Influence of Teacher-Students Classroom Interactions on Students' Achievement in Environmental Pollution in Biology

By

Awolere M.A.

Abstract

There was a time when the traditional approach of teaching was adopted by most of the teachers, where the learner used to be dependent only on the lecture delivered by the teachers. Students were not exposed to enough practice of speaking on their own and hence the interaction among the students in a classroom was almost absent. But as the education system changed with time so have the teaching methods. Education system now demands more of student interaction rather than just listening to the instructor. Hence, classroom interaction is very essential in today's education system. The study therefore assessed the influence of teachers' classroom interaction on the students in environmental pollution in Biology among some selected secondary schools in Oyo state. A survey design was employed by the researcher. Ten secondary schools and twenty Biology teachers were randomly selected for the study from two local government areas of Oyo state. Three instruments were used for the study, it includes; Students Pollution Achievement Test (SPAT, r=0.92), Research Interview Schedules for Teachers (r=0.80), and Research Interview Schedules for Students (r=0.81). Two hypotheses were tested at 0.05 level of significance. The result revealed positive but significant relationship between teachers classroom interaction and the achievement of the students (r=0.39 and P>0.05): Negative and insignificant relationship of teachers classroom behaviour and Students Achievement (r=0.461, P<0.05). Necessary recommendations were given to various groups that may be involved in promoting a solid relationship between teacher-students relationship and student's achievement in Biology.

Introduction

Many scholars and educationist have carried out various studies on the importance of classroom interactions (between the teachers and learners) in relation to students outcomes in the teaching and learning process. Classroom interaction is a practice that enhances the development of the two very important educational skills which are speaking and listening among the learners. This device helps the learner to be competent enough to think critically and share their views among their peers (Awolere, 2005). However, many other studies have also been carried out in terms of their relationship to achievement of students (learners) in science (Frazer and Agada, 1989). The major concerns of many researchers on classroom interaction have been the search for ways of improving the teaching and learning of science using the most effective and conductive classroom atmosphere for presenting the subject matter of science (Olagunju, 2002).

It is of great necessity to look at the ways of improving the performance of learners in science subjects especially considering the facts that the classroom activities in many learning situations are usually dominated by the teachers alone. Researchers revealed that even science teachers are not exempted in this act (of teacher's domination). Other research works carried out were in favours of the science teachers that they would have made use of teaching strategies that would involve participation of the learner provided there are teaching and learning facilities.

Some other reasons advanced as to why the science teachers could not but only rely on verbal explanation are:

- overloaded curriculum
- lack of training programmes or workshop
- lack of skills in handling difficult concepts (Olagunju 2002)

Hawkins and Pea (1987) suggested that knowledge develops as a result of the interaction between an individual and his environment. The child is surrounded by a

rich cultural setting, which they defined as "objects and events". These play a crucial role in construction of the knowledge that the student brings into the classroom. Such "objects and events" which are unique to each individual culture and locality include the interaction of the media, people, plants, animals, buildings, informal learning situations and the practices of social institution which help in formulating curriculum for a child's education.

Objectives of classroom interaction as identified by Chidolu (2001) include.

- This type of interaction helps the learners to identify their own learning methods.
- This interaction will guide the learners to communicate with their peers easily and will give them an exposure to the vase genres of language learning.
- It will help the learner to come face to face with the various types of interaction that can take place inside the classroom.
- Classroom interaction aims at meaningful communication among the students in their target language.
- It also aims at probing into the learner's prior learning ability and his way of conceptualizing facts and ideas.
- This practise will help the teacher to have a detailed study of the nature and the frequency of student interaction inside the classroom.

Classroom interaction can be categorised under these main headings such as:

- Collaborative Learning
- Discussion and Debates
- Interactive Sessions
- Loud reading
- Story-telling
- Soliloquies
- Conversation with learners
- Role play

While working on the various teaching interactions by the teachers during the teaching-learning process, Adozuka (2001) recognized two main interactions in teaching and learning situation, these are:

i. teacher-centred
ii. student-centred

Teacher-centred is a situation whereby the teacher dominates the class and does all the teaching. In other words, the learners are made passive recipients of the learning situation. Only the teacher is active, he/she is autocratic in the classroom as he/she teaches, he/she dictates and gives facts alone, including the overview of the materials, his/her personal opinion about the subject matter is all and final. A teacher in this type of interaction allots little or no time to asking questions, which may lead to the learner's response to an intellectual task.

Student-centred interaction involves the learners being given ample opportunity and freedom to express their mind (opinion) and to do things in the class. In other words, the opinions and suggestions of the learners are respected to an extent. The learners also participate in making certain decisions in the class (active participation of the learners in the entire teaching-learning situation). The role of the teacher during these sessions is passive yet very crucial. It is the responsibility of the teacher to create a learning atmosphere inside the classroom. It is through these interactive sessions that the teacher can extract responses from learners and motivate them to come out with new ideas related to the topic. He/she is an observer who helps the learners to construct an innovative learning product through group discussions, debates and many more. He/she will define himself/herself as a planner who plans out the best of the modules of interaction that would be effective to invite the learners in classroom interaction.

Researchers including Chacko (1981), Chidolue (2001), have been so much concerned with the phenomenon of teacher-student interaction in the classroom situation, in recent times. Hence, the need for the researcher to work on the same subject matter in relation to the students level of participation and achievement particularly in environmental pollution in Biology.

It has been concluded through various research works that classroom interaction is a system of interlocking social role. The interrelated activities that build the teacher and students have to participate actively in the process of teaching and learning. Teaching and learning in Biology must be complimentary therefore the Biology teacher must have clear and specific aims and objectives of what they want to teach, they must call up the learner experience and link it to the new materials or instruction to be taught in a logical manner that calls for active learning. In a typical science classroom, one will likely observe a variety of activities of the teacher such as explaining concepts, asking question, moderating discussion, going through assignment, demonstrating experiment and giving tests. One is also likely to observe students taking part in activities like group discussion, watching the teacher demonstrating science experiments, performing experiments, solving problems or discussing assignments. The activities of the teacher connote teaching because they are aimed at facilitating the intellectual understanding of science as a subject. Likewise, the student's activities that result in gaining knowledge or ability constitute learning. Richards (1998) therefore said the nature of teacher and students' interpersonal behaviour has been shown to be factor that is associated with students' achievement in science, attitude to science and other factors such as students' sex and cultural background.

From the various notions of classroom interaction and teacher-pupil role, emerges the fact that each has a vital role to play. What is yet to be resolved is the extent of the involvement of each partner in the discourse. Among various research works on the similar topic-teacher-students classroom interaction, a teacher concluded that "she had become more aware of her students' need for clear communication and that that had become a focus for her in improving her classroom teaching (Richards, Newby and Fisher, 2001).

Research works revealed that very pleasant and interesting learning outcomes have resulted as a result of good (or better) teacher-students classroom interaction which determined students' level of participation and learning outcomes. Eggen and Kauchak (2001) identified a number of teachers' competence facilitate a caring and supportive classroom environment, they include teachers' enthusiasm, caring, being firm, democratic practices to promote students' comprehension and performance.

This research work is mainly to find out role the teacher- student interaction in the teaching and learning of environmental pollution in at least ten randomly selected secondary schools in Oyo State.

Statement of the Problem

It is of great necessity to look at the ways of improving the performance of learners in science subjects especially considering the facts that the classroom activities in many learning situations are usually dominated by the teachers. Research works had been carried out in which science teachers have made use of the interaction of teachers-learners in teaching especially in other school subjects. This study specifically investigated the influence of teacher-students classroom interaction and achievement in the teaching of environmental pollution in Biology.

Research Hypotheses

$H0_1$: There is no relationship between the teacher classroom interaction and the achievement of students in environmental pollution.

$H0_1$: There is no significant effect of teachers' classroom behaviour and the learning outcomes of Biology students.

Methodology

A descriptive (survey) design was employed by the researcher, which has to do with the collection of data in order to test the hypotheses and answer the research question raised in the study.

The target populations of the study were SS I Biology students. The reason being that the topic environmental pollution falls within the first year in joint

schemes of work for senior secondary schools in Oyo state.

The sample consisted of ten randomly selected secondary schools in Iseyin, and Itesiwaju Local Government Areas of Oyo state.

A total number of twenty (20) biology teachers were involved in the study. (two from each school).

More than twenty biology teachers could have been used but for the fact that not all secondary schools in the two local Government Areas could boast of two Biology teachers in their schools, hence only twenty were used, (two per school).

A total number of four observers were engaged for proper natural observation of both the teachers and the pupils in their perspective schools.

From each of the four local government areas, five secondary schools with intact classes were randomly selected, making up the total number of twenty schools. Eighty students were finally involved in the study.

Three instruments were used for this study, basically:

i. Students' Pollution Achievement Test (SPAT).
ii. Research Interview Schedule for Biology Teachers.
iii. Research Interview Schedule for Biology Students.

Students Pollution Achievement Test (SPAT)

The pollution achievement test was a multiple choice test prepared by the researcher with five alternatives (or options), one correct answer and four distracting options.

This test is initially 40-item multiple choice questions compiled for students from the SS I biology curriculum contents. The questions were based on:

- the definition of pollution (4 items)
- the types of pollution (11 items)
- names and sources of pollution (12 items)
- effect and control of pollution (13 items)

The purpose of the achievement test was to find out students' comprehension of some basic concepts in environmental pollution, bearing in mind that students had been exposed to some aspects of the topic during their junior secondary school integrated science curriculum content and even in SSI biology.

A test blue print was prepared to reflect the different levels of Bloom's taxonomy of the cognitive domains on one axis and content areas on the other. Initially, forty items were drawn from the SSI curriculum (topics on environmental pollution).

Table1: Table of Specification for SPAT

	Knowledge	Comprehension	Application	Analysis	Synthesis	Evaluation	Total
Definition of pollution	-	1	1	-	-	-	2
Types of pollution	1	2	2	1	-	1	7
Names and sources	3	1	1	1	1	1	8
Effects and control	1	1	4	1	-	1	8
Total	5	5	8	3	1	3	25

These items were subjected to scrutiny by a number of experienced biology teachers at the senior secondary school level and experts in test construction for

evaluation of the suitability for the target population i.e. SSI students.

The twenty five items survived the scrutiny in terms of form, content, reading level and behavioural objectives; therefore were judged to be content and face valid. The final form of the test had items distributed as shown in the test blue-print below.

The Student Pollution Achievement Test (SPAT) was subjected to a measure of internal consistency using the Kuder-Richardson formula 21.

25 items were finally found to process between 40-60% difficulty indices and were therefore selected. Other items were dropped because they were either too easy or too difficult.

Kuder-Richardson (KR- 21) was employed for SPAT. Reliability analysis is calculated thus,

$$KR\text{-}21 = \frac{n}{n-1}\left(1-\frac{x(n-x)}{nS^2x}\right)$$

Where: n=number of items correctly answered.

S^2x= variance of the total test.

X= mean of the total test.

While $S^2x = \frac{X^2}{N-1} - \frac{N(X)^2}{N-1}$

Research Interview Schedule for Biology Teachers

This Interview Schedule is an instrument designed to investigate from the Biology teachers, how the teacher-students classroom interactions can serve as correlate of students' level of participation and learning outcomes discrimination power of the test and the difficult indices of the items were computed after administering the test to 29 SS1 students from Iseyin and Itesiwaju Local Governments, especially in environmental pollution in biology.

The instrument is a five-point likert scale ranging from 1 to 5, and has thirty items. Cronbach alpha measure used to validate the instrument gave a value of 0.80.

Research Interview Schedule for Biology Students

This is the third instrument, designed to investigate from the biology students, what they think the biology teachers should do, to help them (students) participate well in the classroom, thereby improving their learning outcomes.

The instrument is made up of 10 items, each having five likert points. The instrument when subjected to Cronbach alpha measure gave 0.81

Data Collection

The data were collected through primary source by administering a well-structured interview schedules (through questionnaire) to both the teacher and his students in a biology class.

Having administered the questionnaire to the respondents, the observer waited to collect them (questionnaire) back. This helped to ensure high percentage return of the copies of this questionnaires Also, a direct observation of the classroom situation was of significant help in collecting the data.

Data Analysis

The data was analyzed by using descriptive statistics such as frequency distribution, means and percentage, chi-square analysis and Pearson product moment correlation was used to test the hypotheses.

Results

Hypotheses 1: There is no relationship between the teacher classroom interaction and the achievement of the students in environmental pollution.

Table 2: Pearson Correlation Coefficient Analysis showing the relationship between the teacher's classroom interaction and the students' achievement

Variables	N	X	S D	r	P	Remark
Teachers' Classroom Interaction	20	35.35	3.30			
Students Achievement	80	23.18	5.41	0.39	0.092	NS

The obtained result in table 2, r = 0.39 and P>0.05 reveals that there is a significant relationship between the teacher's classroom interaction and the students learning outcome (achievement).

Table 2 above reveals the relationship that exists between the teachers' classroom interaction and the students' achievement. The correlation coefficient is 0.39 and the P>0.05. This relationship is positive one though not significant. Hence, the null hypothesis 1 is not rejected.

Hypothesis 2: There is no significant relationship between teachers' classroom behaviour and students' achievement in biology.

Table 3: Pearson Correlation Coefficient analysis showing relationship between the teachers' classroom behaviour and students' participation and achievement

Variables	N	X	SD	R	P	Remark
Students achievement	80	35.28	25.30			
Teachers' classroom behaviour	20	83.70	11.32	-.461	0.041	S

Table 3 above shows that the effects or relationship of teacher's classroom behaviour is positive on students Achievement. The r-value is -0.461 with (P 0.041) <0.05. Therefore, the null hypothesis three is hereby rejected.

The result of the findings in table 3 shows that the teacher's classroom behaviour has negative relationship with the students learning outcomes. The table gives the correlation co-efficient (r) values of -0.461, P0.05. In the words of Scott-Jones and Clark (2005), academic achievement dependent on individual abilities and aspirations. The social environment in which learning takes place can enhance or diminish the behaviour that lead to achievement (Scott-Jones and Clark, 2005), what the result implies is that the behaviour of the teacher in the classroom will have positive influence on the students achievement. If this is so, then a teacher should see himself/herself in the classroom not as a dictator but a partner in teaching-learning process.

Discussion, Summary, Conclusion and Recommendations

Discussion

The findings from the research work revealed that there is a positive relationship between the teacher's classroom interaction and pupil's achievement. This can be seen in table 1 with correlation coefficient (r) of 0.461.

This significant relationship established by the result findings is not different from Richards (1998) that "the nature of teacher and students interpersonal behaviour has been shown to be a factor that is associated

with students' achievement in science". (Pg. 96).

Chidolu (2001) therefore said, "The teacher and pupils play complementary roles". (Pg 93) The implication of this significant relationship is that, for students to achieve so much in the classroom teaching, the teacher should be ready to be a partner as well as a friend of the pupils. From the various notions of classroom interaction and teacher-pupil role emerges the fact that each has a vital role to play. The only problem as at now is that, the extent of the involvement of each partner in the discourse is not yet established.

Science teaching should be quite different from the teaching of other subjects. The quality of the science teacher (love, and concern for students) is more important in science than any other teaching aspects. (Chacko, 2001). The result of this research work corresponds to the work of McREL products on classroom interactions and achievement (http://www.mcrel.org/PDFconversion..., 2005) which established the fact that there are actions that can improve the quality of teacher and students' interaction.

In the words of Joyces (1996), it was stated that "a good teacher's personal qualities and characteristics should be 'being natural, being warm, being pleasant, being approachable and being tolerant". (Pg. 88) Jones continued to say "students prefer teachers who are warm and friendly". (Pg. 70) In line with the result of the findings was also the work of Chidolu (2001) that "when there is a solid classroom interaction between the teacher and the pupils, and the level of their students' achievement is raised. Little wonder then that Awolere (2005) opined that "as teachers, our effective teaching is largely determined by the extent of our relationship skills with the students". (Pg. 88)

Conclusion

It is my view that when there is a positive classroom interaction between the teacher and his pupils, the pupils will get the attention needed to eventually aid their achievement in biology. The research can be concluded with the fact that, if teachers want the students to achieve at better rate, they (students) should be considered as human first and be allowed to positively interact in the classroom.

The students' interaction may initially not yield the expected result, but with guidance and expected motivation from the teacher, the students will eventually make a meaningful contribution that will lead to an achievement on their (students) part. The science teachers should also use instructional techniques that will not only make him or her a benevolent dictator but a co-facilitator in the learning process with his learners.

Recommendation

The following recommendations cut across various groups:

Many science teachers lack the adequate skills with which they should impact scientific knowledge, skills and scientific attitudes to science students. Such science teachers should endeavour to improve themselves through periodical in-service trainings, seminars and workshops.

Some science teachers are dictators in their teachings due to their inadequate instructional techniques. Such teachers should try to make a change in such a way that they will be able to equip the young scientists with sound foundation of the principles and facts of science. The change can still be made through regular seminars and workshops on science teaching.

The science students themselves should be ever ready to learn and imbibe sound foundation of the principles and facts of science. Nigerian science students are often confronted with problem of local scientific principles at the expense of the real western science. Because of the traditional cultural background of the African child, the introduction of western science is likely to create a conflict of ideas. (Adesoji, 2002). This is because hi/her mind is already loaded with 'local' scientific principles, which are likely to negate those of western science.

To be free from all these local scientific ideas and principles, it will take the science students to be fully committed and dedicated to western scientific ideas and be free from unnecessary suggestion, which cannot be proved.

The involvement of the parents cannot be over emphasized, as the community, and the science students themselves need their support.

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