PATTERNS OF CLASSROOM INTERACTIONS AND STUDENTS' REACTIONS TOWARD STUDY BARRIERS IN BIOLOGY LESSONS

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Abstract

The study sought to identify and analyze the classroom interactions and students' reactions toward study barriers in biology lessons in Ilorin, Nigeria. This study was a descriptive research of the survey type. Intact biology classes of three hundred and twenty-four (324) senior secondary school II students (SSSII) and ten (10) biology teachers participated in the study. The instruments used for data collection were an adapted Flanders Interaction Analysis Categories System (AFIACS) and an Adapted Study Technology System Tool (ASTST). Three research questions were raised and answered from which one research hypothesis was generated and tested at 0.05 level of significance. Teacher talk (79.25%) was the predominant pattern of classroom interaction in biology lessons. Lack of Mass was the most frequently encountered study barriers in biology lessons. The misunderstood word was the predominant (48.46%) study barriers in teachers dominated classrooms, while, lack of mass (46.29%) was the predominant study barrier in students' dominated classrooms. There was a significant difference between the number of study barriers encountered by students under each pattern of classroom interaction during biology lessons ($X^2_{(9)} = 405.36$, $p < 0.05$). The study concluded that classroom interaction influences the type of study barriers that students' encounter during biology lessons. The study recommended that there is a need for biology teachers to involve students more in the teaching and learning process so as to aid student talk classroom interaction pattern and also, take note of the study barriers in the classroom, thereby improving the performance of students.

Keywords: Biology Lessons, Biology Teaching, Classroom Interaction Patterns, Study Barriers, Students Reactions

Introduction

Biology is a natural science that deals with the living world (Adubi, 2011). It helps in the study of structure, function, growth, origin, evolution and distribution of living organisms (Biology Dictionary, 2016). Despite the importance of biology, the performance of students' in biology is still on the decline (Olorundare, 2014). Since classroom is the avenue for most teaching and learning in a formal school system. Significant positive insight can be gained into the level of success and failure of teaching and learning activities through the analysis of classroom interactions (Inamullah, 2005). The liveliness of teaching is a great determinant of effective students learning (Grouws, 1981). During teaching and learning process in the classroom, teachers establish the pattern of general conduct while the students show certain types of reactions toward this pattern. As a result, students participate to a varying degree and show different reactions depending on the conduct of the teachers.

The combination of teacher's method of teaching, teaching materials and students classroom participations leads to a certain interaction pattern and therefore, serves as the determinant of specific study barriers. Classroom interaction is considered a productive teaching techniques and it refers to the whole range of activities and experiences through which the teachers; curriculum, materials, and the learners' interact (Runmei, 2008). It has to do with the interactive processes through which teachers' implement the curriculum and impart learning to students using the available materials (Goh& Fraser, 2010).Dagarin (2004) argues that classroom interaction is "a two-way process between the participants in the language process, the teacher influences the learners and vice versa" and during such influence, there are factors, obstacle and hindrances that may negatively affect the learning process which may reduce the learning impact on the student.

Abimbola (2015) described learning as a conceptual change, which involves understanding new things and getting better ways to do things. The avenue to better learning and good academic performance in schools are good and experienced teachers, good study environment, good study habit among others (Olawunmi, 2016). Abimbola (2015) defined study barrier as something that impedes students' ability to study effectively thereby preventing them from learning. Hence, a barrier to learning is anything that stands in the way of a child being able to learn effectively. Also, barriers are factors which have adverse effects on the learning process of students or that which blocks studying by students, thereby preventing them from learning effectively.

There are three distinct and primary barriers which can obstruct a person's ability to study. These barriers produce physical and mental reactions (Hubbard, 2003). They are (1) lack of mass (2) too steep a gradient and (3) the misunderstood word, were by no means secluded as fundamental to effective education. Mass is the real physical object of the subject matter in teaching and learning, and it could also be in the form of pictures, sketches and demonstration kits. A gradient is a means of doing things stepwise or systematically. It becomes steep when it does not follow the regular order by jumping steps. A misunderstood word is a word that is not understood at all or a word wrongly understood and results in a misconception or alternative conception (Abimbola, 2015). A learner may experience one or more barriers to learning throughout his or her education. If one recognizes and understands what these barriers are and how to handle them, the ability to study and learn will be very much improved (Abimbola, 2015).

Kaniz (2015) examined the barriers in teaching learning process of Mathematics and identify some of the major factors that obstruct the teaching and learning to be pedagogical, social, economic, administrative, and policy aspects and attitude of students and teachers. The Ncube (2013) study on barriers to learner achievement in rural secondary schools in Zimbabwe sought to analyze the perceptions of school principals on barriers to effectiveness in rural Zimbabwe. The result captured the ill-temperedfeelings, anxieties, and frustrations of the participants as they repeatedly cited several barriers, chief amongwhich were: lack of significant funding; lack of quality teachers; unfriendly rural schools' environment, andlack of teacher retention. Furthermore, Fabunmi and Folorunso (2010) study examined poor reading culture: the barrier to students' patronage of selected secondary school libraries in Ado Ekiti. The findings showed that the materials in the school libraries are not adequate, not organised, not relevant, and school librarians not readily available.

Therefore, it is established that both classroom interaction and study barriers have a relationship that one cannot over emphasize. Consequently, to achieve optimum and efficient learning process in the classroom, barriers or obstacles must be taken into cognizance so as to ensure that its adverse effects are reduced to the barest minimum and also leverage on better ways to influence efficient learning experience in the classroom.

Researchers such asFebby (2014); Egbuna and Onyegegbu (2013); Hammang (2012); Sita (2010); Onwuachu and Nwakonobi (2009); Kalu (2008) have extensively conducted research works into classroom interaction patterns in science classes. Febby (2014) studied the analysis of classroom interaction using Flanders Interaction Categories System (FICS), the study concluded that students were not active enough in the classroom interaction. The findings of Egbuna and Onyegegbu (2013) on the interaction pattern in senior secondary school practical biology classroom showed that biology teachers dominated the practical biology and initiated interactions themselves. In sex-segregated schools, girls interact more frequently with biology teachers and their classmate. A study conducted by Hammang (2012) engaging first, sixth and eleventh-grade teachers concluded that teachers were the most famous actors in 84 percent of classroom communication process and that less than one-half percent of classroom verbal behavior was spent in discussion of feelings and interpersonal relations.

Sita (2010) study on classroom interaction characteristics in a Geography class conducted using English medium. The findings indicated content-cross as the most dominant characteristic in immersion classroom interaction. It reflected that most of the teaching-learning time was devoted to questions and lectures by the teacher. Onwuachu and Nwakonobi (2009) study investigated students' evaluation of their biology teachers' classroom interaction and their feelings towards biology lessons. Three research questions guided the study. The data was analysed using mean scores and multiple regression analyses. The findings showed that biology students perceived their teachers mostly as leaders, understanding, admonishing and strict.

Kalu (2008) study on classroom interaction patterns and students' learning outcomes in physics was to observe and code the interaction patterns in physics lessons and also to relate the identified patterns to students' post-instructional attitude towards physics andperformance in low and high academic tasks. The study indicated a significantly positive relationship between interaction pattern and students' post-instructional attitude and low academic task achievement.

In view of the reviewed studies, it could be concluded that the researchers did not go further in checking the study barrier that is associated with a particular classroom interaction patterns.

Statement of the Problem
The domain for formal educational activities is the classroom. It is the avenue for most teaching and learning in a formal school system. The elements that interact in the classrooms are the teacher, students and the learning materials. The success of the interactions in the classroom significantly has an impact on students' achievement. Evidence abounds in science education literature that students often encounter study barriers in their efforts to achieve meaningful learning during and after classroom lessons. Thus, this study was carried out to analysed classroom interactions and students' reactions towards study barriers in biology lessons in Ilorin, Nigeria.

Purpose of the Study
The purpose of this study was to analyse classroom interaction and students' reactions to learning barriers in biology lessons in Ilorin, Nigeria. Specifically, this study:
1. Identified and analysed the various patterns of classroom interactions during biology lessons in senior schools in Ilorin, Nigeria
2. Identified and analysed the study barriers encountered by students' during biology lessons.
3. The predominant study barriers encountered by students during biology lessons under each pattern of classroom interactions.

Research Questions
In line with the purpose of this study, the following research questions were raised.
1. What are the patterns of classroom interactions taking place during biology lessons?
2. What are the study barriers encountered by students' during biology lessons?
3. What are the predominant study barriers encountered by students' during biology lessons under each pattern of classroom interactions?

Research Hypotheses
HO_1: There is no significant difference in the number of study barriers encountered by students during biology lessons under each pattern of classroom interactions.

Research Methods
Descriptive research was employed in carrying out this study. Survey research type was adopted for the study because the information was obtained from the respondents on classroom interaction patterns and their reactions towards study barriers. The population for the study was all senior secondary school Biology Teachers and Students in Ilorin; the target population was all senior secondary school II (SSSII) biology teachers and students in Ilorin. The sample for the study was drawn using a multi-stage sampling technique to select 10 schools. Intact biology classes of three hundred and twenty-four (324) senior secondary school II (SSSII) students and 10 biology teachers participated in the study. Classroom interactions and students reactions to study barriers were observed through video recording. Two research instruments were used for this study. The first one is the Adapted Flanders Interaction Analysis Categories System (AFIACS) and the second one is the Adapted Study Technology System Tool (ASTST). Both

instruments were used in the collection of data for this study. AFIACS was used to observed, record and code the teacher talk, student talk and other interaction activities in the classroom. ASTST was used to observe and record the reactions students showcase when faced with learning barriers in biology lessons. The data from the video recording was played several times to observe and identify students' reactions to learning barriers during biology lessons.

The Adapted Flanders Interaction Analysis Categories (AFIACS) and Adapted Study Technology System Tool (STST) were given to two biology teachers teaching in senior secondary schools, two lecturers in the Department of Science Education, University of Ilorin and two experts in measurement and evaluation. Modifications and contributions made were exploited for face and content validity of the instruments. Data for the study was obtained through video recording (natural observation) during classroom lessons. Naturalistic observation is a means of observing individuals in their natural settings. Before the observation, the researchers made a visit to the selected schools and solicit the permission and assistance of the appropriate authorities in writing. The researchers also sought the consent of the students and the biology teachers by giving them consent form to endorse and indicate their willingness to participate in the study. The researchers simply observed and record what happens as things naturally occur in the classroom. For observing classroom interaction, the researchers sat in the best position to hear and see the teacher, as well as all the students and then record the category that best represent the completed activities. Thus, the researchers recorded these observations in a Coding sheet (AFIACS). For capturing study barriers, biology lessons were captured with a video recording device. Both the teachers and students were informed about the video recording and their consent was fully sought before the recording. The data obtained from the research questions were answered using frequency count, cross tabulation relation analysis and percentages, while the hypothesis was tested using chi-square statistics.

Results

Research Question 1: What are the patterns of classroom interactions taking place during biology lessons?

Table 1 reveals that there are three types of classroom interactions taking place during biology lessons. They are (1) Teacher talk (2) Student talk and (3) Silence or Confusion. Teacher talk was the predominant pattern of classroom interaction. It accounted for 79.25% of the interactions in the classroom.

Table 1: Patterns of Classroom Interactions in Biology Lessons

Classroom Interactions	Frequency	Percentage
Teacher Talk	317	79.25
Student Talk	60	15
Silence/Confusion	23	5.75
Total	**400**	**100**

■ Teacher Talk
■ Student Talk
■ Silence/Confusion

Figure 1: Patterns of classroom interaction in Biology lessons

Research Question 2: What are the study barriers encountered by students' during biology lessons?

Table 2 reveals that students' react to the lack of mass, too steep a gradient and the misunderstood word during biology lessons. Lack of mass was the most frequently encountered study barriers in biology lessons, it accounted for 47.75%, while the misunderstood word accounted for 47.00% and too steep a gradient 5.25%, respectively.

Table 2: Study Barriers Encountered by Students during Biology Lessons

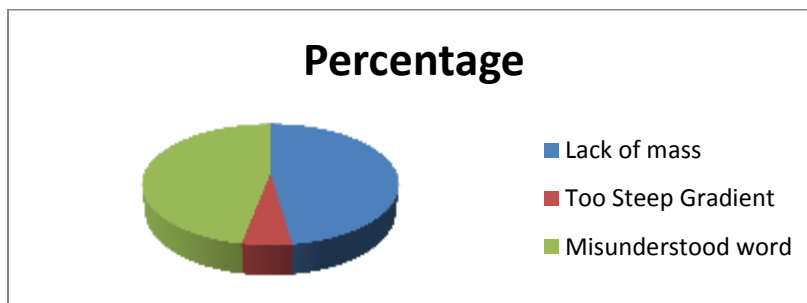| Study Barrier	Frequency	Percentage
Lack of mass	191	47.75
Too Steep Gradient	21	5.25
Misunderstood word	188	47.00
Total	**400**	**100**

Figure 2: Study Barriers Encountered by Students during Biology Lessons

Research Question 3: What are the predominant study barriers encountered by students during biology lessons under each pattern of classroom interaction?

Table 3 reveals that the misunderstood word was the predominant study barriers encountered by students during teacher talk interaction pattern. Reactions to the misunderstood words accounted for 48.46% of the observed reactions to study barrier, which was closely followed by lack of mass (46.91%) while too steep a gradient accounted for 4.63% respectively.

Lack of mass was the predominant study barrier encountered by students during student talk interaction pattern. It accounted for 46.94% of the observed reactions to study barriers during the lessons.

During silence/confusion class interaction pattern, lack of mass (59.25%) was also the predominant study barrier observed.

Table 3: Cross Tabulation Relation Analysis of the Study Barriers encountered by Students' during Teacher Talk, Student Talk and Silence Classroom Interaction Patterns

Study Barriers	Classroom Interaction			Total
	Teacher Talk	Student Talk	Silence	
Lack of Mass	152	23	16	191
	46.91%	46.94%	59.25%	47.75%
Too Steep a Gradient	15	5	1	21
	4.63%	10.20%	3.70%	5.25%
The Misunderstood Word	157	21	10	188
	48.46%	42.86%	37.03%	47.0%
Total	324	49	27	400
%	100	100	100	100

Legend:
- Lack of Mass
- Too Steep a Gradient
- The Misunderstood Word

Figure 3: Study Barriers encountered by Students during Teacher Talk Classroom Interaction Pattern

Legend:
- Lack of Mass
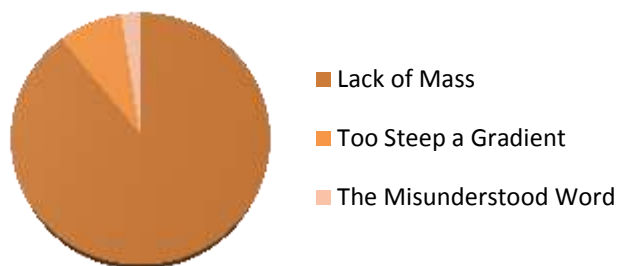- Too Steep a Gradient
- The Misunderstood Word

Figure 4: Study Barriers encountered by Students during Student Talk Classroom Interaction Pattern
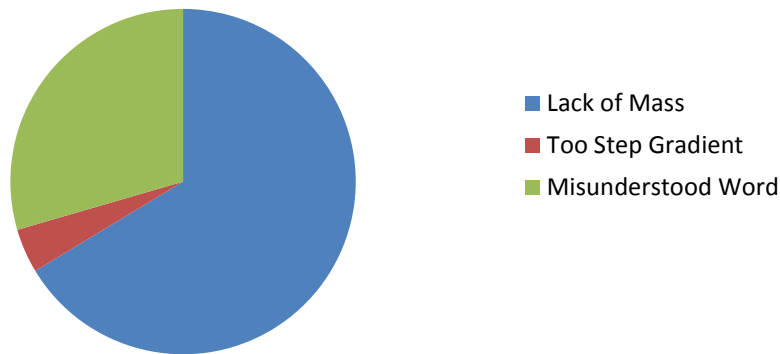
Figure 5: Study Barriers encountered by Students when there is Silence/Confusion Interaction Pattern

Hypothesis: There is no significant difference in the number of study barriers encountered by students during biology lessons under each pattern of classroom interactions

Table 4 reveals the chi-square analysis of the significant difference in the number of reactions of students to study barriers observed in teacher talk, student talk and when there is silence or confusion. The table showed that the calculated X^2- value ($X^2_{(9)} = 405.36$, $p < 0.05$) was significant at 0.05 alpha level. This indicates that there was a significant difference between the numbers of study barriers encountered by students under each pattern of classroom interactions; hence, the hypothesis was rejected. Lack of mass had the highest number of study barriers (47.75%) which was closely followed by the misunderstood word (47.00%) while too steep a gradient had the least of the barriers which accounted for 5.25% as shown in table 6.

Table 4: Chi-Square Analysis of Significant difference between the Reactions of Students to Study Barriers Observed in the Patterns of Classroom Interactions

	Classroom Interaction							
Study Barriers	Teacher Talk	Student Talk	Silence / Confusion	Total	X^2	df	P-value	Decision
Lack of Mass	152	23	16	191				
Too Steep a Gradient	15	5	1	21	405.36	9	.00	Rejected
The Misunderstood Word	157	21	10	188				
Total	324	49	27	40				

P < 0.05

Summary of the Major Findings
From the analyses and interpretations of the data collected for the study, the following are the major findings based on the research questions raised.

1. The patterns of classroom interactions taking place during biology lessons were (1) Teacher Talk (2) Student Talk and (3) Silence/Confusion.
2. The study barriers encountered by students during biology lessons were (1) Lack of Mass (2) Too Steep a Gradient and (3) The Misunderstood Words.
3. Lack of mass and the misunderstood words were the predominant study barriers encountered by students under each pattern of classroom interaction.
4. The study showed a significant difference between the study barriers encountered by students under each pattern of classroom interactions during biology lessons.

Discussion
The findings of the study revealed teacher talk, student talk and silence/confusion as the patterns of classroom interaction during biology lessons. The study also revealed three (3) types of study barriers namely, lack of mass; the misunderstood word and too steep a gradient that were encountered by the students during biology lessons.The study showed a significant difference between the study barriers encountered by students under each pattern of classroom interaction. However, lack of mass and the misunderstood words were the predominant study barriers encountered by students under each pattern of classroom interaction. The findings suggest that classroom interaction patterns influence the type of study barriers that students encounter during biology lessons.

The predominant pattern of classroom interaction in biology lessons was teacher talk classroom interaction pattern. It was observed that little room was given to student talk classroom interaction pattern. Hence, students were not able to interact well and expressed their understanding in biology classroom; this could be one of the reasons why students do not perform to expectation in most external examinations at the Senior Secondary School level in Nigeria. Therefore, this finding indicated that most of the teaching-learning time was devoted to lectures by the teachers.

The finding is in agreement with Febby (2014); Egbuna and Onyegegbu(2013) and Cockayne (2010) that classroom interactions typically follow an initiation-response-feedback structure and that biology teacher dominate biology lessons and initiate interactions themselves. Kalu (2008) findings indicated that teacher talk interaction pattern influences students' low academic achievement. However, this finding is contrary to that of Tomlinson (2014), Hammang (2012), Sita (2010), Brophy (2010) and Jackson (2006) that teachers were not aware of the classroom interaction pattern, nor did they want to monopolize classroom teaching and that teacher were unaware of certain aspects of classroom behavior.

Specifically, the finding highlighted that lack of mass and misunderstood words were the predominant study barrier encountered by students in biology lessons. The finding suggests that the mass, which is the actual physical object of the subject matter such as an instructional material is not always present during classroom lessons and words that are not clarified which lead to misconceptions could occur during biology lessons.

Conclusion

Based on the findings of this study, it was concluded that there are three (3) patterns of classroom interaction namely teacher talk, student talk, and silence /confusion during biology lessons. It was also concluded that the study barriers encountered by students during biology lessons were lack of mass; the misunderstood word and too steep a gradient.

Furthermore, the pattern of classroom interaction influences the type of study barriers students' encounter in biology lessons. Misunderstood words and Lack of mass are the predominant study barriers encountered by the students during teacher talk and student talk interaction patterns respectively.

Recommendations

The following recommendations are considered relevant based on the findings of this study:

1. There is a need for biology teachers to involve students more in the teaching and learning process so as to aid student talk classroom interaction pattern thereby improving the performance of students.
2. Biology teachers should take up the appropriate pedagogical approach that makes students more active in classroom lessons.
3. Biology teachers should take cognizance of the words misunderstood by students during and after the lesson and clarify such words. Misunderstood words do not allow students to learn meaningfully.
4. Biology teachers should make use of biology and English dictionaries to clarify words misunderstood or words that could lead to misconception during classroom lessons.
5. Biology teachers should endeavour to always provide the mass such as the use of an instructional material which serves as an interactive detail during teaching and learning process, which in turn would improve the performance of students.
6. Biology educators should make use of advance organizers or other innovative strategies so as to move from known to unknown or systematically thereby not skipping any gradient to ensure meaningful learning.

Suggestions for Further Studies

Considering the general scope of this study, further researches could be carried out to analyze classroom interactions and study barriers in other science subjects. Also, this type of study could be carried out in other parts of the country to give a holistic picture of the analysis of classroom interactions and students' reactions towards study barriers in biology lessons. The variables not covered in this study can be investigated by other researchers. Further studies can also be conducted to look into the influence of classroom interactions on students' reactions to study barriers in Nigerian schools.

More research can also be carried out to determine if there is any relationship between classroom interactions and students' reactions to study barriers in biology lessons. This can also be replicated among teachers to find out if their pattern of classroom instruction influence students' academic achievement in biology or other science subjects in general.

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