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PAPER 32

POTENCY OF FIELDWORK IN THE DEVELOPMENT OF PROBLEM-SOLVING ABILITIES IN ECOLOGY BY SENIOR SECONDARY SCHOOL BIOLOGY STUDENTS

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Abstract
In view of high premium placed on teaching of ecology through fieldwork by the SSS biology Curriculum and the importance of acquisition of problem-solving skills and Environmental Education (E E), this study investigated the potency of studying ecology concepts through fieldwork instead of the traditional expository method of teaching. 161 SS II biology students divided into two groups of a semi-urban school (n =78,n=83) were taught ecology using fieldwork and expositing approaches respectively. Treatment lasted for a period of five weeks. An Ecology Problem-Solving Test (EPST) was used to generate pre-and post-test data. Means and t - test were used to analyse data. Results revealed a significant difference in achievement with the experimental group showing superiority. It was concluded that it is through field interaction that meaningful learning which is necessary for developing background experience for problem solving can be acquired.

Introduction
A major concern of nations all over the world today is the state of man's environment and the implication for his survival and sustained existence. Top on the priority of bilateral issues center on environment (1992 UNESCO/NERDC summit). Adara (1993) identified the environment of today as man's worst enemy and called for better attention to the environment. Nigeria's National profile" confirmed a great threat to land, water, atmosphere, vegetation, wild life as well as man. They recommended introduction of the environmental dimension to the teaching of ecology in secondary schools. Even the biology curriculum emphasized the use of field studies, among other techniques as a "must" in the teaching of biology and ecology in particular. The importance of teaching ecology through field exercises in student's acquisition of Environmental Education (EE) as well as skills necessary for solving environmental and ecological problems have been stressed (Olagunju 2002). Tbilisi conference on environmental education sees EE as a process aimed at developing a world population that is aware of and concerned about the total environment and its associated problems, and which has the knowledge, attitudes, motivation, commitment and skills to work individually and collectively towards solving current problems, and prevention of new ones. Though a seemingly nebulous task, Olagunju (2002) emphasises that EE is subsumed in ecology which is the study of the influence of

human activity in altering normal ecological relationship, creating new habitats or to downgrade and destroy old ones.

There is a growing consensus that understanding the nature of the environment by an understudy of the working and relationship among organisms, as is usually the practice in ecology, develops in the students, an understanding of the socio-cultural surrounding (Olagunju 2002), 2002), ability to appreciate nature and the need to preserve it (Noibi and Laal 1991), and the acquisition of visionary ways of handling ecology problems that abound in man's surrounding (Moemeke 2002). These view thus stress the importance of teaching ecology not only as a section of a school subject (biology) but as an avenue for the acquisition of necessary knowledge for useful living as stated in the Nigeria National objectives for education (NPE 1998 P 9). Ecology also covers more than 40% of the biology curriculum and so contributes the largest single- unit percentage to the total knowledge inherent in secondary school biology.

Literature has revealed that ecology remains the most dreaded aspect of biology by both students and teacher in Nigeria secondary schools (Johnston and Mahmoud 1980). Osisioma (1994) attributed this, to the divers nature of the area. Waheed and Lucas (1992) blames the wide degree of abstractness of the area, while Okeke and Ochuba (1986) argue that its position at the end of the curriculum makes it either hurriedly taught or not taught at all. Thus students, leave the school without knowledge of ecology or with an infinitesimal one. When it is taught at all, teacher, resort to conventional lecture or expository method (Ajewole 1991) which is contrary to curricula recommendations. Also the chief examiner's reports of West African Examinations Council(WASC) for 1990, 1992 and 1997 in the ordinary level examination reveal a consistent poor performance in biology. These reports point at ecology as the major reason of failure in biology. To the reports. students do not only misunderstand ecology concepts but will avoid the choice of ecology questions whenever possible. Several authors have also accused teachers of killing students' interest in ecology by their use of non-productive and uninteresting instructional strategies that do not involve field work (Finely, Stewart and Yarroch 1982, Johnstone and Mahmoud 1980,Okeke and Ochuba 1986,Olagunju 2002). Consequently, they call for the teaching of ecology by student participatory field work in which the teacher acts as facilitator as well as adopting and problem-solving posture to its study.

On the other hand, the development of problem-solving skills in students has been a major goal of education. Quite early in this century, Whitehead (1929) noticed the unsatisfactory level of student problem-solving abilities and warned teachers to avoid teaching that generates "inert knowledge". By this, he meant knowledge that cannot be applied to problem situations. Agina-Obu (1993) quoting Garrett and Statterly, (1990) defined problem solving as a process by which the learner discovers a combination of previously learned rules that can be

used to achieve a solution to a novel problem situation. If the teacher's method of teaching ecology has been blamed severally for the inability of student to perform creditably in ecology concepts and inability to solve ecology problems, it may be necessary to find out empirically the potency of fieldwork as an instructional tool in this regard.

Method

Selected ecology topics (estimation of density/population of a named plant using a quadrat, tropical rainforest and feeding relationship in an ecosystem) were taught to the two groups of SS II students of biology in a semi-urban Nigeria school. The topics were drawn from the SS II syllabus. A quazi experimental (non equivalent group) design was used. The intact classes consisted of a total of 161 students who participated in the study. Of this population, 78 students received instruction in ecology through student-participatory field work while the remaining 83 students were taught by the conventional lecture method.

Prior to the treatment sessions, all subjects were tested using researcher- prepared Ecology Problem Solving Test (EPST) which consisted 14 multiples choice items. The reliability of the EPST was found by Kudder Richard formula 21 to be .70 and scored dichotomously. The test was re-administered a week after treatment was completed to collect post-test data. The whole exercise lasted for five weeks.

Result and Discussion

Table l summarizes the difference in mean of the experimental and control group due to treatment

	Experimental	**Control**
No of subjects (N)	78	83
Post-test $\overline{X}$	14.8	11.48
Pre-test $\overline{X}$	6.67	7.19
Mean difference	7.83	4.39
Pretest SD	3.77	3.55
Post SD	4.9	3.72

Table II t-test for significance of initial difference between groups in EPST

Group	N	x	S.D	Cal. t-value	Critical t	Sig.
Experimental	78	6.67	3.77	-0.64	1.960	
Control	83	7.19	3.55			

Table III: t-test of significance of difference in means of the groups in post-test achievement in EPST

Group	N	x	S.D	Cal. t-value	Critical t	Sig.
Experimental	78	14.8	4.9	3.94	1.960	0.00*
Control	83	11.48	3.72			

Significance at.05 alpha level

All groups were found to be equivalent at the pretest but varied significantly after the treatment was administered(1-3.94>1.960, df 159 at 0.5 level) thus showing superiority of studying ecology concepts through student participatory fieldwork over studying the same concepts through conventional expository/lecture method in which students do not interact with materials.

Studying ecology through fieldwork provides the learners the opportunity to do science the real way by employing problem-solving models in biology such as that suggested by Olagunju (2002).

It involves such steps as

a. defining a problem
b. collecting information related to the solution process
c. reasoning through the problem state to the solution process
d. checking and evaluating the solution.

Student problem-solving skills can only be enhanced by helping them acquire a wide range of experiences available in the field and which are necessary for solving problem. Field investigation during study of ecology concepts encourage students to work collaboratively and undertake peer interaction which have been found to be effective strategies for teaching science (Lazarowitz 1998 and Hertz Lazarowitz 1998).

Conclusion

It is evident that teaching ecology through student involved ecological field work holds greater potentials for developing competencies for solving problems. As an opportunity to get first hand experience about organism in nature and to develop the individuals mind in certain areas that may be outside lesson objectives. Although some may argue that the use of such field work is time wasting judging by the wide areas needed to be covered within a short space of time in biology before final examination. It is also possible to note that such field exposures will enable students appreciate ecology across topic boundaries. In a developing Country like ours where technological quest is foremost, developing students' intuitive thinking cannot be over-looked as almost all technological inventions and discoveries are products of imaginative thinking. Nigeria with a rich, natural environment must tap such an unparalleled resource for academic development of the youths.

This is quite important if we realized that the richest laboratory ever known, is the environment.

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