

Influence of Student's Attitude in Mathematics Performance among Learners in Public Secondary Schools in Kilifi Sub-County, Kenya

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Abstract: Mathematics is of central importance to modern society, because it provides the vital underpinning of the knowledge economy. Despite the important role that mathematics plays in society however, students continue to perform poorly in mathematics in national examinations. The current study assessed the influence of student's attitude on performance in mathematics among learners in public secondary schools in Kilifi sub-county. The study targeted mathematics heads of department, mathematics teachers and Form 3 students from all the public secondary schools in Kilifi Sub-county. Multistage sampling was used to come up with a sample of 156 respondents comprising 12 mathematics heads of department, 24 mathematics teachers and 120 students. Questionnaires were used to collect data. Descriptive statistics comprising frequencies, percentages, mean and standard deviation were used to organize findings. Chi-square tests and correlation analysis was used to establish relationships. SPSS was used to aid in data analysis. Majority (68%) of the teachers in the study disagreed that students generally like Mathematics and believe they will get good grades. Majority (68%) of the students in the study agreed that mathematics is too complex and it is difficult for them to pass. Majority (67%) of the heads of departments indicated that students have a negative attitude towards mathematics. There was a statistically significant relationship ($p=0.00$) between students' attitude towards mathematics and performance in public secondary schools in Kilifi sub-county. The study concludes that students' attitude influences performance in mathematics among learners in public secondary schools in Kilifi sub-county. Specifically, students hold poor perceptions towards the subject and this negatively affects their performance in mathematics. The study recommends that public secondary schools in Kilifi sub-county should hire motivational speakers in order to change their bad perception of mathematics. Benchmarking with schools performing well in mathematics should also be done where students can visit and learn.

1. INTRODUCTION

Under achievement in mathematics has remained a global concern even in the developed countries. Studies conducted by American Institute for Research (AIR) to investigate mathematics performance on USA students-4th and 8th grades as compared with peers around the world and by National Assessment of Education Progress (NAEP) that assessed the progress in mathematics of students in grades 4, 8 and 12, found that grade 4 pupils performed below average mark consistently from 1996-2007. The study also revealed that teachers were the major cause of poor mathematics performance in the US (AIR, 2007). This characteristic of under achievement in mathematics is also observed in the middle – income and developing countries. In developing countries, many scholars, educators and trainers have long been interested in exploring issues contributing effectively and quality academic performance (Mweti 2010). Farooq, Chandhry, Shafiq, and Berhanu (2011) while studying factors affecting students' quality of academic performance in

Pakistan they concluded that family characteristics like socio-economic status are significant predictors for students performance at school besides the other school factors, peer factors and students factors. In Jamaica, poor attitude to mathematics as a subject evident and view the subject as being little or no use outside schools as according to the Ministry of Education, Youth & Culture (2003). In South Africa, Mji and Makgato (2006) pointed out that those who take mathematics do not perform well because they are not motivated. Yega (2002): teachers, students and parents have negative attitude towards teaching and learning of mathematics. Chiriswa (2003) agreed with the above view and recommended that mathematics teachers and students be given incentives to raise their moral for better grades in mathematics.

In a troubling trend, performance in Mathematics and sciences in the Kenya Certificate of Secondary Education (KCSE) examination has been declining for the last three years. A report by Otieno (2017), on Nation Newsplex review of national examination analysis indicate that an overwhelming majority of the KCSE candidates nationally failed in Mathematics and the sciences from 2014 to 2016. Nearly 90 per cent, or 493,184 of the 569,733 candidates who sat the Mathematics Alternative A paper in 2016 scored between C- and E. This was about a 10 percentage increase from each of the two previous years. In contrast, four per cent (20,682) of the 2016 candidates scored either an A or A-. Half the candidates scored an E, the lowest grade, while the average mean grade was D, a drop from D+ in 2014 and 2015. Performance in the Maths Alternative B paper was even worse, with 99 per cent of the 1,442 candidates who sat the paper scoring less than grade C. Less than one per cent, or three candidates, scored either grade A or A-. (Otieno, 2017). This is a worrying trend that needs urgent and stringent measures to reverse before the situation gets out of hands and derail the country's progress towards industrialization and vision 2030. A baseline study by the Centre for Mathematics, Science and Technology Education in Africa (CEMASTEA) a government agency, shows that teachers routinely advise students they consider weak not to take up science courses, when they should be encouraging them instead. Other challenges identified include poor school infrastructure. Also, many schools were not proactive in entrenching the study of science (Otieno, 2017).

Kilifi County is one of the six counties in Coast region. The county has seven sub counties namely, Kilifi North, Kilifi South, Ganze, Malindi, Magarini, Rabai and Kaloleni. It has 17 divisions, 54 locations, 165 sub-locations. It has seven constituencies and thirty five county wards which are in line with the Kenyan Constitution 2010. The population of the county was estimated to be 1,217,892 in 2012 as projected in the Kenya Population and Housing Census 2009, composed of 587,719 males and 630,172 females. The secondary school age (14-17 years) population stood at 102,868 in 2009 representing 9.27% of the total population. The actual enrolment stands at 35,670 which is much far below the estimated secondary age population of 112,893 as at 2012. It is expected to increase to, 123,896 and 135,971 in 2015 and 2017 respectively. This poses a major challenge to the county that currently has only 120 secondary schools with 710 teachers. The gross enrolment rate in secondary school in the county is very low at 42.5 percent while the net enrolment rate is 34 percent with differentials being reflected with boys having a higher enrolment rate than girls. Performance in secondary schools has also been poor compared to neighbouring counties and national average.

When reviewing literature on student's attitude towards mathematics, it is evident that several factors play a significant role in influencing student's attitude towards a subject. These factors can be categorized into two distinctive perspectives. Firstly, factors associated with the students themselves which include; student's mathematical achievement score (Köğçe *et al.*, 2009), anxiety towards mathematics, student's self efficacy and self concept, extrinsic motivation (Tahar *et al.*, 2010) Secondly, the factors associated with the school, teacher and teaching. Some of these factors that influence attitudes are teaching materials used by teacher, teachers' classroom management, teachers' content knowledge and personality, teaching topics with real life enriched examples, other student's opinions about mathematics (Yilmaz, Altun & Olkun, 2010), teaching methods, reinforcement (Papanastasiou, 2000), receiving private tuition and teachers attitude toward mathematics (Köğçe *et al.*, 2009).

Due to these several factors students have different attitude towards mathematics. More often, the public image of mathematics is labeling it as a difficult, cold, abstract, theoretical and ultra rational subject (Ernest, 2004). However, some studies show that students have a relatively positive attitude towards mathematics (Tezer & Karasel, 2010; Yilmaz *et al.*, 2010; Fan, Quek, Yan, Mei, Lionel & Yee, 2005). Sometimes, Mathematics is also considered as very important and largely masculine subject (Ernest, 2004). Wills (2010), asserted that positive attitude towards a subject was related positively to performance. In Kenya, research done by Nui and Wahome, (2006) in secondary education, has showed that consistent failure in sciences might be attributed to attitudes of students and teachers had towards the subjects. Based on

this research, it means, attitude is a key component that influences performance. In agreement to this Manoah, Indoshi and Othuon (2011) in their study observed that attitudes played a critical role in students' performance. Students with positive attitude tended to perform well in an exam. Considering these studies, the role of attitude could be a key factor in determining how well a curriculum is implemented in learning institutions and in particular Mathematics subject.

Statement of the Problem

Mathematics is part of our daily life; as such the provision of quality education and subsequent high performance is inevitable for the realization of Kenya's Vision 2030 (Onderi, 2015). Despite the important role that mathematics plays in society, Students continue to perform poorly in mathematics in national examinations. Ranani (2014), indicate that, performance in mathematics has been generally poor in many parts of the Country. Njoroge (2014) also decries the poor performance in mathematics despite the fact that it is one of the key subjects expected to turn Kenya into an industrialized country by the year 2030. The same trend of poor performance in mathematics has been noted in Kilifi sub county over the years as. This trend indicates that very few students attain the required grade of C+ in the subject which is the minimum grade required to pursue a degree course in local universities. The implication of the poor performance in mathematics in the sub county (D-) means that majority of students dream for tertiary education has been jeopardized by poor performance in mathematics.

There exists a host of studies examining teaching of mathematics and mathematics performance such as (Musu *et al.*, 2012; Mbugua, Kibet, Muthaa and Nkonke, 2012; Munuve, 2013; Kiwanuka *et al.*, 2015; Karigi, 2015 & Idowu, 2016). However, from a general perspective, majority of these studies have little or no regard for social economic disparities in a particular region and tend to ignore adequacy and quality of teaching and learning facilities in public schools and public schools teachers workload. Not enough has been done in regard to student performance in mathematics in Kenya . This study is dedicated to fill these gaps in knowledge by assessing how students' attitudes influence performance in mathematics among learners in public secondary schools in Kilifi sub-county.

Purpose of the study

To assess the influence of student's attitude on performance in mathematics among learners in public secondary schools in Kilifi sub-county.

2. LITERATURE REVIEW

Theoretical Review

Bandura's Social Cognitive Theory emphasizes how cognitive, behavioral, personal, and environmental factors interact to determine motivation, behavior and performance of an individual (Crothers, Hughes, & Morine, 2008). The Social Cognitive Theory is composed of four processes of goal realization: self-observation, self-evaluation, self-reaction and self-efficacy. These components are interrelated, each having an effect on motivation and goal attainment (Redmond, 2010). Pajares and Schunk (2001) suggested that students who believed they were capable of performing tasks used more cognitive and meta-cognitive strategies and persisted longer. Below is an explanation of components of social cognitive process

Self-observation: Observing oneself assess one's progress toward goal attainment as well as motivate behavioral changes (Zimmerman & Schunk, 2001). Self-observation allows a student to compare his current performance with a desired performance or grade. Schunk and Zimmerman (2004) state that specific goals or grade specify the amount of effort required for success and boost self-efficacy because progress is easy to gauge. Self evaluation: Students gain satisfaction when they achieve goals that they have set and value. When individuals achieve these valued goals, they are more likely to continue to exert a high level of effort, since sub-standard performance, for instance in mathematics will no longer provide satisfaction (Bandura, 2001).

Self-reaction: If the progress made is deemed acceptable, then one will have a feeling of self-efficacy with regard to continuing, and will be motivated towards the achievement of their goal or grades in future. If a student has achieved a set grade in mathematics, they are likely to re-evaluate and raise the standard (grades); whereas, if a person has not achieved the goal, they are likely to re-evaluate and lower the standard (goal) to an achievable goal. Self-efficacy: One's belief in the likelihood of goal completion can be motivating in itself (Bijl & Baggett, 2002). Self-efficacy refers to people's

judgments about their capability to perform particular tasks. Task-related self-efficacy increases the effort and persistence towards challenging tasks; therefore, increasing the likelihood that they will be completed (Axtell & Parker, 2003). Students' judgments of their capability to perform academic tasks, predict their capability to accomplish such tasks (Bandura, 2001).

The concept of this theory allowed the study to examine the influence of a student attitude towards performance in mathematics as well as the effects of teacher related factors on student performance. According to Pajares (2009), social cognitive perspective is the understanding that individuals are imbued with unique capabilities. Primary among these are the capabilities to plan and learn through vicarious experience. These capabilities provide students with the cognitive means by which they are influential in determining their excellence in academics.

Empirical Review

A Portuguese study by Mata, Monteiro and Peixoto (2012) revealed that, in general, students held positive attitudes towards mathematics and also highlighted the main effects of grade and math achievement on these attitudes. In Opolot-Okurut (2005) study, secondary school students' attitudes towards mathematics were investigated. The results indicated significant differences in all the attitudes variables measured between the male and female students. The students in the high-performing schools indicated higher attitudes than the students in the low-performing schools. Comparing English and Norwegian pupils' attitude, Peppin (2011) argued that for it as a socio-cultural construct embedded in and shaped by students' environment and context in which they learn mathematics. Whilst there were differences which could be seen to be accounted for by differently 'figured' environments, there are also many similarities. It was interesting to see that, albeit based on a small statistical sample, in both countries students had a positive attitude towards mathematics in year 7/8, which dropped in year 9, and increased again in years 10/11. In a meta-analysis of academic self-efficacy studies reported that, self-efficacy beliefs account for approximately 14% of the variance in students' academic performance and approximately 12% of the variance in their academic persistence" (Multon, Brown & Lent, 2011).

Small-scale research study by Khan (2011) set out with two purposes. The first purpose of the study was to investigate the difference between public and private school students' attitudes towards mathematics at the secondary level in Quetta, Pakistan. Another aim of the study was to find out whether there is a difference between male and female students' attitudes towards mathematics. The results of the study indicated that there were no significant differences between public and private school students' attitudes towards mathematics at the secondary level. Results at subscale level also revealed that no significant differences between the public and private systems were found except for the subscale 'value of mathematics'. Furthermore, the results of the study indicated that there were significant differences between male and female students, where male students reported to have a significantly high degree of positive attitude towards mathematics as compared to their female counterparts. Interestingly, results in each school type also revealed that male students claimed to have a more positive attitude towards mathematics than female students. The results of the study provide significant insights into male and female students' attitudes towards the discipline in both public and private secondary schools.

Vella (2011) quantitative study showed that the attitude is significantly related to the performance. In terms of attitude scores statistical significance in favour of males was found for Form 3 Area Secondary students and in favour of females for Form 1 Area Secondary students. Negative attitudes towards mathematics tend to increase as the age of the students increases. In terms of achievement, girls seem to be out performing boys in annual examinations. Asante (2012) found that school environment, teachers attitudes and beliefs, teaching styles and parental attitudes were identified as explanation factors that account for student's attitudes towards mathematics. Ajisuksmo and Saputri (2017) results revealed that attitudes towards mathematics and students' mathematics achievement were significantly correlated ($r = 0.505$; $p < 0.001$). No significant correlations were shown between metacognitive skills and mathematics achievement ($r = 0.081$; $p > 0.05$), as well as between attitude towards mathematics and metacognitive skills ($r = 0.143$; $p > 0.05$). The regression model was fit in predicting the contribution of attitudes towards mathematics and metacognitive skills on mathematic achievement for 25.5%. However, looking at the p value of the t test it was shown that the attitude towards mathematics contributes to the model, but not the metacognitive skills. No significant difference was found on mathematics achievement. Aqajani *et al.* (2015) results showed that mathematics anxiety of female students is significantly more than mathematics anxiety in male students. The results showed a significant difference in math anxiety

between mathematics and science fields in the humanities. Nikmanesh & Yari (2014) showed a significant correlation between self-efficacy and test anxiety. In addition, there is a significant positive correlation between the three components of self-perception, including the passive perception, acting perception and aggressive perception, and test anxiety.

3. CONCEPTUAL FRAMEWORK

The conceptual framework shows the variables in the study

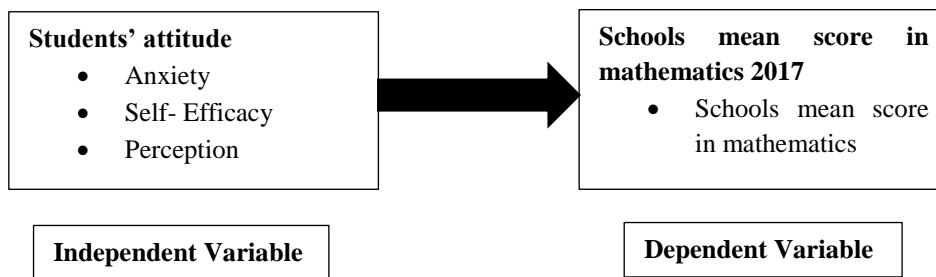


Figure 1: Conceptual Framework

4. METHODOLOGY

The study adopted a cross-sectional descriptive study design. The study was undertaken in all public secondary schools in Kilifi Sub-County, in Kilifi County. mathematics heads of department, mathematics teachers and form three students from all the public secondary schools in Kilifi Sub-county were targeted since they could easily relate to the trends in mathematics performance in their schools and have easy access to the required data. There were 35 public secondary schools in Kilifi Sub-County with 35 heads of mathematics department, 220 mathematics teachers and a population of 28,567 students. Multistage sampling involving Slovin's formula and purposeful sampling was used to come up with a sample of 156 respondents comprising 12 mathematics heads of department, 24 mathematics teachers and 120 students. The study used questionnaires and a qualitative interview schedule. Self-administered questionnaires were used for data collection from mathematics teachers and students. A qualitative interview schedule was used to collect data from heads of departments. A pretest was undertaken in 5 secondary schools in the neighboring Ganze Sub-County. Pretest data yielded an average coefficient of 0.74 that was within the acceptable limits. Descriptive statistics comprising frequencies, percentages, mean and standard deviation were used to analyze data with the support of Statistical Package for Social Sciences (SPSS) version 22.0. Chi-square tests and correlation analysis were used to establish relationships. The findings were presented in form of tables.

5. FINDINGS

Response Rate

A total of 132 questionnaires were returned out of a possible 156 representing a 85% response rate. This was a high response rate as it is greater than the 70% recommended for descriptive studies.

Socio-Demographic Characteristics of Respondents

Socio-demographic characteristics in the study included gender, age, level of education and experience of teachers. The findings are presented in Table 1. Majority (72%) of the respondents in the study were male. This shows that there was great gender disparity among teachers of mathematics of public secondary schools in Kilifi Sub-County. Slightly above half (52%) of the respondents were aged between 31 and 40 years while 28% were aged between 21 and 30 years. This shows that mathematics teachers of public secondary schools in Kilifi Sub-County were relatively young. The findings show that slightly above half (52%) of the respondents in the study had acquired a degree while 38% had acquired a bachelor's degree. This shows that mathematics teachers of public secondary schools in Kilifi Sub-County were highly trained as all of them had acquired post-secondary education. Slightly less than half (47%) of the respondents had a working experience of between 11 and 15 years while 38% had a working experience of between 6 and 10 years. this shows that the respondents were experienced enough to enable them respond resourcefully to the questions in the study.

Table 1: Socio-Demographic Characteristics of Respondents

Characteristic	Category	Frequency	Percentage
Gender	Male	15	72%
	Female	6	28%
	Total	21	100%
Age (years)	21-30	6	28%
	31-40	11	52%
	41-50	3	12%
	>50	2	8%
	Total	21	100%
Level of education	Diploma	11	52%
	Bachelor's degree	8	38%
	Post graduate degree	2	10%
	Total	21	100%
Teaching experience	<5	1	3%
	6-10	8	38%
	11-15	10	47%
	>16	3	12%
	Total	21	100%

Students Attitude towards Mathematics and Performance in Mathematics

Majority (68%) of the teachers in the study disagreed that students generally like Mathematics and believe they will get good grades however 32% of the respondents disagreed. The vast majority (96%) agreed that mathematics usually makes students feel uncomfortable and nervous during mathematics lessons and test leading to poor performance however, 4% of the teachers disagreed. Majority (62%) also agreed that mathematics teachers have built confidence of their students on their ability to pass well in KCSE. However, 36% disagreed and 2% of the respondents were uncertain. In addition, the vast majority (93%) of teachers agree that many students feel they have no ability or talent to succeed in Mathematics however 6% of the respondents disagreed.

Slightly above half (55%) disagreed while 45% agreed that learning Mathematics involves a lot of memorization of formula which are difficult to grasp and Many times miss Mathematics lessons because the subject is difficult. Similarly, 84% disagreed, 12% agreed and 4% were uncertain that Mathematics is too complex and It is difficult to pass Mathematics it in KCSE especially in this school. It is normal that majority of students fail in the subject. The vast majority (98%) agreed that students attitude towards mathematics greatly influences their performance on the subject. However 2% of the respondents were uncertain.

Table 2: Teachers' Responses on Students Attitude towards Mathematics

Statement	SA	A	U	D	SD
Students generally like Mathematics	22%	10%		20%	48%
Mathematics usually makes students feel uncomfortable and nervous during mathematics lessons and test leading to poor performance	56%	40%		4%	
Mathematics teachers have built confidence of their students on their ability to pass well in KCSE	44%	18%	2%	18%	18%
Many students feel they have no ability or talent to succeed in Mathematics.	56%	38%		4%	2%
Learning Mathematics involves a lot of memorization of formula which are difficult to grasp and Many times miss Mathematics lessons because the subject is difficult	25%	20%		38%	17%
Mathematics is too complex		12%	4%	28%	56%
Students attitude towards mathematics greatly influences their performance on the subject	78%	20%	2%		

Key: SA = strongly agree, A = Agree, U= Uncertain, D= disagree, SD = Strongly disagree

Majority (68%) of the students in the study agreed that mathematics is too complex and it is difficult for them to pass however, 32% disagreed to this. Majority (60%) disagreed, 34% agreed while 6% were uncertain that mathematics doesn't scare them at all and they believe that they would get good grades. The findings show that majority (80%) of the students agreed while 20% disagreed that mathematics usually makes them feel uncomfortable and they get nervous during mathematics lessons and tests. In addition, slightly above half (57%) of the students disagreed, 39% agreed and 4% were uncertain that they had no confidence in tackling Mathematics related problems. The findings show that majority (63%) of the respondents agreed, 35% disagreed while 2% were uncertain that they had no ability or talent to succeed in Mathematics. Majority (71%) of the students agreed while 29% disagreed that mathematics teachers had made them feel that they had the ability to pass well in mathematics. Majority (75%) also agreed and 25% disagreed that mathematics is a worthwhile and necessary subject. However, slightly above half (58%) of the respondents disagreed, 39% agreed and 1% were uncertain that mathematics is of no relevance to them and they expected to have little use for it when they get out of high school.

Table 3: Students' Responses on Attitude towards Mathematics

Statement	SA	A	U	D	SD
Mathematics is too complex and It is difficult to pass	43%	25%		16%	16%
Mathematics doesn't scare me at all and I believe I will get good grades	24%	10%	6%	38%	22%
Mathematics usually makes me feel uncomfortable and I am nervous during mathematics lessons and test	57%	23%		16%	4%
I have confidence in tackling Mathematics related problems	22%	17%	4%	19%	38%
I have no ability or talent to succeed in Mathematics	25%	38%	2%	23%	12%
Mathematics teachers have made me feel I have the ability to pass well in math's	33%	38%		22%	7%
Mathematics is a worthwhile and necessary subject	48%	27%		23%	2%
Mathematics is of no relevance to me and I expect to have little use for it when I get out of high school	1%	38%	3%	31%	27%

Key: SA = strongly agree, A = Agree, U= Uncertain, D= disagree, SD = Strongly disagree

Majority (67%) of the heads of departments indicated that students have a negative attitude towards mathematics. Some of their responses are captured below:

"In my opinion, most students adopt a negative attitude towards mathematics due to the notion that mathematics is difficult."

"The attitude towards mathematics is not taken positively because mathematics is a hard subject"

"Students' attitude towards mathematics is positive they just lack the confidence to approach and tackle it"

Table 4: HODs Responses on Students Attitude towards Mathematics

Response On Attitudes	Frequencies	Percentage
Positive	3	33
Negative	6	67
Total	9	100

Performance in Mathematics in KCSE

Performance in mathematics among participating schools was noted over a period of 5 years in order to assess how student attitude, family background, adequacy of teaching and learning resources and teachers' preparedness, workload and motivation influence performance in mathematics among learners in public secondary schools in Kilifi Sub County. Findings in Table 5 shows that the participating schools consistently performed poorly over the study period with a mean grade of D- each academic year.

Table 5: Performance in Mathematics in KCSE

Academic	Mean average
2013	2.28
2014	2.46
2015	2.41
2016	2.48
2017	2.53

Influence of Student's Attitude on Performance in Mathematics

There was a statistically significant relationship ($p=0.00$) between students' attitude towards mathematics and performance in public secondary schools in Kilifi sub-county.

Table 6: Chi-square output

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	30.037 ^a	9	.000
Likelihood Ratio	24.038	9	.004
Linear-by-Linear Association	.102	1	.749
N of Valid Cases	75		

6. DISCUSSION

The study sought to assess the influence of student's attitude on performance in mathematics among learners in public secondary schools in Kilifi sub-county. Findings showed that students' attitude was significant ($p=0.000$). This shows that there was a significant relationship between students' attitude and performance in mathematics among learners in public secondary schools in Kilifi sub-county. The negative attitudes and phobia towards mathematics among the students could be attributed to the culture of failing mathematics in the study area. Traditionally, mathematics has been a poorly performed subject and as such students hold the belief that they will eventually fail. This is consistent with Ernest (2004) finding that more often, the public image of mathematics is labeling it as a difficult, cold, abstract, theoretical and ultra-rational subject. It is also consistent with findings of Manoah *et al.* (2011) in their study observed that attitudes played a critical role in students' performance. Students with positive attitude tended to perform well in an exam. It is however in contrast to findings of Tezer & Karasel, 2010; Yilmaz *et al.*, 2010; Fan, Quek, Yan, Mei, Lionel & Yee, 2005 which showed that students have a relatively positive attitude towards mathematics.

7. CONCLUSION

The study concludes that students' attitude influences performance in mathematics among learners in public secondary schools in Kilifi sub-county. Specifically, students hold poor perceptions towards the subject and this negatively affects their performance in mathematics. The students see it as a hard complex subject that is hard to grasp and as such majority of students have lost interest and are resigned to the fact that they will fail in it.

8. RECOMMENDATIONS

The study recommends that public secondary schools in Kilifi sub-county should hire motivational speakers in order to change their bad perception of mathematics. Benchmarking with schools performing well in mathematics should also be done where students can visit and learn. A wider study comprising of more schools should be conducted to enhance our understanding on students' attitudes performance in mathematics among learners in public secondary schools.

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