EFFECTS OF INTERACTION PATTERNS ON STUDENTS ACHIEVEMENT AND INTEREST IN MAGNETISM IN BASIC ELECTRICITY IN TECHNICAL COLLEGES IN SOUTH-SOUTH, NIGERIA.

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Abstract

This study investigated the effects of interaction pattern on students' achievement and interest in magnetism in Basic Electricity in technical Colleges in South-South Nigeria. It was guided by two research questions and two hypotheses. The design was quasi experimental study, out of the population of 801 Senior Technical Class Two (STC II) students, sample of 268 STC II students drawn by purposive and simple random method from four Colleges was used for the study. The four Colleges were assigned to experimental and control groups respectively using simple random sampling. Two intact classes in each College (one as experimental and the other as control group) were randomly selected. Instruments (BEAT and BEIS) were developed, validated and reliability duly established before using them to collect data. The research questions were answered using Mean and Standard Deviation while Analysis of Covariance (ANCOVA) was used to test the hypotheses. The finding were that the mean achievement and interest scores of STCII students in experimental group was significantly higher than those in the control group. Based on these findings some recommendations were made.

The school system is a private or public educational establishment and one of its responsibilities is charged with the provision of training programmes which will help to meet the human resources needs of the nation. One of such school programmes where the youth are provided with the opportunity to acquire the skills and knowledge for effective nation building is the technical College programme.

Technical Colleges provide the students with programmes in Vocational areas for a period of three years. According to Akpan (2003), Technical Colleges are designed to prepare individuals to acquire practical skills, basic scientific knowledge and work attitude required as craftsmen and technicians at sub-professional levels. Okoro (2006) stated that Technical Colleges are regarded as Principal Vocational Institutions in Nigeria that give full vocational training intended to prepare students for entry into various occupations as artisans, craftsmen and technicians.

Basic Electricity is one of the fundamental subjects offered in electrical installation and maintenance practice, Radio and Television (RTV) and electronics trades. The subject deals with all the basic issues involved in electricity and electronics technology as well as other engineering crafts. According to Bird (2007), Electricity is the set of physical phenomena associated in the presence and flow of electric charge. Nilsson & Riedel (2007) also defined electricity as the type of energy fueled by the transfer of electrons from positive and negative points within a Conductor. Electronics, on the other hand, deals with electrical circuits that involve active electrical components such as vacuum tube, transistor diode and integrated circuits and associated passive interconnection technologies (Theraja, 2007). Basic Electricity, therefore deals with all the fundamental issues of current and static electricity as covered in the closely – related field offered in the technical college up to the terminal certificate level. Hence, Basic Electricity is offered as a general subject to Electrical, Radio and Television students in the Technical Colleges and any teacher from either of the departments can teach it as the other departmental subjects. The purpose of teaching these subjects is for students to learn effectively. This is because educators generally agree that the purpose of formal teaching is for learning to occur (llori, 2004). The first evidence of the effective learning is a bright academic performance in terminal and certificate examinations. In education, the academic performance of a student in a paper and pencil test or examination is represented by a test score or grade that is usually called students' achievement score or grade or simply achievement.

According to Okoye (1997), academic performance is called achievement score because it shows much of the knowledge and skills gained by the student after being taught the course content upon which that examination is based. Nworgu (2006) stated that achievement score shows the degree of attainment of an individual in academic task, course or performance to which they were sufficiently exposed. Hence, it is the evidence that technical college students have gained all these Electrical – Electronics achievement scores in the National Business and Technical Examination (NABTE).

These continuous poor academic achievement reduces students interest in electrical – electronics studies and had other adverse effects on the entire programme objectives. Obodo (2004), defined interest as the feeling of intent, concern or curiosity about an object. It is also regarded as the condition of wanting to know or learn about some object. Students usually hate a subject which records high rate of failure in certificate examination. Considering the poor performance of technical college students

with the attendant deterioration of interest and attitude in the programme of study, one is bound to be worried. For example, in the year 2008, out of the 135 students that sat for winding of electrical machines at GTC Port Harcourt, Rivers State, 126 students had failed grade representing 93% failure while nine passed with different grades representing seven percent,

(NABTEB, 2008). In the same year, 23 students sat for Radio Communication (Electronics) at GTC Port Harcourt, six had passed and 15 failed representing 65% failure. Again, in 2009 at GTC Ahoada, Rivers State, 83% of the enrolled students failed winding of electrical machines (NABTEB, 2009)

Many reasons have been advanced for the dismal state of basic electricity and other electrical – electronics subjects. While some are of the view that the teachers incompetence is a contributing factor, others attribute the poor performance in Basic Electricity and other electrical – electronics subjects in National Business Certificate (NBC) and National Technical Certificate (NTC) examinations to teachers non utilization of appropriate instructional strategies. Various teaching methods are used by technical teachers in teaching Basic Electricity in order to bring about a meaningful learning. These include lecture method, discovery method, project method, demonstration method etc.

The most commonly used is the lecture method, this method is employed by many Basic Electricity teachers because of its advantages which include, it saves time and energy, it encourages the art of note taking, lecture method also encourages student to read widely and it also allow the teacher to cover a lot of ground within a short time. Despite these advantages, this method had failed to encourage creative thinking in the learner leading to poor achievement of the student. Okoli (2011) states that many teachers prefer the lecture method of teaching which is teacher centered. This teaching method may not enhance achievement or promote positive attitude to students, hence, there is need to adopt strategies that might improve the teaching and learning of Basic Electricity by exploring the use of some innovative learner centered teaching method called “Interaction Pattern”.

Interaction means the action or influence of person or things on each other reciprocally. Hornby (2005) simply defined Interaction as the influence on each other of people working together. It is a two-way communication system where there is exchange of responses or action between the involved parties. In the class room or laboratory, the predominant way or regular way in which interaction happens is called interaction patterns (Anaekwe, 1997). Class room interaction patterns explain the ways students and teachers relate in class. This can be:

(a) Teachers–Student’s interaction patterns, that is, interaction between teacher and an individual student or group of students.

(b) Students – Students interaction patterns, that is where students react to each other’s action, attitudes and opinions during class sessions. Student–Students

interaction patterns are further divided into cooperative, competitive and individualistic interaction patterns.

(c) Teacher – materials interaction patterns, that is, when the teacher is manipulating instructional materials, machines, equipment for the purpose of skill learning.

(d) Student – material interaction patterns, that is, when students work on instructional materials, machines and equipment to solve practical problems or experiment with specimens and model (Shomoosi, 2004). Class room interactive teaching using interaction patterns as an instructional strategy where by the teacher consciously and skillfully plans and executes every lesson so that all the various interaction patterns are effectively applied in each lesson delivery. Looking at the various teaching methods so far reviewed, it could be seen that these interaction patterns/techniques might be more efficient in teaching and learning of basic electricity thereby improving students achievement and interest in the subject. Against this background therefore, the need arose to determine the effects of interaction patterns on students achievement and interest in magnetism in Basic Electricity in Technical Colleges in South – South Nigeria.

Statement of the Problem

The persist poor achievement and interest of students in Basic Electricity as revealed by both research findings and chief Examiner Reports call for concern. The problem has to a large extent been attributed to ineffective teaching method employed by the teachers and especially lecture method which is teacher centered.

Consequently, there is a great need to improve the teaching and learning of Basic Electricity by exploring the use of some innovative learner-centred teaching methods, since meaningful learning may be as a result of active participation of the students but the large nature of Nigeria classes had had their practicability nearly impossible. Moreover, the lecture method has failed to recognize the technical based subjects. This calls for the trial of another learner centered activity oriented method. Hence, the problem of this study is to find out the effects of interaction patterns on students achievement and interest in magnetism in Basic Electricity in Technical Colleges in South-South Nigeria.

Purpose of the Study

The purpose of this study is to investigate the effects of interaction patterns on students' achievement and interest in magnetism in Basic Electricity in Technical Colleges in South – South Nigeria. Specifically, the study intended to:

1. Determine the effects of class room interaction patterns on students achievement when taught magnetism in basic electricity.
2. Determine the effects of class room interaction patterns on students interest when taught magnetism in basic electricity.

Research Questions

The following research questions guided the study,

1. What are the mean achievement scores of senior technical class two (STC 11) Basic Electricity students taught "magnetism" with interaction patterns and those taught the same topic using lecture method.
2. What are the mean interest scores of senior technical class two (STC 11) Basic Electricity students and those taught same topic using lecture method.

Hypotheses

The following hypotheses were tested at 0.05 level of significance

$H0_1$: The mean achievement scores of Basic Electricity students taught "magnetism" with interaction patterns will not differ significantly from those taught the same topic using lecture method.

$H0_2$: The mean interest scores of Basic Electricity students taught "magnetism" with interaction patterns will not differ significantly from those taught the same topic using lecture method.

Methodology

The design of the study was Quasi-Experimental Design of the pre-test and post-test – non equivalent Group Design, using intact classes without randomization. The study was conducted in Senior Technical Class Two (STC II) Basic Electricity Students in Technical Colleges in South-South Nigeria. The population of the study comprised of all senior technical class two (STC II) students offering Basic Electricity, numbering 801. The sample used for the study was 268 STC II students (128 Interaction Patterns) group and 140 lecture method group) drawn out from the four technical Colleges in Delta and Rivers State. Purposive sampling method was used to select the four technical Colleges from the twenty six technical Colleges in South-South Nigeria. Simple random sampling was used to select two intact STC II Classes in each of the four technical Colleges and for assigning the intact classes to experimental and control groups.

The instrument used for data collection was Basic Electricity Achievement Test (BEAT) containing thirty multiple choice questions and the Basic Electricity Interest Scale (BEIS) containing twenty five multiple choice questions. The items were developed from magnetism as contained in STC II Basic Electricity curriculum. The BEAT and BEIS were subjected to both face and content validation. The content validity was ensured using the table of specification for both the BEAT and BEIS. The reliability of the instrument was established through trial testing of the instruments on a group of STC II Basic Electricity students not used in the study. Two forms of reliability were established. The BEAT was established using the Pearson Product Moment Correlation method with a correlation coefficient of 0.87 while that of BEIS Instrument was 0.79 using Cronbach Alpha method.

The research assistants adopted the following procedure in the administration of the instruments before the treatment; the research subjects were given the pretest. The main treatment for the study was the teaching of the five units of the content, "introduction to magnetism – Electromagnetic induction". Two lesson plans were developed for the teaching of the experimental and control group. The experimental lesson plan was used for the teaching of the experimental group where the students learn and implement experimental vocabulary while the control lesson plan was used for the teaching of the control group which does not involve scientific experiment. This lasted for six weeks. After the treatment, the post-BEAT and BEIS was administered to the subjects in both the experimental and control group. After the Post-BEAT and BEIS, the retention test was administered with the pre BEAT and BEIS.

The scripts for the pre test, post and retention test were marked by the researcher and the students' scores recorded. Mean and standard deviation were used to answer research questions while Analysis of Covariance (ANCOVA) was used to test the hypotheses at 0.05 level of significance.

Data Presentation and Analysis

The results obtained were presented and analyzed in the tables based on the research questions and the hypotheses.

Research Question 1:

What are the mean achievement scores of senior technical class (STC II) Basic electricity students taught magnetism with interaction patterns and those taught the same topic using lecture method?

Table 1: Mean Achievement Scores and Standard Deviation of Students in Interaction Patterns and Lecture Method.

Code	Types of Test	Mean	Standard deviation	N
Interaction	Pre –(BEAT)	10.20	2.86	128
Patterns (1)	Post (BEAT)	18.88	3.06	
Lecture Method	Pre –(BEAT)	10.36	2.85	140
(2)	Post (BEAT)	14.78	4.07	
Total		13.55	3.21	268

Source: *Field Study 2013*

Data Table 1 shows that the mean achievement scores of the experimental group in the post BEAT was 18.88 with a standard deviation of 3.06. This mean is higher than that of the control group with a mean of 14.78, and standard deviation of 4.07. This gives a difference in mean achievement scores of 4.10 in favour of the interaction patterns and

their standard deviation difference is 1.01 in favour of lecture method. The Pre BEAT-Post BEAT gain of 8.68(18.80-10.20) for the experimental group was also higher than that of the control group which was 4.42(14.78-10.76) and their standard deviation difference is 1.22 in favour of experimental group. The experimental group therefore achieved more than the control group.

Hypothesis 1:
The mean achievement scores of Basic electricity students taught "magnetism" with interaction patterns will not differ significantly from those taught the same topic using lecture method.

Table 2: ANCOVA Table of Students Scores in Basic Electricity Achievement Test (BEAT) N = 268

Source of variation	Degree of freedom (df)	Sum of Squares	Mean square	F. Value	F. (Significance)	Decision
Between Groups	1	1078.36	1078.36	81.85	0.000	Rejected
Within Groups	265	3491.18	13.17			
Total	**266**					

The result in table 2 indicates that method of instruction is a significant factor in students mean achievement scores, HO_1 is therefore rejected. This means that there is significant difference in the mean achievement scores of students taught with interaction patterns and those taught with lecture method. The experimental group achieved significantly higher than the control group in Basic Electricity test. Hence, the use of interaction patterns influence students' achievement in Basic Electricity.

Research Question 2:
What are the mean interest scores of Senior Technical Class Two (STC II) Basic Electricity students taught "magnetism: with interaction patterns and those taught the same topic using lecture method.

Table 3: Mean Interest Score and Standard Deviation of Students in Interaction Patterns and Lecture Method.

Code	Types of Test	Mean	Standard Deviation	N
Interaction patterns (1)	Pre –(BEIS) POST (BEIS)	45.29 61.35	8.23 13.15	128
Lecture method (2)	Pre –(BEIS) POST (BEIS)	45.11 59.42	8.16 12.36	140
Total		13.55	10.47	268

Source :*(Field Study 2013)*

In table 3, the mean post interest score (BEIS) of 61.35 with standard deviation of 13.15 for Experimental group is higher than that of control group which had a mean interest score of 59.42 with a standard deviation of 12. 36. Therefore, the difference in the mean interest score between the two group which 1.93 is in favour of experimental group. Also the experimental had Pre BEIS-Post BEIS gain of 6.06 which is higher than that of the control group with a gain of 4.31. This indicates that students exposed to interaction patterns strategy gain more interest in the Basic Electricity content than those exposed to the control group.

Hypothesis 2:

The mean interest scores of Basic Electricity students taught "magnetism" with interaction patterns will not differ significantly from those taught the same topic using lecture method.

Table 4: ANCOVA of Students Mean Interest Scores in Basic Electricity Interest Scale (BEIS)

Source of variation	Degree of freedom (df)	Sum of Squares	Mean square	F. Value	F. (Significance)	Decision
Between Groups	1	215.77	215.77	1.33	0.25	Rejected
Within Groups	265	162.40				
Total	**266**					

The data in table 4 indicates that method is a significant factor on students interest in basic electricity at p=0.05. The F- value of 1.33 is greater than the F- significance of 0.25 at 5% probability level thus, hypothesis 2 is rejected. This means that there is significant difference in the mean interest score of students taught with interaction patterns and those taught with lecture method. The interaction patterns resulted to higher mean interest scores than the lecture method in basic electricity interest scale (BEIS). Hence the use of interaction pattern strategy influenced interest in basic electricity.

Discussion of Findings:

From table 1 the findings revealed that students exposed to interaction pattern strategy (experimental groups) had a higher mean achievement scores in Basic Electricity Achievement Test (BEAT) compared with their lecture method (control group) counterpart. This is further confirmed by high achievement which indicated that instruction method was a significant factor in the achievement of students in the basic electricity content. This means that the students who were taught using the interaction patterns strategy performed better than those who were taught using lecture method. The reason for the better performance by interaction patterns (experimental group) was that the students were able to link the new concepts to the relevant concepts they were familiar with. Thus, the result of the study revealed that the adoption of relevant instructional strategies enhanced meaningful learning of electrical- electronics course. This study is supported by Okebukola's (1992) view that students demonstrate greater understanding of mathematics as a result of their exposure to the concept mapping strategy.

Table 3 revealed that the students in interaction patterns (experimental group) had a greater mean interest than the lecture method (control group). The table 3 shows that students in interaction patterns (experimental group) had greater interest score. Hence the use of interaction pattern strategy enhanced the interest of students in basic electricity. This is in compliance with Agwagah's (2004) findings that the instruction in mathematics reading which was given to students for a period of six weeks, significantly improved their interest in Algbra. The results of this study vindicate Eze-Ugo(1999) findings that students exposed to interaction patterns techniques show greater interest in basic electricity content than those who were not.

Conclusion:

The following conclusions are made based on the findings of this study, the result of this study provides the empirical evidence that the interaction pattern strategy enhanced students achievement and interest in basic electricity. The students taught using the conventional techniques (lecture method) achieved less. This performance in basic electricity depended on the method of instruction.

Recommendations:

The following recommendations are made based on the findings of the study

1. Since interaction pattern is found to be an effective strategy for improving students interest and achievement in basic electricity, the basic electricity teachers should accept it as one of the strategies to be used in the basic electricity classroom.

2. Workshops/Seminars should be organized for serving basic electricity teachers. This will enable them learn how to use the strategy in teaching the subject.

3. Authors of basic electricity text books should illustrate the application of interaction patterns in their texts.

4. State and Federal governments should evolve interest motivating packages for electrical- electronics students, considering the hazardous nature and difficulty of their course offering and the importance of basic electricity.

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