UTILIZATION OF THE NATURAL ENVIRONMENT FOR THE EFFECTIVE TEACHING OF DIFFICULT BIOLOGICAL CONCEPTS IN SENIOR SECONDARY SCHOOLS IN JOS NORTH PLATEAU STATE.

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Abstract

The essence of this study was to find out biological concepts that are perceived difficult to teach and ascertain the effect of the use of the natural environment as a teaching strategy on the academic performance of biology students in the perceived difficult concepts, and find out reasons why these concepts are termed difficult to teach. The study employed the natural environment as a teaching strategy to improve on the quality of teaching. The study had three objectives and three research questions. A hypothesis was formulated and tested at 0.05 level of significance. The research design adopted was the quasi-experimental of the non-equivalent control group design, specifically the posttest only control group design. The field survey design was also employed. The target population constituted 116 secondary schools, 105 teachers and 17400 biology students. Ten teachers and 35 students were sampled using the

*convenient sampling technique. Validity was ensured by three experts, one in measurement and evaluation, two in Biology. Results indicated that the concept of chromosomes was the most perceived difficult by biology teachers. The most common reason given was the abstractness of concepts. The use of the natural environment as a strategy was found to improve the quality of teaching, and also had positive effects on learning. It was recommended that the quality of teachers' training program be improved, in addition innovative teaching strategies should be adopte*d

Key words: Biology Teaching, Biology Learning, Effective Teaching, Effective Learning.

The major goal of science education is to teach students how to acquire scientific knowledge and skills and to apply them in real life situations. Our environment represents the macro-laboratory and is richly endowed with resources for teaching science. The natural environment encompasses all living and non-living occurring naturally on earth. The environment encompasses the interaction of all living species, climate, weather, and the natural resources that affect human survival and economic activities. In other words, it is an environment that is not influenced by people. It is an ecological complex which includes all plants, animals, abiotic factors such as mineral, rocks, water bodies, and the layers of the atmosphere (The free encyclopedia, 2015). The natural environment enables students to effectively explore their environment thereby making learning practical, interesting and permanent. The natural environment serves as an outdoor classroom and laboratory in the teaching and learning process. This makes learning more effective.

Effective teaching according to Layne (2012) is the ability to cultivate thinking skills, stimulate interest in subjects and motivate students to learn. Teachers are one of the key elements in any school setting and effective teaching is one of the key propellers of school improvement. Teacher effectiveness is generally measured in terms of students' outcome and classroom processes that promote better student outcomes. An effective teacher makes expert use of existing instructional materials and facilities in order to devote more time to practices that enrich and clarify content. Effective strategies help to engage students in learning develop critical thinking skills and keep students on task. It involves all approaches that a teacher may take to actively engage students in learning. These strategies drive a teacher's instruction as they work to meet specific learning objectives. Some of these strategies include; hand-on, minds-on, discovery, field trip experimentation etc.

Difficult concepts are those ideas or principles in biology that are abstract in which teachers and students have misconceptions. This implies that teachers and students lack the framework to deepen their understanding of those concepts. It is an observe fact that some concepts in the biology curriculum are very difficult for teachers and students to comprehend. Some of the concepts include homeostasis, genetics, evolution, nervous coordination, cellular respiration. Among the reasons advanced for this difficulty in the mastery of these concepts is the in-effective teaching of the concepts and lack of interest on the part of the students due to the learning environment. Instructional strategies which do not consider the learners characteristics are bound to fail (Kimball, White, Milanowski & Borman, 2014).

According to Damar (2004) the act of teaching lies in creating a good learning situation and responding creatively to new situations as they arise. Teaching may require one or two different strategies to teach concepts this is why in teaching, the teacher has at his or her disposal several teaching strategies which can be adapted appropriately. It is desirable that biology teachers should endeavour to improve the quality of their teaching through the use of environmental resources so as to make learning more effective and result oriented. Biology teachers need to explore exhaustively their different environment with a view to identify natural environment which can be used to the advantage of the learners.

Teaching outside the classroom using natural environment helps students to understand and appreciate the application of concepts in real life as described by the school curriculum. There is anecdotal and empirical evidence about benefits of utilization of natural environment in learning experiences. For example, students often speak of their understanding of learning biology concepts when they embark on field trips. Besides outdoor activities in teaching and learning have demonstrable long term effects on behavior and educational achievement of students (Atilla, 2012, Agbowuro & Amos, 2016). The natural environment makes what is learnt in the classroom and laboratory concrete, this is because, through the process, students gain experience and acquire firsthand information on learning concepts. School outdoor activities deal with living organisms in their natural habitat. The utilization of natural environment in teaching difficult concepts makes it easier for students to understand concepts.

Statement of the Problem

Most biology teachers often use the laboratory and other teaching aids in the classroom as their main resources for teaching. They do not expose students to real life experiences outside the classroom (Uduak & Iyang, 2008). Science teachers do ignore

the utilization of the natural resources within their environment in the teaching and learning process. The natural resources which are good sources of knowledge for effective teaching of different concepts in biology have been neglected by most teachers which results in rote learning and students' poor performance in biology (Agbowuro & Amos. 2016). Poor teaching methods and learning environment adopted by teachers at senior secondary school level in Nigeria have been identified as the major factors contributing to poor performance of students in biology (Ahmed & Abimbola, 2011; Kareem, 2003; &Umar, 2011). The WAEC chief examiner's annual report (WAEC, 2012) indicates that students lack the understanding of basic concept in biology

Purpose of the Study

The study sought to achieve the following objectives:

1. Find out biology concepts that are perceived as difficult by biology teachers
2. unearth reasons responsible for teachers perceived difficulty in some biological concepts.
3. determine whether the use of the natural environment as a teaching strategy can improve the quality of teaching.

Research Questions

The study answered the following questions in the course of the study

1. What biology concepts do biology teachers perceive as difficult to teach?
2. What are the reasons responsible for biology teachers perceived difficulty of some biological concepts?
3. What is the effect of the use of the natural environment as a teaching strategy on the performance of biology students?

Hypothesis

There is no significant difference between the mean scores of biology students taught using the natural environment and those taught in the classroom

Significance of the Study

This study will be of benefit to teachers, students, curriculum planners, policy makers, and other relevant bodies in the education sector and the society. The study will equip biology teachers on how best to prepare and use the natural environment to teach abstract concepts. It will provide a framework for organizing seminars, workshops and conferences for science teachers on the utilization of natural environment in teaching abstract concepts. This study will identify the need to stimulate students' cognitive and manipulative skills and enable them link learning to the natural environment making

learning concrete there by appreciate the value and usefulness of the natural environment. The findings of the study will enable policy makers in education to emphasize the use of the natural environment in the teaching of scientific concepts. Curriculum planners will see the need to structure the biology curriculum in line with the natural environment. Finally the study will enable the society at large to appreciate the usefulness of the natural environment and strive to conserve it.

Method and Procedure

The research designs for this study are the quasi-experimental of the non-equivalent control design, specifically the posttest only control group design, and the field survey design. The posttest-only control group design was used. This experimental method offers potentially the most useful true design. The notation is as follows:

R X 01
R 02

The posttest only control group design provides ideal control over all threats to validity and all resources of bias. The design utilizes two groups one experience treatment (group A) while the other did not (group B). The design controls history and maturation bias. Random assignment to the experimental group and control group prevented problems of selection and mortality. In addition the design controls for a simple testing effect and the interaction between testing and treatment by giving no pretest to either group. Data analysis for the posttest-only control group design centers on comparisons between the mean for O1 and mean for O2.

The quasi-experimental design enables the researchers to draw causal inferences and to observe whether an independent variable affects the dependent variable. In other words, an experimental research design involves the comparison of the effect of a particular treatment or no treatment (Awotunde & Ugodulunwa, 2004). Quasi-experimental design is characterized by manipulating the independent variable to observe the effect on the dependent variable. Quasi-experimental design is used where it is not possible to carry out a random assignment of subject groups. The choice of this design was anchored on the fact it is more practicable to conduct where the sample size is small as it is the case of this study. Of the four types of quasi-experimental design, the non-equivalent control group design or static group comparison design was used. Two groups were used. Group B which was SSII B was the control group taught in the normal classroom setting while group A, which was SSII A was the experimental group, taught using the natural environment. The quasi-experimental and the survey design were used. The population consisted of 116 secondary schools, 105 teachers and 17400 students. The sample was made up of 35 students and 10 teachers. The sampling

technique was the convenient sampling technique. This was informed by the accessibility of schools. Two instruments were used to collect data. These were the Biology Students Performance Test (BSPT) and a questionnaire (BTQ) for the biology teachers, this was a 5 point Likert scale used in rating the responses of the teachers on perceived difficult concepts. The instruments were validated by two senior biology lecturers. The data was analyzed using percentages, ranking, means, and the t-test.

Results and Discussion

This section presents the analysis of data collected in the course of the study. It contains results obtained from the Biology Students Performance Test (BSPT) and the Biology Teachers Questionnaire (BTQ)

Research Question One

What biology concepts do biology teachers perceive as difficult to teach?

Table 1: Concepts perceived difficult to teach.

S/No	Concepts	Frequency	% difficulty	Frequency	% easy	Rank
1	Chromosomes	9	90	1	10	1
2	Gene	8	80	2	20	2
3	Homeostasis	8	80	2	20	2
4	Fertilization	8	80	2	20	2
5	Translocation	8	80	2	20	2
6	Probability chance	8	80	2	20	2
7	Evolution	8	80	2	20	2
8	Cell division	8	80	2	20	2
9	Circulatory system	7	70	3	30	9
10	Cellular respiration	7	70	3	30	9
11	Glycolysis	7	70	3	30	9
12	Genetics	6	60	4	40	12
13	Neuron	6	60	4	40	12
14	Osmoregulation	5	50	5	50	14
15	Photosynthesis	4	40	6	60	15
16	Nutrient cycling	3	30	7	70	16
17	Pollution	3	30	7	70	16

18	Reproduction	2	20	8	80	18
19	Ecology	2	20	8	80	19
20	Conservation	1	10	9	90	20

From the relay of data in table 2, 9 teachers out of 10 perceive the concept of chromosomes most difficult to teach. 8 of the teachers perceive the concept of genetics, homeostasis, fertilization, translocation, probability chance, evolution and cell division as exacting. The circulatory system, cellular respiration and glycolysis were perceived as an uphill task by 7 of the teachers. 6 teachers expressed discomfort in teaching, genetics and neuron. 5 teachers perceived osmoregulation as a toilsome. 4 teachers perceived photosynthesis as hard to teach. 3 of the teachers perceived nutrient cycling and pollution as herculean. Two teachers perceived reproduction and ecology as bothersome. 1 teacher looks at the concept of conservation as effortful. The concept of chromosome was ranked first and conservation least.

Research Question 2

What are the reasons responsible for teachers' perceived difficulty?

Table 2: Teachers reasons for perceived difficulty

S/No	Teachers Reasons	Frequency	Rank
1	Complexity/Abstract nature of concepts	10	1
2	Learning environment	9	2
3	Misconception of concepts	8	3
4	Teachers ' experience	8	3
5	Unavailable instructional environment	6	5
6	Insufficient time allocation	6	5
7	Low commitment	2	7

Table 2 shows the various reasons advanced by teachers as explanation for perceived difficulty in the teaching of the concepts earlier spelt out. The most common reason was the complexity/abstract nature of concepts. Low commitment was ranked as the most uncommon reasons for perceived difficulty.

Research Question 3

What is the effect of the use of the natural environment as a teaching strategy on the performance of biology students?

Table 3: Post-experimental performance profile of the experimental group and control group

S/No	Experimental Group	Control Group
1	56	56
2	81	31
3	78	39
4	74	25
5	58	69
6	70	86
7	55	07
8	72	13
9	91	23
10	86	14
11	58	12
12	21	60
13	44	22
14	66	12
15	36	39
16	74	44
17	94	12
18	30	
Mean	**64**	**32**

Table 3 relays the posttest scores of the experimental group which expresses better performance than the control group.

Hypothesis

Table 4: t-test analysis on post-experimental performance of biology students

Groups	N	$\bar{X}$	S^2	Df	t cal	Critical t	Decision
E	18	64	3.6			P= 0.05	Ho
				33	4.3	2.04	
C	17	32	3.8				rejected

E = Experimental group
C = Control Group

The data in table 4 indicate that the calculated t value (4.3) is greater than the critical value (2.04). Therefore the null hypothesis is rejected.

Discussion

The findings of the study revealed that teachers perceived 14 biological concepts as difficult to teach and learn. These are chromosomes, genetics, homeostasis, fertilization, translocation, probability chance, evolution, cell division, circulatory system, cellular respiration, glycolysis, nervous system, gene and osmoregulation. These findings are in line with those of Abinbola (1998) and Tekkaya et.al. (as cited in Atilla, (2012) who had earlier reported that biology teachers generally perceive genetics and evolution as concepts difficult to teach and learn. The findings of the research revealed some reasons attributed to teachers' perception of difficult concepts. These are teachers' lack of content knowledge, teaching inexperience, abstractness of concepts, poor teaching methodology and lack of commitment, non -conduction of practical work, subject not taught as associated with daily life and lack of content knowledge. These findings concords with the findings of Oni (2006) and Atilla (2012) that experienced teachers have less difficulties in teaching. Table 4 showed that there is significant difference between the mean scores of the students taught pollution using the natural environment (experimental group) and those taught in the classroom (control group). Those taught using the natural environment performed better. This showed that the natural environment had positive impact on the students' performance as the students were guided by the teacher to carry out some activities themselves by interacting with the natural environment. When a lesson is enhanced with real-life experience the concepts taught becomes relevant and real to students. It also gives students the opportunity to think critically as they participate in fact finding.

Conclusion

Meaningful teaching and learning of science occurs when what is taught is linked to nature. By this effort, learners can develop creative thinking, meaningful learning and apply knowledge acquired. Teachers are a key element in the educational system and effective teaching is one of the key propellers of academic achievement. Teachers' effectiveness is generally measured in terms of students' outcome. An effective teacher makes expert use of instructional materials and facilities in order to devote more time to practices that enrich and clarifies the subject content. Effective teaching involves all approaches that a teacher may take to actively engage students in learning. These strategies drive a teachers' instruction as they work to meet specific

learning objectives. The research on teachers effectiveness has provided teachers with a relatively clear understanding of the fundamental principles for effective instructional practice. Teachers should use these empirically supported principles as a basis for their instructional effectiveness.

Recommendations

1. The teaching of biology should be firmly based on extensive and vigorous nature study.
2. Government should establish more conservation centers and maintain existing ones.
3. Teachers should be encouraged through workshops, seminars and conferences to appreciate the science of the natural environment.
4. Students should be taught right from nursery school on how to appreciate nature. This will enable them to grow with biological knowledge of their environment
5. Teacher training programs should be more pragmatic.

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