INFLUENCE OF CLASSROOM INTERACTION PATTERNS ON ACHIEVEMENT IN BIOLOGY AMONG SENIOR SECONDARY SCHOOL STUDENTS

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ABSTRACT

The study investigated the influence of classroom interaction patterns on achievement in biology among Senior Secondary School Students in Anambra State. One research question and one null hypothesis tested at 0.05 level of significance guided the study. A causal comparative or (expost-facto) design was used; a population of 10, 206 SSII Biology students in government owned Secondary Schools in three education zones namely; Awka, Nnewi and Onitsha of Anambra State. The sample consisted of 265 SSII biology students (141 males and 124 girls) drawn from 10,206 biology students. Purposive and random sampling technique was used for the study. Six (6) single sex schools (2 males, 2 females and 2, co-educational) were purposively sampled from the three education zones. Two instruments were employed for data collection namely: Biology Achievement Test (BAT) constructed by the researchers and an adapted questionnaire titled "Previous Classroom Interaction Categorization Test (PCICT) designed to evaluate the level of participation of the teachers compared with

students for each pattern of interaction in their precious biology classroom activities. BAT and PCICT were validated by two biology educators and two expert in measurement and evaluation all from Science Education Department, University of Nigeria Nsukka. BAT reliability coefficient was established using Kuder-Richardson 20 (K-R2O) method which gave 0.86 and PCICT reliability was established using Pearson Product Moment Correlation coefficient which gave an index of 0.80. Data were analyzed using mean, and standard deviation to answer the research questions while one-way Analysis of Variance (ANOVA) was used to test the null hypothesis. Result showed among others that classroom interaction patterns significantly influenced students' achievement in biology. Recommendations and conclusion were highlighted.

Key Words: Classroom interaction patterns, Achievement, Biology, Students

INTRODUCTION

Biology is one of the most popular science subjects offered by both science-oriented and art based students in the Senior Secondary Certificate Examination (SSCE) in Nigeria. Studies have shown that there is an increasing yearly enrolment in S.S.C.E biology, but each year candidates achieve poorly in examination (Nwagbo & Obiekwe, 2009; Okoye, 2010). The result for Senior Secondary Certificate Examination (SSCE) in biology shows very poor performance, making for the need to improve biology teaching and learning in Nigeria. Statistics from West African Examination Council (WAEC, 2015; 2016; 2017) revealed that students' achievement in biology was very poor and that students failed to obtain grades at credit level and above, which would qualify them for University admission in biology and other science related disciplines (Chief Examiner's Report, 2017). Student's poor achievement in biology has been linked to a number of contributing factors among which are: incompetent mode of teacher's delivery of the subject, inadequate use of instructional materials and ill-equipped biology laboratories (Okoye, 2011). Biology classroom activities are characterized by a rigid teacher-centred pattern where/students active participation are not allowed. Questioning skills are poorly used to evoke productive classroom discussion (Uzoechi, 2008). Teacher – centred instruction lead to weak classroom discourse based on role memorization and no provision for development of intellectual and creative thinking skills among students (Uzoechi 2008). Thus, biology classroom interaction quickly deteriorated into meaningless waste of time. Therefore, the need to improve biology classroom activities among students' since achievement in biology is still not impressive.

Teaching is a process of enabling pupil' to acquire knowledge and skills in an interactive process that involves the teacher, student and the environment which helps in promoting learning through classroom activities, (Aggarwal, 2006). Some classroom teaching/learning activities include: demonstration, questioning, experiments, reinforcement and reactions to teacher's teaching (Sadler, 2006). Inamullah (2005) stated that interaction between the teacher and student is an essential part of all the teaching and learning processes. Classroom interaction is the sum total of activities taking place in the classroom between the teacher, the learner and the learning materials during the teaching process (Okoye, 2011). An interaction between the teacher and student during teaching – learning process modifies behaviour, helps students to socialize, develop desirable attitude and interest, create an atmosphere to develop problem – solving skills (Okoye, 2011). Aggarwal, (2006) maintained that classroom Interactions helps in improving students active participation and involvement during teaching learning process.

Classroom Interaction Pattern (CIP) is a process where the teacher and student have reciprocal effects upon each other through what they say or do in the classroom to achieve

instructional objectives (Matelo, 2005). It is seen as a successful transmission of a message between the teacher and the student, (Shomoosi 2004). Onimisi, (2006) stated that classroom interaction pattern consist of a lesson situation in which the teacher and students through verbal and non-verbal actions have reciprocal influence on each other. The verbal actions include: the teacher initiation of a lesson, students listen passively and respond through questions or recitation. Then the teacher may react either verbally or non-verbally in an encouraging or disapproving manner (Onimisi, 2006). Pattern refers to the way of doing something (Hornby, 2001). An interaction that occurs in a classroom forms a communication context for learning. Thus, in teaching-learning process, classroom interaction pattern is the way a teacher discusses, converses, talks and expresses verbally and non-verbally to students during learning activities. It is the verbal communication pattern or style of the teacher and the students in a classroom activity.

Copper and Robinson (2000), classified classroom interaction pattern into a four dimensional character involving interaction between: teacher and student, student- student, teacher-material and student material.

- Teacher – Student interaction pattern consist of where the teacher initiates, guides and direct classroom talk with students, (Viiri and Saari, 2006). This talk is directed towards a specific target or problem. The talk pattern is related to the problem-solving method, because their characteristics are similar (Akuma, 2005).

- Student-student interaction pattern enables students to talk with their peers in a group to solve a common problem (Viiri and Saari, 2006). This discourse pattern involves the participation of every member of the group. This is used to implement the co-operative/collaborative learning strategy because they are similar.

- Student-material interaction pattern enables an individual or a class to work with science equipment, preserved organisms or life Specimens'. This involves students' active participations and acquisition of manipulative skills (Okoli, 2011).

- Teacher – material interaction pattern involves how the teacher illustrates teaching with instructional materials in the classroom (Jaja, 2002). Instructional materials are potent tools, which can be used to effectively communicate science, while enriching the learning experiences of the learners (Okoye, 2010).

Several interaction patterns have been designed and used in teaching and learning processes as a mean of enhancing achievement in science. The interaction patterns of interest to the researchers in this study include: teacher – student interaction pattern, student – student interaction pattern and teacher – material interaction pattern. The researchers employed an interaction pattern adapted from (Abdullah and lannone, 2010; Penny, 1996; and Flanders, 1966) known as previous classroom interaction categorization Test. This was designed to evaluate the level of participation of the teacher compared with students for each pattern of interaction in their previous classroom activities. It has a scale range which is made up of three categories namely:

(a) Teacher Active, Student mainly Receptive ranging from 1 to 1.49.

(b) Teacher Active, student Equally Active ranging from 1.50 to 2.49.

(c) Students Active, teacher partly Receptive ranging from 2.49 to 3.00.

The three categories are not conventional but are chosen by the researchers. Unlike other classroom interactions analysis, this scale is not based on any form of observation.

Classroom interaction pattern is an instructional strategy which a teacher should consciously and skillfully plans and executes in every lesson so that the above interaction patterns plausibly and effectively applied per instant in each lesson delivery. Also, the learning outcome of student's achievement should be measured after classroom interaction patterns in the context of teaching. It is therefore necessary to determine whether biology achievement depends on effective classroom interaction pattern on the context of teaching. Therefore, this study aims at investigating the influence of classroom interaction patterns on achievement in biology among senior secondary school students in Anambra State.

RESEARCH QUESTION

One research question was posed to guide the study.

(1)   What is the influence of classroom interaction patterns on the mean achievement scores of students in biology.

HYPOTHESIS

One null hypothesis was formulated to guide the study and was tested at 0.05 level of significance.

HO: Classroom interaction patterns have no significant influence on the mean achievement scores of students in biology

RESEARCH METHOD

The design of the study was a causal comparative or (expost-facto) design, where the independent variables among subjects cannot be manipulated or controlled. The study was carried out in three education zones of Anambra State namely: Awka, Nnewi and Onitsha. The population of the study consisted of all the senior secondary two (SSII) biology students numbering, 10,206 biology students in government – owned secondary schools in the three education zones. The sample consisted of 265 SS II biology students (141 males and 124 girls drawn from 10,206 biology students. purposive and random sampling technique was used for this study. Six (6) single sex schools (2 males, 2 females and 2 co-educational) were purposively sampled for a proper representation of the schools in the three education zones. Two instruments were used for data collections. Biology Achievement Test (BAT) Constructed by the researchers and a questionnaire for biology teachers and students titled "Previous Classroom Interaction Categorization Test" (PCICT), adapted from (Abdullah and Larnone, 2010; Penny, 1996 and Flanders, 1966). "PCICT" was designed to evaluate the level of participation of the teachers compared with students for each pattern of interaction in their previous Biology classroom activities.

PCICT has a scale range and is made of three categories namely:

(a) Teacher Active, Student Mainly Receptive ranging from 1 to 1.49.
(b) Teacher Active, Student Equally Active ranging from 1.50 to 2.49.
(c) Students Active, Teacher Partly Receptive ranging from 2.49 to 3.00

The three categories are not conventional but are chosen by the researchers. Students and teachers are therefore to make responses based on their personal experience during previous biology classroom activities. Unlike other classroom interaction analysis, this scale is not based on any form of observation. Three response options are available for each item; indicate a tick in the appropriate interaction option experienced by you in your previous biology class session. BAT is a multiple-choice objective test based on the units of study in SSII biology curriculum used for the study. BAT and PCICT were validated by two biology educators and

two experts in Measurement and Evaluation all from Science Education Department, University of Nigeria, Nsukka. The reliability of BAT was determined using Kuder-Richardson 20 (K – R20) method which gave the coefficient of internal consistency to be 0.86 which was high enough for the study. While, PCICT was determined using Pearson Product Moment Correlation Coefficient which gave a reliability index of 0.80. PCICT was preferred for use in this study because it provides a range to identify different types of interaction processes in previous biology classroom activities. PCICT was administered in the six sampled schools to students with the help of the trained research assistants. At the end BAT instrument was administered on each of the students in the six sampled schools. The scripts from each student were collected and marked using the marking guide and scores used for data analysis.

Data were analyzed using mean and standard deviation to answer the research questions while Analysis of Variance (ANOVA) was used to test the null hypothesis at 0.05 level of significance.

RESULTS

The findings of the study were presented sequentially, according to the research question and hypothesis.

Table 1: Mean Achievement scores and Standard Deviation of Students in Previous Biology Classroom Interaction Categorization test (PCICT).

Groups	Previous Biology classroom interaction category test	N	Mean	STD
PBCICT 1	Teacher Active, students mainly receptive	52	29.44	6.54
PBCICT 2	Teacher Active, Student Equally Active	72	27.45	7.23
PBCICT 3	Student Active, Teacher's Partly Receptive	143	24.89	6.25
	Total	**297**	**26.45**	**6.80**

The result of table 1 shows that students in group 1 in Teachers Active, Students Mainly Receptive in Previous Biology Classroom interaction category test had a mean achievement scores of 29.44 and Standard Deviation of 6.54, and students of group 2 in Teacher Active, Students Equally Active in Previous Biology Classroom interaction test had a mean achievement scores of 27.45 and standard deviation of 7.23 while students of group 3 in Students Active, Teacher's Partly Receptive in Previous Biology Classroom interaction category test had, a mean achievement of 24.88 and standard deviation of 6.25.

This implies that Students in group 1 performed better than group 2 and 3 respectively while the group 2 students performed better, than group 3 students in biology achievement test. Therefore, classroom interaction patterns had a significance influence on the mean achievement scores of students in biology.

Table 2: One-way Analysis of Variance (ANOVA) of Students' Mean Achievement Scores in Previous Biology Classroom Interaction Categorization Test (PBCICT)

Source	df	Sum of Squares	Mean Squares	F	Sig	Decision
Between Groups	2	891.8220	445.9110	10.2972	.0000	S
Within Groups	266	11518.9364	43.3043			
Total	**268**	**12410.7584**				

Table 2 result shows that students' mean achievement scores in previous biology classroom interaction category differ significantly in achievements. This is indicated by the calculated = – value of 10.2972, which is significant at .0000 which is less than 0.05 level of probability. Therefore, the null hypothesis of no significant influence of classroom interaction patterns on the mean achievement scores of students' in biology is rejected. This suggest there is a significant influence of classroom interaction patterns on the mean achievement scores of students in biology in the previous classroom interaction category test, which consisted of three categories namely: Teacher, Active, Students Mainly Active (group 1), Teachers Active, Students Equally Active (group2) and Students Active, Teacher Partly Receptive (group 3) respectively.

To find out the direction of difference, a Scheffe post hoc multiple comparison test between two means, at 0.05 level of significance were carried out and presented in table 4

Table 4: Scheffe Post-hoc multiple comparison Test between two mean scores in previous Biology classroom Interaction Category.

The difference between two means is significant if

Mean (J) – Mean (I) > = 4.6532 "RANGE SOQT" ($^1/_N$ (1) + $^1/_N$ (J) with the following value(s) for Range 2.48

Indicates significant difference which are shown in the lower triangles

Mean	PECICI
24.88	Group 2
24.45	Group 2
29.44	Group 1

Indicates group significant difference at 0.05 level of significance.

The result in table 4 revealed that each group in previous biology classroom interaction category differed significantly from each other. The result showed that students in group 3 had a mean score of 24.88 which differed significantly from group 2 and group 1 respectively. The students in group 2 had a mean score of 27.45 which differed significantly from group 1 and group 3 respectively while the students in group 1 had a mean score of 29.44 which differed significantly from, group 2 and groups 3.

This implies that students in group 1 performed better than, group 2 and group 3 respectively. While the group 2 students performed better than group 2 and 3 respectively while the group 2 students performed better than group 3 students in biology achievement test. Therefore,

classroom interaction patterns had a significant influence on the mean achievement scores of students in biology.

DISCUSSION OF RESULTS

A null hypothesis of no significant influence of classroom interaction patterns on the mean achievement scores of students' in biology was rejected (calculated F-value 10.2972 which is significant at .0000, but is not significant at 0.05 level of probability). This implies that there is a significant influence of classroom interaction pattern on students' means achievement scores in biology.

The relative effectiveness of classroom interaction patterns in enhancing students' achievements could be due to the unique characteristics in the teacher-student interaction pattern. The teacher guides and directs the classroom talk towards a specific, target (Viiri & Saari, 2006). This result is in line with the findings of onimisi, (2006) that teacher-guided discussion during lesson can be synonymous to a learner-centred approach in teaching. There is no doubt an essential ingredient in student's optimal academic achievement and good classroom climate. The promotion of good classroom interaction, therefore, enabling social and psychosocial atmosphere through democratic leadership style during lessons and personal qualities that must be endearing (Onimisi, 2006).

The student-student interaction patterns or discussion patterns promote co-operative learning; the participants strive for mutual benefits among group members (Smith and Hardman, 2003). The student-student learning discussion incorporates the elements of listening, talking, questioning, responding, reflecting, exchanging viewpoints, debating, writing answers and comments to questions and reading assignments for class discussion (Gwee & Hoor 2001). Hence, students learn through social interaction which is a powerful learning tool in the educational system, (Smith, 2000). This result is in line with Lee's (2000) finding that only 11 out of 42 learners spoke during questions and answer discussion in the teacher fronted discussion, while 46 out of 46 learners spoke during the group discussion among students which showed participation of every student in a lesson. The finding implied that students found facts which helped them to contribute meaningfully to achieve better result. The finding that students' mean achievements scores in biology were significantly influenced by classroom interaction patterns is in agreement with the findings of Okoli, (2006) that two interaction learning styles, teacher-student and student-student interaction patterns significantly enhanced students' achievement in biology. Therefore, the finding that classroom interaction patterns significantly influenced students' academic achievement in biology is not misleading.

EDUCATIONAL IMPLICATIONS

The results of this study have obvious implications for biology teachers, students, for other teachers, curriculum planners and stakeholders in education. The study provides empirical information on the effectiveness of classroom interaction patterns on achievement in learning biology education. The teacher-student interaction pattern enables the teacher to give students effective guidance in a learning situation. The student-student interaction pattern enables the teacher to organize students into groups to solve a common problem. Through student-student interaction pattern learners are allowed to contribute ideas and knowledge freely for a common purpose. The brighter students assist the slow learners as they work and discuss together in a small group. This helps to reduce the persistent poor students' achievement in biology among students.

The study also has implications for curriculum planners for teachers' professional development. The classroom interaction pattern involves the acquisition of different type of skills which can be learnt by biology teachers and other classroom teachers including pre-service teachers. Incorporating the various skills of the classroom style in pre-service and in service training would encourage vast improvement of teacher effectiveness in the classroom.

RECOMMENDATIONS

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

- It is evident that since the adoption of the classroom interaction patterns was found to be effective in improving students' achievement in biology, teachers should use classroom interaction to facilitate their biology teaching.
- In-service training, workshops and symposia should be organized and made compulsory for practicing teachers to embrace the skills of classroom interaction patterns.
- School should organize workshops and seminars internally which will enable teachers and students to share ideas on the skills of classroom interaction patterns.

CONCLUSION

The result of this study reveal that: classroom interaction patterns significantly influenced students' achievement in biology.

REFERENCES

Aggarwal, J. C. (2006). *Essentials of educational technology: teaching – learning innovation of education*. Delhi: Vikas Publishing House PVT Ltd.

Akuma, N. (2005). Effects of guided discovery method on senior secondary school students' achievement in map work. *The Journal of world Council of Curriculum and Instruction Nigeria Chapter 5* (2), 185-194.

Cooper, J. & Robinson, P. (2000). Informal small strategies in large classes. In Macgregor, T. J., Copper, K.T., Smith & Robison, P. (Eds.) *Strategies for energizing large classes: From small groups to learning communities: New Directions for reaching and learning.*

Flanders, N. (1966). *Teacher influence on classroom interaction analysis theory, research and application.* Addison: Wesley Reading, M.A: USA 103-116.

Gwee, C. E. & Hoon, T. C. (2001). Large group teaching: Adding value and optimizing educational outcomes. *Journal of Education 5(4), 8-9.*

Hardman, F. & Smith, K. L. (2003). Interactive whole class teaching in the national literacy strategy. *Journal of Education*. 33 (2), 197-215.

Hornby, A. S. (2001). *Oxford advance learners* dictionary *of current English* (6th Ed) Oxford: University Press.

Inamullah, M. (2008). *Patterns of classroom interaction at different educational levels in the light of flander's interaction*. Unpublished Ph.D Thesis, University of Nigeria, Nsukka.

Jaja, O. P. (2002). Assessment of biology study support environment in our schools. *43*rd *Annual conference Proceeding of Science Teachers' Association of Nigeria.*

Lee, J. F. (2000). *Task and communicating in language classrooms*. New York: McGraw-Hill Publishers Ltd.

Matelo, A. (2006). Describing classroom interaction. Retrieved on line-file: IIC:/Documents % 20 and 20% settings/Administrator my %20 Documents/Untitled. Htm 20th December, 2017.

Nwagbo, R.C. & Obiekwe, C. (2009). Using constructivist model as a practical approach to effective teaching of soil types and water holding effects of soil on vegetation for sustainable development. In Nwagbo, C.R., Nzewim, U. M., & Ajewole, A. G. (Eds.) *Proceeding of National Biology Panel workshop Series,* pp 88 – 95.

Onimisi, J. A (2006). *Impact of types of teacher training on students achievement and attitude towards integrated science in Kogi State*. Unpublished Ph.D thesis, university of Nigeria, Nsukka.

Okoli, J. N. (2011). Activity-Based approach and use of analogy for effective teaching of organization of life using organisms. In Okoli, J. N. & Nzewi, U. M. (Eds.) *Proceedings of National Biology Panel Workshop Series,* pp 8 – 15.

Okoli, J. N. (2006). Effects of investigative laboratory approach and expository method on acquisition in science process skill by biology students of different levels of scientific Literacy. *Journal of Science Teachers Association* of Nigeria. 41 (1 & 2), 79 – 88.

Okoye, P. O. (2010). Influence of instructional resources on the successful implementation of biology curriculum in senior secondary schools. *Journal of South East Women in Colleges of Education. A Multidisciplinary Journal*, 49 – 54.

Okoye, P.O. (2011). *Influence of classroom interaction patterns and students' cognitive styles on achievements in biology in senior secondary schools in Anambra State.* Unpublished Ph.D Thesis Report, University of Nigeria, Nsukka.

Penny, U. (1996). A Course in language teaching: Practice and theory Cambridge: University Press.

Saddler, R.E. (2001). Promoting discourse and argumentation in science teacher education. *Journal of Science Teacher Education.* 17,323 – 346.

Shomossi, N. (2004). The effect of teachers questioning behavior in EFL classroom interraction. A classroom research study. From nshomossi@yahoo.com Retrieved February 10th 2017.

Viiri, J. & Saari, H. (2006). Teacher talk patterns in science lessons: Use in Teacher Education. *Journal of Science Teacher Education*, 17,347 – 365

Uzoechi, B. C. (2008). Unpublished Ph.D Thesis Report, University of Nigeria, Nsukka.

West African examination council (2015, 2016, 2017). *Chief examiner's report*