STEM JOURNAL OF ANAMBRA STAN

(STEMJAS)

Maiden Edition

2010

Editor-in-Chief
Ray O'small Nwokike
Department of Mathematics/Statistics
Federal Polytechnic, Oko.

STEM JOURNAL OF ANAMBRA STAN (STEMJAS)

Maiden Edition 2010

Editor-In-Chief

Ray O'small Nwokike

Department of Mathematics/Statistics

Federal Polytechnic Oko

Mobile: 08062630952

E-mail: rayokike2003@yahoo.com

Printed and Published by Amaka Dreams Ltd Awka 08037449926.

Instruction to Contributors

Papers are invited from researchers

- In science (pure and applied) and technology
- The length of the articles should be between 6 and 10 typewritten pages excluding tables and appendices.
- Only papers not previously, published in journals should be sent in for publication.
- Footnotes/references follow the APA format.

GENERAL:

a) Manuscripts should follow the outline stated above.

b) Three copies of such manuscripts and correspondence should be addressed to the Editor-in-Chief, Department of Maths/Statistics, Federal Polytechnic Oko Anambra State, Nigeria.

Please send along a diskette of dimension 3.5" (8.75cm)/CD ROM containing the manuscript preferably in Ms Word, Ms Excel, Corel Chart, Page Maker and Corel Draw.

c) The text should be written in English; subscription rate per volume is N6000.00 postage (excluded).

Note: a free copy of the journal will be sent to the author(s) while additional copies will be purchased from the Editor-in-Chief.

FOREWORD/ EDITORIAL COMMENTS

The vital role played by Science, Technology, Engineering and Mathematics (STEM), in the development of nations have for long been recognised and effectively utilised by the developed nations of the world.

Conversely, those nations that have failed to recognise or gave undue attention to the catalytic role of STEM in their national development agenda, are referred to as under- developed. Obviously, our country, Nigeria falls within this latter category. To this end serious effort is needed from all stakeholders in nation building including the Science Teachers Association of Nigeria (STAN), in redressing this ugly trend thereby paving the way for Nigeria to take its rightful position among the developed nations of the world, the so much canvassed vision 20/2020 agenda.

The Science Teachers Association of Nigeria (STAN), a non-profit making professional Association, has its cardinal goal as promoting Science, Technology, Engineering and Mathematics teacher effectiveness in Nigeria. This goal is anchored on the realisation that no meaningful national development initiative can be fully achieved if the role of the teacher is neglected. This goal is achieved through a number of avenues including workshops, seminars, conferences, excursions, quiz/ project competitions and a number of academic publications. Through these avenues, ideas are cross-bred among STEM teachers and researchers at primary, secondary and tertiary levels thereby engendering the professional development of the members.

The STEM JOURNAL OF STAN 2010, is a product of Anambra State Branch of the Association and this Maiden Edition is meant to encourage members to publish and make progress as well as facilitate the interchange of ideas among STEM teachers at the state, national and international levels on issues of relevance to national development particularly, those bordering on STEM.

Articles are invited from contributors on regular basis. The views and opinions expressed by the authors are not necessarily those of STAN but that of the individual contributors.

It may be pertinent at this juncture, to give credit to the Immediate past Executive of STAN, Anambra State under the able leadership of Dr. C. V. Nnaka (Mrs.) for initiating this journal project and the Editorial Board for bringing the job to a logical conclusion.

God Bless.

Dr. Mars C. Anaekwe
Chairman
STAN Anambra State.

TABLE OF CONTENTS

STUDY ON THE DIFFICULT CONCEPTS IN SENIOR SECONDARY SCHOOL BIOLOGY CURRICULUM

BY
V.N. NZELUM
SCHOOL OF SCIENCES
FEDERAL COLLEGE OF EDUCATION
(TECHNICAL) UMUNZE

ABSTRACT

This study was specifically on the study of difficult concepts in senior secondary school biology curriculum; and was conducted within Aguata Education zone of Anambra State, Nigeria. The population of the study comprised all the SSIII students and the biology teachers. The sample of the study was 800 subjects consisted of 680 SSIII students and 120 biology teachers. Mean was used to analyse the data and criterion point was 3.0. The instrument for data collection was a 30 – item questionnaire. Among the findings were that genetics, evolution, biometry etc. were some of the difficult concepts in Biology. Teacher's factors that serve as predictor to the difficult nature of the concepts included the qualification of the teacher, area of specialization, strategy of teaching and not having the knowledge of objectives of the programme. The paper recommends among other things that quarterly workshops on capacity building for biology teachers should be organized to enable them acquire more skills on how best to handle these concepts for better instruction to students.

Introduction

Science is seen as a dynamic and objective process of seeking knowledge, and an enterprise that involves people searching, investigating and seeking verification of natural phenomena. Since science is both an organized body of knowledge and a process of finding out knowledge, it therefore demands that it should be taught through hands-on-methods approach. Science generally is an institution in which a community of people work and are bound together by certain social organizing relations to carry out certain tasks in society (Tindimubona, 1993). Bernard (1992) stated that science is one of the most powerful sources of ideas moulding beliefs and interests to the universe and society and indeed man's whole pattern of thought, culture and politics. From the two definitions, science is seen as a tool with which man learns about his environment, its resources and problems and how to control and utilize them productively and sustainably.

Biology being one of the core natural sciences studies life and its environment. It has as its objectives as spelt out by the National Policy on Education (1981, 1998 and 2004), and the cardinal objectives of the syllabus are to prepare pupils to acquire:

- Adequate laboratory and field skills in biology
- Meaningful and relevant knowledge in biology
- 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, 1985).

Attainment of the above objectives by the biology students is consequent upon the manner of approach or techniques employed by the biology teachers in implementation of the contents of the curriculum. It is an observed fact that some concepts in biology curricula are very difficult for students to comprehend. Available statistical evidence has revealed poor performance of students in science subjects especially biology. This is attributed to poor handling of some concepts and practical lessons in biology in schools.

Among the reasons advanced for this situation is difficulty in understanding some of its concepts. The search for method of helping the students to get over this problem involved studies in areas of some biological diagrams, pronunciation of some biological terms, experimentation and reliability of some biology text books.

Baja (1983) in his own submission said that investigation requires a careful identification and analysis of the sources of these problems namely, the teachers, the students, the subject matter, the learning environment and application of appropriate remedies.
These concepts if fully discovered and articulated will help to device a better approach to unravel the hard nuts of the concepts as to helping the students understand the concepts easily and be in a better position to attain the objectives as spelt out in the National Policy on Education. It is in the light of this, that the researcher deemed it very pertinent to carryout a survey on the difficult concepts in biology education curriculum of Senior Secondary School within Aguata Educational Zone of Anambra State, Nigeria.

Statement of the Problem

One of the major problems that confront the Nigerian education system is the issue of continued poor performance of students in sciences in the National Examination Council (NECO) and the National Business and Technical Examination Board (NABTEB). Unlike every other science subjects, Biology is a subject that is at the heart of Senior Secondary School Students apart from being one of the compulsory subject at that level. But despite this interest by the students, a high failure rate is often being recorded for the student in the subjects at SSCE/WAEC examinations as revealed by the chief examiners report (2005, 2007, 2008 and 2009). The West African Senior Certificate Examination (WASSCE) Chief Examiner's reports of 2008 states that, the performance of candidates in Biology was poorer that that of last year (2007) considering the mean scores of 18 and standard deviation of 10. What could cause this poor performance include; the teacher, difficult concepts, non-mastery of prerequisite biology contents or the methodology of teaching. This study however

sets out to investigate the difficult concepts in biology education at Senior Secondary School level within Aguata Education Zone.

Purpose of the study

The main aim of this study is to:

- Survey the concepts in biology that students perceived as difficult.
- Find out the teachers' factors as predictors of the difficult concepts.
- Suggest strategies to improve the mastery of the difficult concepts as to enhance students' performance in such areas.

Research Questions

1. What are the biology concepts that the students perceive as being difficult in understanding?
2. What are the teachers' factors that serve as predictors to the difficult nature of the concepts?
3. What are the strategies to improve the mastery of the difficult concepts by the students?

Method

Survey research design was adopted in the study, which was conducted at Senior Secondary Schools in Aguata Education Zone. The population of the study comprised all the SSIII Biology students and biology teachers. The sample for the study consisted of 800 SSIII students and 120 Biology teachers drawn from Senior Secondary Schools in the three local government areas that made up the Aguata Education Zone by disproportionate sampling technique. Twenty schools were selected from each local government area by simple random sampling technique. An instrument known as perceived difficult concepts in biology (PDCIB) was used for data collection. The PDCIB is a 30-item test designed to obtain students' and the teachers' responses on the difficult concepts in Biology, teachers' factors as predictors and the strategies. The instrument was designed by the researcher and validated by two experts in science education from Federal College of Education (T), Umunze. Kuder –

Richardson was used to test the reliability after the trial testing of the instrument and the internal consistency was calculated, at the end of which reliability index of 0.74 was obtained.

The instrument was administered to students with the help of their teachers. The responses of the students were analyzed using mean. Any responses with a mean of 3.00 and above is regarded as accepted or agreeable on a 4-point scale of Strongly Agree, Agree and Disagree, Strongly Disagree with the assigned values of 4, 3, 2 and 1.

Research Question 1: What are the biology concepts that the students perceive as being difficult in understanding?

Table 1: Mean Responses of Students on Difficult Biology concepts.

S/N	Concepts	SA	A	D	SD	N	X	REMARK
1	Genetics	302	281	119	98	800	3.0	Agree
2	Evolution	425	268	78	29	800	3.4	Agree
3	Respiration	389	278	87	46	800	3.3	Agree
4	Nervous system	401	186	99	114	800	3.1	Agree
5	Physical constituent of cells	211	134	285	170		2.5	Disagree
6	Vertebrates	104	156	360	180		2.3	Disagree
7	Lower plants	198	201	291	110		2.6	Disagree
8	Invertebrates	189	222	263	120		2.5	Disagree
9	Hormones	76	126	305	293		2.0	Disagree
10	Conservation	102	164	332	202		2.2	Disagree
11	Cell division	186	172	284	154		2.4	Disagree
12	Ecology/climatic zones	405	194	98	103		3.4	Agree
13	Photosynthesis	412	192	100	96		3.2	Agree
14	Man, disease and his environment	213	120	296	131		2.5	Disagree
15	Arthropods	392	268	85	55		3.2	Agree
16	Biometry	388	280	85	47		3.2	Agree

Table 1 revealed that items 1, 2, 3, 4, 12, 13, 15 and 16 with their corresponding means (x) of 3.0, 3.4, 3.3, 3.1, 3.4, 3.2, 3.2 and 3.2 were the difficult concepts in Biology as agreed or accepted by the students.

Research Question 2: What are the teachers' factors that serve as predictors to the difficult nature of the concepts?

Table II: Mean Responses of the Respondents on Teachers' Factors as Predictors to Biology Difficult Concepts.

S/N	Concepts	SA	A	D	SD	N	X	REMARK
1	Qualification	60	35	15	10	120	3.2	Agree
2	Teaching experience	44	20	37	19	120	2.5	Disagree
3	Area of specialization	65	31	14	10	120	3.2	Agree
4	Teachers' gender	30	25	14	51	120	2.1	Disagree
5	Teachers' knowledge	68	24	10	18	120	3.2	Agree
6	Teaching strategies	57	28	13	22	120	3.1	Agree
7	Assessment practices	26	20	31	43	120	2.2	Disagree
8	Programme objectives	61	32	11	16	120	3.1	Agree

From the above table, the respondents agreed with all the items with the exception of item 2, 4 and 7 as teachers' factors that serves as predictors to difficult biology concepts.

Research Question 3: What are the strategies to improve the mastery of difficult biology concepts by the students?

Table III: Mean responses on strategies to improve mastery of difficult concepts in Biology.

S/N	Concepts	SA	A	D	SD	N	X	REMARK
1	Use of instructional materials in teaching	302	211	88	99	800	3.0	Agree
2	The use of concept map in teaching	366	252	86	95	800	3.1	Agree
3	Integration of vernacular during instruction	166	176	267	241	800	2.2	Disagree

4	Using analogue to illustrate concepts	248	163	202	187	800	2.6	Disagree
5	Capacity building workshops to be organized for in-service teachers on these difficult concepts	384	256	93	67	800	3.2	Agree
6	Adoption of inquiry method of teaching	360	194	106	140	800	3.0	Agree

Table 2 showed that items 1, 2, 5 and 6 with the mean responses of 3.0, 3.1, 3.2 and 3.0 respectively were the strategies to improve the mastery of these biology difficult concepts by the students.

Discussion and Conclusion

The concepts considered to be difficult to students for easy comprehension by the respondents included the concepts of genetics, evolution cellular respiration, nervous system, ecology/climatic zones, photosynthesis, biometry and Arthropods. This was in agreement with the activities of Biology panel of STAN in organization of workshops to sort out the easiest way or approaches to unravel the mystery behind the difficult nature of some of these concepts. The poor performance of students in some of these areas as revealed by the Chief Examiners Report (2005, 2007 and 2008) equally showed that these concepts are not at home with the students' in terms of acquisition of knowledge and comprehension of contents of the subject matter.

From Table II, teachers' factors that serve as predictors to difficult concepts in Biology included the qualification, area of specialization, knowledge of the subject matter, teaching method adopted and understanding the objectives of the programme. Qualification of the teacher contributed significantly to the problem of biology difficult concept. This finding collaborates early researchers with emphasis on integrated science graduate handling the course in order to get results (Okebukola, 1989; Akale, 1992). The teaching method adopted in

teaching also become significant in this study and is a pointer that not just any teaching method can be employed to handle these concepts in the class. Having the knowledge of the objective of the programme is quite pertinent to surmounting the difficult nature of the concepts because when a Biology teacher understands 'why' and 'what' these concepts should be taught well he/she would put in his best to achieve the stated objectives there by getting the desired result. Kathy (2000) stated that knowing the objectives of the programme is important in getting results because Curriculum, Instruction and Learning outcomes are closely linked.

To curb ignorance and improve the mastery of these concepts by students, teachers should endeavour to use instructional materials in teaching, use concept map to emphasize the key points and the flow of pertinent information to students. However, there are no substitutes to a thorough professional development in the field of biology as experience on the job is not enough to deliver the goods. A thorough understanding of the principles, philosophy and objectives of any programme such as biology is a prerequisite for successful implementation of the Curriculum; as adage says, no nation can rise above the quality of its teachers and no programme can succeed where the workforce is not well equipped.

Recommendations

The following recommendations if fully utilized can help improve the mastery of the difficult concepts in Biology:

- The stakeholders in education industry should see to it that quarterly workshops on capacity building are organized for biology teachers on approaches to handle these concepts for easy mastery by students.
- All Biology teachers by compulsion, must register with one or two professional associations and attend conferences.
- Enough instructional materials should be provided for instruction in schools.

- Biology teachers should use concept mapping, and inquiring methods of instruction to highlight more on these difficult concept.

References

Akala, M.A.G (1992). Integrated Science Programme: Constraints and Prospect in Nigerian Schools. *The Nigerian Teacher Education Today* 1 (2): 96 – 100.

Baja, S.T (1982). *Teaching Integrated Science Creatively*: Ibadan; Ibadan University Press.

Bernard, J.D (1992). Animal Versions on the Origins of Western Science. *Isls* 83 (4). 65 – 68.

Federal Ministry of Education (1985). National Curriculum for Senior Secondary School (1).

Federal Republic of Nigeria (1998). National Policy on Education. Lagos: Government Press.

Federal Republic of Nigeria (1981). National Policy on Education. Lagos: Government Press.

Federal Republic of Nigeria (2004). National Policy on Education. Lagos: Government Press.

Katty, C (2000). How do we assess learning in integrated science. In:

BSCS (Ed) making sense of integrated science. A guide for high schools. Colorado Spring: USA. 71 – 82.

Okebukola, P.A. (1989). The Nigerian Integrated Science Project. A comparative task analysis of the old and revised version. 24th annual conference proceedings of STAN. 157 – 163.

Tindimubona, H.R. (1993). Establishment of a science culture in Africa. Science and public policy 20(4) 30 – 32.

WASC (2005) West African Examination Council, Chief Examiner's Report 32-36.

WASC (2007) West African Examination Council, Chief Examiner's Report 21-27.

WASC (2008) West African Examination Council, Chief Examiner's Report 19-22.

WASC (2009) West African Examination Council, Chief Examiner's Report 17-23.