



An Investigation into the Effect of Active Learning Approach on Senior Secondary School Students' Achievement in Physics in Makurdi Local Government Area

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Abstract.

A shift from the traditional to a progressive mode of education in the past years had led to an increased interest in learners' individual differences. The new paradigm is Active Learning approach or student-centred, based on inclusiveness, collaborative learning, critical thinking, creativity, innovation and encourages diversity of reception and processing of information. Hence, this study investigated the effects of active learning approach on student's achievement in the concept of fluid mechanism in Makurdi Local Government Area of Benue in Nigerian Senior Secondary One Physics, 300 Senior Secondary one (SS1) Physics students were used for the study, 60 students each from five schools. A simple random sampling technique was used to select five schools from the population. A quasi-experimental design was adopted for the study; Physics

Achievement Test (PAT) with multiple choice question type consisting of 20 questions on the topic fluid at rest and motion was the instruments used for gathering the data. Analysis of mean and standard deviation were used to analyze the data. The results showed that active learning approach/guided discovery is the most effective approach for physics students with sensing/intuitive learning method, demonstration is the most effective Active Learning Approach for physics students with sequential/Global Learning method while conventional approach is the most effective for physics students with visual/verbal learning method. The results also indicated that Active/Reflective learning method was placed first in the order of facilitating student's achievement in physics when taught with guided discovery, demonstration and conventional learning strategies



respectively. This implies that the three Active Learning Approaches can be used for the enhancement of the achievement of students with Active/Reflective learning methods in the concept of fluid at rest and in motion in physics. It is commended among others that teachers should find out the learning styles or method of their students and use appropriate active learning approach that will be concise for effective teaching and learning to take place in physics classrooms.

Keywords: *Active learning Strategy; Concepts; Learners' Achievement; Approach; Methods*

INTRODUCTION

Active learning, through which students become active participants in the learning process, is an important means for development of student's skills. In the process of active learning, students move from being passive recipients of knowledge to being participants in activities that encompass analysis, synthesis and evaluation besides developing skills, values and attitudes. Effect of active learning not only emphasizes the development of student's skills but also their exploration of their own attitude values.

Afolabi & Akinbola (2010) have maintained that the active

learning consists of three factors which are interrelated. These are: Basic elements, Learning strategies and teaching resources. The basic elements of active learning are speaking, listening, reading, writing and reflecting. These five elements involve cognitive activities that allow students to clarify the question, consolidate and appropriate the new knowledge. The second factor of learning is the learning strategies that incorporate the above five elements. These are small groups, cooperative work, case studies simulation, discussion problems solving and journal writing. Third factor of active learning is teaching resources that the teacher uses to encourage students to interact and participate actively in the activities.

Brookfield (2010) pointed out that Active Learning Approach is carried out by a class discussion, it may be held in person or in an online environment. Discussions can be conducted with any class size, although it is typically more effective in smaller group settings and environment allows for instructor guidance of the learning experience. Discussion requires the learners to think critically on the subject matter and use logic to evaluate their and other's positions. As learners are expected to discuss material constructively and intelligently, a discussion is a good



follow-up activity given the unit has been sufficiently covered already. Some of the benefits of using discussion as a method of learning are that it helps students explore a diversity of perspectives, it increases intellectual agility, it shows respect for students' voices and experiences, it helps students develop skills of synthesis and integration. In addition, by having the teacher actively engage with the students, it allows for them to come to class better prepared and aware of what is taking place in the classroom.

Further examples of the application of the principles of physics include weather forecasting, designing of rockets for space exploration, proliferation of different types of television and use of electronics for communication. It has been affirmed that physics is and will remain the fundamental science (Mankilik & Umaru, 2011, Erinsho, 2013; Aina & Olanipekun, 2014). It can therefore be inferred that other sciences rely on the knowledge obtained through the study of physics. Physics is therefore the pillar of science and technology since it seeks to explain natural phenomena and propels the increase in technological changing society (Zhaoyao, 2010).

Physics is encountered in our daily activities. How a spaceship is launched into space is explained by

the third law. The force of the exploding gases pushes the rocket through the air into space. Once the rockets are in space, the engines are switched off and it keeps on moving at a constant velocity. This is possible because the first law states that an object will move with constant velocity if no net force acts on it. This law also makes us realize the importance of wearing seat belts in cars. The seat belt protects us when a car is involved in a crash.

Studying physics could instill the basic knowledge of life and reasoning abilities that helps one to make ethical decisions on the use of science and technology (Adeyemo, 2010). The challenges of our present society demand knowledge of problem solving, active learning approach and decision making skills.

Statement of the Problem

Despite the fact that science is an important learning area for economic, scientific and technological development, it has resulted in the high rate of failure among the senior secondary school students in physics and other science subjects. Often the educator is blamed for the poor performance among other factors such as availability of teaching facilities and the attitude of the learners towards the subject. Teaching methods therefore, are crucial factors that



affect the academic achievement of students (Erinosho, 2013). The use of lasher's active learning approach in teaching physics in secondary schools has not been reported in Nigeria. This study was therefore, intended to add to the body of knowledge. The study provides empirical evidence on the effects of the active learning approach on English second language Learner's achievement in secondary school physics. Therefore, this study is poised to finding the answer to the question, what is the effect of active learning approach on senior secondary school students' achievement in physics.

Purpose of the Study

The objectives of this study were to investigate the effect of an active learning approach on the achievement of Senior Secondary School (SSS) students in physics. The study was done by comparing the achievements of students taught physics with an active learning approach to that of students taught through traditional direct instruction.

In addition, the study also determined whether learners taught with active learning approach retained the material better than those taught with traditional direct instruction after ten months.

Research Questions

Therefore, the dissertation focuses on the following three questions:

1. How does the use of active learning approach influence student's achievement and retention of knowledge in physics
2. What is the achievement of male and female students taught physics using active learning approach?

Hypotheses

- (I) There is no statistically significant difference in achievement in physics tasks between learners who were taught using the active learning approach (ALA) and those taught using traditional direct instruction (TDI).
- (II) There is no statistically significant difference in achievement of male and female students taught physics using active learning approach.

Research Methodology

The researcher administered the physics achievement test (PAT) to the two groups of students before they were taught. This was done to verify whether the two groups were at similar cognitive level, this was followed by the class room teaching. The two groups were taught the same selected content of subject under similar conditions, the lesson were prepared and guided by the same



objectives. The only differences were that, the experimental group was taught using active learning approach, while the control group were taught without active learning approach. At the end of the teaching period the physics achievement test (PAT) was again administered to both groups, the scripts were collected, marked and the scores recorded for the purpose of analysis.

After the experiment and data collection, the collected data were tabulated for a statistical analysis and the data was analyzed using mean score and standard deviation. The t-

test at 5% level of significance was used to test the hypothesis while the mean scores and standard deviation of the two groups were used to answer the research questions.

Results

Hypothesis One: There is no significant difference in the academic achievement of students taught physics with active learning approach and those taught physics without active learning approach.

The data collected for testing the above hypothesis is contained in Table 1 below:

Table 1: Standard deviation and t-value for subject in the experimental and control groups.

Group	N	D F	SD	t-value calculate d	t- value critica l
Experimenta 1	3 0	58	12.1 2	4.45	2.0
Control	3 0	58	9.81		

From Table 1, the calculated t-value (4.45) is by far greater than the critical value (2.00) at 0.05 level of significance. By this, we reject the null hypothesis, and conclude that students perform much better in physics when they are taught using active learning approach.

Hypothesis Two: there is no significant difference between male and female students taught physics using active learning approach.



The data collected for testing the above hypothesis is contained in Table 2 below

Gender	N	DF	SD	t-value calculated	t-value critical
Males	19	28	10.11	3.30	2.05
Females	11	28	10.72		

From 2 above, the calculated t-value (3.30) is greater than the critical value (2.05) at 0.05 level of significance, by this, we reject the null hypothesis and conclude that male students taught physics with active learning approach perform better than their female counterparts.

Discussion

Two hypothesis been presented for this research have been presented, analyzed and interpreted. The findings will be further discussed in this section.

It was found for table 1 that students taught physics using active learning approach had a mean slope of 56.50. That is, they performed significantly better than their counterparts who were taught the same content but without active learning approach who had a mean score 43.83. The value of calculation from the students t-test at 0.05 level of significance presented in table 2

was also greater than the critical value, therefore, the null hypothesis one is rejected. This means that there is a significant difference in the academic achievement of students taught physics using active learning approach and those taught without using active learning approach.

This study has revealed (from the achievement scores of students) that exposing students to adequate and correct use of active learning approach during teaching of physics makes than understand the subject better. This is line with the findings of Kala (2011) who observed that the quality education children receive has direct bearing the availability or lack of facilities and the overall atmosphere in which learning takes place.

This study agrees with the findings of Tyoasue (2010) who discovered from his research on gender difference in the performance of students in 2006/2007



MOCK/SSCE Physics that there was significance difference in the performance of male and female students in the examination.

Conclusion

It can thus be concluded that:

- i. The correct use of active learning approach has significance effect on student achievement in physics.
- ii. There is need for active learning approach in teaching concepts.
- iii. Male students achieve better in physics than female students when both are taught using active learning approach.

Recommendations

The proceeding recommendations are here in made:

- i. Due to the importance of effective use of active learning approach in teaching, the curriculum for training teachers in Nigerian universities and colleges of education should be revisited with emphasis placed on how to effectively use active learning approach for teaching science subjects, especially physics.
- ii. Government authorities, proprietors and school heads should intensify efforts in purchasing, maintaining/replacing damaged instructional materials and laboratory equipments.
- iii. Professional organizations such as the Science Teachers Association of

Nigeria (STAN) Mathematical Association (MAN) should encourage their members on how to use instructional material during lesson delivery.

- iv. Physics teachers should not see the lack of standard active learning approach in schools as excuse to fail, but rather turn to improvisation of these materials as research has shown that improvised materials have the same effect on students' achievement like the standard active learning approach (Onasanya & Omosewe, 2011).
- v. Government, Ministry of Education, proprietors and school heads should reward teachers who through effective use of active learning approach achieve results.

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