ASSESSMENT OF VERBAL INTERACTION IN PRIMARY MATHEMATICS CLASSROOM USING FLANDER'S INTERACTION ANALYSIS CATEGORIES SYSTEM (FIACS)

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Abstract

For successful teaching of mathematics lessons in primary schools, the proportion of teachers, students' verbal interaction, teachers' motivational skills and influence on students are crucial. The study assessed the proportion of teachers, students' verbal interaction, teachers' motivation and influence on students, in the delivery of mathematics lessons in primary schools. All the three primary five mathematics teachers of Federal College of Education (Technical), Akoka staff school were used for this study. The Flander's Interaction Analysis Category System (FIACS); an instrument used for observing verbal interaction between teachers and students/pupils in the classroom was employed. Mathematics lessons delivered by these teachers were recorded in a cassette and replayed to enable the researchers code the verbal interaction using FIACS. The results of the coded verbal behaviour showed that teachers used periods for concentrated lectures that were neither mixed with teacher's questions nor pupils' contributions. It is therefore recommended that teachers should involve their pupils during lesson delivery in mathematics. Teachers should also employ re-enforcement to encourage pupils' where their contributions are outstanding.

Keywords: *Assessment, Verbal Interaction, Primary School, Mathematics, Classroom, Flander's Interaction Analysis Categories System.*

Introduction

Mathematics is key in the achievement of scientific and technological development of any nation. This is because, it forms the foundation not only for higher mathematics, but also for science and technology that requires the language of mathematics. According to Adedayo (2001), primary mathematics should provide the child with basic skills in numeracy, and promote positive attitude towards mathematics. Scientific and reflective thinking calls for the need to develop critical and insightful thinking ability which can be promoted through carefully implemented primary mathematics programme. For a successful implementation of any programme, the issue of teachers and their teaching process are critical. According to Imogie (2006), there is a universal agreement that if teachers are apathetic, uncommitted, uninspired, lazy, unmotivated, ignorant in their discipline and impart wrong information they are not only useless but dangerous.

According to Adepoju (2004), majority of mathematics teachers in Nigerian Schools have same knowledge and understanding of mathematics, but do not know how to impart the little they know. There is therefore the need to probe into the teacher-pupil interaction in mathematics classroom. According to Fitri (2018), classroom interaction is the action performed by the teacher and the students in the process of teaching and learning in the classroom. Classroom interaction is both verbal and non-verbal. Generally, interactions between teachers and students are very important as they establish the success of teaching-learning process. Specifically, the verbal interaction could be observed with higher reliability when compared with the non-verbal interaction. Hence the need to assess the verbal interaction between teachers and their pupils in mathematics classroom in this article.

One of the most common techniques to assess classroom verbal interaction is the Flander's Interaction Analysis Categories System, FIACS (Amidon & Flanders, 1967). FIACS is an observational tool designed for observing only the verbal communication in the classroom, non-verbal gestures are not accounted for. It is used to classify the verbal behaviour of teachers and students as they interact in the classroom. The

Flander's Interaction Analysis Category (FIAC) is a ten (10) Category System of Communication possibilities. The first seven (7) Categories are classified as 'Teacher-Talk ', the next two (2) categories are classified as 'Student-talk ' while the tenth (10th) category is classified as 'silence or confusion'. Please find in the table 1 the highlights of the ten (10) categories and brief explanations of each.

Table 1: Flander's Interaction Analysis Categories (FIAC) Model

Category	Description
1	**Accepts Feeling:** Accepts and clarifies the tone of the students in an unthreatening manner. Feelings may be positive or negative. Predicting or recalling feelings are included.
2	**Praises or Encourages:** Praises or encourages students' actions or behaviour. Jokes that release tension, but not at the expense of another individual, nodding head or saying "um hm?" or "go on" are included.
3	**Accepts or Uses Ideas of Students:** Clarifying, building, or developing ideas suggested by a student. As teacher brings more of his own idea into play, shift to category five.
4.	**Asks Question:**Asking a question about content or procedure with the intent that students answer.
5.	**Lecturing:** Giving facts or opinion about content or procedure; expressing his own idea using rhetorical questions.
6.	**Giving Directions:** Directions, command, or orders which student are expected to comply with.
7.	**Criticizing or Justifying Authority:** Statements intended to change student's behaviour from unacceptable to acceptable pattern, stating why the teacher is doing what he is doing; extreme self-reference.
8.	**Student-Talk-Response:** Talk by students in response to the teacher. Teacher initiates the contact or solicits student statement.
9.	**Student-Talk-Initiation:** Talk initiated by student. If "calling on" student is only to indicate who may talk next, observer must decide whether student wanted to talk.
10.	**Silence or Confusion:** Pauses, short periods of silence and period on confusion in which communication cannot be understood by the observer.

As shown in Table 1, there are 10 categories which are divided into teacher-talk, student-talk, and silence or confusion. In teacher-talk categories are accepting feelings, praising or encouraging, accepting or using ideas of students, asking questions, lecturing, giving directions, and criticising or justifying authority. Student-talk categories are responding and initiation. Finally, classroom verbal interaction includes time spent in confusion and chaos in which the communication is interrupted and then the state of silence occurs. According to Amatari (2015), 68 percent of teacher-tasks within the classroom are verbal. Nafrina (2007) in a study of classroom interaction in grade 8 shared that the teacher was dominant. In a related study on 'The Analysis of Teacher-Talk and Learner's Talk by Nurhasanah (2013), teacher played dominant part in classroom interaction. The percentage teacher-talk was 54%, student-talk was 44% while silence was 2%. The study also ranked teacher-talk in descending order as follows: asking questions, giving direction, criticising, accepting ideas, lecturing, accepting feeling and praising.

Asmara(2007) analysing the speaking classroom interactions at the tenth grade of SMA Negeri 7 Swarkata in 2006/2007 academic year found that the percentage of teacher's talk was higher than students talk time. The interaction pattern therefore showed that the teacher was active while students were passive. The finding by Mujahidah (2012) in the English classroom at the 8th grade showed teacher demonstrating the interaction, while 'asking questions' was the most applied category. The finding by Pujiastuti(2013) was similar to Mujahidah (2012) but giving directions and lecturing were found as the most frequently used categories among all. Al-Amiri(2016) showed that giving directions was the most frequently used of the teacher-talk while student's response specifically was the most frequently used of the student-talk. Studies also conducted by Al-Farra (2004), Al-Hadi(2009) and Nurmasitah(2010) all showed higher proportion of teacher-talk in various classroom interactions.

Generally, the above studies reviewed showed a higher percentage in teacher-talk compared to student-talk and confusion or silence. None of the study reviewed was however conducted in a primary Mathematics class in South-Western part of Nigeria. Hence this study sought to assess the teacher pupil verbal interaction in primary mathematics classroom using Flander's Interaction Analysis Category System. Majority of the mathematics teachers in Nigerian schools have the knowledge and understanding of the mathematics they are to teach, but do not know how to impart the knowledge. Aside the fact that no teaching takes place without verbal interaction, verbal behaviour can be observed with higher reliability than non-verbal. This study therefore sought to assess the teachers and pupils' verbal interaction in primary mathematics classroom using the Flander's Interaction Analysis Category System (FIACS).

Research Questions
Specifically, the study attempted to answer the following research questions:
  (i)   What are the percentages of teacher-talk and student-talk in the primary mathematics classroom?
  (ii)   Which Categories of teacher-talk and student-talk were mostly applied during the mathematics classroom verbal interaction?
  (iii) What are the percentages of direct and indirect influence of the teachers on the students in the primary mathematics classroom?
  (iv)   What is the level of students' motivation and participation?

Methodology
The study was carried out in Lagos State. The population comprised of all Primary 5 pupils and Mathematics teachers in Federal College of Education (Technical), Akoka staff primary school. In this study, the Flander's Interaction Analysis Category System (FIACS) was used. This system is concerned with verbal behaviour in the classroom; since it can be observed with higher reliability than non-verbal behaviours. The assumption is based on the fact that the verbal behaviour of an individual is an adequate sample of his total behaviour. The classification as shown in Table 1 of this article gives central attention to the amount of freedom the teacher grants to the students (Amidon & Flander, 1967). All the categories of statements that occurred (stated in Table 1) in the classroom are classified into one of three major sections as follows: (i) Teacher-talk (categories 1-7); (ii) Student-talk (Categories 8 and 9) and (iii) Silence or confusing (category 10).

The mathematics lessons deliveries of three primary five mathematics teachers in Federal College of Education (technical) staff school Akoka Yaba Lagos were recorded. The recorded lessons were replayed in order to code the verbal interactions in those classes. This was done by recording the category numbers of the verbal behaviours every 3 seconds. Tally marks in the form of clustering five slash together to facilitate the subsequent collection and computing of frequencies and percentages of the verbal interaction patterns. After the coding, the coded data was plotted into a matrix and then the

analysis was carried out to get the information on verbal interaction between the students and the teacher, based on Flander's Interaction Analysis Category System (FIACS).

Result:

Table 2: Verbal Interaction Patterns

Pattern	Teacher		
	A	**B**	**C**
Category 1	0 (0.00)	0 (0.00)	0 (0.00)
Category 2	1 (0.19)	2 (0.39)	2 (0.57)
Category 3	3 (0.57)	15 (2.95)	6 (1.70)
Category 4	49(9.37)	72 (14.17)	45 (12.75)
Category 5	418 (79.92)	304 (59.84)	200 (56.66)
Category 6	2 (0.38)	2 (0.39)	8 (2.27)
Category 7	0 (0.00)	3 (0.59)	1 (0.28)
Category 8	41 (7.84)	102 (20.08)	45 (12.75)
Category 9	0 (0.00)	1 (0.20)	3 (0.85)
Category 10	9 (1.72)	8 (1.57)	43 (12.18)
Total	523	508	353
%Teacher-Talk	473 (90.44)	396 (78.35)	262 (74.22)
%Student-Talk	41 (7.84)	103 (20.08)	48 (13.60)
% Silence	9 (1.72)	8 (1.57)	43 (12.18)
Indirect Influence/Positive Re-enforcement	4 (0.76)	17 (3.35)	8 (2.27)
Direct Influence	2 (0.38)	5 (0.98)	9 (2.55)
Revised I/D Ratio	2	3.40	0.89

Note: Percentages in parenthesis

Table 2 shows the pattern of verbal interaction in the primary mathematics classrooms. Teacher-talk was dominant in all the three classes. Percentage teacher-talks for teachers A, B and C were found to be 90.44%, 78.35% and 74.22% respectively. Category five which is lecturing is the most prominent of all the categories for each of the three teachers. Percentage lecturing for teachers A, B and C were found to be 79.92%, 60.04% and 56.66% respectively. This showed that generally, teachers dominated the classes. Categories four and eight were more prominent compared to the remaining seven categories. For category four, which is asking questions, the percentages obtained for teachers A, B and C are 9.36%, 14.17% and 12.75% respectively. Category 1 which is teacher's acceptance for students' feelings, the percentage is 0% for each of the teachers, meaning that teachers generally do not at all accept students' feelings and this behaviour does not help in creating a positive atmosphere in the classroom which could enhance learning.

Student-talk was generally low. The percentage student-talk for teachers A,B and C were found to be 7.84%, 20.08% and 13.60% respectively. Category eight, which is student-talk in response to teacher were found to be prominent compared to category 9 which is student-talk initiated by students. The percentage student-talk in response to teachers for teachers A, B and C were found to be 7.84%, 20.08% and 12.75% respectively; while the percentage student-talks initiated by students were found as 0%, 0.20% and 0.85% respectively.

The student-response initiative which is category 9 was seen to be very poor with percentages 0.00%, 0.20% and 0.85% for teachers A, B and C respectively. None has up to 1%. This demonstrates that apart from responding to teachers' questions, they hardly contribute by making their comments and suggestions. The positive re-enforcement is given by the sum of columns 1-3. The percentages of positive re-enforcements for teachers A, B and C are 0,76%, 3.35% and 2.27% respectively. Student participation ratio is sum of columns 8 and 9 divided by the total sum. This is the same as the percentage

student-talk, which are 7.84%, 20.08% and 13.60% for teachers A, B and C respectively. All these indicate a low participation in each of the cases.

Table 3: Matrices for Teacher A

	1	2	3	4	5	6	7	8	9	10	Total
1											0
2				1							1
3				3	1						4
4				2	4	2		39			47
5				31	381					4	416
6								2			2
7											0
8		1	3	12	26					1	43
9											0
10					6					4	10
Total	0	1	3	49	418	2	0	41	0	9	523

In table 3, highly loaded 5-5 implies a teacher dominated class which could also imply emphasis on content. The loaded 4-8 cell implies that the teacher asks questions and encourages students before asking another question.

Table 4: Matrices for Teacher B

	1	2	3	4	5	6	7	8	9	10	Total
1											0
2					2						2
3		1		3	7			2			13
4				9	3			57			69
5				38	264	1				2	305
6				1				1			2
7				1				1			2
8		1	15	19	26	1	2	40		6	110
9											0
10				1	2		1		1		5
Total	0	2	15	72	304	2	3	101	1	8	508

From table 4, just as with teacher A in table 2, highly loaded 5-5 implies a teacher dominated class which could imply emphasis on content and the loaded 4-8 cell implies that the teacher asks questions and encourages students before asking another question.

Table 5: Matrices for Teacher C

	1	2	3	4	5	6	7	8	9	10	Total
1											0
2			2								2
3				1	4					1	6
4		1		2		4		34		4	45
5				20	164		1	2	1	13	201
6				1	1			5	1		8
7					1						1
8		1	2	20	16	1		2		2	46
9					1	1				1	3
10				1	13	2		2	1	22	41
Total	0	2	6	45	200	8	1	45	3	43	353

Loaded 10-10 implies long silence, while the loaded 10-5 implies silence followed by lecture. Like teachers A and B, highly loaded 5-5 implies a teacher dominated class which could also imply emphasis on content while the loaded 4-8 cell implies that the teacher asks questions and encourages students before asking another question.

Discussion of Findings
Teacher-talk was dominant in all the three classes. Category five which is lecturing is the most prominent of all the categories for each of the three teachers. Student-talk was generally low.All the three Mathematics teachers dominated throughout the period the lessons lasted. There is no teacher that took less than 50% of the lesson period talking. Teacher A spent more than 90% of the time lecturing. Moreover, considering categories 8 and 9, teacher A has the lowest percentage. This means that the teacher was not bothered about finding out whether or not he was really communicating to the pupils. The teacher spoke almost throughout the lesson period. This problem seems to be general. Amidon & Flanders (1967), in their findings revealed that in the teaching of mathematics, science and other relatively structured subjects, teachers lecture more than they ask questions.These findings are in agreement with Nafrina (2007); Nurhasanah (2013); Asmara (2007); Mujahidah (2012); Pujiastuti (2013).This implies that majority of teachers often dominate their mathematics class.

Category 8, which is student-talk in response to teacher were found to be prominent compared to category 9 which is student-talk initiated by students.One area that needs urgent attention is category 9 (the students' response initiatives). There was nothing like that in A and B; even in C it was only 3 cases (less than 1%). This shows the type and extent of students' participation in a lesson. Apart from responding to teachers' questions, students should be encouraged to contribute by making their comments and suggestions.

From tables 2-4, it is clear that none of the teachers demonstrated any acceptance of students' feelings (as represented by category 1). They all seemed to be focused on the subject matter rather than looking closely at the students' personality and feelings. This is not the best practice, because, the emotional state of the learner could affect learning positively or negatively. The interactions are almost void of positive reinforcement. In the three separate observations, the teachers' percentage positive reinforcement for teachers A, B and C were 0.76%, 3.35% and 2.27% respectively. Hence no teacher had up to 4% of the interaction as positive re-enforcement up to 1% of teacher A interaction was made up of positive re-enforcement. This probably explains why many Nigerian school age children still hate mathematics. Students' positive reinforcement goes a long way to motivate the pupils to learn better. When this is absent in a mathematics class, it will make the pupils to believe and act according to the discouraging comment they hear about the subject.

Apart from questions and answer section during lesson delivery in Mathematics, verbal interaction between teachers and pupils is mere dumping of teacher's ideas on pupils. Comparing category 3 (where the teacher uses students' ideas) with category 8 (where students respond to questions, the gap is wide in each of the interactions. For teacher A, the number in category 3 is 3 (0.6%) while that of category 8 is 41 (8.2%). This suggests that when students respond to questions asked; most of the time, teachers often continue their lessons or asked other questions without passing any comment or giving a feedback on the students' responses. Otor (2000) observes that evaluation should not only focus on assessment of achievement, it should of necessity touch on improvement of achievement by providing feedback on students' learning. Teacher Basked more questions and had more time on students' responses. More of this should be encouraged, since learners' participation is bound to enhance learning. This is especially applicable in mathematics.

Amajor Spectacular observation on the three Mathematics teachers is the very low number of criticisms noticed during the lessons. Teacher A did not even engage in this, throughout the period. The possible explanation for this is probably the environment. The school is a college staff school to take care of wards of lecturers and other educated parents who are members of staff of the College.

The Revised ID Ratio: This is employed to find out the kind of emphasis given to motivation and control in a particular classroom. Here the number of tallies in column 6 and 7 was used to divide the number of tallies in column, 1, 2 and 3.Teacher B was therefore observed to use motivation and control than teachers A and C. The motivation and control by teacher C was rather too low.

Conclusion
The Flanders interaction Analysis Category System (FIACS) is a useful research tool for assessing verbal behaviour in lesson delivery in Mathematics. Considerable use of 5-5 cells by all three teachers show that the teachers use periods for concentrated lectures, uninterrupted by teacher questions or pupil contributions.

Recommendation
The following recommendations were made:
  I.   There is the need for Mathematics teachers to adopt verbal interactions for allowing pupil's contributions and participation in Mathematics lesson delivery.
  II.   Since children learn better by doing, teachers should involve students more in verbal interaction in mathematics classroom.
  III.   Teachers should also employ positive reinforcement in the mathematics classroom.
  IV.   The need for feedback when questions are asked and students' responses are also pertinent to the effectiveness of lesson delivery in Mathematics. Students' ideas should be used to throw more light into the subject matter.
  V.   As much as possible, rather than being negative, teachers should employ motivating words to encourage pupils' interest in Mathematics.

VI.   The teacher trainers in tertiary institutions as well as facilitators during in-service trainings of mathematics teachers should both emphasize and demonstrate the need for student centredness in the classroom. T

VII.   eachers should be encouraged by way of recognition and remuneration so that they will in turn be able to encourage their students to learn mathematics.

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