A Regression Analysis of Mathematics Achievement on Achievement Motivation Factors. A Case Study of Secondary School Students in Busia County, Kenya

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ABSTRACT

A majority of KCSE candidates in Samia Sub-County have been performing below average in mathematics. Studies have been conducted to address this problem but significant progress has not been achieved. To address this problem, this study sought to examine achievement motivation as a predictor of mathematics achievement in order to come up with a model that can be used to predict mathematics achievement. The study was anchored on achievement theory of motivation by McClelland (1985). Quantitative research methodology was adopted with a correlational research design. The target population for this study was 5395 Form three students in 28 public secondary schools in Samia Sub-County. Purposive sampling, proportionate sampling and simple random sampling techniques were used to select the participants. A sample size of 361 students was selected from a target population of 5395. Academic motivation scale and mathematics achievement score sheet were used to collect data. Pilot study was conducted among 30 students in one public secondary school in Samia Sub-County to establish the validity and reliability of achievement motivation scale. The researcher conducted a number of descriptive statistics such as mean, percentage, and standard deviation to describe the study variables. Inferential statistics was used to test the research hypotheses. Results revealed that achievement motivation score had a strong, positive and significant relationship with mathematics achievement, r (346) = .76, p < .05. Achievement motivation was also found to be a significant predictor of mathematics achievement. The study recommends that teachers and curriculum developers should include and improve ways of enhancing achievement motivation in their teaching methodologies and in the school curriculum to ensure that it works for the benefit of the students in learning mathematics and better achievement in the subject.

Key Words: Achievement Motivation; Mathematics Achievement; Secondary School Students

BACKGROUND TO THE STUDY

In most countries around the world, mathematics is the foundation of scientific thinking, innovation and technological development. Owing to the importance of mathematics in skills development, the subject has been made obligatory in both primary and secondary schools in most education systems of the world. Students who perform well in secondary school mathematics are considered to possess adequate problem solving skills that can be tapped in Science, Technology, Engineering and Mathematics (STEM) fields to steer social and economic development (Aydemir & Karali, 2019). The importance of mathematics in schooling and the benefits it brings to society cannot be overemphasized. As a result, learning and

achievement in mathematics has continued to be an area of scholarly interest.

According to Malik and Abbas (2018), mathematics significantly contributes to scientific and technological development of a nation. Valero (2018) also confirms this assertion by agreeing that the knowledge and skills acquired through mathematics play a key role in looking for solutions to the challenges that face humanity. Some of the key sectors in the world economy that rely heavily on mathematical skills include; manufacturing, health and agriculture. According to Barwell (2018), mathematics education is also important for environmental sustainability. Despite the importance of mathematics, many countries around the globe are still contending with low quality achievement in mathematics.

Research efforts have been made to address this issue and the results indicate that performance in mathematics is influenced by several factors. Gamboa et al. (2019) indicated that achievement in mathematics is determined by student's ability and interest in mathematics. Huda (2018) found out that attitude, skills as well as beliefs influence mathematics achievement. In the same vein, Mazana and Montero (2019) in their study found out that students' attitude contributes to their achievement in the subject. In Kenya, studies have been conducted in different counties on mathematics achievement. For instance, Chepkieng (2020) studied the effect of metacognitive knowledge on academic achievement while Kipngetich (2021) examined the role of motivation in academic achievement. However, in Busia County little has been done particularly on achievement motivation variable. This study investigated achievement motivation as a predictor of mathematics achievement.

Achievement motivation refers to the drive or force behind the desire to accomplish goals (Schunk et al., 2008). It is reflected on approach, persistence, and level of interest to accomplish academic tasks. It entails actions or behavior that is directed towards academic success through self-regulation and self-efficacy. Achievement motivation plays a key role in learning and it helps students to realize their goals (Marumo et al., 2019). Chon and Shin (2019) opined that motivation plays an important role in learning and is categorized into three domains namely; extrinsic, intrinsic, and amotivation.

Extrinsic motivation is a reward-driven behavior where a person is motivated to perform an activity and exhibit certain behaviour because they want to be rewarded or avoid punishment (Schunk et al., 2008). In this type of motivation, external forces drive an individual to act or behave in a certain way. According to Onyekere and Okoro (2018) external factors such as the desire to pass a test to avoid punishment and get a reward influence student's achievement in mathematics. Karina and Sullivan (2018) also confirmed in their study that there was a notable influence of teacher support, rewards, and environmental factors on academic achievement of students.

Intrinsic motivation is an internal drive or desire to achieve success in academics (Schunk et al., 2008). This type of achievement motivation is subjective but it is believed that it occurs as a result of the pleasure derived from performing a certain task. Intrinsic motivation has been reported to have a profound influence on academic achievement in mathematics among the students. According to Alkharusi and Adel (2020), intrinsic motivation is correlated to mathematics achievement among students. Heydeir and Steinmayr (2020) indicated in their study that many students perceive mathematics as a difficult subject but those who are intrinsically motivated do well no matter how hard the task is. Therefore, intrinsic motivation is an important psychological construct in mathematics achievement.

Amotivation refers to a reduction in the desire to initiate or persist in goal-directed behaviors (Schunk et al., 2008). It arises from lack of competence to carry out an activity and low expectation to achieve success. Amotivation affects subjective and behavioral aspects of goal-oriented behavior. Tran and Nguyen (2021) in their study established that there existed a negative correlation between amotivation and mathematics achievement. Similarly, Ilter (2021) revealed that amotivation which is characterized by lack of effort belief, less value on the tasks and perception about the characteristic of the task negatively affect achievement in

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mathematics.

STATEMENT OF THE PROBLEM

Mathematics achievement in a majority of secondary schools in Samia Sub-County has been below average. For a period of five years, 2016 to 2021 the sub county has been registering below average achievement in KCSE examinations with a majority of the students scoring grade D and below. For instance, in the year 2016, 2017, 2018, 2019 and 2021 the mathematics mean scores in KCSE were 2.246(D-), 2.201(D-), 2.015 (D-), 2.435(D-) and 2.342 (D-) respectively. Mathematics skills and achievement play a significant role in daily endeavors, job placement and career development of the students. Therefore, the below average achievement in mathematics indicates that the affected students are not equipped with adequate skills to realize their full potential in life. Furthermore, they will have limited opportunities in job placement and career development. This hampers social and economic development in the county and the country at large hence the need for the current study to address the problem.

Based on the background to the study, the variables associated with mathematics achievement have identified factors like motivation, attitude, resilience, self-concept, self-efficacy among others. Despite the abundance of empirical evidence on the variables that can be addressed to improve mathematics achievement among secondary school students, this problem has continued to persist in the country and in Samia Sub-County in particular. Most of the variables that influence achievement in mathematics are influenced by contextual factors that vary from one place to another. In Kenya, there are a number of studies that have been conducted on the predictors of achievement in mathematics. The studies have identified a number of variables such as home factors, school factors and psychological factors. It is worth to note that the results obtained may be used to address the problem in Samia Sub-County but the studies differed in terms of practical knowledge and application to address the problem. Furthermore, there was limited research in Samia Sub-County on how achievement motivation predicts mathematics achievement.

Significance of the Study

The study aimed to address the poor achievement in mathematics in most of the secondary schools in Samia Sub-County. The findings may be useful to education stakeholders in helping the students adopt new learning strategies to improve achievement in the subject. The teachers may use the findings to address students' mindsets and motivation issues toward mathematics. In addition, parents and guardians may use the findings to guide them in providing required resources and support to enhance mathematics achievement. Furthermore, the findings may help the guidance and counseling teachers with empirical evidence on learner characteristics that may be manipulated to enhance achievement in mathematics. Similarly, the findings may assist education policy makers to improve policies that may guide curriculum and initiate interventions aimed at enhancing achievement in mathematics. The research findings may also help researchers in the future as they seek to enhance knowledge in this area of study.

LITERATURE REVIEW

The link between achievement motivation and mathematics achievement has been studied extensively. Eunhye and Sunghwan (2019) did a study to explore changes in achievement motivation and mathematics scores among multi-ethnic pupils in South Korea. The researchers used a three-year longitudinal case study. The study involved a group of grade six pupils. Interviews were conducted in two ways: formal and semi-structured. For data analysis, a code book was used to identify the major themes. The study's findings revealed that pupils' motivation to succeed in mathematics influenced the scores the pupils obtained. This study can be used to improve mathematics achievement by enhancing achievement motivation but achievement motivation of learners may vary based on level of learning and context. Therefore, this may not

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be the case among students in Kenya which prompted the need for this study to address the population gap.

In another research, Amanda et al. (2020) investigated the predictive weight of cognitive, motivational, and affective characteristics on mathematics achievement among students in Spain. A total of 2365 students took part in the research and the researchers used descriptive and regression analyses. The results showed that the extent of the relationship between intellectual ability and mathematics accomplishment was less than the extent of the relationship between motivational and emotional elements and mathematics achievement. It was also found that children who had superior intellectual ability, more perceived competence in mathematics, and higher intrinsic drive performed well in mathematics assignments. This research was vital to address the issue of the current study but it did not address the different types of achievement motivation as postulated in the achievement theory. The current research was conducted to address the theoretical gap.

The association between achievement motivation and achievement in mathematics has also been studied in Nigeria. Okotie and Adeyemi (2019) investigated achievement motivation as a predictor of academic accomplishment among students in Edo State, Nigeria. A total of 698 students took part in the research. The sample was selected using multi-stage sampling procedure. Pearson correlation coefficient and multiple regression were used in data analysis. The study's outcomes showed that students' achievement motivation impacted on their academic achievement in mathematics. Achievement motivation of students vary from one context to another and therefore a similar study in Kenya was necessary for more conclusive results.

Furthermore, Ifelunni and Clara (2019) conducted a research in the South-East of Nigeria to explore motivation as a driver of academic achievement of primary school kids in mathematics. The research employed a correlational research design. The study involved 400 students as a study sample. Data were collected using intrinsic and extrinsic motivation scale and mathematics achievement test. Data were analyzed using Pearson coefficient and regression analysis. The study's findings revealed a link between intrinsic motivation and academic achievement in mathematics among elementary school students. The study was conducted among young children and therefore the results may not be generalized to adolescent secondary school students in Busia County hence the need for the current study.

In Kenya, research has been conducted to determine the link between achievement motivation and mathematical achievement. Kariuki and Mbugua (2018) did a research to explore teacher-related motivating factors influencing students' academic achievement in Nyeri and and Kirinyaga counties. The descriptive survey study involved a total of 370 students. Data were gathered through questionnaires and the study's findings revealed that teacher motivation had a positive impact on students' academic achievement. The study focused on teacher motivation while the current study focused on achievement motivation among secondary school students to address the population gap.

Studies have also been done on motivation and academic achievement in Kenya but little is known on the link between achievement motivation and achievement in mathematics in Busia County. A related study by Kipngetich (2021) conducted in Kitui County to find out if motivation influence academic achievement. Data were gathered using questionnaires. A total of 193 students took part in the study. Multiple regression and the Pearson correlation coefficient were utilized in data analysis. It was established that academic motivation, self-efficacy, and academic achievement were significantly related. However, the research focused on general academic achievement. The current research focused on mathematics achievement to establish if similar results can be obtained when different approaches are used.

METHODOLOGY

Research Design

A correlational research design was used to investigate the association between achievement motivation and

mathematics achievement. Seeram (2019) described correlational research design as a non-experimental research design that facilitates prediction and explanation of the relationship between variables. This research design was appropriate for this study because it enabled the researcher to examine how achievement motivation predicts mathematics achievement. There exists three types of correlational research design namely explanatory, predictive and model testing (Seeram, 2019). Explanatory emphasizes on the description of the relationship among variables, predictive design focuses on determining how the dependent variable changes with different values of the independent variable and model testing involves statistical analysis to examine how a combination of independent of variables predict the dependent variable. The current study employed the three types of correlational research design based on the study objectives. The above design was appropriate for the current study since the researcher was not able to manipulate student's achievement motivation.

Sampling Techniques and Sample size

Samia Sub-County, public secondary schools and Form three students were selected using purposive sampling. The study focused on public secondary schools because most of them have been performing below average in KCSE every year. Proportionate sampling was used to select the number of students from each school category. Simple random sampling was used to select the stream and students from each school to be involved in the study. Simple random sampling technique gave each student an opportunity to participate in the study which enhanced the reliability of the results (Seeram, 2019). Krejcie and Morgan's table of sample determination (Krejcie & Morgan, 1970) was used to determine the sample size of the students to be involved in the study. Using this table, a sample size of 361 students was selected from a target population of 5395.

Research Instruments

i. Academic Motivation Scale

The researcher adapted academic motivation scale by Vallerand et al (1989) to collect data on achievement motivation. The scale had 28 items which measure achievement motivation on a seven point Likert scale. Items 2, 4, 6, 9, 11, 13, 16, 18, 20, 23, 25 and 27 measured intrinsic motivation. Items 1, 3, 7, 8, 10, 14, 15, 17, 21, 22, 24 and 28 measured extrinsic motivation. Items 5, 12, 19 and 26 measured amotivation. The authors reported a reliability coefficient of 0.79 but the researcher carried out a pilot study to establish the reliability of this scale in Kenya. The researcher had permission from the researchers to use the scale. The pilot study results show that the reliability coefficient for academic motivation scale was .95. The reliability coefficient was above 0.7 and therefore acceptable as recommended by Abdella and Al shabibi (2018).

SCORING THE AMS

Key for AMS High School version -28 items

Item

Type/ domain/orientation of Motivation measured

2, 9, 16, 23 Intrinsic motivation – to know

6, 13, 20, 27 Intrinsic motivation – toward accomplishment

4, 11, 18, 25 Intrinsic motivation – to experience stimulation

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3, 10, 17, 24 Extrinsic motivation – identified

7, 14, 21, 28 Extrinsic motivation – introjected

1, 8, 15, 22 Extrinsic motivation – external regulation

5, 12, 19, 26 Amotivation

Calculations;

To calculate a participant's score on the AMS, the mean response for each of the sub-scales was found. These means varied between 1 and 7. The means were then inserted in the following formula which was used to calculate a self -determination index which was taken as the participant's academic motivation score. The formula had been adapted from Vallerand, Pelletier, Blais, Briere, Senecal, and Vallieres (1992).

2{(know+acc+stim/3)} + iden – {(intro+reg/2) + 2amo} = Academic Motivation.

know = intrinsic motivation to know; acc = intrinsic motivation to accomplishments; stim = intrinsic motivation to experience stimulation; iden =139 identification; intro = introjected regulation; external regulation; amo = amotivation.

This formula gives scores ranging from -18 (very little self-determination/academic motivation) to +18 (extreme self-determination/ high academic motivation)

ii. Mathematics Results Mark Sheet

The researcher used mathematics results mark sheet to collect data on mathematics achievement. The researcher obtained the results from the director of studies in the school for end of term one examination 2023. The questionnaire and mathematics scores were given the same code for verification of the mathematics score from the results mark sheet. To make the marks comparable across the different schools, the scores were transformed to Z scores and then to *T* scores using SPSS Version 25.

Data Collection

Self-reports were used to collect data from the students. Before administering the questionnaires, the researcher gave clear instructions to the participants. After which the participants were given the questionnaires to fill in their responses within the allocated time. The participants were assigned unique codes based on their admission numbers that they wrote on the questionnaires. The codes were used to verify the mathematics scores from the mark sheet. The researcher requested for mathematics scores mark sheet for the participants who were involved in the study. In some schools teachers assisted the researcher in data collection. They were taken through the procedure to ensure that reliable data is obtained. Each participants was given about 40 minutes to fill the questionnaire. 361 questionnaires were administered but only 346 questionnaires were returned translating to 96% return rate.

Data Analysis

The data were coded and data files created for computer analysis using the statistical program for social sciences (SPSS) Version 25. The data were checked for outliers and missing values. The researcher ran a number of descriptive statistics such as mean, percentage, and standard deviation to describe the study variables. Inferential statistics were used to test the following research hypotheses.

H_{01}: There is no statistically significant relationship between achievement motivation and mathematics achievement.

FINDINGS

Table 1 shows the descriptive statistics of age and gender of the respondents.

Table 1: Age and Gender of the Respondents

		Gender		Total
		Male	Female	
Age	16.00	4 (1.16%)	2 (0.06)	6
	17.00	27 (7.80%)	23 (6.65%)	50
	18.00	69 (19.94%)	75 (21.68%)	144
	19.00	44 (12.72%)	37 (10.69%)	81
	20.00	24 (6.94%)	16 (4.62%)	40
	21.00	10 (2.89%)	6 (1.73%)	16
	22.00	1 (0.29%)	1 (0.29%)	2
	23.00	2 (0.58%)	2 (0.58%)	4
	24.00	0 (0.0%)	3 (0.87%)	3
Total		181 (52.31%)	165 (47.69%)	346

From Table 1, majority of the male students were aged 18 represented by 19.94% while the minority was those aged 22, represented by 0.29%. The male students had no respondent aged 24 years. For the female students, the majority were aged 18, represented by 21.68%, while the minority were those aged 22 represented by 0.29%. Unlike the male students who had none, the female students aged 24 were represented by 0.87%.

Table 2: Descriptive Statistics of Achievement Motivation by Gender

Gender	N	Min	Max	*M*	*SD*
Male	181	-2.88	12.67	3.15	2.52
Female	165	-11.87	8.42	2.68	2.97
Total	346	-11.87	12.67	2.93	2.75

Note. N = 346; Min = Minimum; Max = Maximum; M = Mean; SD = Standard Deviation

As shown in Table 2, male students obtained the lowest score of -2.88 and highest score of 12.67, with a mean score of 3.15 and a standard deviation of 2.52. The female students obtained a minimum score of -11.87 and a maximum of 8.42, with a mean score of 2.68 and a standard deviation of 2.97. This shows that the male students did better than their counterparts on achievement motivation.

Table 3: Descriptive Statistics of Achievement Motivation Sub Scales

	N	Range	Min	Max	*M*	*SD*
Intrinsic Motivation	346	59.00	25.00	84.00	64.92	14.29

Extrinsic Motivation	346	52.00	32.00	84.00	72.63	10.98
Amotivation	346	24.00	4.00	28.00	16.15	7.07

Note. N = 346; Min = Minimum; Max = Maximum; M = Mean; SD = Standard Deviation

As shown on Table 3, the extrinsic motivation obtained the highest mean score of 72.63 with a standard deviation of 10.98. Their lowest score was 32 while the highest score was 84. The intrinsic motivation followed with a mean score of 64.92 and a standard deviation of 14.29. Their minimum score was 25 while the maximum was 84. The lowest mean score of 16.15 (*SD*=7.07) was obtained by amotivation sub scale. The lowest score was 4 while the highest was 28.

Table 4: Levels of Achievement Motivation among the Students

	Frequency	Percent
Low	107	30.9
Average	217	62.7
High	22	6.4
Total	346	100.0

Note. N = 346

As indicated in Table 4, the majority of the respondents had average achievement motivation represented by 62.7%, followed by those with low achievement motivation at 30.9%, then those with high achievement motivation at 6.4%. The descriptive statistics of mathematics achievement were obtained by gender to determine if there exists gender differences. The results are presented in Table 5.

Table 5: Descriptive Statistics of Mathematics Achievement by Gender

Gender	N	Range	Min	Max	*M*	*SD*
Male	181	35.66	34.15	69.82	51.11	9.94
Female	165	33.96	33.73	67.69	48.79	9.96
Total	346	36.09	33.73	69.82	50.00	10.00

Note. N = 346; Min = Minimum; Max = Maximum; M = Mean; SD = Standard Deviation;

As shown on Table 5, the male students obtained a higher mean score of 51.11 (*SD* = 9.94). Their minimum score stood at 34.15 while the maximum was 69.82 giving a range of 35.66. The females obtained a mean score of 48.79 (*SD* = 9.96). Their minimum score was 33.73 while the maximum was 67.69. The results showed that male students performed better than female students.

The study sought to determine the association between achievement motivation and mathematics achievement. The null hypothesis was formulated as follows:

H_{01}: There is no significant relationship between achievement motivation and mathematics achievement.

Linear regression analysis and product moment correlation were used to determine the relationship. First, the relationship between the three domains of achievement motivation (intrinsic, extrinsic, and amotivation) and mathematics achievement were examined using Pearson r and the results are shown in Table 6.

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Table 6: Correlation between Achievement Motivation and Mathematics Achievement

		Mathematics score
Achievement Motivation	Pearson Correlation	.76**
	Sig. (2-tailed)	.00
	N	346
Intrinsic Motivation	Pearson Correlation	.77**
	Sig. (2-tailed)	.00
	N	346
Extrinsic Motivation	Pearson Correlation	.58**
	Sig. (2-tailed)	.00
	N	346
Amotivation	Pearson Correlation	-.18**
	Sig. (2-tailed)	.00
	N	346

From Table 6, the achievement motivation score had a strong, positive and significant relationship with mathematics achievement, r (346) = .76, p < .05. Therefore, the null hypothesis was rejected. The results suggest that the higher the achievement motivation, the higher the mathematics score. Regarding the sub scales of achievement motivation, intrinsic motivation had a strong positive and significant relationship with mathematics achievement, r (346) = .77, p < .05. Similarly, extrinsic motivation had a positive and significant relationship with mathematics achievement, r (346) = .58, p < .05. Amotivation had a negative significant link with mathematics achievement, r (346) = -.18, p < .05. This implies that the lower the amotivation among form three students the higher the mathematics achievement and vice versa. Students with high levels of intrinsic, extrinsic achievement motivation performed better in mathematics compared to students with low levels. Equally, students with lower levels of amotivation perform better than those with higher levels of amotivation.

Having confirmed that there exists a significant relationship between achievement motivation and mathematics achievement, the prediction values of intrinsic motivation, extrinsic motivation, and amotivation on mathematics achievement were computed. The findings are presented in Table 7.

Table 7: Regression Coefficients for the Prediction of Mathematics Achievement

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	16.71	2.582		6.47	.00
	Intrinsic Motivation	.52	.04	.748	14.545	.00
	Extrinsic Motivation	.13	.47	.14	.271	.00
	Amotivation	-.10	.05	-.07	-2.04	.04
a. Dependent Variable: Mathematics Achievement						

From Table 7, the results revealed that intrinsic motivation had a positive and significant predictive value of mathematics achievement among form three students in Busia County (β = .52, t (346) = 14.55, p < .05). This implies that a unit increase in intrinsic motivation increases mathematics achievement by 0.52. Secondly, the amotivation sub scale had a negative and significant predictive value on mathematics

achievement (β = -.10, t (346) = -2.04, p < .05). This implies that a unit increase in amotivation decreases mathematics achievement by 0.1. Thirdly, extrinsic motivation had a positive and significant predictive value on mathematics achievement (β = .13, t (346) = .27, p < .05). A unit change in extrinsic motivation is associated with 0.13 change in mathematics achievement. The prediction equation for mathematics achievement from achievement motivation is as follows;

$\hat{Y}$ = 0.52Int. Mot. + 0.13Ext Mot. – 0.1Amotivation

DISCUSSION OF THE RESULTS

The objective of this study was to examine the link between achievement motivation and mathematics achievement. It was established that there exists a significant positive relationship between achievement motivation and mathematics achievement. When the association between the sub scales of achievement motivation and mathematics achievement was examined, it was established that both extrinsic and intrinsic motivation had a positive and significant relationship with mathematics achievement implying that an increase in any of them will lead to an increase in mathematics achievement. Furthermore, it was established that amotivation had a negative relationship with mathematics achievement implying that the lower the amotivation, the higher the mathematics achievement. The predictive values of intrinsic motivation, extrinsic motivation and amotivation on mathematics achievement were significant. The findings of this study are supported by McClelland's Achievement Theory of Motivation (1985). The theory divides achievement motivation into three sub scales including intrinsic, extrinsic and amotivation. On intrinsic motivation, the theory argues that the students can be pushed by internal factors to perform well so as to achieve the set academic goals. Thus, the spirit of excellence is driven by the student's desire to achieve set academic targets. On extrinsic motivation, the theory asserts that students can get motivated to perform better in mathematics so as to please others, control or influence others by having authority over them. Those possessing such a kind of motivation work to perform well in order to be recognized and direct others. They are driven by the desire to lead others. On amotivation, the theory claims that the students may prefer to maintain personal desires such as relationships in order to gain social recognition and affiliation with others who impel them to achieve success in academics. All these assertions can be used to explain why there exist positive relationship between intrinsic and extrinsic motivation and mathematics achievement, and a negative relationship between amotivation and mathematics achievement.

The findings of this study on the existence of a positive association between achievement motivation and mathematics achievement agrees with the findings of previous researchers in similar area. For instance, in South Korea, Enhya and Sunghwan (2019) established that the pupils' motivation to pass in mathematics influenced the scores the pupils obtained. This indicated that achievement motivation has a relationship with mathematics achievement. Xiao and Sun (2021) reported results that are congruent to those of the current study. The study established that the students who were self-motivated (intrinsic motivation) to achieve better results in mathematics performed far much better than those who did not.

In Spain, Amanda et al. (2020) found that the pupils with intrinsic motivation did better in mathematics than those who did not, a clear indication of the association between achievement motivation and mathematics achievement. The findings of this study are also consistent with those obtained by Okotie and Adeyemi (2019) in Nigeria while conducting a similar study. The researchers established that the students' achievement motivation impacted on their academic achievement in mathematics. These findings are similar to the results of the current study.

In Kenya, Kariuki and Mbugua (2018) conducted a study to explore teacher-related motivating factors influencing students' academic achievement in Nyeri and Kirinyaga counties. The researchers established that teacher motivation had a positive impact on students' academic achievement. Teacher motivation is a

form of extrinsic motivation, and thus the findings are congruent to those of the current study. In Kitui County, Kipngetich (2021) conducted a similar study and established that academic motivation, self-efficacy, and academic achievement were significantly related. However, this study did not investigate mathematics as a subject but the overall impact of academic motivation on academic achievement. Therefore, the findings of the current study support those of previous researchers who conducted studies in similar areas. Clearly, the results demonstrate the importance of achievement motivation in mathematics achievement.

CONCLUSIONS

The first study objective was to determine if there exists a significant association between achievement motivation and mathematics achievement. The study concludes that there exists a significant relationship between achievement motivation and mathematics achievement. Based on the findings from the sub scales of achievement motivation, the researcher concludes that there exists a positive and significant relationship between both extrinsic and intrinsic motivation and mathematics achievement implying that any change in any of them will lead to a significant change in mathematics achievement. The study further concludes that there exists a negative and significant relationship between amotivation and mathematics achievement implying that the lower the amotivation the higher the mathematics achievement among secondary school students. To improve on mathematics achievement teachers need to support students to reduce on amotivation.

RECOMMENDATIONS

- **Practice Recommendation**

There is need for teachers to come up with guidance programmes to boost achievement motivation among the students for better mathematics achievement in secondary schools.

- **Recommendations for Further Research**

Having established that the predictive values of achievement motivation on mathematics achievement of form three students in Busia County, there is need for further research to be done in other counties to establish if similar results would be obtained.

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