Effect of Syllabus Coverage on Secondary School Students' Performance in Mathematics in Kenya

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ABSTRACT Mathematics plays a vital role in individual, national and global development. However, over the years mathematics has been one of the most poorly performed subjects in the Kenya Certificate of Secondary Education Examinations (KCSE). In an attempt to improve performance, great effort has been put into completion of the syllabus. Recently, a study was done in Kakamega South district, covering a total of 85 secondary schools, whose objective was to determine the percentage of the syllabus covered, and compare it to student performance. 16 out of the 85 schools were purposively selected and used in the study. A total of 64 people, thus the head teacher, the head of mathematics department, and two randomly selected mathematics teachers, from each of the 16 schools, served as respondents. A descriptive survey design was adopted for the study, and data collected using three questionnaires. Correlation between syllabus coverage and student performance was 0.8343, established using the Pearsons Product Moment Correlation Coefficient formula, and its significance tested using the conversions equation 't = r($\sqrt{n-2}$)/(1- r^2)'. Furthermore, a One Way Analysis of Variance, (ANOVA) was determined, to confirm that syllabus coverage has a significant effect on student performance in mathematics at KCSE level.

INTRODUCTION

The main objective of teaching mathematics at secondary school level in Kenya is to produce a person who will be numerate, orderly, logical, accurate and precise in thought. It is emphasized that certain content in the syllabus be covered, and specific concepts and skills mastered by students, who are tested by the Kenya National Examinations Council after four years (KIE 2002). This is because some concepts and skills like measurement, statistics, scale drawing, and calculus are useful and are applied in other subjects like physics, chemistry, biology, and geography (KNEC 2000a).

Also, four basic goals for teaching mathematics, have been identified as: utilitarian, personal development, economic growth, and cultural values (Scopes 1973). Mathematics is used in measurement, transport and communication, in management of organizations, to prepare daily routines, timetables, and leave schedules, and it is a requirement in all careers and training. Baxton (1984) notes that, mathematics is the gate and key of science. Neglect of it works injury to knowledge, since he who is ignorant of it cannot view science or the things of the world. It is an international language, expressed clearly and with precision (Costello 1991; Durkin 1995). It uses an internationally accepted symbol system that has condensed meaning and is understood by all (Githua 2001). Thus, it facili-

tates trade transaction across boarders as quantification is understood universally. Mathematics is utilized in all cultural settings like entertainment, construction of buildings, making of furniture, interior design, and decoration.

However, over the years, performance in mathematics has continued to show a downward spiral. Various researchers have identified factors that are believed to course poor performance. These include: poor teaching methods and an acute shortage of text books (Eshiwani 2001), the difficult mathematical language (Oterburn and Nicholson 1996), terminology and utilization of symbols that are unusual and unfamiliar to students (Wasike 2003), and negative attitude of students, teachers and parents (Githua 2001). In a recent study, 'Effect of syllabus coverage on student performance in mathematics' (Shikuku 2009), it was established that these factors do not directly contribute to poor performance in mathematics. Instead, late or non-coverage of the mathematics syllabus contributes to poor performance.

THE PROBLEM

Mathematics is inevitably utilized in daily activities, social sciences, engineering, aerodynamics, and military advancements among other fields (Cockroft 1982). Yet it is still the most poorly performed subjects at KCSE level. In an attempt to improve performance, some parents

arrange and pay for extra tuition for their children, so that they cover all topics within the syllabus. These topics include; Arithmetic, Algebra, Geometry, Statistics, Probability, Navigation etc, whose concepts are tested at KCSE examinations. Parents claim that extra tuition allows time for revision later on in the year, leading to good performance. This paper contributes to the observation that early syllabus coverage, leads to good performance at KCSE level mathematics.

PURPOSE OF THE STUDY

The purpose of the study was to determine the effect of syllabus coverage on student performance at KCSE level mathematics.

METHOD

Sample

This study sought information on students who had completed KCSE between 2003 and 2007. As such, records on syllabus coverage and student performance were sought from 16 secondary school head teachers, 16 heads of mathematics departments, and 32 mathematics teachers from Kakamega South district of Western Province. The district had 85 secondary schools which were stratified into four categories according to performance, and four schools randomly selected from each category to be used in the study.

Research Design

A descriptive survey design was adopted for this study. The researcher was able to access records of syllabus coverage and the corresponding student performance for the years 2003 to 2007. Factors affecting syllabus coverage were also captured from the sampled schools.

Instruments

Three questionnaires namely; the Head Teacher Questionnaire (HTQ), the Head of Mathematics Department Questionnaire (HODQ), and the Mathematics Teacher Questionnaire (MTQ), were used to collect data for the study. Items in the questionnaires were mainly concerned with school policy on syllabus coverage, records of work covered and records of marks for all tests and examinations. They also sought to find topics in mathematics that were consistently left untaught by most schools, and then compare the percentage of syllabus covered to corresponding mean scores at KCSE level over the five years.

Reliability of the instruments was established by the test-retest method. Two schools from Butere Mumias district were selected for the pilot study and therefore were not included in the final sample of the study. Pearsons Product Moment Correlation Coefficient (PPMCC), r_{xy} was calculated for each instrument, and yielded the following results: HTQ, r_{xy} was 0.9883 for school 1 and 0.9913 for school 2. HODQ, r_{xy} was 0.9989 for school 1 and 0.9974 for school 2. MTQ, r_{xy} was 0.9967 for school 1 and 0.9805 for school 2. This showed that the instruments were reliable and could be used to collect data in the field.

RESULTS AND DISCUSSION

The effect of syllabus coverage on student performance was ascertained using PPMCC and was found to be 0.8343 which is greater than 0.5, showing that a positive relationship existed between them. The significance of r_{xy} was established using the conversions equation ;'t $= r(\sqrt{n-2})/(1- r^2)$' and was found to be 10.271 which is greater than the table value 1.868, confirming that syllabus coverage had an effect on student performance. Furthermore, a One Way Analysis of Variance (ANOVA) was determined and showed that syllabus coverage has a significant effect on student performance at KCSE level mathematics. Details of the results are shown in the following tables.

From Table 1, it is evident that schools that cover 100% of the syllabus perform better than

Table 1: Percentage of syllabus covered; by the time students sit KCSE examinations by categories "a", "b", "c", and "d".

Category	Average % of syllabus covered in each category	KCSE average mathematics mean score in each category
a	100 %	5.6188
b	80% - 100%	2.4283
c	50% - 80%	1.8361
d	< 50%	1.3977

Table 3: Mean score for school categories according to syllabus coverage

	N	Mean	Std. deviation	Std. error	95% confidence interval for mean		Minimum	Maximum
					Lower bound	Upper bound		
100% coverage	4	5.6188	.37038	.18519	5.0294	6.2081	5.11	5.98
80-100% coverage	4	2.4283	.17512	.08756	2.1496	2.7069	2.20	2.63
50-80% coverage	4	1.8361	.27433	.13716	1.3996	2.2726	1.54	2.19
50% coverage	4	1.3977	.09149	.04574	1.2521	1.5433	1.30	1.52
Total	16	2.8202	1.72558	.43140	1.9007	3.7397	1.30	5.98

Table 4: A One-Way Analysis of Variance

	Sum of squares	Df	Mean square	F	Sig.
Between groups	43.910	3	14.637	232.812	.000
Within groups	.754	12	.063		
Total	44.664	15			

those which cover less than 50% of the syllabus.

Table 2 shows calculation of r_{xy} while Table 3 shows mean scores, standard deviations standard error, and confidence interval for the mean.

Results from Table 4 show the F value as 232.812, and a significance of 0.000 at alpha level 0.05, which is greater than the table value of $F_{(3,12)} = 3.49$, further confirming that syllabus coverage has a significant effect on student performance at KCSE level mathematics.

Table 2: Correlation between percentage of syllabus covered and mean score

Category	% of syllabus covered (X)	Average mean score (Y)	X^2	Y^2	XY
a	100	5.6188	10000	31.5710	561.880
b	90	2.4283	8100	5.89660	218.546
c	65	1.8361	4225	3.37130	119.346
d	50	1.3977	2500	1.95360	69.8850
Total	305	11.281	24825	42.7925	969.657

CONCLUSION

Students who cover the mathematics syllabus, have a better mean score than those who fail to cover the syllabus. Students who cover the syllabus early in the year and spend more time on revision, have an even better mean score than those who cover the syllabus just before KCSE examinations. To cover the syllabus early in the year, both students and teachers have to put in extra time for which the parents pay handsomely. Some schools use team teaching to ensure all topics in the syllabus are understood by all students. They also ensure both teachers and students are present in school and actually attend lessons. Some schools expel slow learners, and have a minimum mark that a pupil must obtain at Kenya Certificate of Primary Education (KCPE), for admission in form one. These findings are in line with the 2005 KNEC report, which indicated that the syllabus is inadequately covered, and topics like navigation, linear programming and calculus which come at the end of the syllabus are never taught.

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