The Influence of Gender and Self-Efficacy Beliefs on Students' Motivation to Learn High School Mathematics in Laikipia County, Kenya

Mbuthia Ngunjiri (PhD)
Laikipia University, Kenya

Abstract: **This study examined the influence of gender and students' self efficacy beliefs on motivation to learn secondary school mathematics in Laikipia County, Kenya. The study was guided by Keller's ARCS model of motivation. Descriptive research design was employed in the study. The target population comprised of all 8357 Form Four students in Laikipia County .Simple random sampling was used to select sample schools and respondents. A sample of 392 students (276 males and 176 females) was selected for the study. A self-administered questionnaire was used for data collection. Cronbach's alpha was used to estimate the reliability of research instruments. Data was analyzed using t- test and simple regression analysis. The study findings revealed that male students had a significantly better motivation to learn mathematics than female students, and that students' self-efficacy beliefs contributed significantly to students' motivation to learn mathematics. The study concludes that mathematics teachers should apply appropriate motivational and self- efficacy enhancement strategies in improving students' motivation to learn mathematics.**

Keywords: **Gender, motivation to learn, self-efficacy beliefs**

I. INTRODUCTION

Mathematics is a compulsory subject at the secondary school level of education in Kenya. The major reason is that mathematics is seen to be useful in different ways within the Kenyan society. Specifically, mathematics is a basis for technological and industrial development (KIE, 2002). Furthermore, it is needed in our daily lives and those who understand and can do mathematics will have significantly enhanced opportunities and options for shaping their future (Bandura et al., 2001). That, perhaps is the reason why parents put a lot of pressure on their children to succeed in mathematics at all levels of education in Kenya. However, despite the perceived importance, secondary school students in Laikipia County continue to perform poorly mathematics in the Kenya Certificate of Secondary Examination (KCSE) examination (Kenya National Examinations Council (KNEC) statistics, 2020) as seen Tables 1 and 2

Table 1: KSCE mathematics mean performance from 2009 to 2015 in Laikipia County

Year	2009	2010	2011	2012	2013	2014	2015
Mean	2.9340	2.6115	3.545	3.950	3.898	3.614	3.731

Note: mean score ranges from 0 to 12, Source:KNEC(2020)

More recently, the poor performance in mathematics from 2016 to 2019 is seen in Table 2. Moreover, the proportion of females passing mathematics in the KCSE examination is less than that of males.

Table 2: KCSE mathematics mean performance by gender from 2016 to 2019 in Laikipia County

YEAR	NO OF STUDENTS	Boys	GIRLS	OVERALL
2016	7237	2.859	2.699	2.779
2017	7643	3.350	3.123	3.236
2018	7828	3.560	3.322	3.441
2019	8357	3.739	3.459	3.599

Note: mean score ranges from 0 to 12, Source: KNEC(2020)

The under-achievement of students in KCSE mathematics especially for females closes many educational and career opportunities to many students. Furthermore, Bandura et al. (2001) argued that people simply eliminate from consideration occupations they believe to be beyond their capabilities, however attractive the occupation may be.

The KSCE mathematics performance for Laikipia County as shown in Tables 1 and 2 indicates than the mean performance has continuously been below 4 mean points (33%) as from 2009 to 2019 based on a maximum mean of 12 points. This is evidence that there is a poor mathematics performance in Laikipia County. The poor performance can be attributed to students' level of motivation among other factors. In Laikipia county there is lack of information on factors influencing students' motivation to learn mathematics as students continue to perform poorly in the subject. This is of great concern and has not received any attention

Motivation is a force that energizes sustains and directs behavior toward a goal (Eggen & Kauchak, 2004). Most motivation theorists believe that motivation is involved in the performance of all learned responses (Huitt, 2001). Therefore, motivation is relevant in the learning process because learning is an active process requiring conscious and deliberate activity (Stipek, 1998). In Stipek's view, it is paramount to students' success in any academic activity. In the current study it is assumed that motivation to learn can be influenced by gender and students' self-efficacy beliefs.

Bandura (1986, 1997) argued that self-efficacy is a belief system that is casually related to behavior and outcomes. That is, people make judgments about their ability to perform certain actions (or tasks) required to achieve desired outcomes. Then, based on their judgments they proceed or not to engage in those actions. According to Bandura (1994), efficacy beliefs (or judgments of capability to perform specific tasks) contribute to motivation in several ways. In Bandura's view, they determine the goals people set for themselves, how much effort they expend, how long they persevere in the face of difficulties, and their resilience to failure. Indeed, mathematics self- efficacy have been shown to influence mathematics achievement (Hackett & Betz, 1987; Liem et al., 2008; Liu & Koirala, 2010).Self- efficacy has also been shown to influence self- regulation in human functioning (Driscoll, 2005; Zimmerman & Cleary, 2006)

According to Bandura (1986, 1994, 1997), self- efficacy influence human functioning through four major process. These are; cognitive, affective, selection and motivational processes**.** *First,* efficacy beliefs affect thought patterns that enhance or undermine performance (Bandura, 1997; McQuiggan Mott & Lester 2008;Pajares,2002).Second, efficacy beliefs influence the kind of emotional reactions a person experiences when he/she takes on specific tasks(Bandura, 1997; McQuiggan, Mott & Lester, 2008; Pajares 2002). *Third,* self- efficacy beliefs influence the choices a person makes and the courses of action that he/she pursues (Bandura 1997; McQuiggan, Mott & Lester 2008; Pajares ,2002). *Fourth,* efficacy beliefs play a role in the cognitive regulation of a motivation. According to Bandura (1997), the mentioned efficacy regulated processes (i.e., cognitive, affective, selection, and motivational processes) not only play a role in setting the course of students' intellectual development, but they exert considerable influence on how well established knowledge and skills are put into use.

The relationship between gender and self-efficacy beliefs has also been of focus in research. It has been indicated that male students at high school and beyond tend to be more confident than female students in mathematics (Pajares & Schunk, 2001). In the present study, it is hypothesized that students' motivation to learn is influenced by gender and self- efficacy beliefs of high school students in Laikipia County, Kenya. The four dimensions of motivation to learn that were the focus of this study are: (i) Attention (A), (ii) Relevance(R) (iii) Confidence(C) or expectancy of success and (iv) satisfication(S) in the learning process (Brophy, 2004; Driscoll, 2005; Keller, 1999, 2006). The instructional strategies for enhancing motivation to learn can be more successful if the relationship between students' gender, self-efficacy beliefs and motivation to learn is established. In Laikipia County, such empirical evidence is lacking and hence the need for this study.

II. OBJECTIVES OF THE STUDY

The objective of this study is to determine the influence of gender and self- efficacy beliefs on students' motivation to learn mathematics in Laikipia County, Kenya

III. HYPOTHESES OF THE STUDY

(All hypotheses are tested at .05 level of significance)

HO_1*:* Gender has no statistically significant difference on motivation to learn mathematics among high school students in Laikipia County.

HO_2: Students' self- efficacy beliefs have no statistically significant influence on motivation to learn mathematics among high school students in Laikipia County.

IV. METHODOLOGY

The target population for this study was 8357 secondary form four students from 113 secondary schools in Laikipia County. This category of students were selected on the assumption that they have covered most of the content in secondary school mathematics syllabus and also are mature enough to form independent opinion in mathematics. The subjects for the study were drawn from twenty (20) randomly selected public secondary schools in Laikipia county. Simple random sampling was used in selection of schools and respondents. The sample consisted of 392 students (i.e., 216 males and 176 females) randomly selected from the sample classes. The sample size was determined using the Krejcie and Morgan's (1970) table of sample sizes.

V. INSTRUMENTATION

In carrying out the study, the students' Motivation to Learn (MTL) scale (Keller, 2006) and Students Self- Efficacy (SSE) scale developed by the researcher were used. The MTL consisted of 34 items. Twenty five items were positively worded and nine items were negatively worded. The items were scored on a five-point scale from Strongly Disagree (1) to Strongly Agree (5). Keller (2006) reported a alpha reliability of 0.95 for the scale. Scoring was reversed for negative items. The SSE scale had 84 items. The scale has eight sub- scales. All the items are presented in form of positive statements, and the responses were scored on an 11 point scale (Bandura, 2006), from 0 (the lowest) to 10 (the highest). The total alpha reliability for the eight subscales was 0.98

VI. DATA ANALYSIS

The t-test, Pearson's correlation coefficient (r), and simple linear regression were used for data analysis

VII. RESULTS

The results of data analysis are presented in the following tables:

Table 1: t-test for the mean scores of male and female students on motivation to learn mathematics

S.No	Gender	N	Mean	df	t-value	p-value
1	Male	216	132.912	391	57.604	.000
2	female	176	131.750			

Note: Table- value of t=1.96

The results of the t-test (Table 1) indicate that there is a statistically significantly difference [t(391=57.604,p=.000)] between male and female students on motivation to learn mathematics, favoring males (i.e.,higher mean). Therefore HO_1 is rejected.

The results for correlation and simple regression analysis are presented in Tables 2 and 3 respectively.

Table 2: Pearson's correlation coefficient between MTL and SSE

variables	R	r square	Adjusted r-square	Std error of estimate	r-square change	F-change	Df1	Df2	p-value
MTL and SSE	.486	.237	.235	12.182	.237	120.845	1	390	.000

The results in Table 2 indicate a statistically significant correlation between motivation to learn (MTL) and students' self- efficacy (SSE)(r=.486, p=.000). Students' self- efficacy explains 23.7% of the variability in motivation to learn mathematics.

The results of simple regression analysis are given in Table 3.

Table 3: Simple regression of students' self efficacy beliefs on motivation to learn mathematics

Source	Sum of square	Df	Mean square	F	Sig. (P-value)
Regression	17934.788	1	17934.788	120.845	.000
Residual	57880.495	390	148.412		
Total	75815.283	391			

a. Dependant variable: motivation to learn
b. Predictor: students' self-efficacy.

The results in Table 3 indicate that the F-value is significant [(F(l, 390) =120.845,p=.000)].The F-value indicates that students' self- efficacy beliefs makes a statistically influence in the prediction of motivation to learn mathematics among high school students in Laikipia County. Therefore, HO_2 is rejected.

VIII. DISCUSSION

From the analysis of data, it was found there is a statistically significant difference between males and female students on motivation to learn secondary school mathematics, favoring males. This finding agrees with Tella (2007) who argued that motivation has an impact on academic achievement of secondary school students in mathematics and that boys reported a significantly higher motivation ($p<.05$) than girls. According to Hughes and Riccomini (2011) and Tella, highly motivated students perform better than lowly motivated students. Therefore, as mathematics teachers attempt to improve the level of motivation of secondary school students, special attention should be given to female students to reduce the gender gap in motivation to learn mathematics. Driscoll (2005) and Keller (1999) has provided the techniques (based on Keller ARCS model), that can be applied to improve students' level of motivation. Among the techniques is to begin the lesson by telling students what you want to accomplish, have students set short term goals, use spoken or written praise, use tests and grades carefully, capitalize on the arousal of suspense, discovery, curiosity, exploration, control and fantasy, use familiar materials for examples, use prerequisites, use simulation and games and minimize unpleasant consequences for students' involvement. These techniques should be applied in the classroom to enhance students' level of motivation to learn especially for female students.

The result also indicated that students' self-efficacy beliefs significantly influence motivation to learn mathematics among secondary school students. This supports the findings by Ayotola and Adedeji (2009), Hughes and Riccomini (2011),Liu and Koirala (2009) and Skaalvik and Skaalvik (2006) that self- efficacy beliefs are significantly related to positive student outcomes such as achievement in mathematics. Moreover, Meece et al. (2006) argued that when students are motivated, they persist longer in tasks, conquer more challenges and achieve more in their academic work. Therefore as part of their normal teaching, mathematics teachers should try to enhance students self-efficacy beliefs in mathematics over and above the development of knowledge and skills in the subject so as to improve the level of motivational and hence a better performance in the subject. According to Pajares (2006) there are several instructional strategies for enhancing students' self-efficacy beliefs. They include : Emphasizing skill development, praising what is praiseworthy, fostering optimism and a positive look of life, promoting genuine mastery experiences, exercising care in grouping practices, selecting appropriate models, tailoring instruction to students' capabilities, challenging under confidence, helping students set proximal than distal goals and providing instrumental rather than executive help in solving problems. These self- efficacy enhancement strategies can help students improve their mathematics self efficacy beliefs which appear to be related significantly to motivation to learn mathematics

IX. CONCLUSIONS

First, findings of this study showed that male students had significantly better motivation to learn mathematics than female students. Therefore, mathematics teachers should put more effort to ensure both girls and boys are equally motivated. Second, self-efficacy beliefs significantly

contributed to the prediction of motivation to learn mathematics among high school students. Therefore, self-efficacy beliefs play an important part in the development of students' motivation to learn mathematics among high school students in Laikipia County, Kenya.

REFERENCES

[1] Ayotola, A,& Adedeji, T. (2009). The relationship between mathematics self efficacy and achievement in mathematics. *Procedia Social and Behavioral Sciences*, 1, 953-957.

[2] Bandura, A. (1986).*Social foundations of thought and action: A social cognitive theory*. New Jersey: Prentice-Hall

[3] Bandura, A. (1994), Self-Efficacy, In V.S. Ramachaudran (Ed.) *Encyclopedia of human behavior* (Vol 4,pp. 71-81). New York: Academic Press

[4] Bandura, A. (1997*). Self-efficacy: The exercise of control*. New Yolk W.H: Freeman and Company.

[5] Bandura, A. (2006*). Guide for constructing self-efficacy beliefs of adolescents* (pp. 307- 337) Greenwich CT: Information Age.

[6] Bandura, A., Barbaranelli, C., Caprara, G.V.& Pastorelli, C. (2001). Self-efficacy beliefs as shapers of children aspiration and career trajectories *Child Development*, 72(1), 187-206.

[7] Brophy, J. (2004). *Motivating students to learn*. Mahwah NJ: Lawrence Erlbaum Associates.

[8] Driscoll, M. (2005). *Psychology of learning for instruction*. Boston: Allyn and Bacon.

[9] Eggen, P.& Kauchak,D.(2004) . New jersey: Pearson Education Ltd.

[10] Hackett, G.& Betz, N.E. (1998). An exploration of mathematics self-efficacy/ mathematics performances correspondence. *Journal for Research in Mathematics Education*, 20(3), 261-273.

[11] Hughes E.M.& Picconini, P,J. (2011) Mathmatics motivation and self efficacy of middle school student. *Focus on middle school*, 24(1), 1-6

[12] Huitt, W. (2001). Motivation to learn: An overview. *Educational Psychology Interactive.* Retrieved April, 2020 from http: //Chiron. Valdosta. edu / whuitt/col/motivation/motivate.html

[13] Keller, J. (1999). Motivation in cyber learning environments. *International Journal of Educational Psychology*, 1(1), 7-30

[14] Keller, J. (2006*). Development of two measures of learner motivation (version 06022*). Available from John Keller at Jkeller@arcsmodel.com KIE (2002). *Secondary education syllabus (Vol II)*. Nairobi: Kenya Institute of Education

[15] KNEC (2020).*Kenya national examinations council statistics* (2009-2019). Available from info@knec.ac.ke.

[16] Krejcie,R.& Morgan,D.(1970). Determining sample size for research activities. *Educational and Psychological Measurement*,30,607-610.

[17] Liem, A.D; Lau, S.& Nie, Y. (2008). The role of self efficacy, task value and achievement goals in predicting learning strategies, task disengagement, peer relationship and achievement outcome. *Contemporary Educational Pschology*, 33,486-512

[18] Liu, X.& Koirala, H. (2010). *The effect of mathematics self-efficacy on mathematics achievement of high school students.* Paper presented at the Northeastern Educational Research Association Annual Conference ,Paper 30, Connecticut, USA,

[19] McQuiggan S.W.,Mott, B.W., & Lester, J.C. (2008). Modelling self-efficacy in intelligent tutoring systems: An inductive approach. *User modeling and User Adapted Interaction*, 18, 81-123

[20] Meece, J.L., Glienke, B.B.,& Burg,S.(2006) Gender and motivation .*Journal of School Psychology*, 44, 351-373.

[21] Pajares, F. (2002). *Overview of social cognitive theory and of self-efficacy*. Retrieved April 2020 from http:/www.emory.edu/education/wfp/eff.htm.

[22] Pajares, F.(2006). Self-efficacy during childhood and adolescence: Implications for teachers and parents. In F. Pajares and T. Urban (Eds.), *Self efficacy beliefs of adolescents* (pp.339-367). Greenwich CT: Information Age.

[23] Pajares, F. & Schunk, D.H. (2001).Self-beliefs and school success: Self-efficacy , self-concept and school achievement. In R. Riding and S. Rayner (Eds.),Perception(pp.239-266). London: Ablex publishing.

[24] Skaalvik, E.M.& Skaalvik,S. (2006) .*Self-concept and self-efficacy in mathematics: Relation with mathematics motivation and achievement.* Paper presented at the proceedings of the 7th conference on learning strategies.Indiana,USA. Tella,A. (2007).The impact of motivation on students' achievement and outcomes in mathematics among secondary school students in Nigeria. Eurasia Journal of Mathematics, Science and Technology, 3(2), 149-156.

[25] Zimmerman B.J.& Cleary T.J. (2006). Adolescents' development of personal agency. In F. Pajares and T. Urban (Eds), *Self-efficacy beliefs of adolescents* (pp.45-69). Greenwich CT: Information Age.