

Evaluation of the Implementation of Biology Programme in Secondary Schools in Benue State of Nigeria

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Abstract: The paper evaluated the implementation of biology programme in secondary schools in Benue State. The study employed the survey and ex-post-facto designs. Two instruments, Biology Programme Evaluation Questionnaires for Teachers (BPEQT), Biology Material Resources Assessment Checklist (BMRAC) were developed, validated and used by the researchers to elicit data from 170 biology teachers in 119 secondary schools randomly selected from 284 schools in the State. The sampling technique was multi-stage sampling. The study revealed among others, that majority (60%) of the biology teachers were not qualified to teach biology, teaching methods often used by teachers were not the same as those recommended for teaching the subject. The study found a significant mean difference in the achievement scores of rural and urban students in West African Secondary School Certificate Examination (WASSCE). For effective implementation of biology programme, more qualified biology teachers should be recruited and unqualified serving ones should be made to go in for in-service trainings.

Key words: evaluation, implementation, biology, programme

1. Introduction

Education particularly in science and technology remains a veritable tool for individual and national development. This has made nations across the world to acknowledge it as a “sine qua non” for eradicating poverty and enhancing economic development.

Biology a life science, according to Odubunmi (2005), stands at the centre of science and technology. Being a life science it has contributed greatly towards improving the quality of human life by providing drugs for curing and preventing human diseases. In addition, the course is also a gateway to noble professions like Medicine, Pharmacy, Dentistry, Nursing, Agriculture, among others.

The objectives of the biology curriculum at the secondary school level is to prepare students to acquire adequate laboratory and field skills in Biology, meaningful and relevant knowledge in Biology, the ability to apply scientific knowledge to everyday life in matters of personal and community health and agriculture, reasonable and functional scientific attitudes, Federal Ministry of Education (FME, 2008).

The implementation of Biology programme has been a matter of serious concern Biology educators. This

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concern arises from the fact that Biology occupies a central position in the scientific and technological development of any Nation (Maduabum, 1992).

The Biology teacher occupies a strategic position as the quality of teachers in any educational system determines to a large extent the quality of the system itself (FME, 2004). In spite of the strategic position of Biology teachers to the successful implementation of Biology programme, research evidence by (Okeke, 1997; Nwachukwu & Nwosu, 2007; Dangbin, 2008) show that most schools in Nigeria lack qualified science (Biology) teachers.

The Biology curriculum just like any other science, is activity oriented and student-centered. Therefore emphasis is laid more on teaching and learning of Biology as a process rather than as a body of knowledge. For this reason the following teaching methods were recommended, field studies, guided, discovery and laboratory techniques/skills. However studies like Okeke (1999), and Nwachukwu and Nwosu (2007) found that science teachers are poorly trained in content and pedagogy. The teaching and learning of Biology just like any other science subject demands active students participation involving the use of material resources. However, available evidence (Onwuegburu, 2005; Olagunju & Abiona, 2008; Taiwo, 2008) point to the fact that essential material resources are inadequately provided in both rural and urban secondary schools in Nigeria. In their submission, Adejoh and Ityokyaa (2008) found no significant difference in the provision of laboratory and workshop material resources between rural and urban Junior Secondary Schools in Benue State. The state of affairs may be responsible for the students non-impressive performance in public examination such as West African Secondary School Certificate Examinations (WASSCE) in the subject in Nigeria. In line with this, Ityokyaa (2006), also found out that, there was a significant difference in the mean achievement scores of students in Biology between rural and urban secondary schools in three local government areas in Benue State. It is against this background that this study is out to evaluate the implementation of Biology programme in Secondary Schools in Benue State.

2. Purpose of the Study

The purpose of the study is to evaluate the implementation of biology teachers in secondary schools in Benue State. The study sought to answer the following questions and test the following hypothesis at 0.05 level of significance.

(1) What are the qualifications of teachers implementing the Biology programme in Secondary Schools in Benue State?

(2) What is the extent of achievement of Biology program objectives in secondary schools in Benue State?

(3) What are the teaching methods employed by Biology teachers in teaching Biology in secondary schools in Benue State?

(4) How adequate are the material resources for implementing Biology programme in rural and urban secondary schools in Benue State?

(5) What has been the trend in the achievement of students in Biology at WASSCE in rural and urban secondary schools in Benue State?

3. Hypothesis

Two hypotheses were formulated and tested at 0.05 level of significance.

(1) There is no significant mean difference in the adequacy of material resources for implementing Biology

programme between rural and urban secondary schools in Benue State Nigeria.

(2) There is no significant difference in the number of Students who passed Biology at credit level in WASSCE between rural and urban secondary schools in Benue State Nigeria.

4. Methodology

The study was conducted in Benue State of Nigeria. Both survey and ex-post-facto design were used for the study. One hundred and nineteen (119) senior secondary school were randomly selected from a population of 284 government grant-aided secondary schools in the State using multi-stage sampling technique. This was because sampling of the required schools were done in stages. The 119 secondary schools were stratified into rural and urban schools covering the three Educational Zones (A, B and C) in Benue State. Sixty five (65) secondary schools proportionally selected from the 182 rural schools in the state, while 54 Schools were selected from the 102 urban schools. All the Biology teachers in the selected secondary schools were used for the study (this was because of their fewer numbers) and WASSCE results of 54,459 students that graduated in WASSCE in the selected secondary schools were used.

Two instruments Biology Material Resources Assessment Checklist (BMRRAC) and researchers developed questionnaire tagged Biology Programme Evaluation Questionnaire for Teachers (BPEQT)) were used in collecting data for the study.

A proforma was developed and used to collect WASSCE results from Deans of Studies in the selected schools for a period of five years (2006–2009). It sought information about the number of students that sat for WASSCE in each school and the number that obtained pass grades (credits) 1–6 and those with failure grades (D7-F9).

(BPEQT) had two sections; Section A, elicited information on the Biology teachers highest Educational Qualifications. Sections B and elicited information on the extent of achievement of Biology programme objectives and teaching methods employed by teachers in teaching Biology. BPEQT had 20 items and was constructed on four point modified likert scale.

BMRAC, had seven columns namely; Serial Number, Material Resources, Minimum Number Recommended, Number Available, Adequate, Not Adequate and Not Available. BMRAC had 118 material resources. The researchers scored each of the resource, Adequate (2), not adequate (1), and not available (0). The maximum score obtainable was 236 (that is, if all the materials are adequate) and the minimum score was 118 (that is if all the materials are available but not adequate. For decision making, a percentage of 50% and above was accepted as adequate and below 50% was inadequate. The validated instruments were administered hand to hand by the researchers and 10 research assistants. Simple percentages, mean and standard deviations were used to answer research questions, while T-test for independent samples and Chi- square were used in testing the hypothesis.

5. Results

Results obtained from analyzed data are presented based on the research questions and hypothesis as follows;

5.1 Research Question One

What are the qualifications of teachers implementing the Biology programme in secondary schools in Benue State?

Table 1 Frequency Counts of Biology Teachers Qualifications in the Sampled Schools.

S/No	Qualifications	No. of Teachers	Percentages	Comments
1	Ph.D (Biology Education)	-	-	-
2	Ph.D (Others)	-	-	-
3	M.Ed (Biology Education)	4	2.4	Qualified
4	M.Ed (Others)	5	2.9	Unqualified
5	M.Sc (Biology + PGDE)	3	1.8	Qualified
6	M.Sc (others)	10	5.9	Unqualified
7	B.Sc (Ed) Biology	42	24.7	Qualified
8	B.Sc (Ed) Others	24	14.1	Unqualified
9	B.Sc (Others)	30	17.6	Unqualified
10	NCE (Biology)	22	12.9	Unqualified
11	NCE (Others)	13	7.6	Unqualified
12	HND (Sc. Tech + PGDE)	5	2.9	Qualified
13	Others	12	1.1	Unqualified
	Total	170	100	

Table 1 shows that, only 54 teachers representing 31.8% of the total number (170) of Biology teachers had the required qualifications to teach Biology. The remaining 116 (68.2%) teachers of Biology in the study area were not qualified to teach Biology.

5.2 Research Question Two

What is the extent of achievement of Biology programme objectives by students in Benue State.

The data analysis is presented in Table 2.

Table 2 Mean (x) and Standard Deviation (S.D) on the Extent of Achievement of Biology Programme Objectives by Students

S/No	Item Statement	X	S.D	Decision
1	The study of Biology helps students to solve personal and society problems in the community, Health and Agriculture sectors.	2.98	0.69	Achieved
2	Biology equips students with the right attitudes and habits.	3.06	0.72	Achieved
3	The study of Biology enables students to acquire relevant and meaningful knowledge.	3.20	0.72	Achieved
4	The study of Biology equips students with functional skills and knowledge for self reliance.	2.92	0.70	Achieved
5	Biology programmes provide students with the ability to apply scientific knowledge in everyday life.	3.16	0.70	Achieved
6	Biology programmes provides students with adequate laboratory and field skills.	2.90	0.85	Achieved

Table 2 revealed that, all the six items statement on the achievement of Biology programme objectives had their means above the criterion mean of 2.50 implying that the Biology programme objectives were achieved.

5.3 Research Questions Three

What are the teaching methods employed in teaching Biology at the secondary school level in Benue State?

Table 3 Descriptive Statistics of Teaching Methods Employed by Teachers in Teaching Biology in Benue State

S/No	Teaching Methods	X	S.D	Remark
7	Inquiry/Discovery	2.14	0.88	Not often
8	Discussion	2.70	0.85	Often
9	Lecture	2.98	0.92	Often
10	Assignment	2.95	0.87	Often
11	Project	2.86	0.75	Often
12	Field trips/excursion	2.06	0.88	Not often
13	Laboratory/experimental	2.35	0.87	Not often
14	Concept mapping	2.11	0.82	Not often
15	Use of Analogies	2.45	1.07	Not often
16	Co-operative	2.13	0.85	Not often
17	Demonstration	3.15	0.84	Often
18	Computer Assisted	1.91	0.97	Not often
19	Team teaching	1.96	0.84	Not often
20	Play-way	1.89	0.85	Not often

Table 3 revealed that, teaching methods serial numbers 8, 9, 10, 11, and 17 had means above the criterion mean of 2.50 and were accepted as often used in teaching Biology. On the other hand, teaching methods serial number 7, 12, 13, 14, 15, 16, 18, 19 and 20 had mean scores below 2.50 meaning they were not often used in the teaching Biology.

5.4 Research Questions Four

How adequate are the material resources for implementing Biology programme in rural and urban secondary schools in Benue State?

Table 4 Analysis of the Level of Adequacy of Biology Material Resources in Urban and Rural Schools in Benue State

Location.	No. of Schools	Level of Adequacy below 50%.	Level of Adequacy from 50 and above
Urban	54	32 (59.3%)	22 (40%)
Rural	65	51 (78.50%)	14 (21.5%)

Table 4 show that 32 (59.6%) of Urban schools had less than 50% of the material resources that were supposed to be provided in their laboratories, while 57 (78.5%) rural schools had below 50% of the material resources that were supposed to be adequately provided for them. The results in Table 4 also show that only 22 (40%) of urban schools had adequate Biology material resources while, 14 (21. 5%) of rural schools had adequate Biology material resources.

5.5 Research Question 5

What has been the trend in the achievement scores of students in Biology at WASSCE in rural and urban secondary schools in Benue State?

Table 5 Students Achievement in Biology at WASSCE in Rural and Urban Schools in Benue State

Location	Year				
	2005	2006	2007	2008	2009
Rural	43.2%	50.1%	52.3%	57.2%	54.1%
Urban	56.4%	58.5%	58.8%	56.2%	59.2%

Table 5 revealed that for rural schools only 43.2%, 50.1%, 52.3%, 57.2%, and 54.1% of candidates who sat for WASSE passed Biology at credit level for years 2005, 2006, 2007, 2008 and 2009 respectively.

For Urban schools 56.4% of candidates who sat for WASSCE in year 2005 passed Biology at credit level. The 58.5%, 58.8%, 56.2% and 59.2% of candidates who sat for WASSCE passed Biology at credit level for years 2006, 2007, 2008 and 2009 respectively.

5.6 Hypothesis One

There is no significant mean difference in the adequacy of material resources for implementing the Biology programme in rural and urban secondary schools in Benue State.

Table 6 T-test Analysis on Adequacy of Material Resources for Implementing Biology Programme in Rural and Urban Secondary Schools in Benue State

Variables	N	\bar{X}	S.D	DF	t-Cal.	t-Crit	Decision
Rural	65	1.1108	0.28838	117	4.168	1.658	Rejected
Urban	54	1.3271	0.27351				

Table 6 shows that t-cal. was 4.168, while t-critical was 1.658 at 0.05 level of significance and 117 degree of freedom, that is t-cal. > t-critical. Therefore the stated hypothesis of no significant difference was rejected.

5.7 Hypothesis Two

There is no significant difference in the number of students who passed Biology at credit level in WASSE between rural and urban schools in Benue State.

Table 7 X^2 (chi-square) Analyses on the Number of Students who Passed Biology at Credit Level in Rural and Urban Schools in Benue State

X^2 Cal.	X^2 Critical	DF	Sig. Level	Decision
209.66	9.488	4	0.05	Rejected

Table 7 shows that the calculated chi-square (X^2) was 209.66 that of X^2 critical was 9.488 at 0.05 level of significance and 4 degree of freedom. Therefore, the stated hypothesis of no significant difference was rejected.

6. Discussion of Results

The result in Table 1 showed that majority of the Biology teachers 116 (68.2%) were not qualified to teach Biology. It could be seen in Table 1 that teachers of diverse academic qualifications without professional teaching background were engaged to teach Biology. This finding supports Daigbin (2008), Nwachukwu and Nwosu (2007) and Okeke (1997) who all found out that many schools in Nigeria lack qualified science teachers (Biology inclusive). For more than 60% of Biology teachers in the study area to be unqualified (academically and professionally) implies that the implementation of the Biology programme in the study area will not be effective.

Results in Table 2 revealed that all the six items covering the objectives of Biology are being achieved, this finding goes contrary to the assertion by Nwosu and Nzewi (1997) and Nwagbo (2005) that, the objectives of Biology specified in the curriculum were hardly achieved, the implication of the finding is that our learners through Biology Education are acquiring relevant, functional knowledge and attitudes.

Findings in respect to Table 3 showed that the teaching methods often used in teaching Biology were demonstration method followed by lecture method, assignment method, project method and discussion method.

This is because their mean scores were above the criterion mean of 2.50. This finding is contrary to the recommendation by Federal Ministry of Education (2008) for the use of field studies, guided discovery /inquiry and laboratory techniques for teaching these subjects.

Results in Table 4 revealed that, majority of the rural schools (78.5%) and urban schools (59.3%) had Biology material resources inadequately provided in the schools. The result is consistent with the findings of Taiwo (2008), Olagunjo and Abiona (2008) and Onwuegbuna (2005) who in their separate submissions found that material resources were inadequately provided in both rural and urban schools in Nigeria.

Results shown in Table 5 revealed that students' achievement in Biology in urban schools were slightly higher as can be seen in their higher percentages. On the whole the achievements of both rural and urban students were within average (except year 2005 for rural schools) when the percentage credit pass was slightly above 40% (43.2%). This findings confirms the assertion by Egbuonun and Ugbaja, (2008) that students achievement in Biology have not been very impressive.

Results in Table 6 established a significant difference in mean adequacy of Biology material resources between rural and urban secondary schools in Benue State. This finding deviates from that of Adejoh and Ityokyaa, (2009) who found no significant difference in the provision of laboratory and workshop materials resources between rural and urban junior secondary schools in Benue State.

Results in Table 7 revealed a significant difference in the number of students who passed biology at credit level in WASSCE between rural and urban schools. This finding supports earlier study by Ityokyaa (2006) who found out that there was a significant difference in the achievement scores of students in Biology between rural and urban secondary schools.

7. Conclusion

Based on the findings of this study, it was concluded that Biology programme was not well implemented in senior secondary schools in the study area due to non-qualified teachers, inadequate provision of material resources and non use of the recommended teaching methods by teachers.

8. Recommendations

(1) The government/schools authorities/PTA should as a matter of urgency recruit more qualified Biology teachers.

(2) Non-professional qualified serving teachers should be made to go for in-service training.

(3) The government/schools authorities should endeavour to provide adequate essential material resources in urban and more especially in rural schools, since the shortage of material resource was more pronounced in rural schools.

(4) Workshops/seminars and conference should be organized by Government for serving Biology teachers, in order to keep them abreast with the recommended/innovative teaching strategies.

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