



SURVEY OF TEACHER – STUDENTS’ CLASSROOM INTERACTION PATTERNS ON STUDENTS’ ACHIEVEMENT AND INTEREST IN SENIOR SECONDARY SCHOOL BIOLOGY IN MAKURDI, BENUE STATE NIGERIA.

BY

BENJAMIN AYODELE FAKOLADE PhD^{1*}, MATTHEW DARE ALE², COMFORT OLUWATOYIN OLUWATOSIN³, OGUNBIYI OLUWAGBENGA JOHN⁴, OYEKUNLE, SIMEON OYEWOLE⁵, ASOGWA BLESSING CHINENYE⁶

¹Faculty of Education / General Studies Unit Air Force Institute of Technology, Kaduna Nigeria

²Integrated Science Dept. Kogi State College of Education, Ankpa, Nigeria.

^{3,6}Faculty of Education Air Force Institute of Technology, Kaduna Nigeria

⁴Biology unit Air Force Institute of Technology Kaduna

⁵General Studies Unit, Air Force Institute of Technology Kaduna, Nigeria.



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Abstract

In this study, a survey of teacher–student Classroom Interaction Patterns on students’ achievement and interest in Senior Secondary School Biology in Makurdi, Benue State was investigated. Ten(10) schools and Ten(10) Biology teachers (5 males and 5 females) were randomly selected. Each teacher was observed teaching by 2 trained observers for 3 lesson periods spaced over 5 weeks. The Classrooms Interaction Patterns obtained were coded and analyzed using the Science Interaction Categories, an adaptation of Flanders Interaction Analysis Categories. Two other instruments, Biology Achievement Test (BAT) and Biology Interest Questionnaire (BIQ) were used to collect data on students’ achievement and interest scores in Biology. Pearson Product Moment Correlation Coefficient and inferential statistics of t-test were used for data analysis. The result of the data analysis at 0.05 alpha level of significant revealed that there is significant relationship between teacher – students’ Classroom Interaction Patterns and students’ achievement and interest scores in Biology. The result also showed that teacher – students’ indirect pattern of Classroom Interaction have positive effects on students’ achievement and interest in Biology. It was therefore recommended that Biology teacher should use indirect pattern of Classroom Interaction as an instructional strategy to enhance students’ achievement and interest. Also, Biology students should be fully and actively involved in the teaching and learning processes.

KEYWORDS: Science Interaction Pattern, Indirect – Direct ratio, Achievement, Interest, Science Teacher

Background to The Study

Over the years, performance of students in Biology has not been encouraging especially in West African Examination Council and National Examination Council Senior Secondary Certificate Examinations. Okafor, (2015) critically looked into the possible causes of students’ poor performance at Senior Secondary School Biology and he gave the following reasons as being basically responsible;

- I. Poor teachers’ method of classroom interactions
- II. Lack of instructional materials and
- III. Lack of student-oriented laboratory activities

The classroom is a natural setting in a school system for observing how teachers interact with their students. Teachers are in an influential position with respect to students and can communicate significant messages concerning expectations, evaluation, and performances. To facilitate good and motivating interaction patterns in the classroom, teachers should create an enabling environment to stimulate the learning of the basic concepts in sciences especially in Senior Secondary School Biology. This study takes a look at the survey of teachers-students’ interaction patterns on students’ achievements and interest in Biology at the Senior Secondary School level. Classroom interaction is seen as the sum total of



all the teachings- learning activities taking place in the classroom between the teacher, the learners, and the learning materials during the teaching-learning processes. It includes verbal and non-verbal behaviors of learners and teachers (Okafor, 2015). According to the Wikipedia Encyclopedia (2020), the term interaction implies an action-reaction or a two-way influence which may be between individual such as pupil – pupil, teacher-pupil, or teacher – target or between an individual and a group such as teacher- audience or between groups or between materials and individual or groups. An interaction is usually inferred from the behavior of person in the environment being studied. This behavior may be verbal or non-verbal and can be classified as being predominantly cognitive, affective, or controlling in nature (Iroha, 2018).

Furthermore, the methods used in observing the nature of interaction patterns in the classroom include activity-oriented instructions, textbook method, active participation, and Indirect – Direct method (ID). Indirect – Direct ratio means a measure of number of times a teacher encourages students to the number of time a teacher discourages students (Iroha, 2018). Others are verbal interaction, non-verbal, teacher-talk, student-talk, questioning techniques among others. All these affect students' achievements level in sciences. Also, interaction analysis provides a description of what goes on in the teaching-learning processes and the way instructional materials are presented to the students.

Interest is the term used to designate a concept pertaining to factor within an individual which attract or repel someone from various objects, persons, and activities within his environment (Kundo and Tutu, 2017). In Nigeria, researchers and experts like Ukoh (2014) and Agwi (2016) found out that high percentage of student in Secondary schools have poor interests in Biology and other science subjects. This study therefore takes a critical look into how teacher – students' Classroom Interaction patterns affect students' achievement and interest in Biology in Senior Secondary Schools in Makurdi Metropolis Benue State.

Statement of the Problem

Beyond the Socio-cultural factors, physical environment, curriculum, language, teaching, behavior management, academic evaluation, and assessment, classroom processes which involve teacher- students' interaction and interest remain an integral part of formal education in schools. It has been established by Uhumuavbi and Umoru (2012) that students' interest in sciences depend largely on teacher-student Classroom Interactions pattern. The academic achievement of students in Biology in Senior Secondary Schools has not been encouraging and below average. The teacher- students' classroom interaction in Biology classes is bedeviled by inherent characteristics such as teachers' inappropriate style of imparting knowledge, conflict of learning among others. Consequently, students' perception and interest in Biology are poor, due to this, students learn less while some do not learn at all in the classroom. All these leads to poor and below-average achievement of students in Senior Secondary School Biology.

Purpose of the study

The purpose of this study is to investigate into the teacher classroom interaction pattern in Biology and how it influence the students' achievements and interest in the subject. Specifically, the study will:

- i. Identify the biology teachers' classroom interaction patterns that influence the students' achievement in the subject in Makurdi metropolis, Benue State.
- ii. Ascertain the influence of the teacher's classroom interaction pattern on the academic achievement of students in Biology;
- iii. Identify teachers' classroom interaction patterns that enhance students' interest in Biology.
- iv. Find out the difference between the classroom interaction patterns of male and female Biology teachers in Makurdi.
- v. Find out if there are differences between the classroom interaction patterns of experienced and the less experienced Biology teachers in Secondary Schools.

Research Questions

The following Research Questions were answered:

- i. What are the predominant teacher-students classroom interaction patterns in Biology?
- ii. What is the relationship between the teacher-students' classroom interaction patterns and students' mean achievement scores in Biology?
- iii. What is the relationship between the teacher--students' classroom interaction patterns and students' mean interest scores in Biology.
- iv. What is the difference in the mean achievement score of students due to the teacher – students' classroom interaction patterns of male and female Biology teachers
- v. Is there any difference between the teacher students' classroom interaction patterns of the Experienced and Less experienced Biology teachers in Makurdi, Benue State?

Hypotheses

The following hypotheses were raised to guide the study:

- i. There is no significant relationship between teacher-students' classroom interaction patterns and students' mean achievement scores in Biology.
- ii. There is no significant relationship between teachers-students' classroom interactions patterns and students' mean interest scores in Biology.
- iii. There is no significant difference in the mean achievement score due to teachers-students' classroom interaction patterns of male and female Biology teacher.
- iv. There is no significant difference between the teachers-students' classroom interaction pattern of the experienced and less experienced Biology teachers.

Methodology

Survey research design was employed in this study. The population comprises of all The Senior Secondary School one Biology students numbering 2,627 and 103 Biology teachers in all the 71 Secondary Schools in Makurdi Benue state. The 71 Secondary Schools in Makurdi metropolis comprises of 35 government grant-aided schools, 10 purely government schools, and 26 private schools. Proportionate stratified random sampling technique was used in determining the sample of Secondary Schools used i.e 5 grant aided Secondary Schools, 2 government Secondary Schools, and 3 private Secondary Schools. Three hundred and sixty (360) Senior Secondary school one Biology students and 10 Biology teachers were randomly selected from the 10 selected schools in Makurdi, Benue State. Three instruments were used to collect data for this study. They are:

- i. Science Interaction Category (SIC)
- ii. Biology Interest Questionnaire (BIQ)
- iii. Biology Achievement Test (BAT).

Data analysis was done using frequency scores, mean, Standard Deviation, and Pearson Product Moment Correlation Co-Efficient (r) to answer Research Questions and inferential statistics of t- test to test hypotheses at 0.05 level of significance. The Indirect-Direct (I/D) ratio was calculated which permitted the comparison of every teacher on an Indirect–Direct behavior scale.

Results

Research Question One:

What are the predominant teacher-students classroom interaction patterns in Biology classes?

Table 1: Teacher – student’s interaction ratio and descriptive statistics of achievement and interest scores for school.

Name of school	No of student	Achiev X	Score	Interest X	Score B	I/D Ratio	D/S Ratio
Govt college Mkd	31	16.84	3.86	80.23	19.75	0.76	1.26
Peniel College Mkd	36	15.06	3.46	88.28	12.25	0.65	1.29
Mbakye Comm Sec Sch, Mkd	19	11.11	2.96	82.11	11.88	0.11	4.47
Methodist High School, Mkd	44	15.59	3.17	86.73	11.11	0.32	2.20
Paedopadis Harmony Secondary School, Mkd	31	15.87	4.43	90.58	8.16	1.33	0.99
Govt Model Sec School, Mkd	32	12.86	3.93	79.19	11.32	0.62	1.69
Valia College Mkd	35	15.43	3.94	88.74	11.72	0.42	1.72
Anglican Sec School, Mkd	50	18.24	3.69	91.30	8.18	1.33	0.94
ECWA sec. School, Mkd	25	15.96	3.95	90.20	12.37	1.33	0.85
AVECO Model College	37	15.82	3.53	89.40	9.79	1.82	0.97
Total	360	15.59	4.02	87.24	12.25	0.64	1.54

Table 1 shows that the total mean interaction for indirect-Direct (I/D ratio) is 0.64. it means that the predominant interaction pattern is that of indirect influence.

Research Question Two

What is the relationship between the teacher – students’ classroom interaction pattern and students mean achievement score in Biology?

Table 2: Paired sample correlation of teacher – students’ interaction on students achievement in Biology

Pairs	N	R	Sig
Achievement scores I/D ratio	10	.675	.032
Achievement scores D/S	10	-.807	.005

ratio

The analysis of table 1 shows the Total mean achievement score of 15.59 with standard Deviation of 0.45. the indirect – direct interaction ratio is 0.64, while the direct- students interaction ratio is 1.54. the relationship between teacher – students’ interaction (as measured by I/D ratio and D/S ratio) and achievement score was investigated using Pearson Product Moment Correlation Co-efficient. Table 2 shows that there is a strong positive correlation between achievement and I/D ratio (r=0.68, n=10, p=0.32). similarly, there is a strong but negative correlation between achievement and D/S ratio (r=-0.81, n=10, p=0.005).

Research Question Three

*Corresponding Author: BENJAMIN AYODELE FAKOLADE PhD



What is the relationship between the teacher- students' classroom interaction patterns and students' mean interest scores in Biology?

Table 3: Paired sample correlation between teachers- students' interaction pattern and students' interest in Biology:

Pairs	N	R	Sig
Interest score & I/D ratio	10	.687	.028
Interest score & I/S ratio	10	-.490	.151

Table 1 shows that the total interest mean score of the student is 87.24 with standard deviation of 12.24. also, from table 1, the I/D ratio is .64 while the D/S ratio is 1.54. The Pearson product moment correlation computation as shown in the table 3 shows that there is a strong positive correlation between interest score and I/D ratio ($r=.69$, $n=10$, $p=.028$). the table 6 also show that there is a medium negative correlation between mean interest score and D/S ratio ($r= -.49$, $n=10$, $p=.151$)

Research question Four

What is the difference in the mean achievement score of student due to teacher-student classroom interaction pattern of male and female. Biology Teachers'?

Table 4: Mean Achievement scores and standard deviation of schools for teachers' sex and experience.

Teacher's Sex	Teachers' Experience	No of Students	Biology Achievement Test	
			X	D
Male	Less Experienced	132	15.98	3.50
	Experienced	55	13.69	3.78
	Total	187	15.31	3.78
Female	Less Experienced	75	17.28	4.04
	Experienced	98	14.92	4.31
	Total	173	15.94	4.34
Total	Less Experienced	207	16.45	3.75
	Experienced	153	14.48	4.15
	Total	360	15.16	4.04

The mean achievement scores of students taught by male Biology teachers as shown in Table 4 is 15.31 with standard deviation of 3.78 while that female Biology teacher is 15.94 with standard deviation of 4.34. This leaves a mean difference of 0.63 in favour of the female biology teacher this means that

the students taught by the female Biology teachers differ in achievement from those that are taught by the Biology teacher. These answers research Questions four.

Research Question Five

Is there any difference between the teacher-students classroom interaction patterns of the experienced and less experienced biology teachers in Makurdi, Benue State?

Table 5: Teachers- Students classroom interaction Pattern in SS1 Biology classes,

S/n	Interaction Category	Less Experienced	Experienced Teacher	Total Mean
Teachers				
	A	0.23	0.47	0.35
	G	6.15	3.23	4.69
	R	5.95	1.73	3.84
	Q	22.60	15.10	18.85
	L	34.17	48.04	41.11
	D	0.14	0.16	0.15
	C	0.79	0.77	0.78
	M	0.00	0.00	0.00
9.	S	1.22	1.79	1.51
Students				
10.	RQ	20.64	15.67	18.16
11.	SQ	1.50	0.03	0.77
12.	I	0.70	0.00	0.35
13.	E	0.00	0.21	0.11
14.	RD	5.83	12.36	9.10
15.	.N	0.42	0.40	0.41
16.	PPI	0.29	0.05	0.34
17.	I/D	0.96	0.40	0.64
18.	D/S talk Ratio	1.26	1.80	1.53

Table 5 shows that the indirect-direct (I/D) ratio in behavior scale of less experiences teachers is 0.96 while that is the experienced teachers are 0.40. the difference between the behavior scale of the teachers is 0.56 in favor of the less experienced teacher. The table also shows that the Direct-student (D/S) talk ratio of students taught by the less experienced teachers is 1.27 while that of the experienced teachers is 1.80. The difference existing in the interaction category is 0.53 in favor of the experienced teachers. The result of Table 8 shows that there is difference between the teacher-student classroom interaction patterns of the experienced and less experienced biology teachers.



Hypothesis One

There is no significant relationship between teachers' student classroom interaction patterns and student mean achievement score in Biology.

Table 6: Paired sample t-test for achievement score and teacher-student classroom interaction.

	Mean	S. D	Error	Lower	Upper	t	df	sig(2tailed)
Achievement score of I/D ratio	14.40400	1.60873	.50872	13.25319	15	28.314	9	.000
Achievement score of D/S ratio	13.58	2.89	.91653	11.50667	15	14.817	9	.000

A paired sample t-test was conducted to evaluate the relationship between mean achievement score and teacher-student interaction. Table 6 shows that there is a statistically significant relationship between student achievement (m=15.59, SD=4.02) and I/D ratio (0.54), t (9) = 28.314, p<0. The eta squared statistics (.51) indicated a large effect size. Similarly, there is a statistically significant relationship between achievement and D/S ratio (1.54), t(q)= 14.82, p<.000 with a large effect size (eta squared=.92). With this result, the null hypothesis is rejected.

Hypothesis Two

There is no significant relationship between teacher-student classroom interaction patterns and student mean interest score in Biology.

Table 7: Paired sample t-test for interest score and teacher-student classroom interaction

	Mean	S.D	Error	Lower	Upper	t	Df	sig(2tailed)
Interest score of I/D ratio	85.8570	4.10	1.29840	82.91982	88.794	66.125	9	.000
Interest score of D/S ratio	85.03	5.11	1.61	81.37513	88.69087	52.587	9	.000

Table 7 is a paired sample t-test conducted to evaluate the relationship between mean interest score of student in Biology and teacher-student interaction. Analysis there shows that there is a statistically significant relationship between interest score (m=87.24, SD=12.25) and I/D ratio (m=0.64), t(q)=66.125, p<0.0. The eta square (1.3) indicating a very large effect size. The analysis further shows that there is a statistically significant relationship between student interest and D/S ratio (m=1.54, t(q)=52.59, p<0.000 with this result, the null hypothesis is rejected.

Hypothesis Three

There is no Significant difference in the mean achievement score due to teacher-student classroom interaction pattern of male and female Biology teachers.

Table 8: Summary of independent Samples t-test of male and female Biology teachers.

Lever's test of Equality of variance t- test for equality of mean

	F	sig	T	df	Sig(2-tailed)
Achievement score	4.875	0.28	-	358	.138
Equal variance			1.485		
Unequal variance					

med	Equal variance	unequal variance	t	df	sig(2-tailed)
			3.405	1.477	.141

Analysis of table 8 shows that the difference in the mean achievement score of students due to teachers-student classroom interaction patterns of male and female biology teacher is no significant at 0.05 alpha level. This shown with the F-ratio of 4.875 at 358 degree of freedom. The significant value of (2-tailed) is greater than 0.05. thus the null hypothesis of no significant difference is therefore accepted.

Hypothesis Four

There is no significant difference between the teacher-student classroom interaction pattern of the experienced and less experienced biology teachers.

Table 9: Summary of independent sample T-test of Experienced and Less experienced Biology teachers. Lever's test of Equality of variance t-test for equality of mean

	F	s/o	t	df	Sig(2-tailed)

*Corresponding Author: BENJAMIN AYODELE FAKOLADE PhD



)		
Interaction category	Equal variance assumed	.000	30	1.000
		.000	1.000	
	Equal variance not assumed	.000	30.000	1.000

From Table 9, the F-ratio for experienced and less experienced teachers' interaction patterns is 1.000, which is higher than 0.05. This means that there is no significant difference in the classroom interaction of experienced and less experienced Biology teachers. Thus, the null hypothesis is accepted.

Discussion and Findings

The predominant teacher-student classroom interaction pattern in secondary school Biology in Makurdi Benue state is in tandem with Iroha (2008) which shows that the indirect method of classroom interaction influences positive learning outcome by student in physics. This was further supported by Agor (2006) who reported that in directed teaching is gradually coming into our educational system. However, Okafor (2011) reported that teachers used more of direct method whose concentration is on lecture method, verbal talk, and subject matters. This study further revealed that Biology lessons were not practical oriented. It was revealed that classroom interaction pattern with high indirect -Direct (I/D) ratio in which student are encouraged to participate and are involved in the teaching-learning process has positive effect on student achievement in biology. The result of this study has shown that the teacher-to-student classroom interaction pattern has impact on students' achievement in Biology.

This study also reveals further that there is significant relationship of teachers-student interaction pattern on student achievement. This finding agrees with Iroha (2008) who found out that student learning outcome correlated positively with classroom interaction pattern in physics where the value of I/D ratio (that is a measure of number of time a teacher encourages students to the number of time a teacher discourages students) was used as a representative of classroom interaction pattern. Also, the more the teacher uses indirect teaching, the more the student achieve positively in academics. This finding, is also in agreement with Okafor (2011) whose work revealed that there is a correlation between the teachers-student classroom interaction pattern and student achievement in Biology. There is a positive relationship between classroom interaction pattern and student level of achievement in Biology. Stubb and Delamont in Iroha (2008) also confirmed that indirect teaching and full participation of student in teaching-learning process and

student achievement in science. This study also revealed that though teachers have more indirect influence on the student than direct influence, the teachers still talk more than the student. This is tandem with Hafiz, Nasir din, and Ishaq (2008) which showed that two third of the total time was used in talking by the teacher.

On the relationship of teacher-student classroom interaction pattern on student interest in Biology, study has shown that the interest of student increased with classroom interaction pattern with high I/D ratio. This is an indication that the more the teacher uses indirect influence and encourage the students, the higher the interest level of student and vice-versa. This finding is in agreement with Iroha (2008) who reported that the more teachers use indirect teaching the more student develop positive attitude towards physics.

Furthermore, Uhumavbi and Umaru (2005) established that interest of students in the science and mathematics depends largely on teacher-student interaction pattern. The student perception of any task especially at the beginning affects the outcome of the exercise more than anything else. Stubb and Delamont in Iroha (2008) also supported this in that indirect teaching and full participation of student in teaching-learning process and in return aid students' interest in science. This study also revealed that the relationship of teachers-student classroom interaction pattern on student interest is significant. This agrees with Okafor (2011) and Iroha (2008) which also found similar result in their separate studies.

On the student achievements and teacher-student classroom interaction pattern of male and female biology teachers perform better than the student thought by the male biology teachers. This is an indication that female Biology teachers are better in classroom interaction, which in turn and student achievement. This finding is in agreement with Okafor (2011) which revealed that male teachers use more of direct influence than the female teachers. The fact that female teachers had higher percentage score in pupil-pupil interaction in the classroom was also established. Also, Agor (2006) reported that gender affected teacher talk and better teacher-student classroom interaction which further enhance learning outcome and achievement of student. This study showed that there exists difference between the teacher-students classroom interaction pattern of the experienced and less experienced Biology teachers. The I/D ratio which is an indication of an indirect method of classroom interaction of less experienced teachers is higher than that of the experienced teachers. Agor (2006) and Okafor (2011) affirmed that experience of the teachers do not have any effect on students verbal interactions in the classrooms. It was further discovered in the study that the experienced teachers talk more than the student in the classroom which resulted into a high Direct-students talk ratio.

Recommendation:

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



1. There is need for Biology teachers' trainers to include indirect patterns of classroom interaction as an instructional strategy.
2. The programme of Biology education at the tertiary level should include indirect pattern of classroom interaction for better students' achievements.
3. Biology teachers should be encouraged to use indirect pattern of classroom interaction to stimulate students interest in biology learning.
4. Indirect pattern of classroom interaction should be used by the teachers to enhance students' achievement in Biology.
5. Teaching of Biology should be practical-oriented and students should fully and actively be involved.
6. More emphasis should be placed on the use of instructional material which are effective tools for the realization and achievement educational goals and objectives.
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