CAUSES AND MANAGEMENT OF STRESS IN PRACTICAL BIOLOGY LESSONS: A STUDY OF FEDERAL COLLEGE OF EDUCATION (TECHNICAL) BICHI

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Abstract

The performance of most biology students in practical biology lessons often expose certain deficiencies in terms of their achieving some specific instructional objectives. Having observed that while some of the learners are usually agitated and excited, others are emotionally disturbed during practical lessons. This paper examines some of the possible causes of stress among biology students of the Federal College of Education (Technical) Bichi during such lessons. The investigation notes that large students' population in the laboratory, inadequacy of practical materials, collection of certain specimens from the field, as well as experimenting with specimens preserved in formaldehyde are some of the factors that cause stress among the students during practical lessons. Some suggestions are made to reduce instances that might predispose learners to stress in the subject.

Introduction

At the level of Secondary School instruction, biology is often seen as a bridge between the arts and science disciplines, hence, it is usually recommended for study and enrolment by almost every student in the terminal external examinations (James and Awodi, 1997).A t the tertiary teacher training institutions of learning, it is also observed that in most cases,b iology subject combinations usually record high student enrolment than most science disciplines (Ukpene, 2001).

The early teaching of science generally for the acquisition of knowledge was fraught with problems such as misrepresentation of science, development of passivity,d ocile learning and dependence on teachers and textbooks (Banu, 1992). It had then been recommended that learners of science education, biology inclusive, should be provided with opportunities to apply the key scientific processes such as observing, classifying, describing communicating, measuring, drawing, formulating hypothesis, experimenting, interpreting data and drawing inferences to learning so as to make the learning concrete. These elements of science education metamorphosed into the underlying principles of practical biology as we now have in schools and colleges today. However, in the drive to expose students to these practical processes of learning,F atubarin (1984),c autioned that practical biology techniques cannot be perfected overnight,b ut have to be built up in the students over time.

Today, practical biology aims at exposing learners to associated classroom learning experiences with biological specimens, real objects, as well as to make them take note of intricate features of interest either in the field or in laboratory experiments. Practical biology lessons are usually held after exposing learners to the theoretical aspects of the learning experiences. During the practical lessons, each student is expected to work on his or her own after receiving the necessary practical instructions, with occasional assistance or guidance from the teacher or laboratory technologist. It was usually common for learners to be instructed to observe, draw and label biological specimens, section specimens, undertake field studies and write report on them, study ecological population of organisms and so on.

Sometimes students are involved in the sourcing of specimens, but most often they work with specimens previously preserved in formaldehyde.

Despite the clearly defined approaches to practical biology in Colleges and other educational institutions in Nigeria, Soyibo (1992), observed that most pre-service secondary school biology teachers still failed to master the basic principles of labeling biological drawings correctly. It is doubtful if the same crop of pre-service teachers reported upon would teach the same concepts correctly to students if they do not improve on their acquisition of the relevant learning experiences. Students who had been poorly brought up on practical biological techniques might develop phobia towards practical biology lessons and consequently, would see it as a frustrating, rather than a practically rewarding academic activity.

It is gladly noted however, that in order to give impetus to practical biology lessons in Colleges of Education, the National Commission for Colleges of Education (NCCE) in its minimum standards (2002) for NCE biology programs, stipulates that all practical courses should have three contact hours on the time table,d espite their one-credit status.

However, deriving from a background where practical biology lessons had been sparingly held,i n most cases only when the external examination bodies (WAEC, NECO and NABTEB) send in practical instructions to schools, exposing most students especially new in-takes in Colleges to regular rigorous practical lessons often generate substantial level of agitations, anxiety and fear of not having to do them wrongly. These emotional problems increase when students realize that every practical work is graded to form part of the continuous assessment (Umoinyang, 1997).T he learners' sudden encounter with a relatively new practical environment presented by making them to work with specimens preserved in formaldehyde, asking them to observe, often to dissect, draw and label biological specimens and objects make the practical biology learning environment to become excited, sometimes boring and stressful.

Asonibare (1984), stipulated that stress is a state of a person in response to changes occurring as the environment places too little or too much demand on him with normal adjustment responses being either unavoidable or not effective enough to re-establish equilibrium. He also asserted that a large number of students in the class make the use of certain equipment for individualized instruction stressful, if such equipment are in short supply. The liberalization of education in the 70s with its attendant increase in students' enrolment (Okobukola, 1984), had dwarfed the efforts of government and educational authorities to adequately provide learning equipment to meet the needs in most biology laboratories. In addition Luffingwell (1979), as cited in Asonibare (1984), suggested that being fatigued and not having free time to relax and unwind could be stress-producing. However, it is pleasing to note that almost every organism requires some dosage of stress to perform at optimum level in its environment (Aina, 1995). Conversely, it is worthy to note that stress does not generate only from unpleasant or distasteful situations. Clark (1988), highlighted that stress (eustress) can equally derive from achievement, triumph and exhilaration. He further pointed out that it is only when stress becomes distress, producing a sense of loss of security and adequacy does it become dangerous to health, well-being and learning. It was further noted that high levels of thought, creativity and retrieval of information from the long-term memory are substantially impaired by extreme stress (Hunt, 1982; Clark, 1988). Could this have been partly responsible for the not-too-impressive performances of students in some practical biology courses (such as BIO 014, BIO 023,

BIO 125 and BIO 216) in F. C. E. (T) Bichi, in the 2002/2003 academic session as noted in Table 1? Extremely dangerous cases of psychological stress in the form of worry might produce tension, leading to stomach ulcers (Seyle, 1956, in Hilgard, 1962), while a person who is constantly worried and anxious functions below his or her capacities (Hurlock, 1997).

Table 1: Students' Performances in Practical Biology Courses

	BIO 014	BIO 023	BIO 114	BIO 125	BIO 216	BIO 225	BIO 315
No Sat	59	59	66	64	21	21	05
No Pass	34(57.6%)	36(61%)	46(69.7%)	38(59.4%)	14(66.67%)	18(85.7%)	4(80%)
No Fail	25(42.4%)	23(39%)	20(30.3%)	26(40.63%)	7(33.33%)	3(14.3%)	1(20%)

Source: Approved semester results.F CE(T) Bichi-2002/2003 session.

Problem of the Study

As practical biology deals with the application of theoretical knowledge to experimental situations to demonstrate the level of acquisition and mastery of instructions, it is expected that the behavioral outcomes of the practical learning experiences should be excellent. On the contrary, most biology students still perform poorly in the practical aspect of the subject as evident from Table 1, where it was observed that poor acquisition and display of less viable practical skills were more paramount in classes with relatively large number of students and at the pre-NCE levels, which is the entry point of most students into the NCE programme. Even though, available specimens, reagents and consumables are "equitably" distributed, and students taught by experts, all of whom are practical biology examiners to various national examination bodies, failure and carry-over rates still range between 14 and 42 percent,h ence the paper is motivated to find out:

i. If the practical biology environment is replete with stressful inhibitions to learning.
ii. The components of biology practical that might constitute major sources of stress to students during practical instructions,a nd
iii. Ways of reducing stress among biology students during practical lessons.

Research Questions

The following research questions were investigated in the study:

1. Are students' population in biology so large and the practical hours so lengthy to constitute sources of stress to learners?
2. Is it stressful for students to source biological specimens from the field, as well as when working with specimens preserved in formaldehyde?
3. Does the lack of appropriate entry behavioral skills and know-how for sectioning, observing, drawing and labeling cause stress among some biology students during practicals?

Hypotheses

The following null hypotheses were tested in the study at the 0.05 level of significance:

1. Stress among students during practical biology lessons is significantly independent of the three-hour duration of such lessons.
2. Stress development among students during practical biology lessons is significantly independent of students' population in the class.

3. Practical stress among biology students during instructions is significantly independent of sources and types of biological specimens used.
4. Stress inducement from sectioning, drawing and labeling of biological specimens is significantly independent of learners' prior acquisition of skills, non-availability of sectioning kits as well as the types of specimens to be sectioned.

Methodology

Design

The study is designed on the exploratory, cross-sectional survey design to generate data on the possible causes of stress among biology students during practical lessons. Using this design, only one observation involving many variables is made in the study and the information generated was to test the hypotheses..

Population

The population of the study consisted of all the registered biology students at the Federal College of Education (Technical) Bichi, in the 2002/2003 academic session.

Sample

The sample of the study consisted of biology students of the Federal College of Education (Tech.) Bichi, Kano State. A total of one hundred and eleven students, comprising of 26 (Pre-NCE), 60(NCE-I), 20(NCE-II), and 5(NCE-III), of the 2002/2003 academic session were used in the study. The test instrument that was administered to the respondents in their respective classes on different days was completed and collected on the spot.

Instrumentation

The research instrument was a questionnaire titled "Practical Biology Students' Stress" (PBSS). It was designed on a rating scale of three response variables-High, Medium and Low, to investigate the relative level of stress suffered from various instructional activities carried out in the practical biology class. A number of items were developed on each research question based on the activities carried out during practical biology to study the level it acts as a stressor. The instrument was corrected by colleagues in the biology department of F. C. E. (Tech), Bichi, and validated through trial-test administration twice at the interval of two weeks. A test,r etest correlation of 7.08 was recorded.

Data Analysis

The data generated from the study was according to the response variables High, Medium and Low, relative to the level of stress suffered from each practical biology activity investigated,a nd further expressed in percentages.

Result

Table II: Stress from Practical Biology Duration

Levels of Stress

		High	Medium	Low	Total	X^2_{cal}
i. The three-hour practical duration is too long.	O E	31 30.5	64 62.0	16 18.5	111	
ii. The duration of practical lessons is boring and stressful.	O E	30 30.5	60 62.0	21 18.5	111	0.84
Total		**61**	**124**	**37**	**222**	

df=2

$X^2 = 0.84 < X^2\ 0.95 = 5.991$

Hypothesis 1

Since 0.84 is less than X^2 0.95 = 5.991, Ho is accepted at the 0.05 level of significance. It is therefore concluded that stress production among biology students during practical biology is not dependent on the three-hour duration of practical instructions.

Table III: Stress from Large Class Size in Biology

Levels of Stress

		High	Medium	Low	Total	X^2_{cal}
i.S tudent's population in practical Biology classes are too large.	O E	90 88.75	16 14.5	5 7.75	111	
ii. Large student size reduces the amount of consumables available to them.	O 98 E	7 88.75	6 14.5	7.75	111	
iii. Individualized attention is minimal.	O E	80 88.75	22 14.5	9 7.75	111	12.592
iv. Working space in the laboratory is small during practical.	O E	87 88.75	13 14.5	11 7.75	111	
Total		**355**	**58**	**31**	**444**	

df=6

$X^2 = 12.9 > X^2\ 0.95 = 12.592$

Hypothesis 2

From Table III above, 12.9 is greater than the test statistic, $X^2 0.95 = 12.592$, we reject Ho at the 0.05 level of significance. We conclude that large students' population in practical biology classes predisposes learners to stress.

Table IV: Stress from Sourcing of Biological Specimens

Levels of Stress

		High	Medium	Low	Total	X^2_{cal}
i. Catching live insects like butterflies and grasshoppers is a Herculean task.	O E	9 54.67	19 16.5	83 39.83	111	
ii. (a) Use of metallic quadrats cumbersome and stressful.	O E	73 54.67	21 16.5	17 39.83	111	
(b) Dragnets are clumsy to work with.	O E	5 54.67	12 16.5	94 39.83	111	
iii. Collecting tadpoles, frogs, mosquito larvae, house flies and cockroaches could be nauseating and messy.	O E	60 54.67	25 16.5	26 39.83	111	18.307
iv. Specimens preserved in formaldehyde have choking, repulsive smell when displayed for practical studies.	O E	95 54.67	10 16.5	6 39.83	111	
v. Specimens from flowers and ponds are seasonal and sometimes temporal to provide the needed instructional materials at all times.	O E	86 54.67	12 16.5	13 39.83	111	
Total		**328**	**99**	**239**	**666**	

df=10

$X^2 = 338.81 > X^2 0.95 = 18.307$

Hypothesis 3

Since the chi-square value, $X^2 = 338.81$ is greater than $X^2 0.95 = 18.307$, we reject Ho at the 0.05 level of significance. Also, we conclude that working with specimens preserved in formaldehyde as well as collecting both terrestrial and aquatic specimens from ponds by students is stress producing.

Table V: Stress Inducement from Sectioning, Drawing and Labeling of Biological Specimens

			Levels of Stress				
			High	Medium	Low	Total	X^2_{cal}
i.	Most students have poor entry behaviours for correct observation of biological specimens.	O E	14 70.4	23 18.6	74 22.0	111	
ii.	Students also display poor skills in sectioning,d rawing and labeling of biological specimens.	O E	68 70.4	31 18.6	12 22.0	111	
iii.	Sectioning animal specimens e.g.i nsect,r abbits etc.i s always a problem.	O E	75 70.4	12 18.6	24 22.0	111	260.16
iv.	Sectioning carpels of flowers and fruits is equally a difficult task.	O E	90 70.4	21 18.6	0.00 22.0	111	
v.	Sectioning kits and trays are not always sufficient.	O E	105 70.4	6 18.6	0.00 22.0	111	
	Total		352	93	110	555	

df=8

$X^2 = 260.16 < X^2\ 0.95 = 15.507$

Hypothesis 4

Since 260.16 is greater than X^2 0.95 = 15.507, we reject Ho at the 0.05 level of significance. We conclude that the lack of adequate exposure to the intricacies involved in sectioning most biological specimens as well as the inadequacy of dissecting kits make sectioning aspects of biology practical lessons to be stressful.

Discussion

The three-hour duration of practical lessons is not suggested as a principal source of stress as indicated by 64 respondents in Table II. This is probably because practical instructions and learning experiences provided are such that could be accomplished within the stipulated time, without putting the learners under so much pressure. However, a medium stress level as purported by 60 respondents point to the fact that the extensive duration of practical lessons could be boring. Large students size in the classes during practical lessons was observed to be a major source of stress as buttressed by 90 respondents. Consequently the large population of students accounts for the reduction in the quantity of consumables and working laboratory space available to them during experimentation. Also affected is the quality and frequency of individualized attention to the students that

drastically reduces.

From Table IV, the study notes that while the use of metallic quadrats for sampling field specimens was cumbersome and stressful, the use of dragnets for the collection of flying insects such as grasshoppers and butterflies was not perceived as a significant source of stress. However, the collection of tadpoles, frogs, mosquito larvae, houseflies and cockroaches was observed to be messy, nauseating and highly stressful according to 60 respondents. On the choking effect of formaldehyde, 95 respondents asserted that the repulsive smell of specimens preserved therein was highly stressful when displayed for practical lessons. Equally highly stressful was the non-availability of seasonal specimens in time of need such as flowers and fruits. For instance, in Bichi, flowers go into full bloom in the second semester, while plant biology (BIO 013) where flowering plants are studied is a first semester course. The investigation further notes from Table V that some students are not disturbed by their poor entry behaviour in making correct observation of specimens. However, 68 of them agree that their inability to section, draw and label was highly stressful. This might be due to the fact that such aptitudes are reinforced with the award of marks, in agreement with the postulation of Umoinyang (1997). Although making sections of biological specimens might be almost always stressful, the situation is made worse by the insufficient number of sectioning kits and trays for students' use.

Managing Stress for Stress Reduction

Stress may not be completely eradicated from one's life. This is because it is not possible to trace it to one or two particular sources. In addition it is an essential drive needed for the optimum activities of life. However, in biology practical classes, stress reduction might be achieved through the following means:

1. The learning process should be structured to expose learners to acquire comprehensive, basic practical procedures before leaving the secondary schools. This will adequately develop in learners, the necessary skills for correct observations, drawing and labeling of biological specimens. However, in Colleges where students display poor learning attitude towards practical biology, rigorous preliminary lessons on practical procedures should be mounted for them before exposure to the real practical courses.
2. Admission of students into biology course combinations in Colleges should be relatively at par with available space, equipment and consumables so that teaching and learning of practical biology is carried out effectively. However, where this is not possible, then the suggestion (Okebukola, 1984) to make students work in small co-operative groups should be adopted.
3. Learners should acquire sectioning kits of their own so as to improve their skills through self-practice outside the formal classroom provisions of practical experiences.
4. Learners should develop the ability to physically relax and unwind, evolve balanced life styles (Clark, 1988) and equitably share their time between leisure and studies so that their minds and brains would be mentally relaxed and alert to function most effectively in both storage and retrieval of learning experiences.
5. Fresh specimens should be used as much as possible so that the ones preserved in formaldehyde are used only on rare occasions.
6. Wooded quadrats as opposed to the metallic types should be used as much as possible.
7. With due approval from the National Commission for Colleges of Education, Colleges could realign practical courses with the appropriate semesters when

seasonal specimens are available.

Conclusion

Effective teaching and learning of practical biology comes under severe threat when the learner are stressed. Although, stress as an unavoidable consequence of the challenges of living could derive from sources extraneous to the practical class, its overwhelming influence on learning outcomes cannot be ignored. It is therefore necessary that both the teachers and learners should evolve a learning environment where stress is managed within a threshold that it does not deleteriously affect the acquisition, retention and display of notable competences in practical biology lessons.

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PracticalBiology Students' Stress Questionnaire (PBSS)

Levels of Stress

		High	Medium	Low
i.	The three-hour practical duration is too long.			
ii.	The duration of practical lessons is boring and stressful.			
iii.	Student's population in practical biology classes are too large			
iv.	Large student size reduces the amount of consumables available to them.			
v.	Individualized attention is minimal.			
vi.	Working space in the laboratory is small during practicals.			
vii.	Catching live insects like butterflies and grasshoppers is a Herculean task.			
viii.(a) (b)	Use of metallic quadrats could be cumbersome and stressful. Dragnets are clumsy to work with.			
ix.	Collecting tadpoles,frogs,mosquito larvae,houseflies and cockroaches could be nauseating and messy.			
x.	Specimens preserved in formaldehyde have choking, repulsive smell when displayed for practical studies.			
xi.	Specimens from flowers and ponds are seasonal and sometimes temporal to provide the needed instructional materials at all times.			
xii.	Most students have poor entry behaviours for correct observation of biological specimens.			
xiii.	Students also display poor skills in sectioning,drawing and labeling of biological specimens.			
xiv.	Sectioning animal specimens e.g.insects,rabbits etc.is always a problem.			
xv.	Sectioning carpels of flowers and fruits is equally a difficult task			
xvi.	Sectioning kits and trays are not always sufficient.			