that Biology teachers, school administrators, SEMB and government should ensure that the needed Biology materials are provided without further delay to ensure the realization and sustenance of the stated educational goals.

Recommendations

Based on the findings and their implications, the following recommendations are made.

- i. Government should come up with policy that every secondary school should have a biological/botanical garden where many of the biology specimens could be grown.
- ii. Government should try to provide the needed biology material in school and adequate finance to maintain them.
- iii. Secondary Education Management Board should ensure that government is well informed on what are to be provided through careful collection of data from school.
- iv. Government should through the Mass Media plead with her sons and daughters to join hands with her in ensuring that all the required materials for effective implementation of SSBC are adequately provided.
- v. In future, the government should always carryout periodic assessment of needs in the area of Biology materials before supplying them.

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