

FEAR-INDUCING STIMULI AMONG STUDENTS DURING BIOLOGY PRACTICAL ACTIVITIES INVOLVING ANIMAL SPECIMENS

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Abstract

This study investigated fear-inducing stimuli among students during Biology practical activities involving animal specimens. Guided by two research questions and one null hypothesis, it employed descriptive survey design. The study was conducted in Njaba Local Government Area of Imo state with the population of 3,111 Senior Secondary School students. 160 SS3 Biology students (64 males and 96 females) formed the sample and were drawn from two randomly sampled co-educational secondary schools in Njaba Metropolis. Instrument for data collection was a structured questionnaire on fear-inducers during Biology Practical Activities involving Animal Specimens (FIDBPAIAS) developed and validated by the researcher. The reliability coefficient of the instrument was 0.72 computed using Cronbach Alpha. Data were analyzed using mean and standard deviation for the research questions and the null hypothesis tested at $p \leq 0.05$, using independent sample t-test. Results showed that fear experienced by Biology students during practical activities involving animal specimens is among other things induced by: odor of formalin solution; touching of preserved animal specimen; seeing of blood during dissection of animal specimen, and dissecting of animal specimen. It was recommended among other things that: Biology teachers should ensure a well-ventilated laboratory to reduce the odor of formalin, and odor of blood during dissection; use freshly collected/live animal specimens during practical activities instead of the preserved ones; and encourage students to wear hand gloves during dissection.

Introduction

Secondary education is the type of formal education a child is exposed to after successfully completing primary education. It serves as a criterion for admission into tertiary education. At secondary school, students are meant to undertake some core and elective subjects in order to acquire the requisite foundation skills for their careers in life. This in effect, facilitates attainment of the lofty aims of secondary education which are: the preparation for useful living within the society and for higher education (FRN, 2014: 14). Biology is

among the science subjects taught at the senior secondary school level. It is defined as the study of living things (Nweze, 2004). Nweze further added that Biology is the science of life. Study of Biology helps students to derive enormous benefits. Among such benefits are to: acquire understanding of the nature of living things, have knowledge of our body anatomy and physiology, understand how we and other living things came to existence, study microorganisms and their effects, study contributions of plants in increasing food availability, as well as to control pests, diseases and pollution (Kwan, Lam & Ofoefuna, 2011). It is the study of living things and their relationships both at macroscopic and microscopic levels. Biology as an activity oriented subject, involves series of practical activities using specimens which enable students to acquire science process skills and scientific attitudes.

Specimens are samples of living organisms in part or whole; removed from their natural habitats and brought to the classroom and/or laboratory for the purpose of being examined. It is also defined as a thing or part of a thing taken as an example of its class or group for study (Nworgu, 2009). Specimens that are used for practical activities in Biology laboratories are classified into life specimens and preserved specimens. Life specimens are those specimens that are freshly collected. They have not undergone any form of preservation. Some examples are: freshly collected Agama lizard (*Agama agama*L.), common toad (*Bufo bufo*L.), tilapia fish (*Tilapia sp.*), black rat (*Rattus rattus*L.), African giant snail (*Achatina achatina*L.), domestic fowl (*Gallus gallus domesticus*L.), earthworm (*Lumbricus terrestris*L.), cockroach (*Periplaneta americana/Blattella orientalis*L.), Guava fruit (*Psidium guajava*L.), cashew fruit (*Anacardium occidentale*L.), twig of mango (*Mangifera indica*L.), stem of cassava (*Manihot esculenta* Crantz), compound leaf of oil bean (*Pentaclethra macrophylla*), flamboyant fruits/pods [*Delonix regia* (Boj. ex Hook) Raf.], coconut fruit (*Cocos nucifera*L.), leaf of *Dacryodes edulis* Lam (African pear), and leaf of *Ocimum gratissimum*L. (scent leaf). On the other hand, preserved specimens are those specimens that have been subjected to one form of preservation or the other using formalin solution otherwise known as formaldehyde (in the case of animals) and/or applying herbarium technique (in the case of plants). This paper has interest on the use of animal specimens during Biology practical activities.

The use of specimens in teaching/learning of Biology is very necessary as they concretize learning, make teachers talk less during teaching/learning process, enable students to see what was said in theory as well as engage students actively in a teaching/learning episode. These corroborate the aphorism that says “what I hear, I may forget but what I see and practice, I remember” (Ngwoke, 2004). In Biology internal and external examinations, it

is obvious that practical sections are assigned greater portion of the total marks yet, students' performance in Biology practical examinations have been reported quite poor by WAEC Chief Examiner. This situation if not redressed, will continue to affect the overall performance of students in Biology. Although practicing with specimens is quite exciting, some students are afraid of Biology practical activities especially when it involves the use of animal specimens and as a result, tend to keep aloof during practical sessions. This study is set to find out those things during Biology practical activities with animal specimens that can ignite tension/phobia among students that make some of them dodge Biology practical activities.

Fear as an emotion can be both protective and debilitating. It is protective when it helps to preclude threats to our lives and/or physical dangers. It is said to be debilitating when it torments our emotional wellbeing. Fear or phobia in this study is any emotive situation experienced by students as a result of what they perceived via sense organs or find difficult to do which make them show apathy/withdrawal symptom towards learning. Fear as an unpleasant emotion is aroused when an individual realizes his/her inability to cope with an impending danger (Ngwoke&Eze 2004). They further assert that fear can be expressed by a child when confronted with a provoking stimulus through withdrawal and paralyzing terror. Fear can be disabling when it is expressed in an individual as phobia or an anxiety disorder (Craske, Vansteenwegen & Hermans, 2006). If such apprehensive conditions are not nipped in the bud, severe maladjustment ensues and increases students' learning difficulties. That could be the reason why Ngwoke (2004) rightly stated that learning situation should protect the learner from the hazards of unpredictable fear, anxiety, threats and insecurity.

Theoretically, the emotion of fear can be explained using Arnold's Appraisal-Excitatory Cognitive Theory of Emotion. For this theory, emotion is envisaged as the feeling of either moving towards things perceived as pleasant and/or avoiding things perceived as unpleasant (Arnold, 1960). In other words, how an individual interprets a situation determines the individual's felt emotion as well as his/her reactions towards it. Fritscher in 2016 opined that one's thoughts serve as crucial determinants of one's emotions and behaviours and as such, to change a person's thoughts and beliefs, it becomes paramount to change the person's behaviours. Fear seems to be associated with gender.

Gender is the various characteristics assigned to boys and girls by a given society. It is society's division of humanity based on sex into distinctive categories (Omoregie & Ihensekhien, 2009). Fear is exhibited by both men and women in most dreaded situations. However, women stereotypically are

more emotional than men. Stereotype means any generally accepted thought regarding certain ways of behaving exhibited by a representative group of individual which may or may not be truthful about them (McCarthy, Yzerbyt & Spears, 2002). The study carried out by Turgeon, March and Dupuis (1998) on panic disorder with agoraphobia showed that panic disorder with agoraphobia is a more severe condition in women. In an assumed frightening setting like being at home alone and watching a stranger walk towards your house as exemplified by Niedenthal, Kruth-Gruber and Ric (2006), women showed greater fear than men. However, practical activities in Biology laboratories are not supposed to mount any psychological stress upon a learner irrespective of gender. But this ugly situation has been observed among some secondary school students by the researcher. Hence; this study was carried out to find out the fear-inducing stimuli experienced by Biology students during Biology practical activities especially when they involve the use of animal specimens, and proffer possible solutions to the identified fear-inducers.

Purpose of the Study

The general purpose of this study is fear-inducing stimuli among students during biology practical activities involving animal specimens. Specifically, the study tries to ascertain:

- i. The fear-inducing stimuli experienced by students during Biology practical activities involving animal specimens.
- ii. The influence of gender on fear experienced by male and female students during Biology practical activities involving animal specimens.

Research Questions

The study was guided by the following research questions.

- i. What are the fear-inducing stimuli experienced by students during Biology practical activities involving animal specimens?
- ii. What is the influence of gender on fear experienced by male and female students during Biology practical activities involving animal specimens?

Hypothesis

Ho₁ There is no significant difference ($p \leq 0.05$) between the fear experienced by male and female students during Biology practical activities involving animal specimens.

Method

The study employed a descriptive survey design. The study was carried out in Njaba Local Government Area of Imo State, Nigeria. Njaba Local Government Area is among the local government areas in Orlu Education Zone one. It has a population of 3,111 senior secondary Biology students. One hundred and sixty (160) SS3 Biology students formed the sample for the study and were drawn from two randomly sampled co-educational secondary schools in Njaba Metropolis; comprising sixty-four male and ninety-six female students. The SS3 Biology students were used for the study because at this level, students had been exposed to a number of Biology practical activities.

The instrument for data collection was a structured questionnaire on Fear-inducers during Biology Practical Activities involving Animal Specimens (FIDBPAIAS) developed by the researcher. The instrument has two sections. In section A, students' demographic data was elicited. Section B has ten items in which respondents ticked as it relates to them on 4-point scale (Strongly Disagree, Disagree, Agree and Strongly Agree). The Strongly Disagree had a score of one (1), Disagree was assigned a score of two (2), Agree had a score of three (3) while Strongly Agree attracted a score of four (4). The benchmark mean value for acceptance was 2.5 while the mean value below 2.5 indicated rejection.

The instrument was face validated by two experts in Biology Education and Measurement and Evaluation respectively. The instrument was trial tested on 30 SS3 students from another local government area in the same education zone who shared the same characteristics with the students under study. Thereafter, the instrument was subjected to Cronbach Alpha and a reliability coefficient of 0.72 was obtained which according to Nworgu (2006) is adequate for the study. The instrument was then administered to the students and collected on the spot. The responded instruments from students were scored and analyzed. The two research questions were answered using mean and standard deviation while the null hypothesis was tested using independent sample t-test.

Results

Research Question 1: What are the fear-inducing stimuli experienced by students during Biology practical activities involving animal specimens?

Table 1: Fear-inducing stimuli experienced by students during Biology practical activities involving animal specimens

Fear-inducers	Mean	Standard Deviation	Remark
Odor of Formalin Solution	3.31	0.90	Accept
Touching of Life Animal Specimen	2.37	1.19	Reject
Touching of Preserved Animal Specimen	3.21	0.93	Accept
Drawing of Animal Specimen	3.06	0.89	Accept
Labeling of Specimen	3.04	0.95	Accept
Seeing Blood during dissection of animal specimen	3.03	0.91	Accept
Odor of Blood	2.84	0.99	Accept
Use of technical terms of organisms to explain some concepts	3.06	0.95	Accept
Writing of Scientific Names of Specimens	2.90	0.96	Accept
Dissecting of Animal Specimen	2.94	1.05	Accept

Note: Benchmark mean value of acceptance is 2.50, N = 160

Data in Table 1 above reveal the fear inducing stimuli experienced by students which include odor of formalin solution, touching of preserved animal specimen, drawing of animal specimen, labeling of specimen, seeing blood during dissection of animal specimen, and odor of blood, among others. These are indicated by their mean values which are above the acceptable benchmark mean value of 2.50.

Research Question 2: What is the influence of gender on fear experienced by male and female students during Biology practical activities involving animal specimens?

Table 2: Influence of gender on fear experienced by male and female students during Biology practical activities involving animal specimens

Fear-inducers	Mean M	Mean F	Std Deviation (M)	Std. Deviation (F)
Odour of Formalin Solution	2.98	3.52	1.13	0.63
Touching of Life Animal Specimen	2.33	2.40	1.12	1.23
Touching of Preserved Animal Specimen	2.78	3.50	1.09	0.68
Drawing of Animal Specimen	2.78	3.24	0.95	0.81
Labeling of Specimen	2.56	3.35	1.00	0.76
Seeing Blood during dissection of animal specimen	2.70	3.25	0.95	0.82

Odour of Blood	2.72	2.93	0.98	0.99
Use of technical terms of organisms to explain some concepts	2.61	3.36	1.04	0.75
Writing of Scientific Names of Specimens	2.42	3.22	1.00	0.78
Dissecting of Animal Specimen	2.52	3.22	1.16	0.87

N = 160, M = 64, F= 96

Note: M = Male F= Female and Benchmark mean value of acceptance is 2.50

The result on Table 2 reveal that female students reported higher tendency of becoming afraid in the presence of fear-inducing stimuli during Biology practical activities than their male counterpart. This is shown by their record of higher acceptable mean value than the male in areas such as odor of formalin solution, touching of preserved animal specimen, drawing of animal specimen, labeling of specimen, seeing blood during dissection of animal specimen, and odor of blood. Others are use of technical terms of organisms to explain some concepts, writing of scientific names of specimens and dissecting of animal specimens.

Hypothesis 1: There is no significant difference ($p \leq 0.05$) between the fear experienced by male and female students during Biology practical activities involving animal specimens.

Table 3: t-test of significance between fears experienced by male and female students during Biology Practical Activities involving animal specimens

Gender	N	Mean	Std. Deviation	df	t	Sig.(2-tailed)
Male	64	2.24	.79	158	-5.50	.00
Female	96	3.20	.49			

Table 3 above showed that gender has a significant difference in fear experienced by students during Biology practical activities. In other words, female students expressed more fear in the presence of fear inducing stimuli during Biology practical activities than the male students.

Discussion

Fear exhibited by Biology students during practical activities involving animal specimens is induced by odor of formalin solution, touching of preserved animal specimen, drawing of animal specimen, labeling of specimen, seeing blood during dissection of animal specimen, odor of blood, use of technical terms of organisms to explain some concepts, writing of

scientific names of specimen and dissecting of animal specimen. Some of these findings were in line with the studies carried out by some researchers. For examples, Oakley (2012) asserted that teachers reported the concerns with dissection to include health and safety issues such as exposure to formalin. Abhijeet and Mukul(2014) in their study reported that 30% of the students had issue with the unpleasant smell of formalin, 24.67% students reported irritation and watering of eyes, others reported symptoms such as running or congested nose (20.67%), sore throat (17.33%), headache (14.67%) and skin problems (12%) among others. In addition, Barr and Herzog (2000) noted that some students become discouraged from pursuing careers in the fields of medicine and science as a result of doing dissections. Since some students had negative experience during dissection, Barr and Herzog further stated that the students showed apathy and hardly touched the animals, they further concluded that all students in their study accepted that there was unpleasant odour associated with dissection. The same is the case with students used in the present study.

The odor of formalin solution is found to make some Biology students dread practical activities. This is because the odor of formalin is irritating and choking to some students. This is in line with the study conducted by Abhijeet and Mukulin 2014 where they reported among other things that 30% of the students in their study had issue with the unpleasant smell of formalin, 24.67% students reported irritation and watering of eyes, others reported symptoms such as running or congested nose (20.67%), sore throat (17.33%), headache (14.67%) and skin problems (12%). Irritating odour of formalin solution can be reduced by ensuring adequate ventilation in Biology laboratories during practical activities. This can be done by encouraging the students to keep all the laboratory windows and doors fully open during practical activities to enhance sufficient circulation of natural fresh air. In addition, there are some secondary schools where the Biology laboratories have ceiling fans installed. Such ceiling fans should be switched on too in order to aid the circulation of artificial air.

Touching preserved animal specimens is among the things reported by students that scares them during Biology practical activities. This substantiates the findings by Mulu and Tegabu's (2012) that students showed signs of fear, and stress while working with the cadavers. The essence of preserving animal specimens is for future use. However, the preservation requires to be properly carried out using non adulterated formalin solution. When formalin solution is adulterated, its potency in preservation is reduced. Thus, the animal specimens preserved using such formalin solutions get bloated and show traces of decay after few weeks thereby making such preserved animal specimens to have

revolting sight and offensive odor when brought out from the specimen bottles. Efforts should be made to discard animal specimens that are undergoing decomposition and such should not be used for practical activities or demonstration classes irrespective of their paucity.

Students should be encouraged to wear hand gloves while touching or practicing with preserved animal specimens. This practice is necessary so as to reduce the occurrence of zoonoses which Nweze(2004) described as the diseases transferred to man through infected animals. In addition to this, it is worthy of note that some laboratory animal specimens are disease vectors. That is, they are carriers of disease-causing microorganisms such as bacteria, protozoa, viruses; fungi et cetera and are capable of transferring such pathogenic microorganisms to individuals practicing with them. Good examples of such specimens are rat, cockroach et cetera. In a nutshell, where live animal specimens are available at the time of the practical activities, they should be used in place of the preserved ones but should first be made unconscious and inactive using anesthesia such as chloroform.

Some students indicated that their paranoid situation during Biology practical activities lies in drawing and labeling of animal specimens. This is in line with the findings of Amer and Ballew (1930) that a critical comparison of students' drawings showed that many students encounter great difficulty in making the required drawings. The truth that drawing of animal specimens especially the ones that involve dissected animals is difficult to some extent should not deter Biology students from practicing with them. Biology teachers need to encourage the students to learn how to draw diagrams while reading their Biology textbooks. Students should be made to understand that Biology drawings are not too artistic but require simple and clear representations of what needs to be drawn. Nwagbo (2007) advised that teachers should guide the students on how to make clear line sketches of the specimens provided. Drawing of specimens during laboratory activities and/or dissecting of animal specimens when required; help Biology students in psychomotor development. This according to Acholonu, Opara and Dimson (2015) should focus on manual tasks requiring manipulation of objects and physical activities. The acquisition of manipulative skills and other skills inherent in psychomotor domain helps students to do science instead of learning science..

Some students also indicated that seeing blood during dissection of animal specimens frightens them during Biology practical activities. This supports the study conducted by Kawai, Villiers, & Fraser (2017) where they found out that the few learners have reservations about animal organ dissection as they preferred artificial organs due to a blood phobia. It behooves Biology teachers to clarify before the commencement of any

practical activity that involves dissection of life animal specimens that it is normal to see blood ooze out when blood capillaries and/or any other blood vessels are cut. Seeing blood simply shows that the animal specimen is alive. Students should be told that blood is a fluid tissue that contains cells which can be studied using microscope. They should wear hand gloves during practical activities that involve dissection as well as those that involve the practice with animal specimens. This prevents direct contact with the animal specimen. Use of hand gloves also prevent blood from touching their fingers directly hence, cushioning the effect of fear of blood they may have when blood touches their fingers. Dissection of animal specimens when the need arises should be done on dissecting boards and all blood stains should be thoroughly wiped off using good absorbent paper.

Also, some students reported that the odor of blood during dissection raises their emotions and makes them withdraw from Biology practical activities involving animal specimens. Barr and Herzog (2000) had indicated in their study that students accepted that there was unpleasant dour associated with dissection. Some students detest the odor of blood and other body fluids from laboratory animal specimens and as such withdraw during biology practical activities involving animal specimens. However, the odour of blood during dissection can be reduced by ensuring adequate ventilation of the laboratory. Putting sweet smelling air fresher at corners of the laboratory may be of help.

Some students reported that they are apprehensive of Biology practical activities involving animal specimens because of the use of technical terms by the teacher to explain some concepts as well as the task in writing scientific names of specimens. This affirms the study conducted by Amer in 2012 that the main reason students' have difficulties in learning biology includes among other things that some concepts are too abstract, and that there are a lot of foreign/Latin words. Teaching Biology using scientific/technical names where necessary is encouraged. However, when used, effort should be made to explain them using their common names in a way appealing to students. Also, writing of scientific names of organisms should be immediately accompanied with their common names for easy understanding by students. Biology teachers should ensure that students correctly pronounce such scientific names when used by asking them to repeat the pronunciation after the Biology teacher.

Students indicated dissection of animal specimen as another activity that stimulates phobia in them during Biology practical activities involving animal specimens. This upholds the findings made by Barr and Herzog (2000) that some students become discouraged from pursuing careers in the fields of

medicine and science as a result of doing dissections. Dissection of animal specimens is performed in order to study the internal organs as well as the anatomy of body systems. It is advised that the Biology teacher demonstrates dissection first on the dissecting board using the specimen and ensured that students are carried along and understood the procedure before they are asked to do it. Hand washing with clean water and sweet fragrant soap is encouraged after dissection. This practice is safe and reduces the foul odor from blood and other animal fluids that result from dissection.

The influence of gender on fear experienced by students during Biology practical activities showed that female students expressed more fear in the presence of fear inducing stimuli during Biology practical activities than the male students. This is in line with the study carried out by Turgeon, Marchand and Dupuis (1998) on panic disorder with agoraphobia which showed that panic disorder with agoraphobia was a more severe condition in women. Sándor, Birkás, and Gyórfy (2015) in their study noted that negative effects of dissection-room were significantly more frequently reported by women than men. The agreement of this study with those of the aforementioned researchers may be because of the misconception and erroneous belief some female students hold that 'girls are weaker sex'. However, scientific attitude of rational thinking when possessed by students would be of great help in discarding imaginary or hallucinated fears. Biology teachers should make students understand that scientists are known to think realistically on issues of interest. Further, scientists do not hang onto superstitious beliefs or ideas (Nworgu, 2009). This corroborates with one of the goals of science education stated in Section 7 subsection 39b (i) that education should be meant to cultivate rational mind for the conduct of a good life and democracy (FRN, 2014 p.22). In essence, scientific attitudes if possessed by Biology students at secondary school level; would enable the affected ones overcome unnecessary tormenting fears which would mar their ambition of becoming future scientists.

Conclusion

Fear experienced by Biology students during Biology practical activities is induced by odour of formalin solution, touching of preserved animal specimen, drawing of animal specimen, labeling of specimen, seeing blood during dissection of animal specimen, odour of blood, use of technical terms of organisms to explain some concepts, writing of scientific names of specimen and dissecting of animal specimen. Since effective learning occurs in an environment that is secure and scary free, it is concluded that Biology teachers should remove all fear inducing situations during practical activities

that involve the use of animal specimens in order to win back those students that are paranoid of the fear-inducing stimuli and hence; choose to keep aloof during Biology practical activities.

Recommendations

Based on the findings and discussions, the researcher recommended the following ways of reducing the fear-inducing stimuli among students during Biology practical activities that involve animal specimens; which shall in turn reduce learning difficulties in Biology practical activities. Biology teachers should:

- have a well-ventilated laboratory to reduce the odor of formalin.
- Encourage ventilation in Biology laboratories to reduce the odor of blood during dissection.
- Use freshly collected/live animal specimens during practical activities instead of the preserved ones.
- Use common names in place of technical terms to explain Biology concepts most often.
- Write the common names of organisms alongside their scientific names when used.
- Advise students to wear hand gloves during dissection.

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