
COMPARISON OF LECTURE AND DISCUSSION METHODS ON ACADEMIC PERFORMANCE OF STUDENTS OFFERING PHYSICS

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Abstract

The study was set out to investigate the significant difference on students' academic performance when taught using lecture method and those taught using discussion method. The samples were selected from Government day Secondary School Tunga Dan Nufe. The researcher made use of purposive sampling technique to select 24 students from lecture method and 24 students from discussion method in Government day Secondary School Tunga Dan Nufe. The researcher used two (2) research Assistants to administer 48 copies of the questionnaire on the respondents. All the 48 copies of the questionnaire were retrieved showing 100 percent return rate. The data generated from the field were collated and the mean score analysis for the items was carried out in order to provide answer to the research question raised in the study. The instrument of the study comprise of ten question and two essay types to answer after post-test, the two tests were compared, the means, standard deviation and the t-test were computed. The two hypotheses formulated were tested and it was discovered that there is significant difference in the academic performance between lecture method and discussion method on post- test. It found out that discussion teaching method is superior over lecture method in teaching physics.

Keywords: Lecture method, Discussion method, Academic performance, Students, Physics.

INTRODUCTION

Teaching and learning are important parts of the process of education which are aimed at the development of learners' understanding and skills with which to become useful citizens in society. Education involves the total efforts of the community to raise its political, social and economic standard of living (Tebabal & Kahssay, 2011). Teaching as stated by Robinson Adjai (1980) is more than just imparting of knowledge but an attempt to help someone acquire some skills, knowledge, Ideas, or change in attitudes through informing, directing, guiding and administering students, identifying what to learn and learning problems, evaluating, reporting and recoding students' performance.

The essence of teaching is to bring about learning Chauhan (1981) defined learning as the acquisition of new ideas, skills, values, and experiences which enable the individuals to modify or alter his action, it also involves the utilization of newly learned concept or acquisition of knowledge to bring, about permanent change in the learner.

The learning and teaching process as highlighted by Chauhan, S.S (1981) includes:

- i. The "input" which is in forms of stimulus or anything that moves or attracts your attention. It may be either a picture or a model.
- ii. The next stage is the "perception"; it has to do with the process of becoming aware of change through the eyes or mind.
- iii. After the perception stage come "covert activities"; this is stage of visible activities that bring about the learning, it is at this stage student can examine, and discuss about the learned object.
- iv. To have a permanent change in behavior there should be repetition of step iii above i.e. to reexamine and re-discuss it again and again.
- v. After repetition comes "Association"; this is the time we can interpret things in the light of our previous experience. We can now reach the stage of "output" or retrieval.
- vi. Chauhan also argued that learning is a continuous process, therefore to stimulate students to learn effectively, teachers should;
- vii. Create avenue for learning in and outside the classroom.
- viii. Inform the students about the educational facilities around them, and how to use e-libraries, laboratories, bookshop and resources Centre.
- ix. Always give the students assignments, teach and discuss the assignments with them.
- x. Encourage the students to develop their area of interest.
- xi. Use the problem solving approach in getting students to learn.
- xii. Use group and individualized method to stimulate the spirit of independent learning among the students.

For effective learning to take place, learning resources must be properly arranged and co-ordinated. Learning resources are those things that help the students in learning. These materials either small or big make learning meaningful and easy. They may be either human resource like the teachers, visual resource like chalkboard, models specimen etc. the audio resources include radio, tape recorder and like; while school environment is resource like buildings, laboratories, libraries etc. these are used to make lessons interesting and gain student attention. They make students more practicable and effective.

In sciences, Physics form the fundamental basis for an argument or theory to other science subjects, technology and engineering (McDermott & Redish, 1990). Therefore, if we must produce good technologists, technology innovators as well as inventors, as a starting point, we need well-bred Physicists and Physics educators which begins right from the secondary schools. Also, the need to increase the number of Physics researchers and

promoting greater collaboration amongst researchers will be of great importance in order to achieve a landmark (Henkel, 2005). The year 2001 report on Physics claimed that; Physics is becoming a thoroughly global enterprise (Appelquist & Shapper, 2001). This transformation reflects on the increasing need for large, complex and expensive facilities for any single nation to build and it is largely a consequence of modern information and communication technology (ICT) which is the heart of the present age of change. Owing to the inevitable role of Physics in the nation's technological development, government at all levels had incorporated the subject in the school curriculum through the research reports of bodies like; National Science and Technology Development Agency (NSTDA), Nigeria Education Research Council (NERC) and Science Teachers' Association of Nigeria (STAN) among others (Tuminaro & Redish, 2004).

In understanding the teaching methodologies, there are four different types of inquiries Vis-à-vis:

a) *Structured Inquiry*: in a structured inquiry, a hands on problem is being investigated by giving the students a procedure and learning materials but the students need not be informed of the expected outcomes.

b) *Guided Inquiry*: in guided inquiry, materials and problem are provided but the students' will have to find their own procedure.

c) *Open Inquiry*: open inquiry is similar to guided inquiry, the only difference is that the students will develop their own problem to be investigated. d) *Learning Inquiry*: in learning inquiry, the students are being engaged in an activity that will introduce a new concept of learning (Llewellyn, 2001).

Government Efforts Toward Improving Achievement in Physics

The Federal Government of Nigeria as well as the 36 States through the various Ministries of Education across the nation is concerned about how to improve the performance or achievement of Students in science especially Physics. The need was in order to develop Nigeria technologically in agriculture, electronics, industry, communication, engineering, and pharmaceuticals etc. This age-long efforts of the government at all levels bring about the idea of establishing institution of higher learning such as universities of science and technology, this has been reflecting in various governments activities in Kebbi State, Nigeria.

Lecture Learning

Herr (2008) opined that "traditional teaching is concerned with the teacher being the controller of the learning environment". Power and responsibilities are held by the teacher and they play the role of an instructor (in the form of lecturer) and the decision maker as regards the content of the curriculum and its specific results. Students are regarded as having knowledge-holes which needs to be filled with the required and specific information. In the traditional teaching method, the teacher is seen as the person who causes the learning process to take place. Johnson et al., (1991) also stated that learning is critically associated with the classroom and it is often more competitive in nature. The contents of the lesson and the method of teaching are very important so that the student can master the knowledge-based via drill and practice.

Discussion learning

Thornton & Sokoloff (1998) opined that: discussion learning is based on the idea that learning is naturally a social act in which the participants talk among themselves. It is through the talk that learning processes take place. On the other hand, Negata & Ponkowski (1981) said that; discussion learning is the umbrella term encompassing many forms of collaborative learning

from small group of projects to more specific form of group work called “collaborative learning”.

STATEMENT OF THE PROBLEM

The method adopted in teaching Physics in the classroom setting has a long way to go in achieving the desired results. However, it is believed that discussion inquiry method will be of greater advantage over the lecture teaching method in achieving a good performance in teaching and learning of Physics at the Secondary School level.

SIGNIFICANCE OF THE STUDY

This study gives sufficient information which serves as an insight into the teaching method to be adopted in the teaching of Physics in Senior Secondary Schools. The study would be of great benefit to the students in terms of; positive interdependence, individual accountability, group processing as well as face-to-face primitive interaction. Also this study would be of great advantage to the teachers and educators in determining the appropriate teaching techniques to be adopted in impacting knowledge on the students.

HYPOTHESES:

1. There is no significant difference in the academic achievement of students taught lecture and discussion methods in teaching and learning physics.
2. There is no significance between the performances of pre-test and post-test by student learning physics using lecture and discussion methods.

METHODOLOGY

This section explains the methodology of this research under the following heading;- Research design, population, sample size and sampling techniques, research instruments, validity of the instruments, method of data collection and method of data analysis.

RESEARCH DESIGN

Experimental research study was employed for establishing relationship between controlled and treatment groups.

Two parallel tests were designed by the researcher. The test topic was drawn from the topic or instruction; Newton laws of motion. After a careful reviews of the topic content the measurable aspects there were noted and question were drawn from the measurable aspects to ensure validity.

The pretest was designed in simple language terms understandable to [he students, since they are not yet introduced to the topic. The post-test which is normally administered after intervention process consists of technical terms related to the topics. The topic taught and the pre-test serve as a basic upon which’ post-p test was developed.

POPULATION

The total population is 496, students out of which is used for this study constitutes a total number of 48 students which can be split into two equal sizes of 24 students each for convenience. The population was selected from 496 total numbers of senior students who offer physics at Government day Secondary School Tunga Dan Nufe.

SAMPLE SIZE AND SAMPLING TECHNIQUES

Stratified randomization procedure was used to draw the samples based on sub-group of the students I.Q scores. Hence, the researcher intends to obtain information or data related

to this study using a sample of 48 senior students who are offering physics in Government day Secondary School Tunga Dan Nufe. The selection was made based on students programmed in physics and moderate understanding of English language.

After delivering the pre-test to the sample of 48 students, scores obtained based on the students' performance were used to split the students into two groups of 24 students each, the division was made in such a way that in each group, there is equal number of above average, average and below average, this grouping was intended to ensure an accurate assessment of the two teaching methods.

The two groups were assigned to lecture and discussion groups respectively and the intervention process was based on these groupings.

RESEARCH INSTRUMENTS

The main instruments for the study consist of pre-test question for a topic and post-test, which were conducted before and after intervention. Content taught during the intervention;

The pre-test and post-test contained 10 multiple-choice questions each and two essay type question to answer one.

The test was written to test the topic content taught during the intervention the topic chosen was Newton laws of motion.

Item one question was to examine the student's understanding of the meaning of the Newton's laws of motion. Items two tested the student's ability to state the mathematical expression of the laws; while item three and four measure student ability to use mathematical approach in solving some numerical problems and definition of velocity and acceleration. Item five and six of the question also tested the students on how to plot a velocity time graph and located the point of maximum velocity and acceleration on the graph. Item seven called on students to come up with various applications of Newton laws of motion

VALIDITY OF THE INSTRUMENTS

The test questions were tested or administered to different set of student on the same category. The result shows the test measured what is expected.

The validation process of the two, then was effectively covered ensuring that only a few if any measurable areas were not left untested. The tests topic which formed part of physics syllabus for senior secondary students and scheme of work and the topic taught were ascertained to be within the student's level of understanding, not below or above their capacity.

METHOD OF DATA COLLECTION

Data gathering procedure was in form of pre-test and post-test pattern, before and after intervention. The student's responses in this process provided us with the outcome needed to accomplish this study. The study class of 48 students constituted the sample population for the pre-test and the post-test, the intervention process also in a group pattern had a population of 24 students in each group. Each group was given varied treatment as allowed by the teaching method in use while discussion method constituted mostly the student activities with little participation and guidance from the teacher. Lecture method on the other hand was as usual teacher dominated; students only listen and copy notes.

The two were both handled by the same teacher under the same classroom condition, except for the variation in teaching method, while the intervention process was going on the researcher invited some colleagues who assessed teacher student's activities, also teacher's students' relationships and level of understanding of the stated objectives among such other parameters. Thereafter, post- test was conducted collectively for the total number of the students that constituted the sample population. The final test scores obtained constituted the bulk of data needed for the study.

METHOD OF DATA ANALYSIS

Correlation statistical tool (t-test) was used to test the hypotheses.

Data analysis took the form of computations to arrive at a decision from the test score.

The mean, variance, the standard deviation and the t-test would be used first on the pre-test for lecture and discussion group and then on the pre-test and post-test of the total population used for the study; and then on the pre-test on each group.

Analysis of the data would be carried out in order to test the hypothesis formulated. Post-test score of lecture and discussion groups would be subjected to t test, analysis; so also the pre-test and post-test results for the whole group which would be tabulate.

T-test is used to determine if the mean performances of two groups are significantly different at selected probability level of 0.5.it is used when the sample is small.

$$T = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{S1^2 + S2^2}{N1 + N2}}}$$

RESULT AND DISCUSSION

DATA PRESENTATION AND ANALYSIS

The following are therefore the format for analysis of data:

1. Analysis of pre-test and post-test scores on group I (discussion group).
2. Analysis of pre-test and post-tees scores on group II (lecture group).
3. Analysis of pre-test and post-test scores on sample students (intact class).

Table I: Mean scores and t-test value for the sample and the study group in pre-test and post-test using lecture id discussion.

Group	Number of Student	Pre-test X ¹	Post-test X ²	T- Value	P. Level	DF
Intact class	48	48.66	36.60	4.00	0.05	47
Discussion	24	58.21	34.29	3.57	0.05	23
Lecture	24	39.00	26.92	2.29	0.05	23

Analysis of data show that the mean scores for the students' performance on the test was as follows;

In group II (lecture group) X = 39.00 for post-test and 26.92 for pre-test, for group I (discussion group) x =58.21 for post-test x=54.29. For pre-test. For the intact class x48.60 for post-test and 30.60 for pre-test the t-test for group I is 3.57, group II is 2.29 and intact class is 4.00.

Analysis of the data has shown that the students' performance on the post- test is better than the pre-test as it recorded the greater means; t-test analysis show a significant difference in their mean score (t-test $4.00 > 0.05$).

Table II: - T-test probably for discussion and lecture group before and after intervention.

Group	Number of Student	Pre-test	Post-test	T-Value	P. Level	DF
		X SD	X SD			
Discussion	24	58.21 28.91	32.21 15.14	3.57	0.05	23
Lecture	24	39.00 26.92	21.18 14.77	2.29	0.05	23

The analysis of the above table shows that the lecture group II has lower mean score compared to the discussion group I. The t-test also shows a significant difference i.e. (t-test = $3.75 > 0.05$).

Table III: T-test for comparison of pre-test and discussion group.

Group	Number of Student	X	SD	T-Value	P. Level	DF
Discussion	24	34.29	15.4		0.05	23
Lecture	24	30.60	14.77	1.68	0.05	23

The analysis of the data above shows that the discussion group I has slightly higher mean than the lecture group II. But the t-test shows an in significant difference of (t-test $1.68 < 0.05$).

Table IV: T-test comparison for post- test on group I and II

Group	Number of Student	X	SD	T-Value	P. Level	DF
Discussion	24	58.21	21.18		0.05	23
Lecture	24	39.00	28.91	2.67	0.05	23

The analysis for table four shows that the performance of students on discussion group I is higher than the performance of the lecture group II after intervention.

Table V: - T-test for pre-test and post-test on the entire sample of students irrespective of treatment.

Group	Number of Student	X	SD	T-Value	P. Level	DF
Post-test	48	48.60	27.06	4.00	47	
Pre-test	48	30.60	15.49	1.68	47	

Analysis of data has shown that the mean score for the students' performance using the two teaching method (discussion and lecture) were as follows: $X=48.60$ for post-test and 30.60 for pre-test. This shows that the performance in post-test after intervention was higher than the pre-test, t-test analysis shows a significant different (t= 4.00 $P > 0.05$) before and after intervention.

LIMITATION OF THE STUDY

This study is limited to two secondary schools and it should be extended to both public and private Secondary Schools in other States of the Federation. However, other

researchers could carry out the study in order to ensure a valid generalization of the findings, other interested researchers could work in tertiary institutions for valid generalization.

CONCLUSION

Conclusively, the result of the analysis for pre-test and post-test of group 1 (discussion group), group 2 (lecture group) and the sample (group 1 and 2) revealed that:

- i. There is significant different in the area of academic performance of group I over group 2 on the post-test, which mean that discussion method is superior over lecture method in teaching physics in our secondary school.
- ii. There is significant different in the mean scores between the pre-test and post-test on group 1 and 2. Meaning that each of the two methods when properly used helps in learning and retention of science among the students.
- iii. A combined effect of discussion and lecture method on student offering physics resulted in a significant increase in the academic performance of the students.

From the above information it there for becomes imperative for teachers of physics to bear in minds that.

- i. Discussion method proved superior in terms of learning and retention of sciences among students.
- ii. Lecture should not be condemned altogether as a teaching method, what matters much about is its used in teaching as the manner of presentation, age and level of the students, individual different among the students and personal qualities of the teachers, such as good voice, fluency on the language of instruction, speed of speeches well as pleasant manner of talking among others.
- iii. Lecture or talking is best used in combination with others methods if it were to benefit the students, hence no teachings can be effective without talking.

RECOMMENDATIONS

Based on the foregoing analysis and discussion the following recommendations are made:

- i. That more research in this area should be carried out and the result be published and made available to enlighten teachers.
- ii. That seminars conference and workshops be organized for teachers to make them fully aware of the advantages of using appropriate method in teaching their students, especially in science subject like physics instead of using only lecture method.
- iii. School administrators should be assigned to impose on teachers the use of improved method of teaching, they should be made to understand that teaching and learning require participation in significant activity and exchange of views. And therefore, use lecture in combination with other methods to facilitate learning in the students.
- iv. Teachers should engage students in significant learning activities like field trips, excursion, visits, debates, quizzes and so on. Teachers should also call upon the school administrators to support the activities where need be.
- v. Since individual difference among students determined the choice of teaching method, teachers should carry out studies of their own in this area using their own students where possible. In order to determine which method or a combination of methods best suit his/her students and adopt it.
- vi. Also since a lot of preparatory work is required on the part of the teachers, some incentives should be made available to enhance the teachers' performance, like the science teacher allowances.
- vii. Teachers' trainers should make enough provisions in terms of material and encouragement to make teachers more competent in their field of specialization.

- viii. Since discussion method requires a lot of time and money intern of the facility and space needed, the federal and state ministries of education should be made to allocate certain amount of money for the purchase of materials, and make available other materials needed and plan the school time table to suit the need of any teaching method.

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