



GSJ: Volume 9, Issue 2, February 2021, Online: ISSN 2320-9186

www.globalscientificjournal.com

EFFECTS OF USING ASEI-PDSI APPROACH OF TEACHING ON THE ACADEMIC PERFORMANCES OF STUDENTS IN BASIC SCIENCE IN JUNIOR SECONDARY SCHOOLS

EMMANUEL OGWAH EMEJI

Integrated Science Department, Ebonyi State College of Education, Ikwo

Affiliated to Ebonyi State University, Abakaliki, Nigeria

Corresponding author: emejiemmanuelo@yahoo.com +2348060125237

HYACEINTH AKPA OKORO

Integrated Science Department, Ebonyi State College of Education, Ikwo

Affiliated to Ebonyi State University, Abakaliki, Nigeria

BASIL NDUDIRIM NWAMUO

Integrated Science Department, Ebonyi State College of Education, Ikwo

Affiliated to Ebonyi State University, Abakaliki, Nigeria

Abstract

The study was aimed at finding out the effects of ASEI-PDSI (Activity, Student-centred, Experiment, Improvisation – Plan, Do, See and Improve) approach of teaching on the students' academic performance in basic science of junior secondary school levels. Method of teaching plays great role to the learning outcome achieved in any teaching and learning situation. There have been vigorous searches for innovations in instructions and strategies for effective delivery of basic science lessons in our secondary schools as against the traditional or conventional methods. Effects of using discussion and demonstration methods in teaching basic science were compared to ASEI-PDSI approach. The design of the study was pretest - posttest quasi-experimental design where Basic Science Achievement Test (BSAT) was used in collecting data from 60 students in three intact JSS 3 classes. The data were analyzed using mean, t-test and effect size. The classes were taught using discussion, demonstration methods and ASEI-PDSI approach to determine and compare their effects on the students' academic achievement. The result of the analysis showed that the two methods and the approach were all significant, however, it revealed that students taught basic science using ASEI-PDSI approach had higher mean achievement reflected in gain score of 13.0 than their counterparts taught using discussion and demonstration. Also, ASEI-PDSI approach in teaching basic science was found to have large effect size ($r = 0.33$). Students taught

using ASEI-PDSI approach performed better when compared to discussion and demonstration methods. They got greater mean achievement in ASEI lesson. ASEI-PDSI approach had large effect size because it is fully activity-based and learner-centred. Teachers should use ASEI-PDSI approach in teaching basic science which allows students participate in class work, improvise instructional materials, retain what is learnt and makes the teaching easy for the teacher when the principles of the approach are properly applied.

Keywords: ASEI-PDSI, activity-based, Student-centred, innovations, approaches, teaching method, performance

I. Introduction

Science is the key to the desired growth and development of any nation, Nigeria inclusive. Yet there has been consistent low enrollment and poor performance of students in science in internal and external examinations. Among other factors, it is suspected to be attributed to poor method of teaching or instruction.

Effective learning depends upon the kind of teaching method adopted by the teacher which can either make or mar the teaching. Nessanya (2010) said that the problem of teaching is not what to teach but how to teach it. Nwonyim (2005) stated that method is “a means of conveying established theories and set goals” it is the relationship between the agent and teacher who is meant to impact the learning to the learner (s). Teaching method can be said to be a set of teaching tactics and instructional format employed by a teacher in carrying out or delivering his lesson or the general pattern created by using a particular set of strategies used in impacting knowledge into students.

There have been vigorous searches for techniques to improve the quality of instructions in teaching basic science in secondary schools and subsequent students’ learning in place of the traditional method or conventional method. Conventional method is therefore a traditional method of teaching where teacher transmits information (subject matter content) verbally to the students.

It is quite common to see that most science teachers who teach basic science in many secondary schools today are teachers that studied science like biology, physics, and chemistry who never had the pre-training on how to combine these subjects in junior secondary schools as basic science. Such teachers use teacher-centered methods in teaching basic science making the subject difficult to the students who then run away from science both in senior secondary schools and higher institutions. This is so because most of these teachers have mastery of their subject, but find it difficult to impart the knowledge to students as a result of the use of wrong teaching methods.

Nessanya (2010) explained that “If the how is cost, then the what, whom and where have little or no significance” which implies that having all required qualifications, attending numerous seminars, and having professional expertise but without knowing the method of teaching (the how) you can hardly relate well with the students for effective learning. This means that if the effective approach is used in the teaching of basic science, the rate at which students enroll into sciences in senior secondary schools and higher institutions will increase. It follows that with a good foundational knowledge of science in junior secondary school one will admire to study it at higher levels.

In Nigeria, Integrated science was introduced and taught at the junior secondary schools (JSS) level as core subject in replacement of general science (FGN 1981). Although Integrated science was propounded by the Science Teachers Association of Nigeria (STAN) in an attempt to draw up a science curriculum for the post primary institution during the period 1968 to 1970 (Oke, 2009), Basic Science is now the fundamental subject on which sciences is built. According to Bajah (1983), integrated science now Basic Science is seen as “an approach to the teaching of science in

which concepts and principles are presented so as to express the fundamental unity of scientific thought and avoid premature or over emphasis on the distinctions between various fields of science.

Science is so beneficial in our society and our everyday life to the extent that we cannot do without it. The applications of science have provided essential amenities such as clothing, shelter, drugs, employment, food, electricity to mention a few, with all these benefits of science, for basic science as a bedrock of all sciences to be taught, appropriate teaching strategies needed to be applied for effective and efficient students performances.

It is in response to this that United Nations Educational, Science and Cultural Organisation (UNESCO) and Science Teachers Association of Nigeria (STAN) work in science education aims at making a difference by providing sound method/basis in basic science which will enable young ones to enroll into science and avail them the opportunity to pursue their goals, regardless of their background (Oke, 2009).

The recent science curriculum of basic science is activity oriented. A good activity method of teaching at this level will make the subject interesting and attractive to the students, it will increase their academic performance and promote their interest to choose and study the science subjects at the senior secondary school (SSS) level and higher institutions. One of such approaches that is activity-based and learner centered is the ASEI-PDSI approach which is an innovation in strategy to salvage the lapses of our traditional classroom practices. ASEI-PDSI stands for activity student- centered, experiments and improvisation- plan do, see and improve.

The ASEI principle is one of the participatory approaches that call for a paradigm shift from conventional practice of teacher-centered and knowledge- base teaching, through PDSI approach to pupils-centered and activity-based method (SMASE, 2006).

According to Emeji (2014), that although learning depends on the method adopted by the teacher in teaching a particular concept, skill or process of sciences, a better method is a method the teacher uses that promotes learning and retention. Hence, the teaching of basic science should be done in such a participatory approach, a child-centered activity –based method (s) that enhances learning outcome and encourage scientific attitudes of the learner positively. Emeji (2014) further stated that the application of the features of ASEI-PDSI approach in the teaching of basic science will promote quality teaching and learning; improve performance of teachers in pedagogical skills and resources utilization as well as pupil's participation in classroom activities which consequently improves the pupils' performance. Activity according to oxford advanced learner's dictionary is a situation in which something is happening or a lot of things are being done. In this context, it could be practical activities, project work or experiment being carried out or something being done.

Looking at the first part of the above ASEI-PDSI approach, ASEI (activity, student-centered, experiment, improvisation) has been seen as a way of engaging learners in experiments and practical activities even in situations where conventional resources are lacking. This can be through improvisation which also helps to develop creativity and linking school learning with immediate learners' environment from where the improvised resources are sourced

PDSI (plan, do, see, improve) as the second part of the approach is a strategy of teaching in which teachers plan the lesson, deliver it and improve their specialty and teaching ability through observing and reflecting from daily classes. Teaching methods/models can be out of date but lesson study cannot be out of date because it is a learning cycle. Lesson study can be continued as long as there is a cycle system and the place where teachers get together, even if teachers change the teaching methods/models. A class is deemed to change moment to moment based on how each

student reacts on what the teacher says. It is important to plan considering children's response such as where children have difficulties and how to deal with the difficulties children have. If children have responded in an unexpected way, teachers need to change their plan promptly so that the class can facilitate children's learning most effectively rather than proceeding class as it was planned by direct teaching presentation (SMASE, 2006).

ASEI – PDSI Approach has been put forth by the STAN in the teaching and learning of basic science. Being aware that learning does not take place unless there is a change in behavior, also since all talking is not teaching and all listening not learning we desire to improve learning by applying the right method. This is in support to Barrant (1976) who stated that nothing is learnt unless we are active in it. Oke (2009) said that to be effective, the training tools and equipment must be similar to those used outside the lesson and in any situation whereby teacher's method is unable to reforest his theoretical lesson with correct teaching aid the performances of students must be poor and such method should not be applied. Oke (2009) further stated that any activity which the teacher performed with the involvement of students that help students to learn is called participatory method. Students are expected to watch and note the procedure and it is mainly used in science to illustrate the operation of certain procedure.

Akanwa (2012) stated that the use of wrong teaching methods affect the performance of students in basic science negatively. For instance air as a topic requires demonstration and experimentation methods, using lecture method will make it difficult. The problem of which method of teaching to be adopted for a particular topic depends on the teacher's training and experience. Activity-based approaches and students-centered method of teaching are advocated for teaching basic science. This is so because this method involves all the students or class in participating in the lesson. Alegu (2005) defined participatory method as activity-based method where the students are expected to perform certain activities and make discovery by themselves". He further said that the use of activities is more prominent in subject like arts, sciences as well as games and sport". There is a limit to the amount of talking a good teacher can do.

ASEI – PDSI approach of teaching in particular deals with learning through actual practice with learning materials or equipments and teaching through previous knowledge of the student's ability and response. Through practice learner becomes more skillful. Chendo (1991) emphasizing on the importance of practical stated that practical is designed to take care of the student's weakness as well as those laboratory successes in practical in basic science.

Harry (1996) in Oke (2009) stated that activity (participatory) method favours students' performance and learning because almost no frustration or problems are reported from the students after the use of image in activity, two-third of students indicate that they help them to understand the concept being presented, and made them more interesting. A good teacher of basic science must know various methods of teaching and when to make use of each one. That is why Fafunwa (1983) in Melody (2009) stated that different lesson objectives, subject matters, and types of students require different strategies that will enhance learning.

ASEI-PDSI approach of teaching is very effective in the teaching and learning of basic science since it deals with learning through actual practice with learning materials or equipment and teaching through previous knowledge of the student's ability and response. The use of ASEI-PDSI approach does not only cater for improvisation and materials but also take care of individual differences there by considering students of high and low abilities, encourages knowledge discovery by the pupils, with these the application of the features of ASEI-PDSI approach in the teaching of basic science in all our primary schools will promote quality teaching and learning thereby making learning more

effective than any other methods. Consequently, the pupils' academic performance will improve and according to the national policy on education (FME 2004) which states that one of the objectives of science education is to lay a sound basis for scientific and critical reflective thinking will be achieved (Emeji, 2014).

II. Purpose of the Study

The study was aimed at finding out empirically the effects of using ASEI-PDSI approach, demonstration method and discussion method in teaching and learning basic science on students' performance and consequent enrollment in sciences. Specifically, the study sought to find out:

A. Whether ASEI-PDSI approach, discussion method and demonstration method have effects on the academic performance of students in basic science.

B. Effect sizes of ASEI-PDSI approach, discussion method and demonstration method on the learning outcome of basic science.

III. Research Question

What are the effects of Discussion method, Demonstration method and ASEI-PDSI Approach on the mean achievement scores of students taught Basic Science as measured by a Basic Science Achievement Test (BSAT)?

IV. Research Hypothesis

Based on the research question this null hypothesis was tested at $p < 0.05$ level of significance.

H₀: There are no significant differences in the effects of ASEI-PDSI approach, discussion method and demonstration method on the mean achievement scores of students taught Basic Science as measured by a Basic Science Achievement Test (BSAT).

V. Method

Pretest - posttest quasi-experimental design was used to ascertain the effects of ASEI-PDSI approach of teaching on the academic performance of students in basic science in comparison to discussion and demonstration methods. The three treatment groups were randomly assigned to three intact classes. The study was carried out in Ohaozara Local Council of Ebonyi State.

The population of the study comprised all students of junior secondary schools class three in Ohaozara Local Council. There are 30 public Secondary Schools with about 1050 students in the JSS 3 classes in Ohaozara. Three intact classes of 20 students each from randomly selected three schools formed the sample for the study. A total sample of 60 students was used in the study.

Lesson plans, pre-test and post-test questions structured as Basic Science Achievement Test (BSAT) were the source of data collection. Each lesson plan was designed to form one treatment group based on discussion, demonstration and ASEI-PDSI approach. Pre-test BSAT was administered on the students before teaching them the topic 'pollination of flowers' based on the treatment group assigned to that class. After teaching each class with the respective treatment plan, post-test BSAT which was the same in content as pre-test BSAT but shuffled in items was

given to the students. The researcher marked and recorded the scores of pre-test and post-test and analysed the data using mean, t-test and effect size (r). Effect size (r) value is graded thus; Small effect ≤ 0.100 ; Medium effect ≤ 0.240 and Large effect ≥ 0.300 .

VI. Results

The results of data analysis based on the research question and null hypothesis showed that:

Research question

What are the effects of Discussion method, Demonstration method and ASEI-PDSI Approach on the mean achievement scores of students taught Basic Science as measured by a Basic Science Achievement Test (BSAT)?

Table 1: Mean (\bar{x}) of Students Achievement in Basic Science

Group	N	Pre-Test	Post-Test	Gain Scores
		\bar{x}_1	\bar{x}_2	\bar{x}
Discussion	20	3.0	10.75	7.75
Demonstration	20	3.25	12.0	8.75
ASEI-PDSI	20	2.9	15.9	13.0

The results in Table 1 show that students taught basic science using discussion method have mean achievement score of 10.75; those taught with demonstration method have 12.0 while those taught with ASEI-PDSI approach have 15.9. Students taught basic science using ASEI-PDSI approach have higher mean achievement reflected in gain score of 13.0 therefore, performed better than their counterparts taught using discussion and demonstration.

H₀: There are no significant differences in the effects of ASEI-PDSI approach, discussion method and demonstration method on the mean achievement scores of students taught Basic Science as measured by a Basic Science Achievement Test (BSAT).

Table 2: Summary of t-test and Effect Size (r) of ASEI-PDSI Approach, Discussion and Demonstration methods on Mean Achievement Scores in Basic Science

Group	N	Pre-test \bar{x}	Post-test \bar{x}	t (cal)	t (tab)	Sig	Effect Size (r)
Discussion	20	3.0	10.75	0.004	2.093	sig	0.003
Demonstration	20	3.25	12.0	0.19	2.093	sig	0.24
ASEI-PDSI	20	2.9	15.9	0.07	2.093	sig	0.33

In Table 2 the data revealed that the pre-test means 3.0, 3.25 and 2.9 are lower than the post-test means 10.75, 12.0 and 15.9 respectively in the three groups. Also, the t-calculated 0.004, 0.19 and 0.07 respectively are lower than t-tabulated 2.093 for all the groups at $p < 0.05$. The null hypothesis was rejected. This infers that there are significant differences in the mean achievement scores of ASEI-PDSI approach, discussion method and demonstration method. To know which method the difference favoured most, the effect size value (r) was determined. The effect size of discussion method is 0.003 which means little or no effect; that of demonstration is 0.24 which is medium effect and that of ASEI-PDSI is 0.33 which represents large effect. The difference was in favour of students taught using ASEI-PDSI approach as it had large effect size.

VII. Discussion

The result showed that students in basic science performed significantly better when taught using ASEI-PDSI Approach than they do using discussion and demonstration methods. The significant difference could be as a result of involvement of students in class work or learning activities which is the child-centered and participatory aspect of ASEI that leads to constructivism, learning and causes retention in what is learnt. This agrees with Alegu (2005) who said that in participatory or activity-based method students are expected to perform certain activities and make discovery by themselves thus leading to high learning outcome. The result also agrees with Otutu (2014) who stated that active learning method has become preferred way to change the traditional teacher centred classroom into newer student centred approach to learning.

The result of the study supports the view of Emeji (2014) that stated that the application of the features of ASEI-PDSI approach in the teaching of basic science promotes quality teaching and learning; improves performance of teachers in pedagogical skills and resources utilization as well as pupil's participation in classroom activities which consequently improves the pupils' performance.

The result showed that demonstration is moderately good in teaching and learning basic science by looking at its medium effect size. However, demonstration method is teacher – centred, whereas the ASEI lesson engages the learners themselves enabling them to bring out the best in them with enthusiasm. This is because according to SMASE (2006) and Emeji (2015), ASEI-PDSI helps in the development of inquiry behavior of the learner; provides an avenue for students to share their ideas; promotes the spirit of team work and cooperation; helps to develop the students thinking and listening skills; encourages the use of locally made materials; takes care of the needs of pupils' individual differences; simplifies attainment of learning objectives; gives students the opportunity to learn by making new discovering, identifying problems and finding possible solutions.

VIII. Conclusion

From the results obtained in the study, it was found that the students performed better in ASEI-PDSI approach than they do in demonstration method and discussion method. The use of methods that are not activity-based in teaching basic science hinders the students' academic achievement as was observed that the students taught using discussion method performed lower than those taught with demonstration whereas students taught with ASEI-PDSI approach performed very well.

Teachers should adopt the use of ASEI-PDSI approach and apply its principles in teaching of basic science. If teachers of basic science should always engage learners in activities and make use of improvisation as a way of involving learners and making the lesson participatory, there will be improved performance..

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