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STANDARDIZATION AND INDEXING OF BASIC ELECTRICITY TEACHER EFFECTIVENESS IN SOUTH EASTERN NIGERIA

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ABSTRACT: *This study provided Standardization and indexing of Basic Electricity Teachers effectiveness in the South Eastern states of Nigeria through effective classroom interaction analysis techniques. Four research questions and four research hypotheses guided the study. Pre-test, post-test, control group, quasi-experimental design was adopted for the study. Samples of 12 teachers and 511 SSII Basic Electricity students were randomly drawn from the population of 57 Basic Electricity Teachers and 932 students. Three validated instruments were used for data collection as follows: Basic Electricity interaction categories (BIC), Basic Electricity Interest Scales (BEIS) and Basic Electricity Achievement Test (BEAT). They were structured to cover the critical indices and criteria for wholesome teacher effectiveness. The reliability coefficient of the instruments were 0.978, 0.60 and 0.977 respectively. Percentages, mean and standard deviation were used to answer the research questions while t-test statistic and analysis of covariance (ANCOVA) were used to test the hypotheses at 0.05 level of significance. The findings of the study revealed the mean of means of critical teacher effectiveness indices and hence Basic Electricity Teachers' effectiveness Benchmark was 58.75 score. It was then recommended that the federal and state ministries of education and Teacher Registration council should adopt this benchmark and enforce it for Basic Electricity Teachers recruitment, promotion and other academic/professional awards/rewards. After the efficacy had been established, this benchmark can then be adopted nationally for all teacher effectiveness assessments at all levels of education in Nigeria.*

KEYWORDS: Indexing, Basic Electricity, Teacher, Classroom Interaction

INTRODUCTION

One of the greatest problems facing Nigerian educational system is lack of an established and constantly used bench mark for assessing teachers' effectiveness practically on graduation, recruitment, promotion and day- to- day fitness for the job. FRN (2004) recognized that no education system can rise above the quality of its teachers and thereby demanded that teacher education programmes in Nigeria should be structured to equip teachers for the effective performance of their duties, but the benchmark for teacher effectiveness is theoretically and utopialy set. Theoretically, because of the assumption that teacher effectiveness correlates positively or equates with the theoretical curriculum which the teacher graduated from. Utopially, because paper qualification (certificates and degrees) are assumed to speak directly for teachers effectiveness. Now, the fact remains that not all holders of certificates or degrees in Nigeria can be effective in their job performance especially at the present level of proliferation of education programmes nation wide (satellite campuses, affiliation programmes, evening programmes, distant learning programmes and Open University programmes). These resulted to the noted problems of persistent students' poor cognitive achievement, loss of interest, poor attitude to lessons and programmes, students drop-out,

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general apathy and even closure of some technical colleges or departments (NABTEB, 2006 and Ama, 2006). Having noted the ineffective, non-integrative and inefficient teaching methods and techniques generally applied by technical teachers, Oyelami (2000) therefore attributed the above problems to teacher ineffectiveness. This calls for an assessment benchmark to ensure that all-comers that are not practically effective in their job performance are shown their way out.

According to Hornby (2001) benchmark is a standard example or point of reference for making comparisons. The concept of bench mark is of physical science origin signifying a mark cut on a rock or concrete post by surveyors of old for measuring comparative levels. In education, it is an empirically established standard point of reference for comparing qualities of programmes, methods, facilities, equipment or activities (Bishop, 1986). In technology and vocational education, practicability is the watch word, hence benchmark is seen here as a practical yard stick for measuring quality and standards (Orange, 2002). It is a practical point of equality between two variables. The problem now is that this practical point, a yard stick or benchmark for assessing teacher effectiveness in Nigeria is not in existence. Teaching practice supervisors do not have it; NCCE do not have it; NUC do not have it, Teacher Registration Council do not have it. What these authorities have are subjective rating scales or check lists which have no relevance to teacher effectiveness evaluation/assessment. Hence this study sought to establish for the nation an objective and empirically valid benchmark for assessing technical teacher effectiveness of Basic Electricity teachers in south Eastern Nigeria which can be adopted in other areas of education.

Basic Electricity is the fundamental subject of study in the fields of electricity and electronics at all levels of Education (Ogbu, 2010). It deals with all the fundamental issues of current-electricity, static-electricity and electronics as studied in schools and colleges. Basic Electricity is so important that students academic performance in it is so crucial and major determinant of their performance in other electronics/electricity (E/E) subjects. This demands competence, efficiency and effectiveness on the part of the teacher in other for students to achieve maximally in Basic electricity.

Teacher effectiveness is simply the ability of the teaching activities of the teacher to produce the expected good learning outcomes on the learner. Bad or negative effects are excluded in teacher effectiveness research. Therefore, teacher effectiveness is the production of expected good learning outcomes (cognitive, affective and psychomotor) by the good teaching behaviours of the teacher which encouraged maximum good learning behaviours from the students (Brophy and Good, 19$6). These definitions highlight the conceptual complexity of teacher effectiveness that led to the difficulty in its measurement. Hence Medley (1987) demanded that three distinct criteria must be used to assess teacher effectiveness, as follows: (a) behaviours of the teacher while teaching (b) learning behaviours or experiences of students which the teaching provided and (c) the outcomes of the teaching (students achievement). These, criteria therefore agreed with Brophy and Good (1986) who had earlier stated that it is a misnomer to equate teacher effectiveness with only success in producing students achievement gain. Hence the major problem of this study was to establish the benchmark on Basic Electricity Teachers effectiveness in line with these criteria which no body had risked his hand in Nigeria because of the difficulty, complexity and involvement. The only technique of establishing Basic Electricity teacher effectiveness that can handle these complexities is the classroom interaction analysis. Classroom interaction analysis is the process of studying classroom interaction patterns by examining the various elements of the

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instructional system and their reciprocal inter-play or relationships. The aim being to understand, describe and assess the way in which the teaching-learning process happens or moves progressively. Galton (1995) defined interaction analysis as a structured or systematic classroom observational technique derived from Flanders Interaction Analysis Category System (FIAC). It involves the spontaneous analysis of the four broad types of classroom/laboratory interaction patterns, such as (a) teacher-student interaction pattern (b) student-student interaction pattern (c) teacher material interaction pattern and (d) student material interaction pattern. The analysis of these patterns takes comprehensive cognizance of the three criteria for assessing teacher effectiveness as recommended by Medley (1987) so that at the end a final index for teacher effectiveness will emerge. In this study, this index for the best experimental group will become the expected benchmark for teacher effectiveness.

In the light of the above, the problem of this study can be stated as follows: that many teachers in the field were not effective in the discharge of their duty because emphasis were laid only on paper qualification. These teachers are not truly interactive in their classes and also lack the knowledge and application of classroom interaction patterns and analysis. To worsen these problems there was no existing benchmark for assessing Basic Electricity teacher effectiveness in Nigeria.

Hence this study was intended to fill these gaps by exposing the teachers to the knowledge and integrative application of classroom interaction patterns and analysis for effective teaching and thereafter establish a benchmark for assessing teacher effectiveness based on the data analysis results for the various experimented and control groups The general purpose of this study was to experimentally establish a benchmark for assessing Basic Electricity teacher in the south Eastern technical colleges of Nigeria through effective classroom interaction analysis techniques.

Research Questions

This study was guided by the following research questions.

1. What were the general nature of interaction patterns prevalent in Basic Electricity experimental and control teachers class sessions as teaching behaviours predictors of teacher effectiveness?

2. What were the effects of application and analysis of classroom interaction patterns on the mean interest scores of students in Basic electricity as learning experiences indicator of teacher effectiveness?

3. What were the effects application and analysis of interaction patterns on students mean cognitive achievement in Basic Electricity as a major learning outcome indicator of teacher effectiveness?

4. What was the overall Basic Electricity teachers effectiveness index (Benchmark) based on the three criteria indices?

Research Hypotheses

This study was guided by the following hypotheses tested at 0.05 level of significance.

H01: The mean interest score of Basic Electricity students taught through the integrative application and analysis of classroom interaction patterns will not differ significantly from

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those taught through conventional methods, when both electrical and R/TV classes (treatment and control) were initially tested for pre-interest in Basic Electricity.

H02: The mean terminal cognitive achievement scores of Basic Electrify students taught through the integrative application and analysis of classroom interaction patterns will not differ significantly from those taught through conventional methods when both electrical R/TV Class (treatment control) were initially tested for pre-cognitive knowledge in Basic Electricity.

METHODOLOGY

This study was pre-test, post-test, non equivalent control group quasi-experimental design. Experimental design is a research effort aimed at exploring cause and effect relationships (Maduabum, 2004). It was quasi-experimental design because intact classes were used for the different experimental model for determining Basic Electricity teachers overall effectiveness as a result of wholesome interactive lesson delivery.

This study was carried out in the south eastern states of Nigeria comprising Abia State, Anambra State, Ebonyi State, ENugu State and Imo State. All the technical colleges in these states formed study population of 932 NTC II Basic Electricity students and 57 teachers.

Simple random sampling technique was adopted for this study to draw three states out of the population, draw one technical college from each state and also draw two intact basic electricity classes in the sampled college randomly assigned to experimental treatment and control groups along with their teachers. 511 NTC II students and 12 teachers were used for the study.

Four measuring instruments were used for data collection in this study: (a) basic Electricity Teacher personal Data questionnaire (BETPDQ) (b) Basic Electricity Interaction Analysis Categories (BEIAC) for coding teachers' teaching behaviours and students' learning behaviours. This instrument was an adaptation of Flanders Interaction Analysis Categories (FIAC) as developed by the researcher. (c) Basic Electricity Interest Scale (BEIS) (d) Basic Electricity Achievement Test (BEAT). All the instruments were face validated while BEAT was also given content validity and construct validity for BEIS. Coefficient of stability of BEAT was 0.993 while its coefficient of internal consistency was found to be 0.977. Internal consistency estimate of BEIS using Cronbach Alpha technique was 0.60 while the Kendall's W. Coefficient of concordance for BEIAC inter-rater reliability was computed to be 0.978.

The materials used for this study were training modules for teachers; interaction analysis lesson plan; interaction analysis categories and interaction analysis observational schedules.

This study was carried out in the third term but the sampling of the teachers was done in the second term so that the experimental treatment teachers will be trained in the knowledge, integrative application and analysis of classroom interaction patterns before the experiment commences in second week of third term. The pre-test of interest inventory and achievement test were administered in the first day of second week of 3rd term to mark the beginning of the study. Thereafter the researcher and his trained assistants used the observational schedules to code teaching-learning behaviours in all the classes of the study both experimental treatment and control classes. A minimum of 12 observations were made for

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each teacher, at least once a week. At the revision week of the term the post-test of interest inventory and achievement test were administered to end the field work. The achievement test was drawn to cover the normal 3rd term units and topics for the NTC II Basic Electricity.

The observational data was tabulated and converted into a composite interaction analysis matrix table. The means and standard deviations derived from the matrix analysis were used to answer the research questions for the teaching-learning behaviour related objectives of the study and therefore teacher effectiveness indices.

Mean and standard deviation were used to answer the research question based on the data collected with interest inventory and achievement test. Hypotheses were tested with analysis of covariance (ANCOV) at 0.05 level of significance.

12.0 version of SPSS computer software package was used for the analysis.

RESULTS

The results of the analysis were presented in tables below in line with the research questions and hypotheses.

Research Question 1

What were the general nature of interaction patterns prevalent in the experimental and control teachers class sessions as teaching behaviour predictors of teacher effectiveness.

To answer this research question, the classroom interaction categories serial codings of the average experimental teacher (Appendix A) and those of the average control teacher (Appendix B) were respectively transformed into composite interaction analysis matrix table in line the with Flanders interaction Analysis Category system (FIAC).

Average experimental teacher's class session that approximated the experimental group mean was used for this matrix analysis. Based on the preserved original sequence of category occurrence in Appendix A the matrix table was computed as sequence pairs, where a separate tabulation is made for each for each overlapping pair of numbers (e.g 4a-10-10:10-2b etc).

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Table 1: Interaction Analysis Matrix Table Showing the Nature of Interaction Patterns Prevalent in Average Experimental Class Session (Frequency and Percentage of Categories Being Indicated

Categories	1	2a	2b	3	4a	4b	5	6	7a	7b	8a	8b	9	10	11	12	13a	13b	13c	14a	14b	15	Total
1	2	8	1	2	-	1	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	15
2a	-	3	5	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	16
2b	-	-	3	3	-	-	4	1	-	-	-	1	-	-	-	-	-	-	-	-	-	-	12
3	-	-	-	6	-	-	14	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	21
4a	-	-	-	-	-	-	-	-	-	-	-	-	-	10	-	-	-	-	-	-	-	-	10
4b	-	-	-	-	-	-	-	-	-	-	-	-	-	17	1	-	-	-	-	-	-		18
5	-	-	-	-	6	10	95	10	-	-	-	-	-	-	9	4	-	-	-	-	-	-	134
6	-	-	-	-	1	2	1	8	-	1	4	5	-	1	-	1	3	2	2	4	5	-	40
7a	-	-	-	-	-	-	4	3	4	3	-	-	1	-	-	1	-	-	-	-	-	-	16
7b	-	-	-	-	1	-	3	3	1	3	-	-	-	-	-	1	-	-	-	-	-	-	12
8a	-	-	-	-	-	-	-	4	-	-	13	-	-	-	-	-	-	-	-	-	-	-	17
8b	-	-	-	-	-		1	5	-	-	-	14	-	-	-	-	-	-	-	-	-	-	20
9	2	3	2	-	-	-	-	2	6	1	-	-	2	-	-	-	-	-	-	-	-	-	18
10	4	2	1	3	1	5	-	-	1	1	-	-	1	19	2	2	-	-	-	-	-	5	47
11	-	-	-	-	-	-	12	-	3	-	-	-	-	-	1	-	-	-	-	-	-	-	16
12	**6**	-	-	-	-	-	-	1	-	1	-	-	-	-	1	8	-	-	-	-		-	17
13a	-	-	-	-	-	-	-	-	1	-	-	-	2	-	-	-	11	-	-	-	-	-	14
13b	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	7	-	-	-	-	9
13c	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	6	-	-	-	8
14a	-	-	-	-	-	-	-	-	-	-	-	-	4	-	-	-	-	-	-	17	-	-	21
14b	1	-	-	-	-	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	19	-	24
15	-	-	-	-	1	-	-	2	-	-	-	-	-	-	1	-	-	-	-	-	-	3	9
Total	15	16	12	21	10	18	134	40	16	2	17	20	18	47	16	17	14	9	8	21	24	9	514

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%	2.92	3.11	2.33	4.09	1.95	3.50	26.07	7.78	3.11	2.33	3.31	3.89	3.50	9.14	3.11	3.31	2.72	1.75	1.56	4.09	4.69	1.75	100
%	**17.91**						**46.49**						**33.85**									**1.75**	**100**

Table 2:Interaction Analysis Matrix Table Showing the Mature of Interaction Patterns Prevalent in Average Control Class Session (Frequency and Percentage of Categories Being Indicated).

Categories	1	2a	2b	3	4a	4b	5	6	7a	7b	8a	8b	9	10	11	12	13a	13b	13c	14a	14b	15	Total
1	-	-	-	1	**1**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**1**	3
2a	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
2b	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
3	-	-	-	-	-	-	2	-	-	-	-	**1**	**1**	-	-	-	-	-	-	-	-	-	4
4a	-	-	-	-	-	-	-	-	-	-	-	-	-	13	-	-	-	-	-	-	-	-	13
4b	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	1	3
5	**2**	-	-	-	6	2	87	9	-	4	-	8	-	-	1	2	-	-	-	-	1	6	128
6	-	-	-	-	-	-	8	10	1	3	-	2	-	2	-	1	-	-	-	-	3	-	30
7a	-	-	-	1	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	2
7b	-	-	1	-	1	-	5	1	-	1	-	2	-	-	-	1	-	-	-	-	-	3	15
8a	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
8b	-	-	-	-		-	8	2	-	-	-	19	1	-	1		-	-	-	-	3	1	35
9	1	3	-	-	-	-	1	2	-	-	-	-	-	-	-	-	-	-	-	-	1	-	5
10	-	-	-	-	-	-	6	1	1	2	-	-	1	15	1	1	-	-	-	-	1	4	33
11	-	1	-	1	1	-	1	1	-	-	-	-	-	-	1	-	-	-	-	-	-	-	6
12	-	-	-	-	-	-	1	-	-	2	-	-	-	-	1	1	-	-	-	-		-	5
13a	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	1	4

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13b	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
13c	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
14a	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
14b	-	-	-	-	1	-	4	1	-	1	-	-	1	-	1	-	-	-	-	-	31	3	43
15	-	-	-	-	3	1	4	2	-	1	-	3	1	1	-	-	1	-			3	33	53
Total	3	1	1	4	13	3	128	30	2	15	0	35	5	33	6	5	4	0	0	0	43	53	384
%	0.78	0.26	0.26	1.04	3.39	1.78	33.33	7.81	0.52	3,91	0	9.12	1.3	8.59	1.56	1.3	1.04	0	0	0	11.2	13.8	100
%	**6.5**						**56.0**						**23.7**									**13.8**	**100**

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Table 1 shows the nature of interaction pattern in the average experimental treatment teacher's class session with frequency of each category column/row occurrences and percentages indicated. The table shows that each interaction category had some frequency counts giving a uniformly flowing nature of interaction patterns. In all, the teacher was integrative in his application of classroom interaction patterns with category 5 (lectures) taking the highest percentage of 26.07% and category 13c (students student individualistic interaction pattern) taking the lowest percentage of 1.56%. The teacher was 17.91% indirect and 46.49 direct giving a total of teacher activities of 63.50%, while 33.85% went to students activities. Only 1.75% of the class session was spent in period of confusion and silence representing a wasted class-time of 45 seconds.

Table 2 shows the nature of interaction patterns prevalent in the average control teacher's class session with categories 8a, 13b, 13c, and 14a having zero frequency counts. The teacher was 56% direct and 6.51% indirect. Students activities accounted for only 23.7% of the class period while the class-time wastage stood as high 265 seconds (13.8%).

Research Question 2

What were the effects of integrative application and analysis of classroom interaction patterns on the mean interest scores of students in Basic Electricity as learning experience indicator of teacher effectiveness?

The result of data analysis pertaining to this research question are presented in table 3 below.

Table 3

Mean and standard deviation of Students Pre and Post-Interest in Basic Electricity as influenced by Classroom Interaction Patterns

Groups		**Pretest**	**Posttest**
	Mean	45.599	68.553
Experimental	Standard deviation	9.199	11.660
	N	262	262
	Mean	47.883	48.121
Control	Standard deviation	9.004	8.915
	N	249	249
Total	Mean	46.738	62.008
	Standard deviation	9.097	12.386
	N	511	511

Table 3 shows that ordinarily, students have an average interest in E/E studies as indicated by the mean pre-interest scores of 45.599 and 47..883 for experimental and control groups respectively. However, students taught by teachers that employed integrative application of interaction patterns showed higher post-treatment interest mean of 68.553 as against 48.121 for the control students.

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Research Question 3

What were the effects of integrative application and analysis of classroom interaction patterns on students mean cognitive achievement in Basic Electricity as a major learning outcomes indicator of teacher effectiveness?

The results of data analysis pertaining to this research question are presented in table 4 below.

Table 4

Mean and standard deviation of Students pre and post Achievement Test scores in Basic Electricity As Influenced by Classroom Interaction Patterns.

Groups		**Pretest**	**Posttest**
	Mean	27.302	69.444
Experimental	Standard deviation	8.899	16.748
	N	262	262
	Mean	25.876	42.576
Control	Standard deviation	8.164	11.693
	N	249	249
Total	Mean	26.605	51.192
	Standard deviation	8.569	16.763
	N	511	511

From table 4 it is seen that students taught by teachers who employed integrative application of interaction patterns (experimental group) performed better than those taught by teachers who employed conventional methods of teaching as shown by their post test means of 69.444 and 42.576 respectively. The difference between these means is very significant compared with the difference between their pretest scores of 27.302 and 25.876 respectively.

Research Question 4

What was the overall Basic Electricity teacher effectiveness Benchmark based on the three criteria indices?

To answer this research question, the means of the major classroom measurable indices/predictors of teacher effectiveness is computed for experimental and control teachers. The three major indices considered here include: teacher behaviour while teaching as shown by interaction analysis matrix table I, interest gains of students as shown by their post interest scores; and finally cognitive achievement gains of students as shown by third post treatment achievement test scores.

It should be noted that the major effectiveness indices shown by the interaction analysis are the teacher's ability to apply indirect influence in his class and his ability to encourage students participation. Frequency counts and representation of these interaction categories in the interaction analysis are used for this overall Basic Electricity teacher effectiveness Benchmark/certification index computation. That is, means of categories 1, 2a, 2b, 3, 4a, 4b, 9, 10, 11, 12, 13a, 13b, 13c, 14a, and 14b inside the matrix table.

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Table 5

Mean and Standard Deviations of Basic Electricity Teachers Overall Effectiveness Benchmark.

Ground	Interaction Effectiveness Score	Interest score	Achievement Score	N	X	Std
Experimental	51.76	68.55	69.44	3	63.27	10.17
Control	30.21	51.12	42.58	3	41.64	10.17
Total	39.23	60.84	51.01	6	52.49	11.31

It should be noted that the caption for interaction effectiveness score could be changed to read: teaching behaviour score, teacher influence score or classroom performance score. Table 5 shows that the mean for this score, interest score and achievement score for experimental group is 63.27 with a standard deviation of 10.71. For control group the overall effectiveness and certification index is represented by the mean of 41.64 with a standard deviation of 12.46.

Hypothesis I

The mean interest scores of students taught through the integrative application and analysis of interaction patterns will not differ significantly from those taught through conventional methods, when both electrical and R/TV classes (treatment and control) were initially tested for pre-interest in Basic Electricity.

Table 6

Analysis of Covariance (ANCOVA) for Mean Interest Difference Between Basic electricity Students Taught Through the Integrative Application and analysis of Interaction Patterns and Those Taught Conventionally by Their Specialist Area Electricity and Electronics (R/TV).

Source of Variation	**Sum of Squares**	**Df**	**Mean Square**	**F**	**Sign of F**
Corrected model	56204.643	4	14051.161	322.717	.000
Pre-interest	32770.878	1	32770.878	752.658	.000
Intercept	4569.690	1	4569.690	104.953	.000
Groups	24262.956	1	24262.956	557.255	
Areas	24.450	1	24.450	0.562	.000
Groups x areas	878.728	1	878.728	20.182	.454
Error	22031.326	506	43.540		.000
Total	2043016.000	511			
Corrected total	78235.969	510			

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Table 6 showed the general result of interest scores analysis of covariance, with only one aspects being very relevant to the objectives of this study. Hence the aspect necessary for testing H01 showed F-ratio of 557.255 being significant at 0.000 level of significance. This means that at even less than 0.001 level of significance the mean interest score of Basic Electricity students taught through the integrative application and analysis of interaction patterns was significantly different from those of students taught conventionally. Hence the null hypothesis was rejected because the observed difference could not be due to chance, error or previous advantage of either group since their obtained mean interest scores had been adjusted in the pre-interest.

Hypothesis 2

The mean terminal cognitive achievement scores of basic Electricity students taught through the integrative application and analysis of interaction patterns will not differ significantly from the those taught through conventional teaching methods when both electrical and R/TV classes (treatment and control) were initially tested for pre-knowledge in the units of study for the term.

Table 7

Analysis of Covariance (ANCOVA) for Difference Between the Mean Terminal Cognitive Achievement Scores of Basic Electricity students taught Through the Integrative Application and analysis of Interaction patterns and Those Taught Conventionally, by Their Specialist Areas of Electricity and Electronics (R/TV).

Source of Variation	**Sum of Squares**	**Df**	**Mean Square**	**F**	**Sign of F**
Corrected model	105765.361	4	26441.340	356.403	.000
Pre-interest	68122.303	1	68122.303	918.221	.000
Interest	10417.558	1	10417.558	140.418	.000
Groups	28668.525	1	28668.525	386.423	
Areas	3258.706	1	3258.706	43.924	.000
Groups x areas	1247.594	1	1247.594	16.816	.000
Error	37539.844	506	74.189		
Total	1482431.000	511			
Corrected total	143305.205	510			

Table 7 showed the general result of achievement scores analysis of covariance, with only one aspect being very relevant to the objectives of this study. Hence the aspect necessary for testing HO2 showed F ratio of 386.423 being significant at even less than 0.001 level of significance. This means that the mean terminal cognitive achievement scores of Basic Electricity students taught through the integrative application and analysis of classroom interaction patterns was significantly different from those of students taught conventionally. Hence the null hypothesis was rejected because the observed difference could not be due to

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chance, error or previous advantage of either group of students, since their obtained mean terminal cognitive achievement scores had been adjusted in the pretest.

Findings of the study

Based on the data collected and analyzed for this study, the following findings were made.

1. Interaction effectiveness index of experimental teachers who employed integrative application and analysis of classroom interaction patterns was higher than those of control teachers who used conventional teaching methods with means 51.76 and 30.21d respectively.

2. Post interest mean of basic electricity students taught through the integrative application and analysis of interaction patterns was higher than for students taught conventionally with means 68.,55 and 48.12 respectively

3. the mean cognitive post treatment achievement test score for experimental group of students was higher than for control group students with score 69.44 and 42.57 respectively

4. The mean interest of basic electricity students taught through the integrative application and analysis of classroom interaction patterns was significantly different from those taught conventionally with f-ratio of 557.255 being significant at 0.000 level of significance

5. The mean terminal cognitive achievement score of basic electricity students taught through the integrative application and analysis of classroom interaction patterns was significantly different from those taught conventionally with an f-ratio of 386.423 at 0.000 level of significance.

6. Teaching effectiveness benchmark of basic electricity teachers in the south eastern Nigeria was computed and found to be 63.27 being approximated to be 63.00%.

DISCUSSION

This study has shown that when teachers are trained in the integrative application and analysis of classroom interaction patterns, their lesson delivery will be characterized by uniformly flowing nature of classroom interaction patterns with all the interaction categories having appropriate counts in the matrix table. This symbolized a deliberately calculated balanced teaching method with auto-monitoring and meta-communication ensuring only 45 seconds class-time wastage throughout the whole lesson period. Contrarily, the study showed disjointed nature of interaction patterns with four categories having zero counts and 245 seconds class-time wastage among the control teachers.

The experimental teachers showed greater indirect influence (17.91) which encouraged greater students participation (33.85) as against control group teachers with fewer indirect influence (6.50) and lower students participation (23.70). All these results agreed with the historical findings of Fauders (1960 and 1969), Cohen and Manion (1993) concerning the effectiveness indices of interaction annalistic teachers and dogmatic conventional teachers. Theses findings were also upheld by Uzuegbnam(1995). Kalu (1997); Ali and Kalu (2001)

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and Hardman et al (2003) who confirmed that teacher effectiveness depends on indirect influence of the teacher and students participation in the on-going lesion. In this study, teacher indirect influence were represented by interaction categories 1, 2a, 2b, 3, 4a and 4b while students participation were represented by categories 9, 10, 11, 12 13a, 13c, 14a, and 14b.

Teacher indirect influences are the chief determinants of the nature and extend of students participation in the on-going lesson while students interest are mostly motivated by the above two factors. These were the interconnected reasons for high post-treatment interest of the experimental group of students 68.553 as against 48.121 for control group students. The interconnection continues because the more the interest of students the higher the cognitive achievement by students as shown in this study; 69.44 for experimented group of students as against 42.58 for the control group of student. Based on all these high interest and cognitive achievement on the part of experimental group students, all the hypothesis in this study were rejected with very high F-ratios. The superiority of the experimental treatment group over the control group in this study is again in agreement with the findings of researchers who had experimental treatment groups in their study (Ezeliora, 1995; Ogwo, 1996; Anekwe, 1997; Strickland, 2004). However, the control group weak pass in this study was similar to the prevalent weak pass of students in NABTEB Basic Electricity examinations for some decades now (NABTEB, 2006).

The mean of means of cognitive achievement scores, interest scores and interaction analysis score yielded the overall Basic Electricity teachers effectiveness index or Benchmark of 63.27% for experimental group in this study. Other names for teacher-interaction Analysis score are: Teaching method score (b) Teaching behaviour score (c) Teacher Interaction effectiveness score. The overall effectiveness index for control class group was 41.64% 42.00% which was unacceptably too low a symbol of teacher ineffectiveness. Determination of overall effectiveness (for serving teachers) and certification index (for graduating teacher trainees) is in line with the demands of researchers and experts in teacher effectiveness research (Brophy and Good, 1986. medley, 19876 and Kupermitz, 2002). Kupermitz (2002) stated categorically that it is a misnomer to equate teacher effectiveness with only the teachers success in producing students achievement gains; hence the above three criteria were involved in this study.

May-parker and Ozumba (1979) lost out in their bid to establish an acceptable theoretical frame and definition for teacher effectiveness in West Africa because they did not consider the above criteria for assessing teacher effectiveness. It was for this reason that this study started by considering these major criteria for evaluating teacher effectiveness and their requisite theoretical bases thereby computing teacher interaction effectiveness score as a sum of indirect influence score and students active participation score. This Benchmark of 63.27% approximated to 63% in this study is the over-all teacher effectiveness index for teachers that had been certificated and their teaching effectiveness index established on or after graduation, when such test is conducted to show continued effectiveness. However, on graduation from teacher education programme or for teachers that had never been tested, it is teacher over-all effectiveness and certification index, like in this study for basic electricity teachers.

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CONCLUSION

Based on the findings of this study, it was concluded that a teacher who received a short period training in the theory, application and analysis of classroom interaction patterns will immediately teach better than his counterparts who did not receive such training. It was also concluded that the true effectiveness benchmark of Basic Electricity teachers can only be assessed and established through the application and analysis of classroom interaction patterns. Finally, it was concluded that teacher effectiveness in any field or subject matter can be assessed and established through the application and analysis of classroom interaction pattern with due considerations to the three principal critera:

(a) teaching behaviour of the teacher (b) Students' learning behaviours (c) Learning outcomes.

RECOMMENDATIONS

Based on the findings of this study, the following recommendations were made:

1. NUC and NCCE should as a matter of urgency entrench in the new Basic Electricity teacher education curriculum, a course at each level that will fully expose the trainees to all technical skills of teaching, pedagogy and the various classroom interaction patterns with proficiency in their integrative application and analysis.

2. Teacher registration council of Nigeria should adopt this teacher effectiveness benchmark and the process of establishing it, not only for Basic Electricity teacher but for all Nigerian teachers' certification index, promotion examination pass mark and relevance (repeated every three years).

3. Incentive-laden in-service training programme should be organized for all serving Basic Electricity teachers by Federal and state government to impart them the knowledge of theories, integrative application and analysis of classroom interaction patterns to enhance their teaching effectiveness.

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APPENDIX 1

BEIC OBSERVATION SCHEDULE

Name of Teacher:……. Name of observer……..

Name of Class:……. Date:……..

INTERACTION BEHAVIOUR	Freq	SERIAL CODING													
Teachers behaviour Categories															
1. Accept feedings															
2. Gives Verbal rewards															
(a) content specific															
(b) Social															
3. Accept and Builds on students ideas.															
4. Questions (a) closed (b) open															
5. Lectures															
6. Directs															
7. criticism (a) content (b)social															
8. (a) teacher materials interaction															
(b) Writes on the board															
9. Supervises															
Student Behaviour															
10. Responds															
11. Questions															
12. Initiates talk															
13. Student-student interaction:															
(a) Cooperative															
(b) Competitive															
(c) Individualistic															
14 (a) Students materials interaction.															
(b) Reads, writers or Draws															
15. Silence or confusion															

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APPENDIX 2

SERIAL CODING OF AVERAGE EXPERIMENTAL TEACHER'S PREVALENT INTERACTION PATTERNS

4a	4b	15	6	12	8a	5	13c	5	10	15	9	3	5	5	1	F
10	10	6	5	6	8a	5	9	5	10	7b	2a	5	5	11	2b	1 - 15
10	10	6	5	8b	8a	4a	7a	5	7a	7b	3	5	11	5	2b	2a -16
2b	10	10	5	8b	6	10	7a	5	12	6	5	5	7a	5	5	2b - 12
2b	1	1	11	8b	6	4b	6	5	12	4b	5	4b	7b	11	5	3 - 21
8b	2a	1	5	6	14a	10	6	4a	1	10	5	10	6	7a	4a	4a - 10
8b	3	2a	5	6	14a	10	8b	10	3	10	5	10	13a	7a	10	4b - 18
5	5	3	6	14b	14a	3	8b	4b	5	4b	12	15	13a	6	4b	5- 134
5	5	3	13b	14b	14a	5	8b	10	5	11	12	15	13a	8a	10	6 - 40
5	5	5	13b	14b	9	5	8b	10	5	5	1	6	13a	8a	1	7a -16
5	5	5	13b	14b	1	5	6	3	6	5	2a	7b	13a	8a	2a	7b- 1 2
4b	5	5	13b	14b	2a	5	14b	3	8b	5	2b	7b	13a	8a	2b	8a - 17
4b	5	5	13b	9	2a	4b	14b	5	8b	6	3	4a	9	8a	5	8b - 20
10	6	6	9	7a	3	10	14b	5	8b	13b	3	10	9	6	5	9 - 18
10	6	8a	6	7a	5	10	14b	5	8b	13b	5	10	7b	14a	5	10 - 47
7b	8b	8a	4a	5	5	15	14b	11	8b	13b	5	9	7b	14a	5	11 - 16
12	8b	8a	10	5	5	15	9	5	6	13b	5	2b	5	14a	4b	12- 17
12	6	8a	10	5	5	7b	2a	5	6	9	6	2b	5	14a	10	13a- 14
1	14b	6	15	5	5	6	2b	5	14b	7a	8a	5	5	14a	10	13b- 9
3	14b	6	11	4b	5	12	3	6	14b	5	8a	5	4a	14a	1	13c- 8
3	14b	14a	5	10	4b	12	5	6	14b	5	8a	5	10	9	2a	14a -21
5	14b	14a	5	10	10	1	5	13a	14b	5	8a	11	4b	2a	15	14b -24
5	9	14a	5	11	10	2a	5	13a	14b	4b	8a	5	10	2b		15 - 8
5	7a	14a	5	7a	12	3	5	13a	14b	10	6	5	10	6		**514**
5	5	14a	5	5	12	5	5	13a	9	3	14a	5	2a	8b		
6	5	9	12	5	1	5	5	9	7a	3	14a	4a	2b	8b		
13a	5	1	12	12	2a	5	4b	7a	7b	5	14a	10	5	8b		
13a	5	4b	1	12	2a	5	10	7b	5	5	14a	4a	5	8b		
13a	5	10	1	7b	3	6	10	5	5	6	14a	10	5	6		
13a	4b	10	11	7a	5	13c	12	5	5	13c	14a	11	5	14b		
7a	10	2a	5	7a	5	13c	12	5	5	13c	9	5	11	14b		
7a	10	2a	5	9	5	13c	11	5	4a	13c	2b	5	11	14b		
6	15	3	5	6	11	13c		4b	10	9	3	11	5	14b		

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APPENDIX 3

SERIAL CODING OF AVERAGE CONTROL TEACHERS PREVALENT INTERACTION PATTERNS

8b	15	5	14b	15	8b	6	8b	5	4a	15	8b	5	F
8b	15	5	11	15	8a	6	8b	5	10	15	8b	5	1 - 3
8b	6	12	11	15	9	14b	8b	12	11	4a	11	5	2a - 1
8b	10	7b	6	15	14b	14b	5	11	3	10	5	5	2b - 1
5	15	5	5	8b	14b	14b	5	4a	5	5	15	5	3 - 4
5	15	7b	5	8b	14b	14b	5	10	5	5	14b	6	4a - 13
11	5	15	5	8b	14b	9	5	7a	5	5	14b	6	4b - 3
2a	5	15	5	5	14b	6	5	3	8b	7a	14b	6	5 - 128
3	5	15	4a	5	14b	7b	15	8b	8b	6	5	7a	6 - 30
5	5	15	10	15	14b	15	15	8b	8b	10	5	7b	7a - 2
5	5	8b	10	15	14b	15	15	14b	14b	5	5	7b	7b - 15
5	8b	8b	5	15	14b	15	14b	14b	14b	5	5	5	8a - 00
6	8b	6	4a	15	7b	4a	14b	14b	5	4b	5	5	8b - 35
5	5	6	10	7b	4a	10	14b	4a	5	10	4a	5	9 - 5
5	5	5	10	8b	10	10	5	10	5	10	10	5	10 - 33
5	6	5	6	14b	10	15	5	10	5	5	10	5	11 - 6
5	6	5	6	14b	7b	15	5	5	5	5	10	5	12 - 5
15	6	5	5	5	2b	4a	5	5	8b	5	14b	4b	13a - 4
15	8b	5	7b	1	5	10	5	5	8b	7b	14b	10	13 b - 0
5	8b	5	12	4a	5	5	8b	5	6	15		10	13c - 0
5	5	6	7b	10	5	5	8b	5	6	15	15	10	14a - 0
5	14b	6	5	10	5	1	5	6	6	15	15	10	14b - 43
5	14b	5	4a	10	8b	3	5	6	14b	15	15	15	15 - 53
4a	14b	5	10	7b	8b	9	5	7a	14b	4b	13a	15	**384**
10	14b	5	10	5	5	6	8b	8b	14b	15	13a	15	
9	14b	5	9	5	15	5	5	5	14b	5	13a	15	
1	6	6	5	5	15	5	6	6	14b	5	13a	15	
15	6	14b	5	5	15	5	10	5	15	5	15	15	
15	7b	14b	5	5	14b	5	12	5	15	5	15	15	
10	5		5	8b	14b	5	12	5	15	6	5	15	

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