

## The Effect of Class Size on Classroom Interaction During Mathematics Discourse in the Wake of Free Primary Education: A Study of Public Primary Schools in Nakuru Municipality

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**Abstract:** The government of Kenya implemented Free Primary Education (FPE) in January 2003. The main objective of this programme was to provide education to all primary school children irrespective of their economic backgrounds. Academic performance in Public Primary Schools in Nakuru Municipality has been declining over time since the introduction of (FPE). This study assessed the influence of class size on classroom interaction during Mathematics discourse in the wake of FPE in Public Primary Schools in Nakuru Municipality. The study adopted ex post facto research design. It targeted all the 59 Public Primary Schools in Nakuru Municipality. Simple random sampling was used to select 4 schools for the study. Mathematics lessons in Classes 1 and 6 were chosen from the selected schools to represent the lower and upper classes respectively. The data were processed and analyzed using descriptive and inferential statistics with the aid of Statistical Package for Social Sciences (SPSS). The findings of the study revealed that FPE policy has led to increased enrolments in schools which have created increased class sizes and Pupil-Teacher Ratios. The increased class sizes have influenced teacher-pupil interaction and pupil-pupil interaction.

**Key words:** Class size, free primary education, Mathematics, teacher- pupil ratio

### INTRODUCTION

The government and the people of Kenya have been committed to expanding the education system to enable greater participation by all in development spheres. This has been in response to a number of concerns including the desire to combat ignorance, disease and poverty, and the belief in the right of every Kenyan child to access basic welfare, including education (GOK, 1965). The government has the obligation to provide its citizens with the opportunity to participate fully in the socio-economic and political development of the country and to attain a decent standard of living. Provision of such opportunities is largely achieved through the expansion of access to and participation in a nation's education system. In Kenya, the commitment to expansion of educational opportunities has been reflected in the various government policy documents and development plans since independence (GOK, 1964, 1976).

It was partly in realization of this that in the run-up to the 2002 General Elections, the National Alliance Rainbow Coalition (NARC), an opposition political party then, pledged to introduce the FPE policy as part of its election manifesto. Upon winning elections and forming a government, NARC, through the Ministry of Education Science and Technology (MoEST), launched the FPE on

6<sup>th</sup> January 2003. The main objectives of FPE according to the NARC government were: to recognize education as a basic right of all children as articulated in the Children Act of 2001; to provide public primary schools with basic learning/teaching materials like textbooks; and to abolish all kinds of fees levies and charges that had for decades kept a large number of children out of school (GOK, 2003). Prior to the declaration of FPE, many school-age-going children were kept out of school because of various reasons. These reasons include: non-affordability of the charges/levies due to the high incidence of poverty at household level; high cost of textbooks and many children who were orphaned as a result of HIV/AIDS pandemic.

The implementation of FPE programme witnessed a 10% increase in enrolment in primary schools nationally. A record of 1.3 million children registered in various schools across the country, raising the enrolment from 5.9 million in 2002 to 7.2 million in 2003 (MoEST, 2004). However, the sharp increase in enrolment rejuvenated the challenges of FPE in the country (Wamukuru *et al.*, 2006). For instance, the number of pupils exceeded the available human and physical facilities in the 18,000 Public Primary Schools in the country. The teacher-to-pupil ratio steadily increased from the recommended 1:40 pupils per class to between 1:60

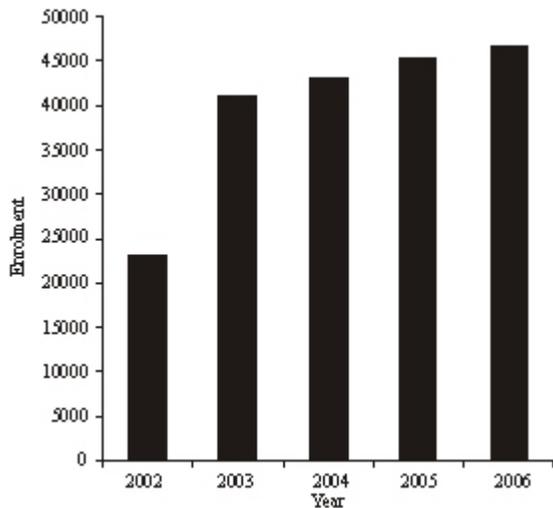


Fig. 1: Trends in Enrolment in Nakuru Municipality primary schools from 2002 to 2006, (Source: NMEQ, 2006)

and 1:90 pupils per class (MoEST, 2004). PPS in Nakuru Municipality, like in most parts of the country, have witnessed a steady increase in pupil enrolment since the introduction of FPE in 2003. Figure 1 shows this trend.

Although studies have been done on the challenges of FPE, they have not paid specific attention to the possible influence of FPE challenges on classroom interaction.

Objectives of the study:

The objectives of the study were:

- To determine the influence of FPE policy on class size and on teacher-pupil ratio in PPS in Nakuru Municipality.
- To determine the influence of class size on teacher-pupil and pupil-pupil interaction during mathematics discourse in PPS in Nakuru Municipality

**Review literature:**

**The etymology of free primary education in Kenya:**

Sifuna (1990) noted that, in its manifesto of 1969, the Kenya African National Union (KANU) government was committed to providing a minimum of seven years of FPE to all school-going age children. The main principle behind this was the need to give priority in educational programmes to those areas in the country that were marginalized during the colonial rule. This would enable them to be at par with other areas and share fully in nation building and development. The government pledged to build primary and secondary schools so that every child in every district would get an opportunity to attend school.

MoEST (2004) reports indicate that a gross enrolment in primary schools has increased from 5.8 million in 2002 to 7 million in 2003 and 7.1 million in 2004. This may

have compromised the quality of education in the country’s public primary schools (UNESCO, 2005) and also jeopardised effectiveness of teaching (Wamukuru *et al.*, 2006). Despite the government’s effort, primary education continues to experience many challenges related to access, equity and quality (MoEST, 2005a). These challenges include: overstretched facilities; overcrowding in schools, especially those in urban slums; high Pupil-Teacher Ratios (PTR) in densely populated areas; high cost of equipment for children with special needs; diminished community support following their misconstrued role vis-à-vis that of the Government in the implementation of the FPE initiative; gender and regional disparities; increased number of orphans in and out of school as a result of HIV/AIDS; and other reasons such as internal inefficiencies (MoEST, 2005b). Mbatia (2004) concur with MoEST that FPE has encouraged more enrolment at lower primary levels and variables such as class size, pupil-desk ratio, pupil-book ratio, school schedule, and class control have changed. Mbatia recommends that variables such as teacher: pupil ratios therefore need to be investigated.

Wamukuru *et al.* (2006) study on the challenges of implementing Free Primary Education in Kenya and its effect on teacher effectiveness noted that the key elements of the FPE implementation that need urgent redress are those that catalyze teacher effectiveness. He further noted that specific challenges that significantly affect teacher effectiveness include large class size, teacher inadequacies and pupil age variation. The current study has addressed some of these challenges specifically class size.

**Class size and teacher- pupil ratio:** Brewer *et al.* (2001) study on class size controversy in Philippines defined class size as the actual number of pupils taught by a teacher at a particular time. They also defined teacher-pupil ratio as teachers who spend all or part of their day as administrators, librarians, special education support staff, teachers, or as performers of other roles outside the classroom. They noted that-teacher pupil ratio is a global measure of the human resources brought to bear, both directly and indirectly, on children’s learning. Thus, teacher pupil- ratio is always lower than the average class size. The discrepancy between the two can vary, depending on teachers’ roles and the amount of time teachers spend in the classroom during the school day. World Bank (1999) reports have shown that there is a wide disparity in the relationship between pupils and teachers in primary schools. For instance, in 1996, a total of 7,224,200 pupils were enrolled at primary level in Kenya and were serviced by 184,393 teachers. This gives a pupil-teacher ratio of 1:37. The ratio was 1:31 and 1:29 in 1993 and 1997, respectively.

Table 1: Teacher and Pupil population of the four selected primary schools in the Nakuru Municipality from 2000 to 2006

School	2000	2001	2002	2003	2004	2005	2006
	No Trs-Ppl						
X1	23-938	23-964	23-984	23-1032	23-925	23-796	21-786
X2	19-800	19-775	19-812	19-892	19-922	19-915	19-908
X3	28-109	28-870	27-857	29-1170	28-1090	27-1050	27-1020
X4	39-758	31-1810	31-1773	30-1801	31-1666	34-1369	34-1268
Mean	27-1147	25-1105	25-1107	25-1224	25-1151	26-1 032	25-996

**Large class size and classroom interaction:** Jungic and Kent (2006) study on teaching large classes in the International Electronic journal of Mathematics Education in Melbourne noted that it is easy to ignore the importance of human interaction when instructing in a large class. He defined large classes as students over 200 in large university lecture halls. He noted that the instructors were too fast in lecturing and the teaching/learning became impersonal, which is often overwhelming for the students. He further noted that the most effective way to use time efficiently in a large class was to prepare typed lecture notes for pupils in advance. These notes list motivations, definitions and theorems that would be presented in the lecture. The notes would include unsolved examples and applications that would be worked out in class. He pointed out that making calculation mistakes, getting stuck in an explanation, losing a train of thought and forgetting a formula were some of the very common human errors made by pupils as a result.

### METHODOLOGY

This study used ex post facto correlation research design to investigate the influence of class size on teacher ratio and classroom interaction. The study concentrated only on public primary schools in Nakuru Municipality of Nakuru District, Rift Valley province. The population from which the sample for this study was drawn consisted of 59 public primary schools in Nakuru Municipality. Random sampling was done to select 4 schools out of the 59 public primary schools that were studied. Purposive sampling was done to select classes 1 and 6 in the lower and upper classes, respectively.

**Instrumentation and analysis:** Observation schedule was used to collect data on teacher activities and pupil activities during mathematics discourse. These included use of lecture method of teaching; use of pupil centred teaching method, demonstrating a skill in class, marking pupil's work, guiding pupils to do an activity, giving orders and commands and using teaching aids (charts). Pupil - pupil interactive activity observed were responds to teacher questions, does work in the exercise book, ask questions or seek clarity does work on the chalkboard, makes noise, disturb the others or fight, does work in groups and use text books to do work. Interview schedule

elicited information from the Head teachers of the sampled schools on the number of teachers in the school, learner population, number of streams per class, use of teaching and learning resources and academic achievement in the National Examinations. To determine the influence of class size on teacher- pupil and pupil-pupil classroom interaction, data collected was based on frequencies observed on teachers and pupil learning activities both in the lower and upper class levels during mathematics discourse.

**Findings:** The study revealed that FPE policy has created high enrolments in schools which have resulted to large class sizes, high PTR, congested classrooms, teacher shortage and high teacher work-load. These factors have affected classroom interaction because teachers find it difficult to give personalised attention to all the pupils, give adequate assignments to test what has been taught and take full control of their classes. On average, the PTR for the sampled schools was 1:80 for lower classes and 1:50 for the upper classes. Table 1 shows Teacher and Pupil population of the four selected primary schools in the Nakuru Municipality from 2000 to 2006.

The results show that in the number of teachers remained the same between the year 2000 and 2006. Some schools witnessed a big drop in the number of teachers between 2000 and 2001. The number of teachers remained constant until 2005. The mean number of teachers for all the sampled schools remained constant at 25.25 between 2000 and 2006. The figures in the table show that after the introduction of FPE in 2003, when the pupil population had risen, there was no commensurate increase in the number of teachers. There was thus a general decline in teacher adequacy during the period.

The study also revealed that teacher- pupil classroom interaction activities in the lower classes were not exploited to the full because teachers used traditional lecture method of teaching. Teachers in the lower classes did not involve all the pupils during classroom interaction. For example, teachers rushed over lessons interacting only with bright pupils ignoring weaker and slow learners, did all the work on the chalkboard, avoided group work which promotes pupil-pupil interaction and did not demonstrate any skill. Despite the fact that teaching methods were being used in the upper classes, they were not being exploited to the full. This is probably why teachers used lecture method of teaching in these classes.

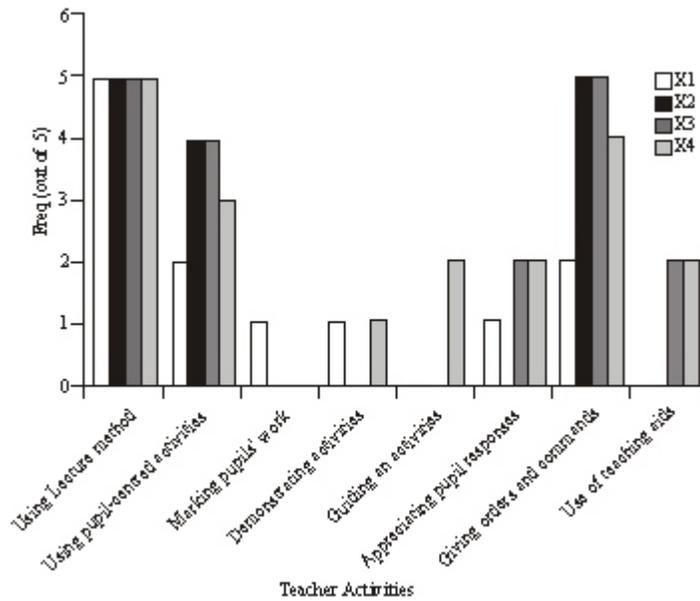


Fig. 2: Frequencies of observed teacher activities in the lower classes

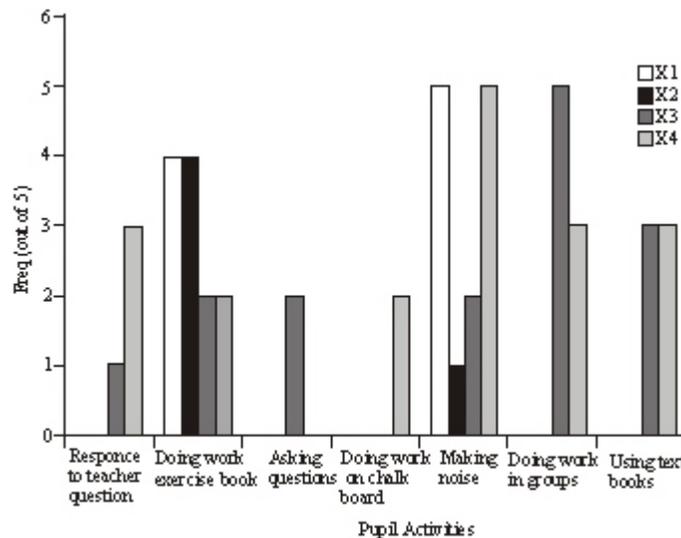


Fig. 3: Pupil activities observed in the lower classes

Figure 2 shows the trends of the average mean frequencies of teacher activities in lower classes as observed in the sampled schools. The results in Fig. 2 show that teachers in the lower classes frequently used the lecture method of instruction during mathematics discourse. An average mean frequency of 5 was registered from the schools sampled. Teachers in these classes did not involve the pupils in the learning activities. Learning was mainly teacher-centred. Question and answer method registered a mean frequency of 3.25. Marking of pupils work had an average mean frequency of 0.25. Demonstration and guiding pupils do work registered a

mean frequency 0.5 each. Pupil appraisal, giving orders and using charts registered an average mean of 1.25, 4 and 1, respectively

The above Fig. 3 shows that Pupil activities in lower classes scored very poorly with mean frequencies of 0.5-1 in the sampled schools. These activities included responses to the teacher's questions, asking questions and doing work on chalk board. The use of text books by the pupils in the Lower class scored a low mean frequency of 1.5. Working in groups and noise-making were equally frequent, with a mean frequency of 2. Doing work in exercise books had a mean frequency of 3. The researcher

observed that teachers in the lower classes did not allow the pupils to participate in the learning by posing to ask questions or allowing pupils to ask questions. Bennars and Otiende (1994) suggest that such teachers who avoid asking probing questions while at the same time not encouraging their pupils are lazy.

### CONCLUSION

**The following conclusions were reached from the analysis of the data from the previous chapter:** FPE policy has direct influence on Class size and teacher-pupil ratio. Factors such as: high enrolments, high class sizes, high teacher-pupil ratios, teacher shortages and high teacher workload were highlighted as indicators of FPE and have influenced classroom interaction. Classes in primary schools have TPR of 1:80 and 1:50 in the lower classes. This influences teaching and learning during interaction especially in core subjects like mathematics which require frequent teacher attention.

Though teachers used a combination of teaching /learning activities to bring about meaningful learning, they did not exploit them to the full. Instead they concentrated on lecture activities as this was probably one way of handling large classes. Teacher-pupil interaction was therefore realised minimal during instruction in classes where lecture activity was used most.

### RECOMMENDATION

In view of the foregoing conclusions, the following recommendations were made. The study set out to access the influence of class size on classroom interaction in the wake of FPE. As the results have shown, there is general agreement that FPE programme opened doors for children, who would otherwise missed a chance to access education and improve their lives. This has created increased class sizes, shortage of teachers, heavy teachers' working load and lack of teacher motivation. In view of this, shift systems should be used where teacher-pupil ratios are high. The government should engage contract and part-time teachers who are cheaper to maintain especially the unemployed trained teachers. This would therefore ease the teachers' working load.

The results have also shown that teachers are demoralized with heavy workloads, handling many lessons, many pupils and work for long hours. It was difficult for them to give personalized attention to all the learners, give assignments to test what has been taught and take full control of their classes. This affects the ability of the teachers to identify pupils' weakness and assist them. There is a likelihood that this would affect quality of education given to the pupils especially in core

subjects like mathematics which require constant practice and feedback to gauge the pupils progress. In view of this, regular in-service training should be given to the teachers to improve teaching skills and performance e.g. appropriate programmes such as SSMASE can also be started to improve teaching mathematics skills in primary schools.

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