

Appraisal of Students' Weakness and Strength in Biology

O. I. Ogorode¹ and C. E. Ochonogor²

¹Delta State University, Nigeria & ²University of South Africa

¹omogheneisrael@yahoo.com and ²Ochonec@unisa.ac.za

Abstract

This research paper was designed to appraise students' weaknesses and strengths in biology in Ughelli metropolis in Nigeria. Three research Hypotheses were raised to include: there is no significant relationship between the shortage of biology teachers and students' weaknesses and strengths in biology; there is no significant relationship between the condition of biology laboratory facilities and students' weaknesses in biology. 164 SS II Biology student and six (6) Biology Teachers were used as sample from six (6) schools (3 public and private respectively). 20 – Item questionnaire was used for collecting data. Spearman's Rank order correlation coefficient (ρ) was used to analyze the data. Among the major findings, is that: There is a strong correlation between shortage of biology teachers and students' weakness in Biology; there is also a strong correlation between the state or condition Biology laboratory facilities and students' level of achievement in Biology. The paper fully discussed the implications of the results of this study to the future of Biology in particular and Science education in general.

Keywords: Weaknesses, strengths, biology, Science Education, biology teachers, laboratory facilities.

Introduction

The Launching of the SPUTNIK 1, the first man-made satellite by the Soviet Union on Friday October 4, 1957 triggered off a broad-based Science Education. Sputnik also inspired a generation of engineers and scientists. Post-Sputnik concerns included curricular issues focusing on what was being taught and how, blames on the schools, rather the student (Rutherford, 1998; Abramson, 2007 and HEL, 1998). According to Maduabum (1989), this ushered in an entirely new era in curriculum development especially science, including Biology. The term "Biology" was derived from two "Greek" words "Bios" and "Logos" where "Bios" means life and "Logos" means "study". Therefore Biology is the Study of life (Taylor, Green and Stout, 2002). Biology or Life Science as the study of living organisms is one of the basic subjects in the Natural Sciences in the Senior Secondary School, which most students do take. It ranges from sub-cellular to whole organism and environment. The importance of Biology in our society cannot be over emphasized. It help us; to understand ourselves and the world around us, increases the quality of the human life (better use of Natural Resources, preventing diseases and developing new ways to use living organism), improve the impact of human on our environment such as conserving natural habits and endangered species or reducing the effects of environmental pollution.

In recent times, there have been complaints from almost all quarters of the African societies that the Standard of Education has fallen, Students' performances in Senior School Certificate Examination (SSCE) Administered by West African Examination Council (WAEC) and National Examination Council (NECO) in Nigeria and such bodies as Department of

Education (DoE) in South Africa continues to deteriorate from year to year, particularly in the areas of Physical Science even Biology or Life Science.

Often times, the Teacher is being blamed for students' ineffectiveness or weaknesses even poor performance in a science subject. Explanation is being proffered only in terms of his/her cognitive or Intellectual ability. Little or no consideration is given to the Students' perception towards the subject (Biology) and other factors that could result to poor academic performance of the student. Egbule (2000) noted that myriads of factors like environmental, hereditary, psychological, and maturational factors affect the performance of a student in any school subject.

On environmental factors, Egbule (2000) said, whether the environment is conducive, distracting, whether there be time pressure, whether the child's home-background or economic status or amount of maturation received from parents, peer group and society culminate in major environmental issues that can positively or negatively affect performance of a student. The environment of the student connotes both the school and the residential environment. This implies that, a student can perform well in school subject (Biology), if the environment is conducive with less time pressure on him and vice-versa.

Students' weaknesses or strengths in Biology are as a result of many factors on the part of the students. These factors include his/her personality, physiological make-up, maturational and motivational aspects as well as his/her interest and attitude towards Biology. This was also supported in Egbule (2000), which asserts that a student will learn positively if he / she has previous experience, pre-requisite of the subject matter; interest in the subject matter to be learnt; if he is intelligent has a large memory span with mental and emotional set as well as the physiological readiness for the subject to the learnt and vice versa.

The issue of the Teacher as one of the factors affecting students' weaknesses in strength in science subject cannot be overlooked. The qualifications of the teachers, methods used by the teachers and shortage of Biology or Life Science teachers greatly affect students' performance in secondary school science subjects. Kalagbor (1998) worked on the effect of qualified and trained teachers in two secondary schools. The result showed that the school with more qualified teachers performed better than school with less qualified teachers in science subjects, particularly, Biology.

Agina (2001) was of the view that non – availability of teachers was a major crisis in teaching of science subjects (Physics, Chemistry and Biology) in most Nigerian Secondary Schools. As a result, some school authorities employed teachers who were not trained in the field of sciences (Biology) to teach Biology. The teaching method adopted by the Biology teacher must be suitable to the subject matter being taught. Max Sobel, (1998), commenting on the job description for teachers summarized by saying that *"Teachers must know the stuff, they must know the students that they are stuffing and they must know how to stuff them artistically"*. The teaching method adopted by the teacher is expected to arouse and sustain the interest of the students in the subject matter being taught. Hence the teacher must have the required knowledge of the subject-matter, the learners' make-up and the best strategy of teaching the topic to the understanding and practice of the learners.

Another issue of major concern in science teaching is that of an ill-equipped laboratory. Abdullahi (1982) pointed out that most of the problems of science teaching in many schools

today are attributed to teachers' inability to help students learn science in a meaningful way. Science teaching should involve learners performing experiments and drawing conclusions to test theories under the supervision of the teachers. This is however, hardly done due to acute shortage or out-right absence of science equipment and facilities in the schools. This situation calls for the use of improvisation by teachers to convey the necessary skills and knowledge of their teaching to the learners. Asenuga (1981) opined that "if any science subject is to be taught well, it should be taught practically". Each student should be able to perform necessary experiments, make certain tools, produce some equipment and record accurate observations.

The influence of instructional materials on learners' performances and science teaching cannot be nip under board. Agun and Imogie 1996 in Effih (2004) were of the views that instructional materials are information carriers designed specifically to achieve the objectives of teaching –learning situation. Good instructional materials play very important roles in the changes that move toward inquiry-centered, standards-based instructions which help to sustain science interest and promote higher learner performance. These are materials that are used to elucidate issues in the transference of information from one to another. They are kinds of tools or equipment that can effectively help the teacher in teaching theory topics in the classroom or otherwise. Ighedo (1986) discussed the importance of instructional materials in the teaching and learning process that: they enable the use of sensory organs, enhance instructional activities, increase motivation and interest of the learners and cater for individual differences. It is expected that instructional materials should be directly relevant to the content of the lesson, integrated with the teachers' whole approach, preceded and followed-up by work calculated to ensure maximum comprehension. Dale (1989) was also of the views that; instructional materials are used to make abstract concepts become concrete and reduce meaningless responses of learners, make learning important, help in developing continuity of thought in the learners which is particularly true of motion pictures and help to offer a reality of experience which stimulate self-activity on the part of the learner. Instructional materials if well applied, boosts the academic performance and strength of biology learners.

Furthermore, at the Senior School Certificate Examination (SSCE) level, according to the Chief Examiner's report (WAEC, 2009) learners are ineffective and perform poorly in Biology due to the following reasons: inability to draw well-labeled diagrams of appropriate sizes and magnifications, poor spelling of labels and technical terms; poor knowledge of classification; inability to relate structures to their functions; inability to state an experiment in a sequential manner; inability to state necessary precautions needed in carrying out experiments; poor interpretation of some biological terms, poor understanding of biology examination questions. <http://www.exampleessays.com/viewpaper/29922.html> (2011) defined weakness as the lack of strength, a self-indulgent want, fragility, or as an inadequate or defective quality in something. WAEC (2009) suggested some ways to overcome students' weaknesses in biology to include: that "Science teachers should endeavor to acquaint students with basic science equipment; Practical classes should be carried out regularly and biology should not be taught as an abstract subject; Students should be taken on field trips to enable them observe organisms in their natural habitats; and Government should ensure that all approved science tutorial classes for external or re-write candidates must have standard laboratories.

Strength is considered here from the perspectives of being a source of support on the one hand and as asset or quality on the other hand. In other words; strengths are the opportunities available for the learners. WAEC (2008) summarized the strengths of biology or life science learners in the form of objectives as follows:

- “1. Understanding of the structure and functions of living organisms as well as appreciation of nature;
- 2, acquisition of adequate laboratory and field skills in order to carry out and evaluate experiments and projects in Biology;
3. acquisition of necessary scientific skills for example observing, classifying and interpreting biological data;
4. relevant knowledge in Biology, needed for future advanced studies in biological sciences;
5. acquisition of scientific attitudes for problem solving;
6. ability to apply biological principles in everyday life in matters that affect personal, social, environmental, community health and economic problems.” (...p.65)

In reality, the above strengths culminated in the form of objectives for teaching Biology or Life Science at the high school level can only be achieved with the provision of the enabling environment, qualified human resources, laboratory space, equipment and facilities and useful improvisations as the case may be, by the stake holders. Unfortunately, the possibility of improving on learners` strengths in the subject and science in general appear to eroded by the gross absence of such opportunities and provisions that would have propelled the learners to higher achievements in Biology.

The purpose of this work was to critically investigate some of the factors that determine students` weaknesses and strengths in biology.

Problem of the Study

The academic performance of students in Biology has been low every year (WAEC, 2009) and this situation calls for a critical investigation of what the cankerworm behind it could be. Based on this, the following questions were raised as the problem of the study:

1. What are the learners` weaknesses in biology or life science?
2. What are the learners` strengths in biology or life science?
3. In what ways do either weaknesses or strengths of learners affect their performance in public examinations?
4. What are the sources of learners` weaknesses and strengths in biology or life science?

Research Hypotheses

- Ho₁: There is no significant relationship between the shortage of qualified biology teachers and learners` weakness in biology.
- Ho₂: There is no significant relationship between Biology laboratory facilities and students` weakness in Biology.
- Ho₃: There is no significant relationship between errors in spelling of Biology terms/poor diagrams and students` weakness in biology.

Methodology

The research design for this study is a simple survey type, hence a descriptive research. The population for the study consisted of all the twenty-five secondary schools (fifteen public and five private) Biology students and teachers in Ughelli Local Government Area of Delta State, Nigeria. A sample of 164 students and 6 Biology teachers from six schools (3 public and 3 private) were was for the study.

The research instrument used was a 20-item questionnaire for Biology teachers and learners in SSII or Grade 11 to collect the required data. The data were analyzed to test the stated hypotheses using the spearman's Rank – order correlation (rho) coefficient. Where all positive responses were denoted by (x) and negative responses by (y)

$$P = 1 - \frac{6 \sum D^2}{N(N^2-1)}$$

DATA ANALYSIS AND PRESENTATION OF RESULT

Testing Hypothesis I

It states that there is no significant relationship between shortage of qualified biology teachers and students' weakness in biology.

Table 1: Relationship between shortage of Qualified Biology Teachers and Students' weaknesses in Biology.

Schools	Responses		Df	P-crit.	P-cal	Level of significant	Decision
	X(+ve)	Y(-ve)					
A	25	12	1	0.99	0.53	0.05	Strong correlation
B	25	12					
C	18	14					
D	18	2					
E	8	7					
F	8	7					

Spearman's rank order correlation coefficient (rho) values between 0.1 – 0.5, represent weak correlation while values from 0.5 – 1.0 represent strong correlation. Table 1 above shows that p-calculated is 0.53 and hence it shows a strong correlation. There is a strong correlation between shortage of qualified biology teachers and learners' weaknesses in biology or life science.

TESTING HYPOTHESIS 2

It states that there is no significant relationship between biology laboratory facilities and students' weakness in biology.

Table 2: Relationship between Biology Laboratory Facilities and Students' weaknesses in Biology.

Schools	Responses	Df	P-crit.	P-cal.	Level of significant	Decision
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	X(+ve)	Y(-ve)					
A	28	10	1	0.99	0.76	0.05	Strong correlation
B	28	10					
C	14	15					
D	14	6					
E	5	8					
F	5	8					

From Table 2, P-calculated is 0.76 which shows that a very strong correlation exists between biology laboratory facilities and students' weakness in biology.

TESTING HYPOTHESIS 3

Hypothesis 3 states that there is no significant relationship between learners' errors in spelling of biology terms/poor diagrams and their weaknesses in Biology.

Table 3: Relationship between learners' errors in spelling of biology terms/poor diagrams and their weaknesses in Biology.

Schools	Responses		Df	P-crit.	P-cal.	Level of significant	Decision
	X(+ve)	Y(-ve)					
A	15	23	1	0.99	0.41	0.05	Weak correlation
B	16	23					
C	15	20					
D	16	4					
E	8	4					
F	8	7					

From the table 3 above, p-calculated is 0.41 at df of 1. This shows that errors in spelling of biology terms/poor diagrams result to a weak correlation with students' weaknesses in biology.

DISCUSSION OF FINDINGS

From Hypothesis 1, it was discovered that there is a strong correlation between the shortage of biology teachers and students' weaknesses in Biology. This implies that shortage of qualified biology teachers has great influence on students' weaknesses in biology. This findings is in line with that of Agina (2001) in which he opined that the area where the teaching of science (Biology) suffers most in Nigerian secondary schools is the non-availability of qualified teachers and this make most school authorities to employ teachers from other fields like chemistry and physics to teach biology. Though Biology is a science subject, it has its own special techniques like every other subject in the school curricula. A situation where a non-specialist biology teacher is used in the teaching of Biology is like putting a round peg in a square hole or vice versa. Gaps created by such a situation certainly result in learners' weaknesses in the subject. Quantitative analyses according to Darling-

Hammond, (2000) indicate that measures of teacher preparation and certification are by far the strongest correlates of students' achievement in reading, science and mathematics. Result of hypothesis 2 shows that a strong correlation exists between lack of Biology laboratory facilities and students' weakness in biology. The findings are in agreement with that of Asenuga (1981), which asserted that, "if any science subject is to be taught well, it should be taught practically, each student should be able to perform necessary experiments, make certain tools, produce some equipment and record accurate observations. The effectiveness of students in learning biology is determined by the extent to which they use the biology laboratory facilities. AAAS (1990) noted that progression in learning is usually from the concrete to the abstract. This is because young learners learn more readily about things that are tangible and directly accessible to their senses which include visual, auditory, tactile and kinesthetic. Indeed, concrete experiences are most effective in learning if they are located within the concept of some relevant conceptual structure. This opportunity is to a great extent provided through the use of laboratory activities aided by the provision of the needed equipment and facilities.

From Hypothesis 3, the calculated correlation coefficient is 0.41 which is less than 0.5 showing a weak correlation. Therefore weak correlation exist between errors in spellings of biology terms/poor diagrams and students weakness in Biology. WAEC (2009) stated poor spelling of labels and technical terms as the first weakness manifested by learner, yet it appears that examiners tend to treat this weakness with some levity against the learners. In other words, ideas contained in the learners' examination scripts overshadow the correctness of the terms used in the answers. This is probably due to the fact that it has become a general problem that most students were not yet exposed to adequate practical works in biology if any, where errors in spelling biology terms/poor diagrams are considered necessary. This brings about shallow experience in biology practical terms and strategies used in biology drawings. As a chain reaction, the situation eventually leads to added weakness in the learners' performance and achievement in biology or Life Science. Learners cannot learn to think critically, analyze information, communicate scientific ideas, make logical arguments, work as part of a team, and acquire other desirable skills unless they are permitted and encouraged to do these things over time (AAAS, 1990).

CONCLUSION

From the findings above, the following conclusion were reached.

- (1) Availability of well-trained Biology Teachers promotes students' strengths in biology.
- (2) The effective use of the Biology Laboratory Facilities enhances students' strength in biology.
- (3) Spellings of Biology terms/poor labeled diagram has slight effect on students' strengthen Biology.

RECOMMENDATION

In view of the findings and conclusion above, the following recommendations will help to reduce learners' weaknesses and enhance their strengths in biology as a school subject.

- (i) Two or more well trained Biology Teachers should be made available to teach biology or Life Science in every high school given the large number of learners that usually opt for the subject.
- (ii) Biology Teachers should try to improve on their methods, techniques and strategies employed in teaching. They need to be resourceful enough to carry the learners along even in the absence of real equipment and facilities in their schools.
- (iii) More laboratory facilities meant for teaching biology should be made available by stake holders and students should be allowed to take maximum control in the usage of these facilities from time to time.
- (iv) Biology Teachers should start teaching students the rudiments, facts, spellings and principles involved in Biology practical's from Senior Secondary I or grade 10 of the high school.
- (v) Seminars, symposia, workshops, quiz competition and conferences on contents, pedagogy and practical activities should be organized on a regular basis for both biology teachers and students to enhance their interest and strengths in the teaching and learning of biology.

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