

Influence of Strengthening Mathematics and Science in Secondary Education (SMASSE) in Service Education and Training (INSET) on the Attitude of Students towards Mathematics Performance in Public Secondary Schools of Rangwe Division, Homa-Bay Sub County-Kenya

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Abstract

The general performance in mathematics in Kenya has been declining over the past years. This prompted the researchers to investigate the influence of STRENGTHENING MATHEMATICS AND SCIENCE IN SECONDARY EDUCATION (SMASSE) IN SERVICE EDUCATION AND TRAINING (INSET) on students' attitudes towards mathematics performance in public secondary schools of Rangwe division. The objectives of the study were to investigate whether SMASSE-INSET had changed the students' attitudes towards mathematics performance and whether there were any significant differences in students' attitudes based on school categories. The study was conducted in Homa Bay Sub County, Rangwe division using a descriptive survey design. The respondents of the study were selected from the Form three students of the year 2013. A sample of 203 students was obtained from the boys' school, the girls' school and mixed day schools using stratified random sampling technique. Content analysis was used to obtain the data on students' performance from 2004 to 2012. Data was collected through the use of students' questionnaire and analysis done using both descriptive and inferential statistics. The study established that the students' attitude towards mathematics was positive though the positive attitude had not been translated to improved performance in mathematics.

Keywords: SMASSE INSET, Attitude and performance

INTRODUCTION

A number of studies indicate that attitude is one of the performance determinants at Kenya Certificate of Secondary Education (Karue, 2006; Omondi, 2010; Wanjohi, 2011; and George, James, Justus & Zachariah, 2012). The studies are in agreement that students' positive attitude in mathematics leads to improved performance in examinations. Other international studies have also noted similar findings. For instance a study carried out by Shahid (2008) on students' attitude towards mathematics in Pakistan revealed that positive attitude affect students' achievement in mathematics positively. The study observed that the way mathematics is represented in the classroom and perceived by students stands to alienate many learners from the content, even when teachers believe they are presenting it in authentic and context dependent way.

Studies carried out on the impact of SMASSE project in Kenya on the students attitude towards the teaching and learning of mathematics revealed that SMASSE Project has had a positive impact on students attitude. Similar results are seen in the studies carried out by Ndiku, (2011); Olick, (2012); and Libiru, (2012). They all agree that SMASSE training has impacted positively on the students' attitude towards mathematics. However, according to Langat (2009), the positive change of attitude had not translated to improved performance in mathematics. Situational analysis reports from the Centre for Mathematics and Science Education in Africa (CEMASTE) team have also indicated the positive attitude by students towards mathematics. For instance a study conducted by the SMASSE project impact assessment survey (SPIAS) on how teacher participation in the SMASSE INSET affects students' attitude and participation in lessons revealed that the quality of INSET let to a better students' attitude towards mathematics and science subjects (CEMASTE, 2010).

Despite the general agreement that SMASSE in-service training has had a positive impact on students' attitude towards the teaching and learning of mathematics, there is still poor performance in mathematics as reflected in Kenya Certificate of Secondary Education examinations (Kenya National Examination Council Reports, 2004-2011). This is a clear indication that the goals of SMASSE project have not been fully attained despite the fact that the project has been in operation for more than ten years. Researchers wonder why the positive attitude as observed by the previous studies on SMASSE cannot translate to a marked improvement in mathematics examinations (Langat, 2009; Libiru 2012). It is also not clear whether the relationship between mathematics performance, attitude change and SMASSE-INSET is a regional phenomenon. This study was

aimed at assessing the influence of SMASSE-INSET on the attitude of students towards mathematics performance in Rangwe division.

METHODOLOGY

The study was conducted in ten public secondary schools in Rangwe division of Homa Bay Sub-County in the republic of Kenya. Rangwe division has one private and ten public secondary schools. There were 203 form three students who participated in the study. The study sample was obtained from Girls boarding school, Boys' boarding school and mixed day schools using stratified random sampling techniques. Students responded to a questionnaire which was used to establish their views on the attitude towards mathematics. The main areas of focus included opinions on what makes the students enjoy mathematics lesson, the frequency of the practical activities in their classroom, how they preferred to be taught mathematics for better understanding and the mathematics activities outside the school. There were ten statements in the questionnaire. Each statement was rated on a 5-point scale ranging from "Strongly Disagree" with a score of 1 to "Strongly Agree" with a score of 5. The students were required to tick in the box corresponding to their option. Data on KCSE performance was obtained from the County director's of education office in Homa Bay County.

RESULTS AND DISCUSSIONS

Students were required to indicate the extent to which they agreed with statements concerning mathematics lessons and activities in and outside the classrooms. Scores from negatively worded statements were reversed before they were used in the analysis. Table 1 below shows the average agreement per statement and the final average for all the items as indicated by the 203 students.

Table 1
Students' attitude towards mathematics

Item No	Statement	N	Sum	Mean
1.	My relation with the mathematics teacher is good	203	862.00	4.2463
2.	My mathematics teacher involves us during the lesson hence making it interesting	203	884.00	4.3547
3.	We always do some activities during mathematics lesson using the locally available materials	203	642.00	3.1626
4.	Mathematics discussions are interesting and we do extend beyond class time	203	674.00	3.3202
5.	Mathematics assignments are less stressful	203	649.00	3.1970
6.	I intend to take a career related to mathematics in future	203	747.00	3.6798
7.	Mathematics is not as difficult as others have been saying	203	775.00	3.8177
8.	My scores in mathematics are high as compared to other subjects	203	527.00	2.5961
9.	I should have dropped mathematics if it was optional	203	723.00	3.5616
10.	I do not understand anything during mathematics lessons	203	825.00	4.0640
MEAN OF MEANS				3.6000

From Table 1, it can be seen that the mean attitude of the whole group of students is 3.6000 which is relatively a high value (72%) on a five-point scale and therefore implying that the students' attitude towards mathematics is positive. Item 2 scored the highest mean of 4.3547 and this showed that students were always involved in the teaching and learning process. Students' response to item 9 on whether they should have dropped mathematics was strongly disagreed upon. This implies that students were aware of the role of mathematics though they still felt their scores were not as high as other subjects. The question therefore could be with the teachers' teaching practices. When the results were analyzed based on school category, the results were as shown in Table 2.

Table 2
Means of students' attitude towards mathematics by school category

Item No	Statement	Boy's boarding (N=45)	Girl's boarding (N=47)	Mixed school (N=111)
1.	My relation with the mathematics teacher is good	4.6000	3.9362	4.2342
2.	My mathematics teacher involves us during the lesson hence making it interesting	4.8667	4.4894	4.0901
3.	We always do some activities during mathematics lesson using the locally available materials	3.8222	3.4681	2.7658
4.	Mathematics discussions are interesting and we do extent beyond class time	4.1333	2.5745	3.3063
5.	Mathematics assignments are less stressful	3.9778	2.4043	3.2162
6.	I intend to take a career related to mathematics in future	4.1333	3.1064	3.7387
7.	Mathematics is not as difficult as others have been saying	4.2889	3.9149	3.5856
8.	My scores in mathematics are high as compared to other subjects	3.1333	2.4043	2.4636
9.	I should have dropped mathematics if it was Optional	4.0222	3.4468	3.4182
10.	I do not understand anything during mathematics lessons	4.7333	4.1489	3.9364
	MEAN OF MEANS	4.1267	3.3894	3.4756

Table 2 shows that the positive attitude towards mathematics is generally high but more in boys' schools than both girls and mixed schools. In item 3, the mean of boys' school was 3.8222, the mean of girls' schools was 3.4681 and that of mixed school was 2.7658. This shows that students in single sex schools rated the item higher than those in mixed schools. It suggests that students in mixed schools are disadvantaged when it comes to using locally available materials in the teaching and learning of mathematics.

Item number 4 gave a mean of boys' school as 4.1333, girls' school as 2.5745 and that of mixed schools as 3.3063. The mean of boys' school was high as compared to the mean of girls and mixed schools. The mean of girls' school was the least implying that girls seem not to find mathematics so interesting when they are on their own. In item number 8, the mean of boys' schools was 3.1333, that of girls' schools was 2.4043 and that of mixed schools was 2.4636. The means for this item was the lowest of all the 10 items. This suggests that generally, students have not developed more confidence in their ability to deal with mathematics than in their ability to deal with other academic subjects. When asked whether mathematics assignments were less stressful, the mean for boys' schools was 3.9778, that of girls' schools was 2.4043 and that of mixed schools was 3.2162. This shows that boys' schools had the highest rating of mathematics assignments being less stressful as compared to girls' schools or mixed day schools. The grand means for boys' schools was 4.1267, that of girls' school was 3.3894 and that of mixed schools was 3.4756.

The results of Table 2 were subjected to a one way ANOVA to determine whether the differences in the means for the three categories of schools were statistically significant. The results were as shown in Table 3.

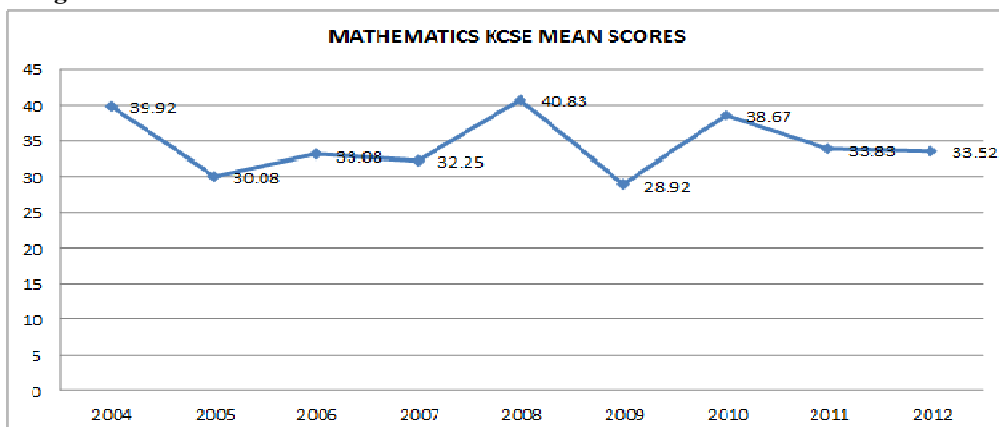
Table 3
One way ANOVA of students' attitudes towards mathematics as per school category

	F	Sig
1. My relation with the mathematics teacher is good	5.147	.007
2. My mathematics teacher involves us during the lesson hence making it interesting	1.080	.341
3. We always do some activities during mathematics lesson using the locally available materials	10.959	.000
4. Mathematics discussions are interesting and we do extent beyond class time	16.627	.000
5. Mathematics assignments are less stressful	16.912	.000
6. I intend to take a career related to mathematics in future	6.726	.001
7. Mathematics is not as difficult as others have been saying	6.175	.002
8. My scores in mathematics are high as compared to other subjects	4.996	.008
9. I should have dropped mathematics if it was optional	2.551	.081
10. I do not understand anything during mathematics lessons	1.212	.300

At $\alpha = .005$ only three items were not significant, implying that students extents of agreement to some seven statements were different according to type of school. This implies that generally attitudes are statistically significantly different according to type of school.

In order to establish the influence of students' attitudes on performance, the analysis of Kenya Certificate of Secondary Education (KCSE) performance in mathematics in the ten public secondary schools was done by establishing the trend in performance using a graph as recorded in Figure 1.

Figure 1 Rangwe division Mathematics KCSE mean scores from 2004-2012



From the graph, it is clearly seen that performance in mathematics has not been consistent. There have been fluctuations in performance with big deviations. For instance a mean of 40.83 percent in 2008 was followed with a mean of 28.92 percent in 2009 giving a negative deviation of 11.91 percent. The inconsistency in performance raises questions as to whether the positive attitude of students' has played a role in enhancing performance in mathematics. From the trend in performance reflected in the graph, it is clear that the performance of mathematics in Rangwe division has neither been steady nor average.

SMASSE INSET in Rangwe division has so far been conducted in two phases with every phase taking a period of four years. The first phase begun in 2004 and ended in 2007 and the second phase begun in 2008 and ended in 2011. Average scores for phases one and two of the SMASSE training were calculated to provide two sets of scores as shown in Table4.

Table 4
Average scores for phase one and phase two of SMASSE INSET

	N	Minimum	Maximum	Mean	Std. Deviation
phase 1	4	30.08%	39.92%	33.83%	4.2510
phase 2	4	28.92%	40.83%	35.56%	5.3081
Valid N (listwise)	4				

The mean scores were calculated to find out if there was any improvement after the first phase of the training which was completed in 2007. The mean for phase one of the training was 33.83 percent whereas for

phase two was 35.56 percent. From the two means, it can be seen that there was a slight improvement of 1.73 percent in the scores after the first phase of the training but the overall performance remains below average (50%). It is clear from the analysis above that the introduction of SMASSE INSET may not have improved the students' performance in mathematics in Rangwe division. These research findings are similar with those of other studies like Langat (2009), Ndiku (2011) and Sifuna & Kaime (2007). They too established that SMASSE INSET had not improved students' performance in mathematics.

CONCLUSION AND RECOMMENDATION

From the research findings that have been presented, it can be concluded that the students have generally developed positive attitudes towards mathematics. The positive attitude is however more in boys' boarding school as compared to both girls' boarding schools and mixed day schools. The positive attitude could be attributed to introduction of SMASSE INSET in Rangwe division. Analysis on KCSE performance in Rangwe division reveals that the positive attitudes of students in mathematics have not influenced performance in the subject.

The authors gave the following recommendations:

- i. Teachers need to encourage students to take careers related to mathematics and to develop creativity in solving mathematical problems.
- ii. The results from this study also suggests the need for teachers to develop positive relations with students, to stress classroom activities which involve active teaching learning process and to engage students in meaningful activities that will demystify mathematics as a difficult subject. This will enhance the performance in mathematics subject.
- iii. The findings indicated a weak positive attitude change towards mathematics by students from mixed schools. There is therefore need for teachers from mixed schools to keep on encouraging students towards having a positive attitude towards mathematics.

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