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# Effects of Full and Quasi – Participatory Learning Strategies on Nigerian Senior Secondary Students' Environmental Knowledge: Implications for Classroom Practice

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Abstract: Environmental education is considered an appropriate intervention for creating awareness of, and an understanding of the challenges of environmental degradation. The introduction of EE into the Nigerian school curricular creates a challenge of how to teach it. A majority of the teachers still employ the old, traditional "chalk and talk" method. This study experimented with two modes of participatory strategies, the full and quasi participatory modes in teaching secondary school students in Nigeria some EE concepts. Three hundred and sixty students were randomly selected and assigned to the three treatment groups. Five hypotheses were tested at $P<.05$ and data was collected using a test instrument measuring students' understanding of the EE concepts taught. Findings from the study indicate that generally students taught using the participatory modes performed better than their counterparts in the conventional lecture group. However, between the two participatory modes examined, it was noted that students in the quasi participatory mode performed better than their colleagues in the full participatory group. An explanation of this could be that the quasi mode offers the learners a unique opportunity to work together in a more flexible way, to read, accept and internalize the basic environmental concepts. The implications of the findings for classroom practice were discussed in the paper.

Key words: Environmental Education, Participatory Strategies, Group Learning, Environment, Nigeria.

## INTRODUCTION

### Background

The present environmental problems in Nigeria have resulted partly from the increasing numbers of persons which outstrip the available resources, with growing distress to many families; and largely from the abysmally low level of environmental consciousness of Nigerians, as shown in recent studies (Muyanda – Mutebi and Yiga – Matovu, 1993; Ekekwe, 1997; Olagunju, 1998; Mansaray and Ajiboye, 1997; Mansaray, Ajiboye, and Audu, 1998; Ajitoni, 2005). Generally, Nigerians are at best indifferent to the environment. The environment is viewed as merely a source of livelihood; as discrete entities, and not as a tightly knit system of inter-dependent structures of rivers, forests, animals, microbes, and flowers. This low level of environmental consciousness has led to unbridled environmental degradation in Nigeria and, *ipso facto*, poverty of Nigerians. It is quite clear from the current understanding of ecological realties that for the underdeveloped and developing societies it is not only that poverty causes pollution but also that pollution causes poverty.

In view of the fact that the Nigerian environment is steadily moving towards a disaster zone (Ekekwe, 1997); the time is ripe for the development of a culture of the environment. By a culture of the environment is meant awareness and a total appreciation of the bounty and promise of the environment, the breadth of its biodiversity, the fragility of various ecosystems, the precarious link between the environment and sustainable development. It also includes the appreciation of the environment as nature's work of art from which man can derive inspiration (Ekekwe, 1997).

The big question is: How can we motivate students and by implication, the society, to take concrete steps, towards promoting a harmony between man and his environment? Even where there is a commitment to providing environmental education as a saving grace, the question remains; how should Environmental Education (EE) concepts be taught to students? On this point there has been considerable debate for several years. Environmental Education (EE) is seen to be the development of (i) understanding about our environment; (ii) positive attitudes towards the earth and its life; and (iii) confidence and skills to make positive changes. However, a key determinant of student achievement is the quality of teaching (Ajitoni, 2005). To be effective, therefore, Environmental Education (EE) requires strategies and learning experiences that are planned, focused, experiential, participatory, anticipatory, and cumulative. All students must have access to learning about the environment. The knowledge and concepts base should include students'

ability to demonstrate (i) an understanding of the ecological processes that support life on our planet; (ii) an understanding of man's interaction with the ecological processes; (iii) an understanding of the effects and the likely implications of change; (iv) an understanding of the development of human relationships with the environment; (v) an understanding of the relationship of different biotic and a biotic cultures with the environment; (vi) an understanding that technological developments have an impact on the environment; (vii) an understanding of the natural, socio-cultural, built and spatial elements of the environment and (v) an understanding of the importance of traditional indigenous knowledge about land care and resource management (ACT, 1997).

Similarly, students should demonstrate by way of application the ability to: (i) recognize the symptoms of environmental problems; (ii) make responsible decisions about the environment; (iii) take personal action to ensure an ecologically sustainable future; and (iv) take collective action to ensure an ecologically sustainable future. Evidently, the current traditional pedagogical practices which are confined to transmitting information and involve telling, reading and memorizing, and the teacher adopting the "fountain of knowledge" approach, have failed to cope with problems of development (Kohle, 1982). Appropriate pedagogical approaches to putting the Environmental Education (EE) message across need to be sought; especially when it is realized that Environmental Education (EE) is not just a "matter of telling the children about it" (Orr, 1994).

## Participatory Learning Strategy

Elsgest (1987) observed that children learn best by being interested fully in their own work; by seeing themselves; doing themselves, by puzzling themselves; by verifying their own suppositions; by experimenting themselves; by drawing conclusions themselves on the strength of evidence which they have collected themselves. They should always make mistakes which they then should rectify themselves in the light of new information and evidence which they have uncovered themselves. This new pedagogic concept should be participatory, that is, should work towards liberation from all forms of repression, inside and outside of classroom, through social interaction, togetherness, and action-oriented communication. This approach should, in the words of Bayer, et al (1980), be anticipatory – it should help in achieving a creative approach to future problems of mankind.

Participatory learning strategy (PL) belongs to the Group Investigation Models of Learning. It is the instructional use of small groups of 3 – 8 members in which learners work together to achieve a common goal and to maximize their own and each other's learning (Johnson and Johnson, 1994, 1999; Ajitoni, 2005). Participatory learning strategy as a philosophy of learning has its theoretical basis in the behaviourists; the cognitive theorist, he constructivist, and the social leaning theorists' views of learning.

Participatory learning is a group learning approach where the learners take an active part in the learning process in which they have a maximum measure of freedom and self-determination. The chance exists of personal meetings, interactions and acquaintances among the learners, and between learners and teachers, and times and space for turning the acquaintances with people and things into experiences. Participatory learning strategy provides ample chances for four stages of adult learning: concrete experience, followed by reflection on that experience on a personal basis; next comes abstract conceptualization which is the derivation of general rules describing the experience, or the application of known theories to it, and hence to active experimentation, the construction of ways of modifying the next occurrence of the experience leading in turn to the next concrete experience (Kohle, 1982).

## Grouping and Group Size

The furtherance of developed, participatory, experiential active and creative learning is tied up with three environmental conditions, which should be fulfilled in the classroom. These are: (i) a maximum measure of freedom and self-determination, (ii) time and peace for turning the acquaintance with people and things into experiences, and (iii) the chance of personal meetings among the students and between students and teachers. These three elements complement one another, thus establishing a fruitful balance. The effectiveness of this fruitful balance has much to do with grouping and group size. By grouping we mean diving the class into smaller work groups for the purpose of learning in classrooms.

Grouping of students emphasizes active participation on the part of learners. Participation in small group discussion may help some students learn and remember 40 per cent of the material taught (Muyanda – Mutebi and Yiga-Matovu, 1993). Williamson (1990) observed that group activity fosters personal involvement, encourages cooperation and sensitivity among the participants, and may help to clarify knowledge and values. Furthermore, there is a growth in students' cognitive outcomes freedom for the students to learn, a freeing of teachers' time to assist weaker students, and improved social and ethnic relations. Groups provide a vehicle whereby learners can seek to influence decisions which affect them directly. The belief in grouping is that each individual has a unique and important role to play.

In the dynamics of group learning, Thelen (1984) suggested about 10 to 15 students. The argument is that the number is large enough for diversity of reactions and small enough for individual participation. If the group is too large, it will be difficult to provide an opportunity for every student to participate during each class and will not enable the group to relate productively. If the group is too small in size, the diversity in the group will not provide sufficient ways of viewing a situation and will not contain enough potential among its members for finding the right solution.

Galton and Williamson (1992) and Gilbert (1995) suggested from three to six students. Button (1982),

however, suggested, for mall groups, there and not more than four members. His argument was that continuous individual participation in groups as large as twenty-five to thirty is difficult to achieve; groups of two can be too small to sustain a discussion; with three there may be rather more material available, but already one can be left out. With four, there is an increasing chance of a member of the group being left out, and groups of five often seem to need a chairman.

## Academic Ability

Contemporary views of school learning and performance recognize the importance of broader range of students' academic competence that interacts with aptitude factors and the learning environment to influence performance in school projects, activities, and tasks (Snow, 1989). These characteristic abilities are reflected in behaviuor such as handling difficulties that arise, getting right to work on tasks, and expressing interest. Academic ability is related to intelligence. The academic ability levels of students show their scholastic aptitude and this goes a long way in determining achievement of learners. Ability has been seen to be one of the many factors that predict a person's achievement (Brush, 1985; Payne, 1992; Hagedorn, 1996 and Aremu, 1998). It has also been shown that learners with different academic ability respond differently to situations and perform differently depending on the types of methods and materials used for the subject of instruction (Aremu, 1998). In effect, it is essential to find out whether the use of one method or another will bring about better performance of learners with varying ability, with reference to grouping and group size.

## The Problem

This study determined the effects of two models of participatory learning full and (quasi-participation) on secondary school students' achievements in selected environmental issues and concepts. Furthermore, the paper examined the interaction effect of group size and academic ability on subjects' knowledge of the environmental concepts.

## Hypotheses

Ho It is generally hypothesized that students in the two participatory learning models will perform better than their counterparts in the normal classroom situation.

$H_{01}$: There is no significant main effect of treatment on subjects' achievement in environmental concepts.

$H_{02}$: There is no significant interaction effect of treatment and group size on subjects' achievement in environmental concepts.

$H_{03}$: There is no significant interaction effect of treatment and subjects' academic ability on their achievement in environmental concepts.

$H_{04}$: There is no significant interaction effect of group size and academic ability on achievement scores of subjects in each of the treatment conditions.

$H_{05}$: There is no significant interaction effect of treatment, group size, and academic ability on the achievement scores of subjects in each of the treatment conditions.

## Method

This study adopted a pre-test, post-test, control group, quasi experimental design, using a 3 x 3 x 2 factorial matrix. The variables of study were the mode of instruction varied at three levels: full participatory learning strategy (FPLS); Quasi-Participatory Learning Strategy (QPLS); and Conventional Lecture Method (CLM), as the independent variable; knowledge of environmental issues and concepts as the dependent variables; and academic ability of subjects – High Academic Ability (HAA); Average Academic Ability (AAA); and Low Academic Ability (LAA); and group size: small group of four members, and large group with eight members, as the intervening variables.

## Subjects

Three hundred and sixty Secondary Two (SSII) students from nine (9) secondary schools in Irepodun Local Government Area of Kwara State, one of the thirty-six states in the Federal Republic of Nigeria, constituted the subjects of this study. The selection of the nine (9) schools was based on stratified random sampling; three schools form each of the three zones that make up the Local Government Area –Ajasse – Ipo, Omu-Aran and Oro. The selection of the three schools from each of the three zones was done by fish bowl random sampling. In each of the nine (9) schools sampled, only one (1) randomly selected intact SSII class was involved in the experiment. Six of the nine schools were randomly assigned as experimental group and three as the control group. Out of the six treatment schools, three were assigned to FLPS and three to QPLS, also three use small groups (4students) and three used large groups (8Students).

## Concept Selection

Based on the information and data gathered from previous works (Vongchusiri, 1987; Rugumayo, 1987, Muyanda – Mutebi and Yiga-Mutovu, 1983; Mansaray and Ajiboye, 1997, Olagunju, 1998), the starting point and motivation for the environment education concepts selected for the study lay in the immediate environmental. These are:

1. The human environment: natural and man-made
2. Natural resources in Nigeria: renewable and non-renewable

3. Inter-dependence in the Nigerian environment: biodiversity; ecology; ecosystem, food chain; food webs, and so on.
4. Pressures on the environment; what man does to the environment.
5. Major environmental issues and problems in Nigeria
   a. Desertification;
   b. Soil erosion;
   c. Flooding;
   d. Environmental pollution;
   e. Population issues and problems.
6. Ozone layer depletion and global warning
7. Environmental education: objectives, sustainable development and conservation.

## Instruments

Four instruments were used in the study: General Aptitude Test (GAT); Participatory Learning Guide (PLG); Environmental Education Module (EEM); and Knowledge of Environmental Concepts Test (KECT).

The General Aptitude Test (GAT) was designed by the researchers to test the students' general knowledge. It was a 50-item multiple choice test and it was validated using students of comparable ability not involved in the study, with a reliability coefficient of 0.86 using Kuder Richardson Kr 21 formula. The scores obtained was used for classifying subjects into three academic ability groups of high, average, and low. The high academic ability (HAA) students were those who scored 70% and above in the GAT. The average academic ability (AAA) students scored from 50 – 69%, while the low academic ability (LAA) students were those who scored from 0 – 49% (Okebukola, 1984; Ojo, 1985; Esan, 1999). Also the KECT was a 30-item multiple choice test designed by the researchers based on the environmental concepts taught the pupils. The test was subjected to validation and a reliability coefficient of 0.92 was obtained using the Kr 21.

The Participatory Learning Guide (PLG) and the Environmental Education Module (EEM) were the experimental materials or stimulus instruments (Adeyemo, 2002), for the study. The Teachers' Instructional Guide (TLG) was the guide for the cooperating teachers in the Full and Quasi Participatory Learning Groups based on Foyle's (1989) and Okebukola's (1984) formats. The Conventional Lecture Method (CLM) group was allowed to work in the conventional or traditional mode. These materials were given both face and content validity by experts in environmental education and research methods.

The Full Participatory and Quasi Participatory Learning Strategy Guides were a 3 - hour and 20 minute session of five periods each, split into three separate sessions of eighty minutes for each of the first and second sessions, and forty minutes for the third and last session. Students were assigned to a four-member group for small group and eight-member group for large group. This was in line with Button's (1982) suggestion of not more than four members for small groups. All groups were mixed in performance level: high, average, and low, based on their scores in the General Aptitude Test (GAT).

The activities in the FPLS group included teacher presentation of lesson for twenty minutes, one of the two major activities performed by the teacher, and the second, spending some time going from group to group, answering questions and clarifying issues. The major activities of the students included assuming and assigning roles to members – recorder, reporter, time-keeper, and, monitor, discussion in groups of four and eight the question posed by the teacher based on the teacher's previous discussion and the assignment given to the students earlier on. Each group presented a report which was the outcome of the members' consensus on the questions. In the groups, students shared ideas, helped each other to learn, pooled resources, shared discoveries, justified their thinking and critiqued each other's idea.

The group reporter, a representative of the groups, presented the groups' report to the general class, to mark the close of the day's session, while members from the other groups reacted to the presentation. These reports were later submitted to the class teacher for grading. The scores went to the groups accordingly.

There was a weekly competition of forty minutes duration. This took place in the third and last session for the week. Three members from each group competed with members from the other groups in quiz to contribute to group scores. This was also an inter-group competition as against intra-group competition or individuals competing for an elusive goal. Students rotated roles of recorder, reporter, monitor, and time-keeper for three weeks after which new groups were formed.

Certificates were awarded to the best groups every week. The award was based on the group's performances in the group reports submitted and the scores received in the weekly competition. Individual members of the group also received rewards in the form of praises for active participation in and contribution to the groups' success and efforts. Thus, cooperation and competition as well as rewards were carried out at group levels.

Teacher's activities in the Quasi Participatory Learning Strategy (QPLS) were the same as in FPLS group. In the students' activities, however, instead of going straight to group discussion, after teacher's presentation, students worked individually and independently of the other students answering the questions. The answers were submitted to the teacher and grades were awarded on individual basis.

The third session which was the last in the week, the forty-minute session, was split into two. The first was a ten-minute weekly test taken by individuals in the groups. This was marked and graded. Individuals were rewarded for high performance and, at the same time, groups which produced the best students were rewarded with bonus marks. The remaining thirty minutes were spent on quiz competition involving all the groups, scores here went to the groups.

Certificates of excellence were awarded to groups based on their performances in their group reports, the

quiz, and the bonus marks accruing to such groups for producing the best student for the week in the individual tests. Individual members were also praised for their contributions toward the success of their groups. Roles were rotated every week; groups were changed every three weeks. Thus, in the QPLS, competition, cooperation, and rewards were at two levels; individual and group levels. The participating teachers in the study were those who had at least a university degree preferably a B.Ed in any field, since environmental education cuts across many disciplines. Also, the teachers were those with a minimum of five years post-qualifications experience.All the subjects for the study were pre-tested using the instruments.Teaching in both the experimental and control groups were carried out for three periods (sessions) of 200 minutes (80 + 80 + 40 minutes) per week for six weeks.

Data collected were analysed using analysis of covariance (ANCOVA) to test the hypotheses and differences among groups, using pre-test scores as covariates. The T-test and Scheffe Multiple Range test were used where significant differences were observed to determine the source of the significance. The Multiple Classification Analysis (MCA) was done to find out how each of the groups performed. All the hypotheses were tested at $P < .05$ level of significance.

## RESULTS

Findings from the study are presented below following the hypotheses tested.

$H_{01}$: There is no significant main effect of treatment on subjects' achievement in environmental concepts.

Table 1 shows that there was a significant main effect of treatment on variations in students' knowledge of environmental concepts ($F (2,341) = 5.540$; $P < .05$). The table also reveals a significant main effect of group size ($F (1,341) = 13.480$; $P < .05$), and academic ability ($F (2,341) = 5.069$; $P < .05$). Again from the table a significant 2 – way interaction effect was found for strategy and group size ($F (2,341) = 6.025$; $P < .05$).

Table 2 presents a summary of the Multiple Classification Analysis (MCA) according to treatment, group size and academic ability. The table describes the direction of observed significance in the analysis of covariance presented in Table 1.

Specifically, experimental group 2 ($E_2$), the Quasi-Participatory Learning Strategy group, $x = 52.40$, while the control group, the conventional lecture method, obtained he lowest mean score ($x = 51.75$).

To determine the source of the observed significance in Table 2, a post-hoc analysis was carried out using the Scheffe Multiple Range and the summary is presented in Table 3.

Table 3 shows that Quasi – Participatory Learning Strategy ($E_2$) group differed significantly from those of the full Participatory Learning (PL) group and the conventional lecture method group. However, the difference in the mean scores of experimental group 1 and the control group is not significant. The results of the analyses in relation to hypothesis one ($H_{01}$) show

Table 1: Summary of Analysis of Covariance (ANCOVA) on the Post-test Achievement Scores According to Strategy, Group Size and Academic Ability

| Source | SS | df | MS | F | *Sig. of F* |
|---|---|---|---|---|---|
| Covariates (Pre-test Scores) | 25327.590 | 1 | 25327.59 | 326.173 | .000 |
| Main Effects | | | | | |
| Strategy | 2463.146 | 5 | 0 | 6.344 | .000 |
| | 860.385 | 2 | 492.629 | 5.540 | .004* |
| Group Size | 1046.743 | 1 | 430.192 | 13.480 | .000* |
| | 787.230 | 2 | 1046.743 | 5.069 | .007 |
| Academic Ability | | | | | |
| | 1150.0554 | 8 | 393.615 | 1.851 | .067 |
| 2-way interactions | 935.638 | 2 | 143.757 | 6.025 | .003* |
| | 200.873 | 4 | 467.819 | .647 | .630 |
| Strategy x group size | | | | | |
| | 129.367 | 2 | 50.218 | .833 | 436 |
| Strategy x academic ability | | | | | |
| Group size x academic ability | 110.280 | 4 | 27.570 | .355 | .646 |
| | 110.280 | 4 | 27.570 | .355 | .646 |
| 3-way interactions | | | | | |
| | 29051.071 | 18 | 1613.948 | 20.785 | .840 |
| Strategy x group size x | 26478.904 | 341 | 77.651 | | .840 |
| academic ability | 55529.975 | 359 | 154.680 | | .000 |
| Explained | | | | | |
| Residual | | | | | |
| Total | | | | | |

* Significant at $P < .05$

that the subjects differed significantly in the mean post-test achievement scores according to the instruction given.

This shows that the Quasi-Participatory Learning Strategy (QPLS) was suited to enhance the academic achievement of Senior Secondary School Students in environmental education. Thus, the null hypothesis one ($H_{01}$) which states that there is no significant main effect of treatment on subjects' achievement in environmental concepts is rejected.

Null hypothesis two (($H_{02}$) states that there is no significant interaction effect of treatment and group size on subjects' achievement in environmental concepts. To test for the hypothesis the ANCOVA at Table 1 as well as the T-test at Table 4 will be referred to.

The results in Table 1 show that the 2 – way interaction effect of strategy and group size was significant (F (2,341) = 6.025; P <.05). The t-test comparison of the post-test mean achievement scores of small and large group sizes were computed to find out the direction of the significant difference reported earlier. This is presented in Table 4. From Table 4, the mean scores show that for all the three treatment groups, subjects in the small groups generally performed better than those in large groups. For the experimental group 1 (FPLS), the mean score for the small group was 55.58 while that of the large group = 44.88. For the experimental group 2 (QPLS), the mean scores for small and large groups, were 54.13 and 52.30 respectively. Also, for the control group, the mean scores were 54.70

Table 2: Multiple Classification Analysis (MCA) of the Post-test Achievement Scores According to Strategy, Group Size and Academic Ability

Grand Mean= 50.41

| | Variable + Category | N | Unadjusted Deviation | *Eta* .24 | Adjusted for Independents + deviation | *Beta* .13 |
|---|---|---|---|---|---|---|
| 1 | Full Participatory | 120 | -.57 | | -.17 | |
| 2 | Quasi Participatory | 120 | 1.01 | | 1.99 | |
| 3 | Conventional Lecture | 120 | -.44 | | -1.82 | |
| 1 | Academic Ability | 152 | -2.33 | .29 | -1.35 | .13 |
| 2 | Low | 135 | -1.27 | | -.05 | .500 |
| 3 | Average | 73 | 7.19 | | 2.92 | .707 |
| | High | | | | | |
| | Multiple $R^2$ | | | | | |
| | Multiple R | | | | | |

Table 3: Summary of Scheffe Multiple Range Comparison of the Post-Test Achievement Scores According to Strategy

| Mean | Groups | Group | Group | Group |
|---|---|---|---|---|
| Group 1 | 352.40 | 1 | 2 | 3 |
| Group 2 | 54.56 | * | * | * |
| Group 3 | 51.75 | | * | |

* Denotes pair of means that significantly differs from each other at P < .05.

Group 1 = Full Participatory Learning Strategy (FPLS)

Group 2 = Quasi Participatory Learning Strategy (QPLS)

Group 3 = Conventional Lecture Method (CLM)

Table 4: T-Test Comparison of the Post-test Mean Achievement Scores of Small and Large Groups in each of the Treatment Condition.

| Treatment | *Class size* | N | X | SD | Df | T-value | Sig. of t |
|---|---|---|---|---|---|---|---|
| Experimental 1` | | | | | | | |
| (FPLS) | Large | 8 | 44.88 | 10.83 | 118 | 4.85 | .000* |
| | Small | 4 | 55.58 | | | | |
| | | | | | | .63 | .532 |
| Experimental | Large | 8 | 52.50 | 13.91 | 118 | | |
| 2 (QPLS) | Small | 4 | 54.13 | | | | |
| | | | | | | 3.73 | .000* |
| Control (Lecture) | Large | 8 | 46.88 | 10.41 | 118 | | |
| | Small | 4 | 54.76 | | | | |

*Significant at P < .05

and 46.88 for the small and large groups respectively.

It was also noted from Table 4 that the differences between the mean scores of subjects in the small and large groups were significant for the experimental group 1 ($t = 4.85$; $P < .05$) and the control group ($t = 3.73$; $P < 0.5$). There was, however, no significant difference between the mean scores of the group sizes for subjects exposed to the experimental group 2 ($t = 63$; $P > 05$). This result shows that the significant interaction effect of strategy and group size obtained from Table 2 was as a result of the contributions of the two group sizes in experimental group 1 and the control group.

$H_{03}$: There is no significant interaction effect of treatment and subjects' academic ability on their achievement in environmental concepts.

From Table 1, it was obtained that there was no significant interaction effect of strategy and academic ability on the post-test achievement scores of subjects ($F(4,341) = .648$; $P > .05$. Thus, null hypothesis three ($H_{03}$) is rejected. Similarly, the three-way interaction of strategy, group size and academic ability on post-test achievement scores of the subjects was not significant ($F(4,341) = 318$; $P > .05$. The null hypothesis five ($H_{05}$) is thus rejected.

## DISCUSSION

Previous researches suggest that encouraging participation in environmental activities is a promising technique for improving students' environmental knowledge. The present study extended this work in another way. It assessed the effects of a shorter period of participation in class environmental activities on a wider range of student variables. The study encouraged students to participate in class activities during a six – week period. This supports the other earlier works, e.g. Learning, Porter, Dwyer, Cobern and Oliver (1997) found that encouraging participation in environmental activities is a promising technique for improving students' environmental knowledge, attitudes or both.

Details from the results indicated that students exposed to the participatory learning strategies (Full and Quasi Participatory) performed significantly better than those in the conventional lecture method (that is, the control group). These findings give support to earlier findings on the significance of group learning methods (participatory, collaborative, cooperative and so on) in relation to the conventional or traditional method (Adeyemi, 2002; Amosun, 1999; Aremu, 1997; Bennett and Dunne, 1992; Cohen, 1994; Panitz, 2000; Sharan, 1999; Slavin, 1995; Slavin and Hurley, 2000; and Veenman, 2001).

What seem evident from the results of this current study is that quasi-participatory learning strategy (QPLS) has a greater potential for effective communication of environmental education messages in the classroom. This is important because the QPLS offers the learners as individuals and together in groups, the unique opportunity to read; accept and internalize the basic environmental education concepts. It is, therefore, possible for the learners to work, within this approach, at their own pace, master the subject as indicated by the accuracy of their own responses and eventually carry such knowledge and experience to their various groups for the benefits of the other group members. The approach equally allows learner the knowledge of immediate feedback which serves as a great motivation propelling learners to want to learn more.

Furthermore, the QPLS seems to have offered the subjects a great deal of motivation for effective learning. Behavioural psychologists such as Skinner (1985), Crowder (1965) have emphasized the importance of learners' active participation in the learning activity and the profound usefulness of immediate feedback. Skinner (1961; 1985) notes that a correct response needs to be reinforced in the shortest possible interval of time and that such reinforcement encourages students to continue in their efforts.

### Group Size, Strategies and Subjects' Cognitive Outcomes

Another inference that could be drawn in the classroom participatory learning is that groups of different size and composition could be formed either by the teachers or by the students themselves. Where group members evolve by choice of the learners, with time, the groups would tend towards heterogeneity and improved performance on the part of group members. This proposition is based on the findings of Benneth and Dunne (1992), Johnson and Johnson (1994), Panitz (2000), Slavin (1995) and Wesseller (1982).

These studies based their arguments on research evidence that informal groups composed by earners are usually heterogeneous or mixed ability, and that learners in the groups learn better in a natural company of others they socialize with. In such groups also, learners feel secured, relaxed and confident. In spite of the differences in their abilities, the learners, in such groups readily interact and are willing to seek help from peers without being ashamed and offer assistance without a feeling of superiority. In the groups, the social, psychological and academic based needs are interwoven and catered for.

Where groups are formed by the teacher based on tests administered, like it was done in this study, the groups could still achieve a lot. The position taken in this study in respect of formation of groups by the teacher was in line with that taken by Slavin (1996). Slavin (1996) believes that it is expedient for the teacher to use ability as the criterion for grouping rather than sex, personality, or socio-economic background. This position enabled learners of varying ability levels (high, average and low) to interact, socialize, solve problems together and take common decisions. This position, too, created positive interdependence among the groups in this study and led to the satisfaction of the social, psychological and academic needs of the learners.

The findings of this study further show a significant interaction effect of strategy and group size for academic achievement. This is interpreted to mean that in each of the treatment conditions, the two groups, small and large, differed significantly in achievement

scores. This finding lends further credence to earlier findings on the influence of group size on learning (Moriarty, 1991; Smith, 1991; Veenman, Benthum, Bootsman, Dieren and Kemp, 2001). Veenman, et al (2001) found that the size of the group must be small enough (2 – 4 members) to obtain a meaningful face-to-face interaction. Smith (1991) saw that two students could learn more quickly than three; while Moriarty (1991) found that the smaller the number in the group the more effective the teaching-learning situation.

Each member of the participatory learning groups was given the opportunity to play the role of a leader and a follower at one time or the other. This, in a way, motivated the students to support their groups and deviant behaviours which could have marred the achievement of group goals were prevented. The changing of roles in groups helped facilitate social skills which Slavin (1995) saw as an essential of group learning. This also helped the students to communicate effectively, provide leadership for group work, build, maintain and sustain trust among group members and meaningfully resolve conflicts within the group. The end product of these could have been the construct of social engineering in the participating groups.

Group activities in the participatory learning also afforded students the opportunity to face common problems collectively. Individuality, which could strain our relationship with the environment should everyone do things individually, was reduced to minimal level. In effect, the findings of this study in respect of group-based efforts are of sublime importance to understanding and using the environment in sustainable manner (Baez. 1987).

## Strategy, Academic Ability, and Students' Cognitive Outcome

The academic ability of the subjects was considered crucial in exerting an effect on learners' achievement in any academic endeavour. The findings of this study indicated that academic ability had a highly significant effect on the variation in subjects' achievement scores. It was found that the high academic ability (HAA) group performed consistently better in all the instructional modes. There were further indications that even in the control group the high academic ability subjects performed better than both the average and low academic ability groups. It is interesting to note, however, that a major finding here is that even the low academic ability subjects in the participatory learning groups performed better in their achievement scores than their counterparts in the conventional lecture method group. This finding surely has a very serious implication for environmental education teaching strategies in Nigeria. The three academic ability groups, though performing differently within each treatment condition, demonstrated a certain consistency that has some relationship with the treatment condition. The high academic ability subject in QPLS performed significantly better than their counterparts in the other two groups, FPLS and CLM. A similar trend was noticed with the average and the low academic ability groups in all the groups.

A conclusion that could be drawn from this is that in spite of the fact that academic ability could be an important factor in this study, this ability itself could be modified by the mode of instruction. Thus, the QPLS significantly facilitated the performance of the high, the average and the low academic ability subjects over and above those in the other groups. Similarly, the FPLS had a significant advantage over the CLM in the three academic ability groups. This, in effect, provides an additional ground for the recommendation of the adoption of the QPLS as well as the FPLS in the teaching and learning of environmental education in Nigeria.

## Implications of Findings and Recommendations

The findings of this study would seem to have some implications for the teaching and learning of environmental education as well as of other subjects in Nigeria. First, the participatory group learning programmes have been found to be a good and viable alternative to the traditional methods of teaching and the noticeable lack of teacher – preparation in environmental education. These findings are pointers to the urgent need for efforts in Nigerian classrooms to be concentrated on invigorating this approach, particularly in the teaching and learning of Social Studies and its allied areas, the "new" subjects such as Environmental Education, Population Education, and Citizenship Education.

Another noteworthy implication of the findings of this study is on the influence of group size and academic ability on subjects' performance in all the groups. Although the participatory group learning strategies were found to be very useful in the teaching and learning of environmental education, they appear to be more suited to high student effectiveness in small participatory groups. Even in the conventional lecture method where students were also grouped into four and eight members per group for small and large groups respectively, as in the other two strategies, even if for no other reason than to encourage social interaction, the feeling of group belongingness and acceptance helped the students achieve high results. Students in the small group (of four members) performed better and adapted more quickly to situations than students in the large group (of eight members). If this was so, the impact of a very large whole class of forty students, in most schools, on the achievement of students would lean more heavily towards the negative aspects than the positive side.

From the perspective of environmental education the results of this study would seem to have serious implications for the use of participatory learning strategies in Nigeria. This is so because a majority of Nigerian schools lack infrastructural facilities and students stay in classrooms of between 40 and 60 students per class, where individuals' competitive work is regarded highly while cooperation is not encouraged. Moreover, students are not in any way allowed some

measure of freedom and they are not able to take responsibility for their own learning.

In summary, the participatory approach explored here seems more viable than the conventional face-to-face classroom practice in teaching environmental education.

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