



Effects of Teaching Methods on Optimization of Students' Achievement on Difficult Topics in Basic Science

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Abstract

The study sought to ascertain the effect of teaching methods on optimization of student's achievement on a difficult topic in Basic Science. The experimental design employing pre test post test was adopted. The sample for the study consists ninety students (45 female and 45 male) selected based on matched randomization and then randomly assigned to lecture group, discussion group, and demonstration group. Each of these three groups was exposed to a four-week instruction on "force". After the treatment all the subjects in the three groups were evaluated using Basic Science Achievement Test (BSAT). The BSAT and the lesson plans for the group were validated by 3 experts. Reliability coefficient of the instrument was computed using Pearson Product Moment Correlation and found to be 0.86. Mean and standard deviation were used to analyze data collected. The major findings include: Demonstration method was found to be effective in teaching difficult topic and that effectiveness of demonstration of demonstration method does not depend on students' initial ability. Based on the result, it was recommended among others that demonstration method of teaching should be adopted to enhance students' learning in Basic Science.

Keywords: Discussion Method, Demonstration Method, Lecture Method, Optimization, Achievement, Difficult Topics and Basic Science

Introduction

The reflection of the importance of Basic Science formerly known as an integration of Science subjects such as biology, chemistry, physics, geography to which the child is exposed at a very impressionable stage calls for serious attention (Agu & Odimegwu, 2006). Basic Science serves as a means of capturing the interest of the learners to appreciate science and as well as to equip these learners with the intellectual skills in science necessary to appreciate science and technology. It is designed to develop interest in the learner and to encourage the learner to pursue further studies in science discipline. The ability to capture and sustain the interest of the students can be achieved

if the teacher is able to choose effective method for each topic.

In Nigeria, various science teachers are making several efforts to improve their effectiveness in teaching through seminar (Maduabum, 2006). So many researchers have tried in identifying effective science teaching through assessment of science teaching methods, attitudes of science teachers and so on. Effective teachers strive towards encouraging and engaging students in learning rather than accepting that some students cannot achieve success. They do all they can to make every student successful because, they believe that every student has the ability to achieve success at school. The researcher discovered from 13 years of



experience as an Integrated Science /basic Science teacher that JS 1 students do not perform well in some topics such as force and man in space. As a way forward, there is need to ascertain effective method of teaching “force” as a difficult topic. Teachers who succeed in teaching difficult topics effectively are teachers who make learning exciting and meaningful (Druger, 2009). The nature of Basic Science is such that it demands a lot of practical; it requires also analytical and critical observation. In order to achieve successful learning, the students must acquire the knowledge in integrated manner (Cascales, Solano & Leon, 2001).

The search for solutions to the effective way of teaching “force” as a difficult topic to JS 1 Basic Science students may fail if one does not look towards the direction of “little things that matters”, such as effective teaching methods. One may argue that a teacher who has spent years in school, involves in active teaching, need not be bordered with the relics on teaching methods. But then, students’ persistent poor achievement in the topics, is a call for concern. Thus, there is need to device a teaching method that will help optimize students’ achievement in identified difficult topics. This highlights the need for effective teaching methods. The ability of the teacher to choose suitable instructional method remove the difficulties encountered in presenting a particular task to the students and also facilitate easy understanding of the topic by the students (Barrows, 1994). The problem of teachers is to discover the teaching method appropriate for a particular topic. Lack of proper teaching method in Basic Science can result to poor performance of students in the subject; therefore, effective teaching is crucial building block of high achievement in Basic Science. Appropriate teaching methods

adopted by teachers help very much in teaching of difficult topics.

A teaching method comprises the principles and the strategies used by teachers to facilitate learning. These strategies are based on two things – subject matter and the nature of the learner (Maduabum, 2006). In this study, three teaching methods were adopted in order to ascertain the most effective method of teaching “force” as a topic in Basic Science. These methods are lecture, demonstration and discussion methods. Lecture method is an oral presentation of information by the instructor. It is the method of relaying on factual information which includes principles, concepts, ideas and all theoretical knowledge about a given topic. In lecture method, the learners are passive; they are required to learn through listening and understanding. To be effective in promoting learning, the lecture must involve some discussions and question and answer period to allow learners to be involved actively. Discussion is a two-way communication between participants (learners) and the teachers. In the classroom situation, the instructor and the participants take part in discussion. The discussion is therefore, a more active learning experience for the participants than lecture method. It is a means by which people share experiences, ideas and attitudes. It helps to foster learners’ involvement in what is being learnt.

Demonstration method is a method of instruction where the instructor by actually performing an operation shows the students what to do, how to do it and through explanation brings out why, where and when it is done. The most effective way to teach an occupational skill is to demonstrate it.



The consideration of the need for effective teaching of difficult topics such as force and as well change negative attitudes which may have been developed in the budding Basic Science students in our secondary schools, calls forth a research of this nature. This research seeks to ascertain whether the teaching methods used will result in significant achievement (gain) in teaching force.

The problem of this research therefore is to expose students to teaching methods and then determine the most effective method of teaching force as a difficult topic. Based on this, the following question was posed to guide the study

1. What is the effect of lecture, discussion, and demonstration methods on students' achievement in force in Basic science?

Also based on the research question, this hypothesis was formulated.

There is no significant effects of lecture, discussion and demonstration methods on students' achievement in force topic of basic science.

Research Method

This study is an experimental design employing pretest posttest design. The design is considered appropriate as this experiment is to determine the effective method of teaching force as a difficult topic which can only be done under controlled conditions. The study was carried out with focus on Basic Science students in Junior Secondary one (JS1) located in Okigwe education zone of Imo State. Okigwe education zone is made up of eleven secondary schools found in Okigwe local government area. The school used for this study; urban model Secondary school is situated in Okigwe local government area. Okigwe local government area is in Imo

State and also in South East geographical zone of Nigeria. The population of the study comprised all Junior Secondary one (JS1) Student in Urban Modern Secondary School Okigwe totaling one hundred and eighty-two (182) students (Aguata Community Secondary School record 2018) From the seventy-four (74) secondary schools in Okigwe education Zone, one co educational school Urban Modern Secondary School Okigwe was purposively selected for the study; a co educational school was used to enable the researcher ensure even gender distribution within the groups. The sample for the study consisted of 90 students (45 females and 45 males) who were selected based on the methods known as match randomization. This was done by getting the first term Basic Science scores of best 21 and last 24 male students and also best 21 and last 24 female students. Three subjects of the same gender with the same score or nearly identical scores were assigned at random one to lecture method, one to discussion method group and the other to demonstration method group.

The Basic Science Test (BST) designed by the researcher and based on the approved syllabus of the Junior Secondary School one (JSS1) in Basic Science was used. The test was on the most difficult topic "force". The test covered the concept studied "force". The teacher made tests designed by the researcher for the experiment has face and content validity. This was revealed by the test blue print used for the teacher made test analysis. In testing for reliability, the test retest method of ascertaining consistency over time was applied copies of Basic Science test (BST) were administered to 20 JS 1 students who did not take part in the final experiment. The test was administered again after two weeks. Computation of the Pearson Product Moment Correlation



between the two sets of the scores yielded a coefficient of 0.86 for stability over time, which the researcher considered adequate for the study. Subjects in the three groups were pretested using the Basic Science Test (BST) used for the post test to determine the level of achievement before the treatment. Different teaching methods (lecture, discussion and demonstration) were used for the treatment. The lecture group, discussion group and demonstration group received lessons on force. These groups were taught for 40 minutes ie 2.05pm to 2.45pm on Tuesday, Wednesday and Thursday

respectively for 4 weeks. None of the groups was aware of its group status in order to reduce experimental bias. After the treatment all the subjects in the three groups were evaluated in order to obtain the post test scores.

Mean scores and standard deviation were used in answering the research questions. The hypothesis was tested using ANCOVA.

Research Question One: What is the effect of lecture, discussion, and demonstration methods on students' achievement in force in Basic science

Table 1: mean achievement scores of lecture, discussion, and demonstration methods in basic science

Methods	N	Pretest		Posttest		Mean gain
		Mean	SD	Mean	SD	
Lecture	30	3.4000	.498	7.3000	.466	3.9
Discussion	30	3.2667	.521	8.2000	.407	4.93
Demonstration	30	2.8333	.699	9.2667	.450	6.43
Total	90	3.1667	.623	8.2556	.919	5.09

Result in table 1 show the mean achievement scores of lecture, discussion and demonstration methods. Result showed that lecture method had a pretest mean achievement score of 3.40 with a standard deviation of .498 and a posttest mean achievement score of 7.30 with a standard deviation of 0.47. The difference between the pretest and posttest mean achievement score for lecture method was 3.9. Discussion method had a pretest mean achievement score of 3.27 with a standard deviation of .521 and a posttest mean achievement score of 8.20 with a standard deviation of 0.41. The difference between the pretest and posttest mean achievement score for lecture method was 4.93. Demonstration method had a pretest mean

achievement score of 2.83 with a standard deviation of .70 and a posttest mean achievement score of 9.27 with a standard deviation of .450. The difference between the pretest and posttest mean achievement score for lecture method was 6.43. However, for the three teaching methods the posttest mean achievement scores were greater than the pretest mean achievement scores with the demonstration method having higher mean gain than other two teaching methods.

H01: There is no significant effects of lecture, discussion and demonstration methods on students' achievement in force topic of basic science.



ANCOVA Test for the Effect of Lecture, Discussion and Demonstration Methods on Students' achievement in force topic of basic science.

Source	Type III sum of squares	df	Mean square	F	Sig.	Partial eta Squared
Corrected model	58.1999	3	19.400	98.588	.000	.775
Intercept	186.770	1	186.770	949.153	.000	.917
Pretest	.044	1	.044	.223	.638	.003
Method	50.933	2	25.466	129.419	.000	.751
Error	16.923	86	.197			
Total	6209.000	90				
corrected total	75.122	89				

a. R squared = .775 (adjusted R squared = .767)

Table 2 shows the calculated f- value of 129.419 with the associated probability value of 0.000. Since the associated probability (.000) is less than 0.05 level of significance, the null hypothesis was rejected. Therefore, teaching methods have significant effect on achievement of students in basic science.

Discussion of Findings

From the analysis and interpretation of data, it was discovered that demonstration method was effective in optimizing the achievement of Basic Science students. The achievement of the students was low during pretest but after the treatment there was a positive change. Interestingly, the results revealed that the mean achievement score of demonstration method group was higher than the other two methods (lecture and discussion method). Therefore, the exposure to demonstration method facilitate students 'learning by optimizing their achievement on difficult topic. This study is not alone in affirming the particular worth of demonstration method. Odukoye, (1994) revealed that children understand and learn faster through learning to do by doing. Education Daily, (1991) affirms that children learn understand and learn faster through active participation and activities. It however, concurs with the findings of

Ogunniyi, (2003) that the most essential teaching skill is the ability to demonstrate and that of Ugwu, (2000) who considered demonstration method as the rightful tool for effective teaching.

Conclusion

The findings of this study revealed that the most effective method in teaching difficult topic is demonstration method. Consequently, the use of demonstration not only facilitates subjects' learning but also optimizes their achievement on the topic. This is not surprising because the criteria for effective teaching can be achieved through the method adopted by the teacher. Demonstration, discussion, lecture method and a lot more are at the teacher's disposal. Therefore, every teacher should make his teaching meaningful by adopting a suitable teaching method for every topic.

Recommendations

The findings of this study have made it possible for the following recommendation to be made.

1. Demonstration method of teaching should be repeatedly used as to enhance students learning.
2. Adequate fund should be made available by government to school heads for provision of instructional



materials for adequate demonstration.

3. Demonstration tables should be provided in Basic Science laboratories to enable teachers to be effective in their demonstration skills.
4. Teachers should be exposed to demonstration method through regular involvement in seminars, conferences and workshop.
5. Demonstration methods should be used as school-based teaching method for difficult topic in Basic Science.

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