

Classroom Discourse Patterns in the Teaching of Mathematics in Secondary Schools in Nakuru District, Kenya

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Abstract: *Students' poor performance in mathematics in national examinations remains a major concern worldwide and Kenya in particular. Teachers, students, parents, curriculum developers and the public have tended to blame one another for the poor performance in mathematics at secondary school level. In an attempt to respond to this problem, the Kenyan mathematics scholars have carried out many studies in mathematics education. Despite these studies, students' performance is still poor. This means that the main reason for this poor performance has not been established. Specifically, the study aimed at determining the type of teacher-student discourse patterns in mathematics classrooms. The study was a cross-sectional descriptive survey focusing on form 3 students and their mathematics teachers. Disproportionate Stratified sampling technique was used to select 9 secondary schools from 67 public schools of Nakuru District. Form 3 students were selected purposively. Simple random sampling used to select a form 3 stream from each of the sampled school where there is more than one stream; otherwise the stream was purposively selected. Quantitative analysis made use of descriptive statistics such as means percentages, and frequencies and Analysis of Variance (ANOVA) values. The data analyzed revealed that mathematics teachers use different discourse patterns in their classes.*

Keywords: classroom, discourse patterns, teaching, mathematics, Kenya

1. Introduction

Mathematics in school curriculum is important to the society in various aspects and Kenya in particular. It equips students with skills that enable them to play an active role in the society. In support of this, Cockcroft (1982: 1) observes that it would be very difficult, perhaps impossible, to live a normal life without making use of mathematics of some kind. One way of doing this is by using logical reasoning in problem solving situations that are encountered by the society in everyday situations. Kiswili (1995) observes that reasoning is mainly developed in the process of learning mathematics and other subjects in the school curriculum. This can probably be developed by encouraging students' participation in teaching (Rukangu, 2000) and learning process in a mathematics classroom. The extent to which these interactions are used in a mathematics lesson was subject to exploration by this study.

The knowledge of discourse patterns that encourage learner participation will improve effective communication (Njuguna, 2000) and interaction in secondary schools mathematics lessons. As a result, the findings will add to the increasing knowledge of classroom research hence student's performance will be improved. This study assumed that mathematics teachers followed the same prescribed syllabus by the Kenya Institute of Education (KIE) and therefore the content of mathematics was the same in all the schools.

Similarly mathematics is used as a means of communication. It is seen as a useful subject due to its provision of powerful, concise, precise and unambiguous means of communication (Mutunga & Breakel, 1992; Cockcroft, 1982). In the teaching and learning of mathematics, such communication can be provided for by using learning aids such as graphs,

charts, diagrams, tables and symbolic representation of abstract information. Such aids help the students not only to explain the problem but also make connection from the resources used (NCTM, 1989). Whereas such connections may help to simplify abstract information for concepts to be easily understood by students, such understanding can be strengthened by useful discourses arising from the application of the resources. It was important to determine whether or not, use of resources encourage students' participation in mathematics teaching and learning process. Hence the discourse patterns arising from such participation was described and observed in the classroom context.

Due to its overall-importance, Mathematics has been made compulsory and examinable at Primary and Secondary schools levels. However, performance in mathematics examinations in schools has persistently been poor worldwide and Kenya in particular. Kenya National Examination Council (KNEC, 2001) mathematics Kenya Certificate of Secondary Education (KCSE) analysis indicates that 5.8% of boys scored between grade A and B and 68.4% scored grade D and below. On the other hand 2.4% of the girls scored between grade A and B while 72% of them scored below grade D. Although boys generally perform better than girls in mathematics in Kenya, the overall performance of mathematics for all the students is quite low

2. Study Design

The selected study design was cross-sectional descriptive survey. It was chosen because it describes and interprets what prevails, or conditions and relationships as they are with the intent of employing data to justify current conditions and practices or to improve them. (Koul, 1984).

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Due to this, it enabled the researcher to obtain discourse patterns that are used in secondary school classrooms in Kenya. The method was also used because it is useful in obtaining quantitative data regarding mathematics learning in the classroom in which various discourse patterns are used.

2.2 Study location

The study was carried out in Nakuru County, Kenya. It has fairly many public secondary schools. It was also chosen since the general students' performance at National level examination and at the district level shows similar analysis.

2.3 Study population

As per the ministry of education records for the year 2002, there are 67 public schools in Nakuru County. This includes 57 mixed, 6 girls' and 4 boys' schools. Thus the study comprised of some stratified randomly selected public secondary school teachers and their students in Nakuru County.

2.4 Sampling technique

The study was restricted to public secondary schools in Kenya. The selection of the sample was done through disproportionate stratified Random sampling technique from a list of public schools. Schools were classified into school types: boys, girls and mixed schools. Three schools from each type were then selected regardless of their proportions in the population using "lucky-dip" type of simple random technique. This technique ensured that every individual has the probability of being selected and selection of one did not affect the selection of the other in any way, thus ensuring a representative sample (Gay, 1992:126). Purposive sampling was used to select the sample of mathematics teachers.

A total of 360 students and 60 teachers filled the Mathematics students' questionnaire (MSQ) and Mathematics teachers' questionnaire (MTQ) respectively.

Sekaran (1992: 253) rightly observes that, for a population size of 2680 and 67, the sample size will be 339 and 59 respectively. This difference in number of students and teachers did not significantly affect the research findings.

The data thus obtained was analyzed and the raw frequencies calculated to provide descriptive data for further analysis. One-way ANOVA (Analysis of variance) was used to show the variation of teaching discourse patterns of teachers in the three types of schools.

3. Findings

3.1 Observed discourse patterns in mathematics classrooms

One of the objectives of the study was to observe the prevailing classroom discourse patterns in mathematics classrooms. To achieve this, the entire classroom discourse was recorded on audio cassettes while the researcher noted down any observational notes. Such notes included non-verbal teacher and students activities such as use of resources and working silence respectively. These activities could influence the classroom discourse patterns in various ways. Most important to the study was how these contributed significantly to the students' interaction in teaching and learning of mathematics.

The study being descriptive research involved creating classroom process for the purpose of analysis. Descriptive statistics were used for coding using FIAC. The frequencies for all the categories in all the recorded lessons were recorded. This included raw frequencies for all the selected schools across the 3 lessons observed. The mean was calculated by dividing the total frequency counts of each category code by the total number of lessons observed. In this study, all the 9 teachers were observed each 3 times, a total of 27 observations. Relative frequency distribution and percentage of the total frequencies of mathematics teachers and students discourses in various categories of FIAC are shown in table 1.

Table 1: Discourse patterns of mathematics teachers and students (using FIAC)

<i>Teachers/ students' discourse</i>	<i>Category code</i>	<i>Totals Observed</i>	<i>Mean</i>	<i>Percentages (%)</i>
1	Accepts students' feelings	210	7.78	0.76
2	Teacher praises students	1723	63.81	6.20
3	Accept and uses students ideas	1695	62.78	6.10
4a	Teacher asks convergent questions	3946	146.15	14.21
4b	Teacher asks divergent questions	686	25.41	2.47
5a	Teacher lectures	262	9.70	0.94
5b	Demonstrates	266	9.85	0.96
5c	Illustrates with teaching aids	5286	195.78	19.03
6	Directs	2936	108.74	10.57
7	Teacher criticizes	149	5.52	0.54
8	Student' response	3067	113.60	11.04
9a	Students initiates	2409	89.22	8.67
9b	Student-student initiation	1182	43.78	4.26
10a	Silence/Confusion	1297	48.04	4.67
10b	Working silence	2632	97.48	9.45
	Totals	27,746	1027.67	100

The statistics in table 1 indicates that the classroom discourse was dominated by the teacher talk. The classroom discourse observed and shown in the table, gave the teacher

authority to control the whole classroom interaction process. Out of the total frequencies of 27746, the teachers' related discourse clustered within category code 1 to category code

7. This gave the teacher 61.78% control of the classroom discourse. A general comparison of the discourse patterns in these schools can be made. Several categories were combined in cases where the mean of similar discourses was relatively small.

One-way ANOVA analysis at $\alpha=0.05$, shows that there was no significant difference in the use of these categories in the three types of schools ($F=2.992$, $p=0.057$). This implies that the use of these categories is quite low in all the three school types.

4. Conclusion

The study established the fact that the teaching-learning environment in mathematics classes is in most cases teacher-centered. The teaching discourses used are in most cases not sensitive to the students needs and thus do not fully provide for students participation in learning activities. It was noted that there was a marked use of lecture with demonstrations (expository) in all classes observed while student-centered technique were sparingly used.

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Author Profile

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