

## Effects of Frequent Assessment on Achievement and Attitude in Mathematics in Kenya, A Case Study of Migori Sub-County

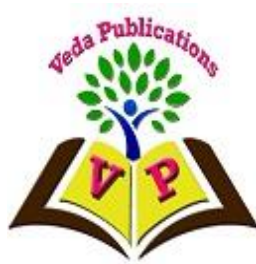
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### Abstract



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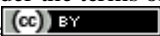
The purpose of the study was to establish whether frequent mathematics assessment enables the learner to achieve high scores in form four. Most schools are employing this method yet they are not sure whether performance in mathematics can improve on using frequent testing. The findings will enable the teachers to employ those methods that have positive effects on the performance of learners and avoid those that are not fruitful to the learners in motivating high achievement in mathematics. The researchers selected senior mathematics teachers and form four students from public schools in Migori Sub-County. The sample was determined using simple random sampling technique recommended by Krejcie and Morgan (1970). The instrument that the researchers used was a questionnaire for each selected student and the senior mathematics teacher in every school. Closed ended questionnaires were used to collect the primary data. Questionnaires were preferred by the researcher because they are relatively cheap, it is free from bias of the interviewer, the respondents have adequate times to give a well thought out answer to the question and communication to respondent is easier through a questionnaire. The questionnaire was administered by the researchers. The study established that frequent assessment leads to improved performance at KCSE level. Most of the respondents strongly agreed that frequent assessments lead to higher achievement. Roediger and Karpicke (2016) have stated that frequent testing has a positive effect on retention and thus leads to high achievement. This study established that frequent assessment reduces anxiety when sitting for exams and this leads to high achievement in mathematics. Dustin (2011) showed that students' anxiety decreased in where frequent assessment was used. Also McDaris (2014) noted that frequent short testing tends to significantly reduce students anxiety. The studies completely agree with the findings in this study that frequent assessment reduces anxiety in exams leading to high achievement. This study hypothesized that frequent assessment leads to high achievement in mathematics. The findings supported the hypothesis. If frequent assessment reduces anxiety then this leads to better performance at KCSE. According to responses from the respondents frequent assessment leads to better performance.

**Keywords:** *Frequent Assessment, Achievement and Attitude, Mathematics.*

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## Introduction

Mathematics is one of the core subjects in secondary school curriculum in Kenya. Performance in the subject is crucial for students' admission to scientific and technological professions. However, there has been persistent poor performance in this subject particularly in Migori Sub-County as revealed by the Kenya Certificate of Secondary Education examination results for the years 2014 to 2018 with mean scores of 3.00, 3.08, 3.02, 3.093 and 3.34 respectively (Sub-County Education's office Exams Analysis - Migori Sub-County). This denies students access to the competitive professions. Factors contributing to this poor performance have not been exhaustively studied though irresponsible teachers resort to frequent testing. The objective of this study was to establish whether frequent classroom assessment (testing) in mathematics leads to higher achievement in the final examination in the Kenya Certificate of Secondary Examination. The study was conducted in Public Secondary Schools in Migori Sub-County, Migori County and correlation between frequency of classroom assessment (testing) on the final exams was studied to see if at all it has a positive influence on performance or not.

There is widespread interest in improving the level of mathematics performance in schools. Apart from the economic benefits of better preparation of young people for the numeracy demands of modern work place and raising the overall skill levels of the work force, there are also social benefits tied to improving access for larger numbers of young people to post-secondary school education and training opportunities and laying stronger foundation to skills for lifelong learning. The interest in raising levels of performance has led to a focus on identifying the range of factors that shape performance as well as understanding how these factors enhance the performance of students and that has led to the usage of frequent testing in most secondary schools in Migori Sub-County. Ma (2015) found that in high school mathematics classes, frequent oral tests increased performance in problem solving skills of students in the treatment group compared with the control group. Townsend and Wheatley (2015) compared four types of treatments in frequent testing in college calculus classes. Group 1 had daily quizzes for 5-10 minutes and a midterm test. Group 2 took quizzes every four or five sessions and a midterm test, group 3 took 40-50 minute tests with a midterm test, and group 4 had only the midterm test. This study showed that group 1 had the highest achievement in mathematics. Another study also found more frequent testing had a favorable effect in high school mathematics classes (Khalaf & Hanna, 2018).

One study found that daily quizzes did not significantly improve students' scores in upper level math courses in high school, but it improved scores of students in the lower level courses such as in algebra classes (Dineen, Taylor, & Stephens, 2017). Furthermore, Kika, Mclaughlin, and Dixon, (2011) compared two groups of students with different testing strategies in high school mathematics classes. In the first two months, the group 1 students took algebra quizzes once a week and in group 2, students took quizzes every two weeks. During the second two months the frequency was reversed, meaning that group 2 received weekly tests while group 1 received biweekly tests. A questionnaire was administered in order to find students' preferences for the type of testing, and the results showed that learners preferred weekly quizzes. This study also found that there was a higher rate of improvement for lower ability students than for higher ability students. The literature shows very few studies regarding the effect on student achievement of giving quizzes daily rather than

weekly. Dineen, Taylor, and Stephens (2017) found that students taking daily quizzes outscored the students taking weekly quizzes. Mawhinney, Bostow, Laws, Blumfield, and Hopkins (2011) compared three groups of students. One group had daily quizzes, the second group had weekly quizzes, and the third group had a test every three weeks. They found out students taking daily quizzes had more consistent learning habits and studied more daily.

Not all research studies show frequent quizzing to have significant benefit on student learning. Burk (2017) found that practice tests did not significantly improve students' actual tests and found that reviewing for a test was as effective as frequent testing. Bangert-Drowns, Kulik, and Kulik (2011) found that even though in a number of studies frequent testing improved student achievement, however, the effect sizes for these studies were not considerably large. In regards to final examination results, another study found there were no significant differences between frequent and infrequent quizzes (Grover, Becker, & Davis, 2014). Kulik and Kulik (2011) also found there is a diminishing return when increasing the number of quizzes. In another study, Noll (2017) states that frequent testing may have a negative effect on student learning since instructional time are reduced. It therefore means that students will not cover the required course work causing a negative effect on exam results.

The researcher selected one geometry teacher who taught six classes to participate in this study. Two of these six classes had a significantly greater number of students with low achievement and higher levels of disruptive incidents, so I selected the other four classes because they were more academically comparable. Selecting two classes for the control group and another two classes for the experimental group was done by random selection. An Independent t-score was used to examine the students' previous term scores to ensure that the two groups were academically comparable. In the treatment group, the teacher administered a 10-minute daily quiz at the end of the class period to all students, while the control group received a 10-minute worksheet and a test on every Friday. At the beginning of the class period, the teacher returned the graded quiz to all students and spent about 5-10 minutes explaining the solution for each question. For the students in the control group, the teacher spent the amount of time explaining the solutions for questions on the worksheets. During the study, both groups were exposed to the same class textbook, materials, lesson contents, and homework. The duration of the treatment was for one term of six weeks. At the end of the term, all students in the control and experimental groups took the same final exam. I used the SPSS program to find the mean scores of final examinations for both groups, and then I examined whether the mean difference between the two groups was significant.

At the end of the six-week term, students in all four classes received the same examination. The final examination was a comprehensive test which covered all the concepts taught throughout the entire duration of the term. These scores are the ones that students received on their report cards in the previous term. Students in the control group took a 55-minute test, which included lessons taught from Monday through Thursday. Student daily quizzes every day during the last 10 minutes of class time, the instructor administered quizzes, and students received their grades the following school day. In both groups students were given the same homework assignment. There were about 13 homework grades during the treatment. The policy for grading homework assignments was that if students completed just a few questions, they received 25, if they did half or about half, they got a score of 50, and if they

did more than half of the assignments, they received a score of 75. If they did all or almost all homework assignments, they received a score 100. The SPSS program was used to find the mean scores of homework assignments for both groups, and then applied a pair-independent t-test to examine whether the mean difference was significant. They received a score of zero for not turning in an assignment.

The previous term final scores from two classes in the control group and from the other classes in the experimental group were examined to determine whether the two groups were different with respect to mathematical achievement. I used an alpha level of .05, which is a measure of type I error and found a  $p$  of .021, indicating the two groups are not significantly different with respect to mathematics achievement. The first research question was whether the treatment had any significant effects on students' mathematics learning as measured by the final examination that the mean of the final examination scores for the control group was 70.41, and the mean of the treatment group's final examination scores was 77.56. Because the  $p$  value is .024 and is less than alpha level of .05, it indicates a significant difference in the two groups' performances. The treatment group, which used daily quizzing, outperformed the control group. The effect size (ES) for this test is .33, indicating a moderate significance between the two groups. Table 1. The Mean Scores of Final Exams for Two Groups

Group	ESM	SD	M	SD
Experimental group (n=34)	79.56	11.96	70.41	11.52
Control group (35)				.33

Note. ES=Effect Size

One limitation of the study is the duration of the treatment, which was for a six- week term, especially since the last six weeks were mainly allocated to reviewing for the final in all classes. Because the participants in this study were over 95% Hispanic students; there may be a problem with generalizing the results to students of other ethnic backgrounds. Future research could investigate the effects of daily quizzes on White, African-American, or Asian students. Future research could also compare a group of students: with daily quizzes to another group without daily quizzes, but with daily homework. In the daily homework group, teachers would require parents to sign a monitoring sheet indicating that they had received their children's daily grades. Such studies could add to the body of research indicating that daily quizzing significantly improves student mathematics achievement.

Dr. William found that, teachers' perception of mathematics assessment affect the teaching of the subject Haigh (2007). This was in agreement with assessment group of 2001 which found that the way teachers perceive assessment influence the way they teach and assess their students. In Malawi there are over 5286 primary schools (Malawi ministry of Education, 2004) yet the researcher only used or researched on only two schools. This number is too small to be used for such a study. However his findings has shown that there other factors that affect Mathematics results.

Limitation in this research is that, the researcher has not told us' the number of schools researched on and the location. Resources in the school were not looked at yet they have a great influence on the learners' achievement in mathematics. However the researcher has made it clear that attitude affect performance in mathematics. However all researchers don't agree on one strategy that can improve mathematics performance in our schools, some believe the performance lies heavily on the preparation of the teacher (Erickson 2005). In

this study the independent variable is frequent assessment and the dependent variable is the learners, score which is measured on the number of exams administered as trials for the preparation of the learner.

### **Statement of the Problem**

Although Kenya, like most developing countries, strives to improve the quality of education, the performance of students in mathematics both at primary school and secondary school remains poor. The knowledge of mathematics is of great value in scientific and technological fields. Mathematics is widely recognized as an important qualification for employment and further studies. It provides a unique type of experience in problem solving which is an essential of a complete education. The purpose of this study is to find out whether frequent testing of the learner in mathematics improves or leads to higher achievement in the final Examination at form four level.

### **The purpose of the Study**

The purpose of the study is to establish whether frequent mathematics assessment enables the learners to achieve high scores in Form.

### **Objective of the Study.**

To find out the effects of frequent assessment on achievement in Mathematics in Secondary School Students' of Migori Sub-County, Kenya.

### **Justification of the Study**

The research is important to teachers, the school management team, the learner, parents and to the researchers. The study may be useful to teacher because if it is proved that frequent assessment motivates the learner to perform then the method will be reinforced. But if at all it is disapproved, it will be dropped and the alternative sort.

To the school management, the research findings may enable them identify areas in which to invest in order to motivate student performance. The research findings may benefit the learner in improving their scores in mathematics.

Parents may equally benefit because the outcome will be for improvement of the performance of their children which is the main reason of them educating their children. To the researchers, the study will enhance the level of knowledge and skills that help to high level of academic qualification in the field of Education. Finally the findings of the study will form a basis for scholars, academicians and researchers who may be interested to pursue this area further.

### **Attitudes towards Mathematics**

A study done by Dan'inna (2017) on students' attitude towards Mathematics as a predictor of their academic achievement in the subject found out that students' attitudes towards mathematics predict their academic achievement in the subject and that students have different attitudes towards mathematics. The study recommended that mathematics teachers in the country should have a means of assessing students' attitudes towards mathematics. Students identified with positive attitudes should be encouraged, while those with negative

attitudes should be guided appropriately. Yasar (2016) performed Multi Linear Regression Analysis with the purpose of determining the factors affecting the attitudes of the students in the study group, the study found that the Gender of the Mathematics Teacher ( $= -.073$ ), the Profession of the Mother ( $= -.069$ ) and the Educational Level of the Father ( $= .049$ ) have effects in determining the attitudes of the students towards mathematics classes.

Karjanto (2017) in his study on attitude toward mathematics among the students at Nazarbayer University Foundation Year Programme indicated that there is no significant difference between male and female students in terms of their attitude toward mathematics ( $t = 0.6804$ ,  $p$ -value =  $002489 > 0.05$ ). They however noted that there is a very significant difference between students who specialize in IRE and MP in terms of their attitude toward mathematics ( $F(2, 105) = 5.6848$ ,  $p$ -value =  $0.0045 < 0.01$ ). Dowker, Cherton, Horton and Mark (2019) argued that the Chinese children performed better in the arithmetic test and also rated themselves higher than the English children, but did not differ in other attitudes. Self-rating in mathematics and lack of unhappiness at poor performance were associated with better performance in the English group. The study found no significant relationships between attitudes and performance in the Chinese group.

Rikhotso (2015) did a Study on primary school learners' attitudes on Mathematics Learning in Mathematics. The study revealed that many learners have negative attitudes towards learning mathematics and that there are many factors which contribute to the negative attitude. Improving on these factors and sensitization of the local community to discard practices which prohibit student's effective participation in learning Mathematics could improve performance in Mathematics. Simegn and Asfaw (2018) indicated that attitude towards mathematics and students' achievement are significantly correlated ( $r = .660$ ;  $p < .001$  (Grade 10) and  $r = .735$ ;  $p < .001$  (Grade 12)). The study suggests that, the school, the teachers, parents, and concerned bodies have to intervene and design ways in order to enhance students' attitude and performance in mathematics, in particular female students. A study by Addae and Agyei (2018) on high school students' attitudes towards the study of mathematics and their perceived teachers' teaching practices showed high perceived attitudes reported in the students' interest in doing mathematics, usefulness of mathematics, and confidence in doing mathematics.

Attitudes are seen as more effective and less cognitive than beliefs or values Khalaf (2016) and often they are defined similarly, and used interchangeably, with dispositions (Elton & Laurillard, 2019). In general, attitudes are directed towards something (in this case, mathematics), are seen as either positive or negative, and are grounded in experience (Khalaf, 2016) commented that "although definitions of attitude vary, they generally include the idea that attitudes are learnt, manifest themselves in one's response to the object or situation concerned, and can be evaluated." A key attitudinal dimension is mathematical confidence (Kivuti, 2015) and it has been identified as critical to effective numeracy development.

A study by Karigi and Tumuti (2015) revealed that teachers have a positive attitude towards teaching of Mathematics. However students have a negative attitude towards learning of Mathematics. This is seen as a factor that contributes to poor performance of Mathematics. Based on the above findings, the study recommended that schools should guide and counsel students on the importance of learning Mathematics. The study also recommended that

schools should also try and motivate students and help them develop positive attitude towards the subject. Studies of teachers and students attitude towards Mathematics in secondary schools in Siaya County, Kenya by Standlause, Maito and Ochiel (2020) revealed that there was good and positive attitude of teachers towards the teaching of mathematics in secondary schools in spite of the shortcomings that has bedeviled the teaching profession and particularly in the teaching of mathematics. It is very important that teachers of mathematics should be motivated, well equipped and be psychologically prepared to teach the subject in the secondary schools. Wanjiru (2019) reported that students generally have negative attitudes towards mathematic subject terming it as a complex subject. The study noted that majority of students from poor backgrounds lack necessary resources for learning mathematics. Teaching resources are also found to be inadequate. The findings showed that poor preparedness of teachers in mathematics is brought about by heavy workload.

### **Mathematical Affective Views and Mathematics Performance.**

A study by Grootenboer and Hemmings (2007) on Mathematics Performance and the Role Played by Affective and Background Factors outlined that the relationships between the respective dispositional and background variables with mathematics performance are significant and in the direction as predicted. Moreover, the findings from a logistic regression showed that a combination of these variables was able to appropriately classify students who either are below-average or above-average mathematics performers.

In reviewing how mathematics anxiety impairs mathematical abilities using structural equation modeling (SEM), Skagerlund, Ostergren and Vastfjall (2019), the findings contrast the different ways in which MA has been suggested to interfere with math abilities. The models indicate that MA may affect math performance through three pathways: (1) indirectly through working memory ability, giving support for the 'affective drop' hypothesis of MA's role in mathematical performance, (2) indirectly through symbolic number processing, corroborating the notion of domain-specific mechanisms pertaining to number, and (3) a direct effect of MA on math performance. Importantly, the pathways vary in terms of their relative strength depending on what type of mathematical problems is being solved. These findings shed light on the mechanisms by which MA may interfere with mathematical performance. Mata, Monteiro and Peixoto (2012) did a hierarchical analysis using structural equation modeling which showed that motivation related variables are the main predictors of attitudes towards mathematics and that teachers and the social support of peers are also highly significant in understanding these attitudes.

A Correlation study results by Mutodi and Ngirande (2014) showed strong positive relationships between performance and perception constructs such as self-confidence, interests in mathematics, teacher and learning support material as well as myths and beliefs. The respondents in this study tend to view lack of proficiency in mathematics as a challenge, and attribute success in mathematics to effort and perseverance. The study further indicated that students also perceive difficulty in mathematics as an obstacle, and attribute failure to their own lack of inherited mathematical ability. These findings suggest that differences in (i) myths and beliefs about mathematics success, (ii) motivation given by mathematics teachers and parents, (iii) mathematics teachers' teaching styles and learning materials and (iv) self confidence in mathematics may lead to differences in perceptions about mathematics. These

in turn may lead to differences in attitudes towards mathematics and learning mathematics which have a bearing on performance.

### **Importance of Frequent Testing**

A study done by Başol and Johanson (2009) on Effectiveness of frequent testing over achievement found out that frequent testing increases academic achievement. Also, the effectiveness of a set of categorical variables possibly related to the overall effect size for academic achievement is sought through Q statistic. Ahmad (2017) did a study on the importance of testing in teaching and learning and noted that testing becomes an integral part of teaching because it provides significant information or inputs about the growth and achievement of learners' difficulties, styles of learning and anxiety levels.

A study by Odino (2015) on factors influencing students' performance in mathematics in Kenya Certificate of Secondary Education explained that non-availability and inadequacy of teaching and learning resources hamper performance in Mathematics. The findings also showed that the teaching methodologies influence performance as well. Findings on the influence of learner's attitude in Mathematics revealed that learners have positive attitude towards the subject. The study recommended that further study be undertaken in both public and private schools in other sub-counties in Kenya to establish the factors behind poor performance in Mathematics.

Research by Namkung and XinLin (2019) indicated that a significant negative correlation exist between MA and mathematics performance,  $r = -.34$ . Moderation analyses indicated that dimensions of MA, difficulty of mathematical tasks, and effects on student grades differentially affected the relation between MA and mathematics performance. MA assessed with both cognitive and affective dimensions showed a stronger negative correlation with mathematics performance compared to MA assessed with either an affective dimension only or mixed/unspecified dimensions. Advanced mathematical tasks that require multistep processes showed a stronger negative correlation to MA compared to foundational mathematical tasks. Findings by Lebens, Graff and Mayer (2011) support the assumption that children of average ability are less influenced by affective factors than children with mathematical difficulties.

A research conducted by Haigh (2007) determined the influence of attitude on performance of students in mathematics curriculum. Students' Attitude towards Mathematics Curriculum across Gender Students' attitude towards mathematics was done with specific reference to the four elements of Mathematics curriculum namely: Objectives, Content, Methods and Evaluation. On objectives both girls and boys had a mean score of 3.8 displaying a positive attitude. On content, girls had a mean score of 2.7 displaying a neutral attitude while boys had a mean score of 3.5 displaying a positive attitude. On methods girls had a mean score of 2.3 displaying a negative attitude while boys had a mean score of 2.8 displaying a neutral attitude. Finally on evaluation, girls had a mean score of 2.4 displaying a negative attitude while boys had a mean score of 2.7 displaying a neutral attitude. In general, girls attitude towards Mathematics have a mean score of 2.8 displaying a neutral attitude while boys had a mean score of 3.2 displaying the same neutral attitude towards Mathematics curriculum. This finding shows that students attitude towards the elements of Mathematics curriculum may have affected performance at MT. The overall attitude of students towards Mathematics is



neutral. A study done by Good and Brophy (2010) revealed that rural and urban students' attitude in Mathematics positively affects their performance. It may be concluded from this study that the students' attitude affected their performance. In this study, ANOVA test was done to determine whether gender has an effect on performance in Mathematics as shown in Table 5. The p-value was 0.2278 which is greater than 0.05 indicating that gender does not affect variation in Mathematics Test.

The objective of this study was to determine the relationship between attitude towards mathematics and performance in Mathematics Test across gender. To achieve this, first the researcher correlated two variables namely students' attitude towards Mathematics with specific reference to the four elements of Mathematics curriculum namely: Objectives, Content, Methods, and Evaluation with performance in Mathematics Test. Pearson product Moment Correlation was used to establish the strength and direction of the relationship that existed between the two variables. It gave rise to the following correlation matrices between students' attitude towards Mathematics curriculum and performance in Mathematics. The correlation analysis for girls was X11,  $r = .651$ ; X12,  $r = .685$ ; X13,  $r = .670$ ; X13,  $r = .667$ . While for boys the correlation analysis was X21,  $r = .796$ ; X22,  $r = .794$ ; X23,  $r = .778$ ; X24,  $r = .773$ .

### **Frequent Testing on improving Scores**

One study by Alade and Kuku (2017) on the impact of frequency of testing on study habits and achievement in Mathematics among Secondary School revealed that gender is not a significant factor when planning to improve study habits and achievement in mathematics. On the basis of these findings, test frequency of every 2 weeks was recommended to improve students' academic achievement in mathematics. Zraggen (2009) did a study on the effects of frequent testing in the Mathematics' Classroom. The study used dot and box plots for the weekly and bi-weekly testing groups to compare the medians and range of the data. Weekly versus bi-weekly testing for the Algebra 1 classes showed that the students who were tested on a bi-weekly basis scored better on both the final exam and retention test than the weekly tested group. When considering the Algebra 2 students, the weekly tested group had scores that were closer together; however they were lower than the bi-weekly tested group, which is consistent with the findings of the Algebra 1 classes.

Hobri, Dafik and Hossain (2018) did a research on the Implementation of learning together in improving students' Mathematical performance. The study argued that learning together model contributed to the development of students' mathematical performance due to proper formation of groups, group members' cooperation to each other's learning and their sincerity to teachers' incentives during the treatment period. Nortvedt and Buchholtz (2018) found a strong relationship between the three focus areas, assessment, teaching, and learning: that impact assessment validity and call for further development of assessment practices in mathematics education. Rosholm, Mikkelsen and Gumede did a study on; Your move: The effect of chess on mathematics test scores and found larger impacts for unhappy children and children who are bored in school, perhaps because chess instruction facilitates learning by providing an alternative approach to mathematics for these children. The results are encouraging and suggest that chess may be an important and effective tool for improving mathematical capacity in young students.

### **The role of Frequent Testing on Students' Anxiety**

Study on Mathematics Anxiety in Secondary School Students by Ng (2012) revealed an average anxiety level of 44% and a negative correlation with achievement. Of the top 5 situations that worried students, 4 were test related. Nonetheless, highly anxious students continued to persevere and enjoy the subject. Shehayeb and Anouti (2018) noted that math content as a whole is a factor that contributes to student's math anxiety in the intermediate and secondary levels which indicates that the current curriculum is built on knowledge and not proper understanding of the subject material and that the content of mathematics in diverse classes is stuffed to the limit that it causes students daily anxiety thus their math specific deficits cannot be properly dealt from one class to another, and that teacher's practices represent a main reason that influences student's math anxiety; and even-though, some of these practices derived from weak to moderate to strong association with student's anxiety, the researcher deduced that items concerning teacher's practices in lower levels should be seriously treated for it causes students math anxiety that may probably keep up with them in later stages.

A study by Yakubu, Bisandu and Datiri (2018) has shown that that; there is a negative relationship between test anxiety and achievement of students in Mathematics and there is no significant difference in the mean achievement scores of male and female students. The educational implications are pointed out and the following recommendations were made; teachers should always find ways of creating and sustaining moderate test anxiety on the students, it is worthwhile to find out the source and level of test anxiety these students have and if they are not really interested in acquiring knowledge but in passing their test, among others. Ramirez, Shaw and Maloney (2018) also acknowledged Mathematics anxiety is a pervasive issue in education that requires attention from both educators and researchers to help students reach their full academic potential.

### **Role of Frequent Testing in Improving Retention**

Hornqvist, Jonsson and Nyberg (2014) have stated that repeated testing with feedback significantly enhanced learning compared to rereading at all delays, demonstrating that repeated retrieval enhances retention compared to repeated encoding in the short- and the long-term. In addition, the effect of repeated testing was beneficial for students irrespectively of working memory capacity. It is argued that teaching methods involving repeated retrieval are important to consider by the educational system. Researches by Yang, Potts and Shanks (2018) have also shown interim testing of studied information and how they facilitate learning and retrieval of new information.

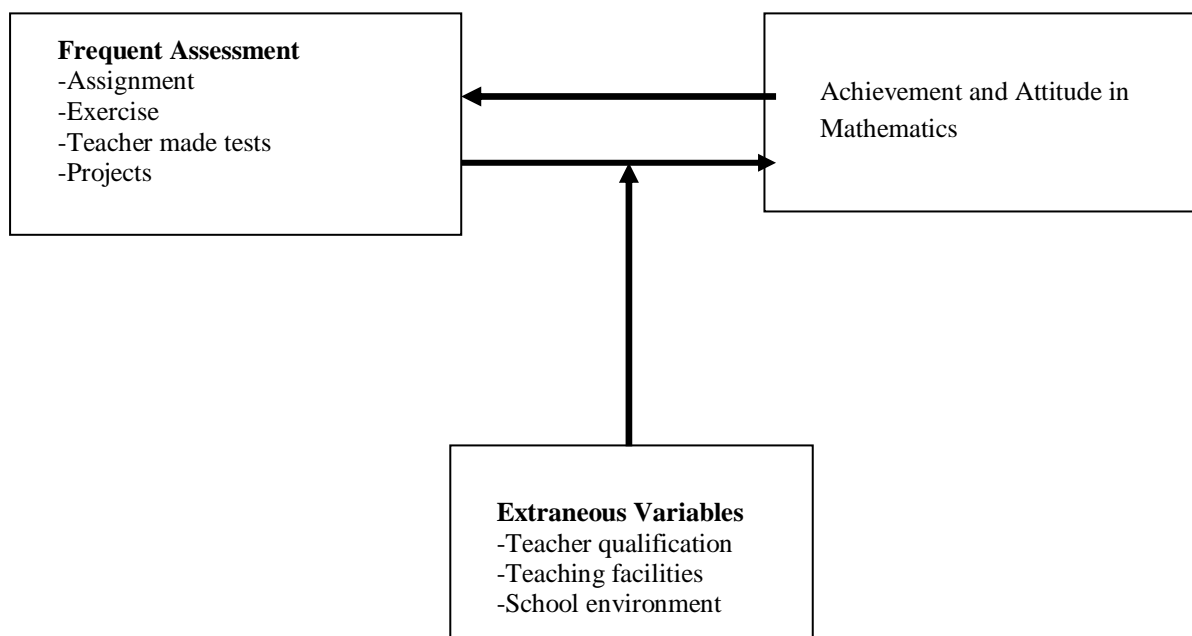
Changeiywo, Ng'eno and Barchok (2013) examined differences in teacher intentions to apply SMASSE methods in teaching secondary school mathematics and science based on gender and working experience in Kericho and Bomet counties of Kenya. The findings indicated that there was no significant difference in teacher intentions to apply SMASSE approaches in teaching secondary school mathematics by gender and working experience. There was however a statistically significant difference in teachers' attitude towards SMASSE methods of teaching mathematics and science by working experience in favour of the most experienced. Kivuti (2015) found that assessment is a crucial tool for simultaneously improving classroom practice and students' performance, and that it can enhance teaching and learning by providing a more focused application for learners.

Makori and Onderi (2013) in their study of Evaluation of Secondary School Principals' Views on the Use of Untrained Teachers in Lesson Delivery in a Free Secondary Education System Era in Kenya outlined that unqualified teachers experience limitations in necessary competences in delivering lessons effectively and therefore negatively impacting on the quality of teaching and learning. Another study by Wamukuru (2016) indicated that changing the levels in student enrolment, PTR, number of classes, number of teachers employed and teacher without relevant policy controls and interventions measures would increase the risk of teacher shortage. Thus there is the need for the policy makers to control the effects of secondary school teacher demand factors to avoid critical teacher shortages in the future.

### Conceptual Framework

#### Independent Variable

#### Dependent Variable



**Figure 1: Conceptual Framework**

Figure 1 shows the conceptual framework of the study. The conceptual framework clearly indicates that frequent assessment strategies being used by the teachers are likely to contribute to students' performance at four levels in secondary schools. Students attending schools where the teachers were using frequent assessment strategy tools regularly could perform better. There are also extraneous factors that may influence the relationship between frequent assessment strategies being used and student performance in .o. level examinations, such as teacher's qualifications, available teaching facilities, and school environment.

### Findings and Discussions

#### The attitude of students and teachers towards frequent mathematics assessment

This study was interested in establishing the attitude of students and teachers towards frequent assessment in mathematics. The respondents were asked whether they like the policy of frequent assessment in mathematics in their school. The correlation coefficient between

attitude and performance showed  $r = 0.45$  at  $p = 0.01$  showing a strong correlation coefficient.

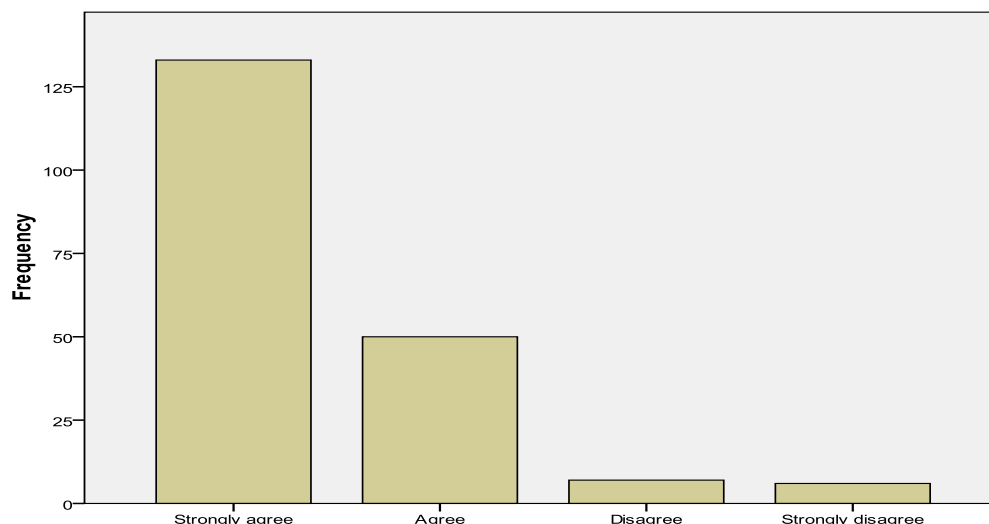
The table below is a summary of the distribution of their responses.

**Table 1: Summary of Students response on Policy of Frequent Assessment**

	Frequency	Percentage
<b>Strongly agree</b>	136	69.4
<b>Agree</b>	49	25.0
<b>Disagree</b>	5	2.5
<b>Strongly disagree</b>	6	3.1
<b>Total</b>	196	100

The graph below presents results for the response on the attitude of students towards frequent assessment in Mathematics.

**Figure 2: Students' Attitude towards Frequent Assessment**



Most of the students strongly agreed that they would like the policy of frequent assessment (69.4%), very few students strongly disagreed with the policy of frequent assessment. Thus students have a positive attitude towards frequent assessment.

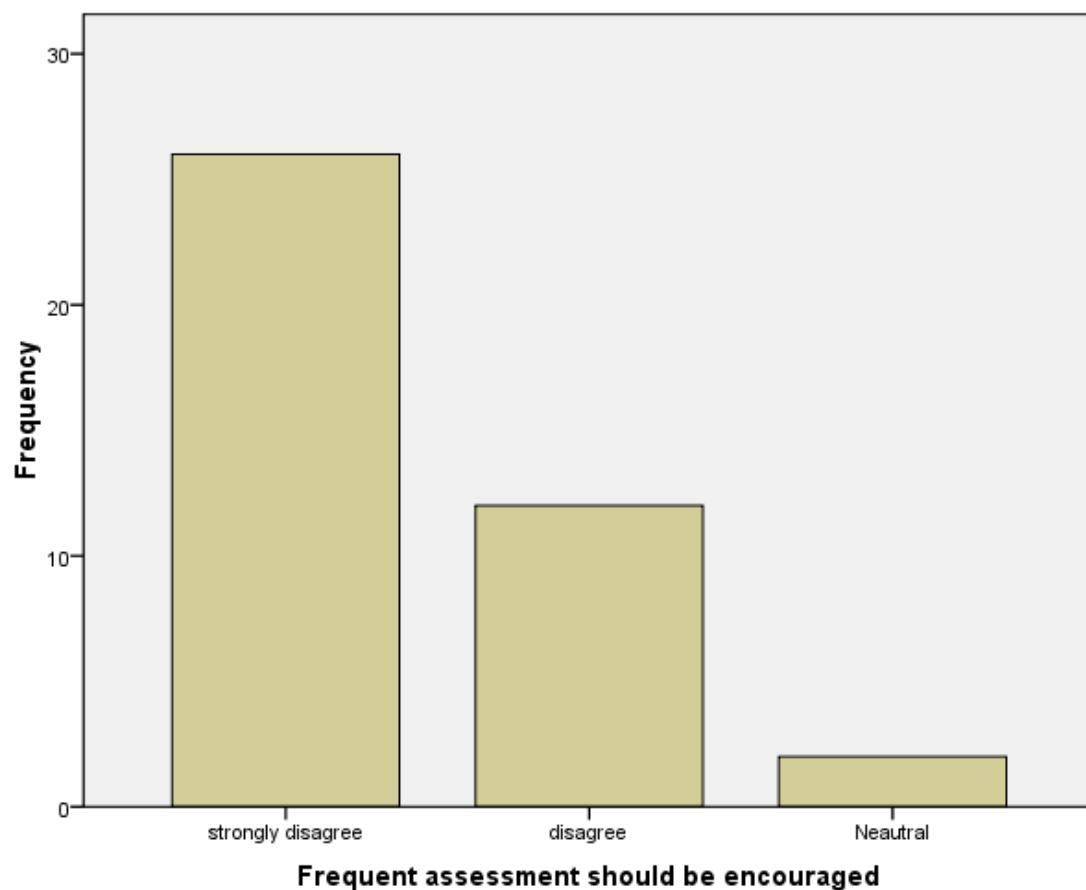
The  $\chi^2 = 230.082$ ,  $df = 3$  and  $P = 0.01$ . The relationship is significant.

The study was also interested in finding out the attitude of teachers towards frequent assessment. The teachers were asked to state whether they liked the policy of frequent assessment. Table 10 is a summary of the response of teachers.

**Table 2: Teachers Distribution**

	Frequency	Percentage
<b>Strongly agree</b>	26	65.0
<b>Agree</b>	12	30.0
<b>Disagree</b>	2	5
<b>Strongly disagree</b>	0	0
<b>Total</b>	40	100

Graph 3 below is a summary of the results for teachers' response on the policy of frequent assessment.

**Figure 3: Teachers Response on the Policy of Frequent Assessment.**

$\bar{X}$  = 4.40 with  $\pm$  = 0.98 for teachers supporting frequent assessment. Both students and teachers support frequent assessment by 94.4% and 95% respectively.

#### **Effects of number of Tests Administered to the Learner on Performance at KCSE**

The student's responses to the statement, the exams we do in a term are and the responses on frequent assessment keeps the students focused were correlated by running their responses through Pearson correlation coefficient which showed  $r = 0.199$  and  $P = 0.01$ . This is a strong correlation that is existing between the testing occasion and frequent assessment keeping the students focused. The students were also asked whether the number of tests improve their performance at KCSE. The correlation coefficient between number of tests done and effect on performance  $r = 0.123$ ,  $P = 0.05$ . This relationship is significant.

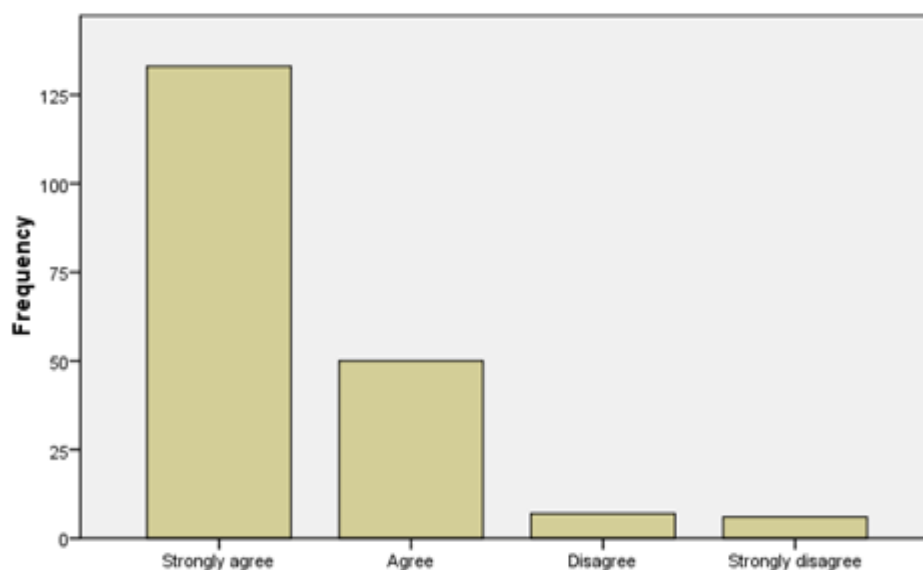
Table 11 is a summary of the results given by the student respondents.

**Table 3: Number of Tests and Performance at KCSE**

	Frequency	Percentage
<b>Strongly agree</b>	133	67.9
<b>Agree</b>	50	25.5
<b>Disagree</b>	7	3.6
<b>Strongly disagree</b>	6	3.0
Total	196	100.0

The results can also be presented in a bar graph in figure 3 below

**Figure 4: Frequent Assessment and Improvement in Performance**



Most of the students felt that the more the number of assessments then the better they will perform at KCSE. Since Mathematics is a practice subject then the more one does it the better they are likely to perform.

The  $\chi^2 = 268.44$ ,  $df = 3$  and  $P = 0.01$ . The relationship is significant.

Also the teachers were asked whether they think that frequent assessment enhanced performance in mathematics. The table 12 below is a summary of the response from the teachers.

**Table 4: Summary of Frequent Assessment and Performance at KCSE for Teachers**

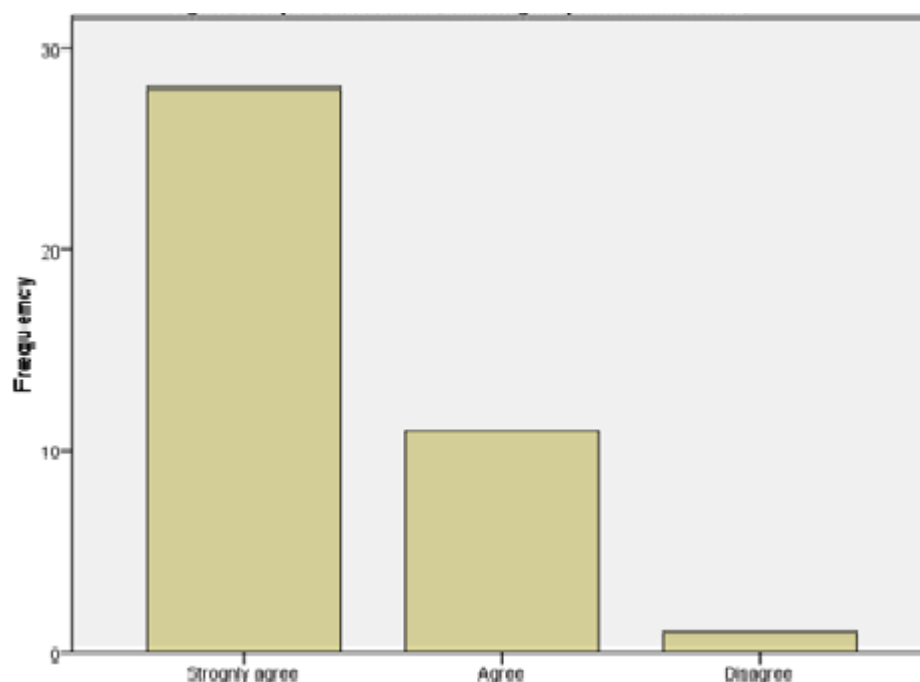
	Frequency	Percentage
<b>Strongly agree</b>	28	70
<b>Agree</b>	11	27.5
<b>Disagree</b>	1	2.5
<b>Total</b>	<b>40</b>	<b>100</b>

Most of the students felt that the more the number of assessments then the better they will perform at KCSE. Since Mathematics is a practice subject then the more one does it the better they are likely to perform.

Also the teachers were asked whether they think that frequent assessment enhanced performance in mathematics. The  $r = 0.45$ ,  $P = 0.05$ . The relationship is significant.

The table 12 above is a summary of the response from the teachers.

**Figure 5 Frequent Assessment Leads to Good Performance in KCSE**



The results show that most respondents i.e. teachers and students strongly agree that frequent assessment improves performance at KCSE.

### Frequent Assessment and Effect on Anxiety of Students in the Exam

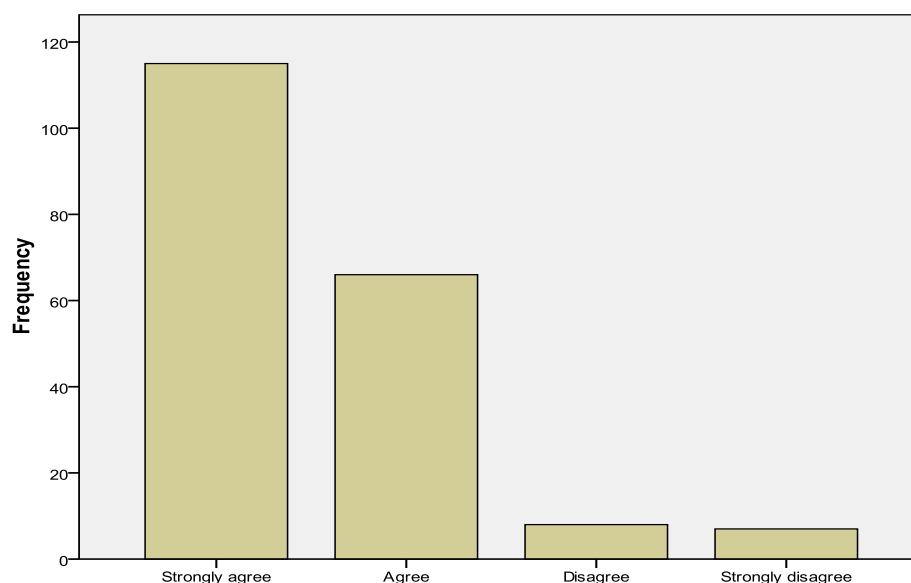
This study was interested in establishing the effect of frequent assessment on the anxiety of the students. The students were asked whether frequent assessment in mathematics reduces their anxiety as they sit for the exams. A summary of the response is shown in the table 13 below.

**Table 6: Summary of Students' Response on Frequent Assessment and Anxiety**

	Frequency	Percentage
Strongly agree	115	58.7
Agree	66	33.7
Disagree	8	4.1
Strongly disagree	7	3.6
Total	196	100

Most of the students strongly agreed that frequent assessment reduced anxiety in the exams (58.7%), those who agreed were 33.7%, followed by those who disagreed at 4.1% and finally those who strongly disagreed were only 3.6%. These results clearly indicate that the more students are assessed anxiety decreases. The results above are represented by the graph 5 shown below.

**Figure 6: Relationship between Frequent Assessment and Reduction of Anxiety**



The mean of reduction of anxiety was 4.40 and this lies between strongly agree and agree. The standard deviation is 0.990 which indicates there is high variation in the response of the



students. The students' fear of mathematics reduces when they are engaged in many tests therefore. High anxiety is associated with failure in examinations. The  $x^2 = 169.224$ , df 3 and  $p = 0.01$ . the relationship is significant.

### Conclusion

This study hypothesized that frequent assessment leads to high achievement in mathematics. The findings support the hypothesis. If frequent assessment reduces anxiety then this leads to better performance at KCSE. According to responses from the respondents frequent assessment leads to better performance.

### Does Frequent Assessment Reduce Anxiety in Exams?

This study established that frequent assessment reduces anxiety when sitting for exams and this leads to high achievement in mathematics. Dustin (2011) showed that students' anxiety decreased in where frequent assessment was used. Also Dempster (2012) stated that frequent short testing tends to significantly reduce students anxiety. The studies completely agree with the findings if this study that frequent assessment reduces anxiety in exams leading to high achievement.

### Recommendations to the Body of Knowledge

The findings have made clear that frequent assessment improves performance at KCSE in Kenya. This has contributed in that many schools and teachers of Mathematics will be able to apply this tactic with the caution that one can avoid learners from being test wise. This study has made a stride in establishing that frequent assessment really reduces anxiety and thus improves performance at KCSE. Teachers can be able to know what students like or dislike in frequent testing.

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