The Relationship between Students' Motivation to Learn and Teachers' Self-efficacy in Mathematics among Secondary School Students in Kenya

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Abstract

This study focuses on the relationship between students' motivation to learn and teachers' self-efficacy in mathematics. It was found that there is a significant gender difference in motivation to learn mathematics, favouring males. Students' motivation to learn did not differ significantly with respect to locality. Teachers' self-efficacy in mathematics significantly contributed to the prediction of motivation to learn mathematics. Mathematics teachers should enhance students' motivation to learn especially for females. Teachers and educators should place emphasis on awareness of sources and enhancement strategies of teachers' sense of efficacy for students' success in mathematics.

In Kenya, greater emphasis is being placed on industrial and technological development (KIE, 2002). As a result students are being encouraged to take up science-related subjects. One subject that cuts across all sciences is mathematics. Mathematics is just one among many subjects which are included in the school curriculum, yet there is great pressure for children to succeed in mathematics when compared to other subjects. Indeed, mathematics plays a fundamental role in the life of human beings, and life without mathematics is almost an impossibility (Cockcroft, 1982). Kenya relies, to a great extent, on its human resource power to meet the challenges of the technological developments, and a substantial

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core of mathematics is needed to prepare students for their involvement in these challenges. Furthermore, those students who understand and can do mathematics will have significantly enhanced opportunities and options for shaping their future (Bandura et al., 2001). In the move towards scientific and technological advancement, Kenya needs nothing short of good performance in mathematics at all levels of schooling. Unfortunately, the performance of students in mathematics at the end of secondary education has not improved in the past decade (KNEC Statistics, 2009). Indeed, Middleton and Spanias (1999) indicated that children enjoy mathematics in the primary grades, but this enjoyment tends to fall drastically when children reach secondary school.

Several factors cause poor performance in mathematics such as, negative attitude towards the subject, lack of interest in the subject, use of traditional methods of teaching and so on. According to Tella (2007), of all the personal and psychological variables that have attracted researchers, motivation seems to be gaining more popularity and leading other variables. Therefore, the issue of motivation of students and the impact on academic performance is considered as an important aspect of effective learning. Infact, psychologists believe that motivation is a necessary ingredient in learning (Biehler and Snowman, 1997; Brophy, 2004; Huitt, 2001; Ormrod, 2006; Stipek, 1998). It is believed that satisfactory school learning is unlikely to take place in the absence of sufficient motivation to learn (Brophy, 2004; Stipek, 1998). A motivated learner strives to understand the subject matter, seeks challenges and persist on tasks even in the face of difficulties (Meece et al. 2006; Pajares and Schunk, 2001). Furthermore, Bandura (1994) suggested that motivation can manifest itself in various forms such as effort expended, persistence and choice of activities.

In Kenya, despite the poor performance in mathematics at the end of secondary school education, there is lack of information on the influence of teachers' self-efficacy in the learning of mathematics. Specifically, the influence of teachers' efficacy in motivation to learn mathematics has received no attention. Skaalvik and Skaalvik (2010) defined teacher efficacy as teacher's beliefs in the ability to plan, organise, and carry out activities required to attain given educational goals. More specifically, it is the confidence that a teacher holds about his/her individual and collective responsibility to influence student learning (Klassen et al., 2010). Bandura (1986, 1994, 1997) identified four sources that impact personal efficacy. They are (i) mastery experiences, (ii) vicarious experiences, (iii) verbal persuasions, and (iv) physiological/ emotional states.

Teacher self-efficacy has been found to be one of the important variables influencing positive teaching behaviour and student outcomes. It is strongly related to job satisfaction and students' achievement (Caprara et al., 2006) and affects the efforts teachers invest in teaching, the goals

they set, and their levels of aspiration (Tschannen-Moran and Hoy, 2001). Among other things, efficacious teachers plan more (Bembenutty, 2007; Gibbs, 2002), persist longer with students who struggle (Tschannen-Moran and Hoy, 2001), are less critical of students who make errors and work longer with low ability students (Hoy and Davis 2006). According to Bruce et al. (2010), generally it appears that students learn more from high efficacious teachers when compared to what they learn from those teachers whose sense of efficacy is low.

In the present study, it is hypothesised that students' motivation to learn is related to teachers' self-efficacy in mathematics. The four dimensions of motivation to learn, which are the focus of this study are: (i) attention, (ii) relevance, (iii) confidence or expectancy for success and (iv) satisfaction (Brophy, 2004; Driscoll, 2005; Keller, 1999, 2006). Tschannen-Moran et al. (1998) suggested that the major influences on efficacy beliefs about teaching are cognitive interpretations of the four sources of self-efficacy information as described by Bandura (1986, 1994, 1997). These sources of efficacy and other strategies for enhancing teacher efficacy as suggested in this study can be more effective if the relationship between students' motivation to learn and teachers' self-efficacy is established. In Kenya, such empirical evidence is lacking and hence the need for this study.

The purpose of this study is to determine whether:

(i) motivation to learn vary with respect to gender and locality, and

(ii) teachers' self-efficacy makes a significant contribution to the prediction of motivation to learn mathematics among secondary school students in Kenya.

Null Hypotheses

(All hypotheses are tested at 0.05 level of significance).

H01 : There is no significant gender difference in motivation to learn mathematics among secondary school students.

H02 : There is no significant difference in motivation to learn between rural and urban secondary school students.

H03 : There is no significant contribution of teachers' self-efficacy to motivation to learn mathematics among secondary school students.

Method

The descriptive survey method was used in the study.

Sample

The subjects for the study were drawn from twenty four randomly selected public secondary schools from Nakuru County Region of Kenya. Simple random sampling was used in the selection of schools. The sample included students from boys schools, girls schools and mixed schools. In all, a total of 493 secondary Form Four students (256 males and 237 females) were randomly selected from the sample classes.

Instrumentation

In carrying out the study, the Students' Motivation to Learn Mathematics (MTL) scale (Keller, 2006), and Teacher's Self-Efficacy in mathematics (TSE) scale (Skaalvik and Skaalvik, 2010) were used. The MTL consisted of 34 items. Twenty five items are positively worded and nine items are negatively worded. The items were scored on a five-point scale from strongly disagree (=1) to strongly agree (=5). Keller (2006) reported on alpha reliability of 0.95 for the scale. The TSE scale consisted of 24 items. The scale has six-subscales. All the items are presented in the 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 cronbach's alpha coefficients for the subscales were 0.83, 0.90, 0.83, 0.91, 0.77 and 0.81 respectively. On the basis of the magnitude of the reliability coefficients of the two scales, which were also reported to be valid, the instruments were found to be adequate for testing purposes. They were subsequently administered to the subjects at the second term (May to July, 2011) of the academic session in Kenya.

Data Analysis

The t-test, Pearson's correlation coefficient (r) and ANOVA were used for data analysis.

Results

The results are presented in the following tables:

The result of the t-test (Table 1) indicates that there is a significant difference between male and female students in motivation to learn mathematics, favouring males (HO1 is rejected).

The result of the t-test (Table 2) indicates that there is no significant difference between rural and urban students in motivation to learn mathematics (HO2).

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

S.No.	*Gender*	*N*	*Mean*	*SD*	*t-value*	*p-value*	*significance*
1	Male	256	129.70	14.71	3.172	0.002	S*
2	Female	237	125.33	15.92			

df = 491, Table-value of t = 1.96, S* = Significant at 0.05 level.

Table 2
t-test of the mean scores of rural and urban students in motivation to learn mathematics

S.No.	*Locality*	*N*	*Mean*	*SD*	*t-value*	*p-value*	*significance*
1	Urban	283	127.5618	15.41	-0.064	0.949	NS
2	Rural	210	127.6524	15.51			

df = 491, Table-value of t = 1.96, NS = Not significant

Table 3
Simple regression of students' motivation to learn on teachers' self-efficacy in mathematics of total sample (N = 493)

Dependent variable		*r*	r^2	*Constant*	*df*		*F*	*p - value*	*Significance (F)*
					k	*N-k-1*			
1	Motivation to learn	0.187	0.035	106.363	1	491	17.70	0.000	S
Independent variable		*beta (β)*		*regression coefficient*	-			*p - value*	*Significance (β)*
1	Teacher self-efficacy	0.187		0.114	-			0.000	S

S = Significant at 0.05 level., df = degrees of freedom

The results in Table 3 show that F-value from ANOVA was significant at 0.05 level. Teachers' self-efficacy explained 3.5 per cent of variance in motivation to learn mathematics. The result of the F-ratio indicate that there is a significant contribution of teachers' self-efficacy to the prediction of motivation to learn mathematics of total sample (HO3 is rejected).

Discussion

From the analysis of data, it was found that students' motivation to learn mathematics was moderate. There was a significant difference between male and female students in motivation to learn, favouring males. This agrees with the finding of Tella (2007), who indicated that motivation has an impact on academic achievement of secondary school students in mathematics and that boys reported a significantly higher ($p < 0.05$) motivation than girls. Meece et al. (2006) argued that when students are motivated, they persist longer on tasks, conquer more challenges, and achieve more in their academic endeavours.

Driscoll (2005) and Keller (1999) have provided the motivational techniques (based on Keller's ARCS model) that can be applied to classroom or similar settings in an effort to promote academic achievement. The techniques are: begin the lesson by telling students what you want to accomplish, make students set short term goals, use spoken or written praise, use test and grades judiciously, capitalise on the arousal of suspense, discovery, curiosity, exploration, control and fantasy, use familiar materials for examples, make students use what they have previously learned, use simulation and games, minimise unpleasant consequences of student involvement and so on. These techniques could be easily applied or integrated in the mathematics classroom. Therefore, teachers need to conduct activities during class time that would develop enthusiasm in mathematics, thus enhancing students' motivation in learning mathematics. Special attention must also be given to female students so as to reduce the gap in motivation between male and female students. It was also observed that motivation to learn did not significantly vary with respect to locality, and this is remarkable.

The results also revealed that there is a positive significant correlation between motivation to learn and teachers' self-efficacy in mathematics. This means that any increase in teachers' efficacy in mathematics is associated with a corresponding increase in students' motivation to learn mathematics. Furthermore, it was found that teachers' self-efficacy made a significant contribution to the prediction of students' motivation to learn mathematics. These findings correspond with the claim that teachers' self-efficacy beliefs are significantly related to students' achievement (Caprara et al. 2006; Singh, 2010). The implication that arises is that mathematics teachers should be aware of the sources of efficacy that influence teacher efficacy. Bruce et al. (2010) posits that the four sources that influence teacher efficacy are: (i) mastery experiences (i.e., direct teaching experiences that are challenging but successful), vicarious experiences (i.e., watching peer teachers of similar ability teach challenging ideas with success), (iii) verbal persuasions (i.e., receiving positive feedback from students, peer teachers and superiors, and (iv) emotional states (i.e., feelings of success and confidence). The resultant efficacy judgments influence the goals teachers set for themselves, the effort they invest in teaching to achieve these goals, and their persistence when facing difficulties. Furthermore, Dembo and Gibson (1985) suggested strategies for enhancing teachers' sense of efficacy. These are: (i) providing preservice teachers with a range of experiences in different social contexts, (ii) providing teachers with strategies to deal with student failure and help them analyse specific aspect of their teaching so that they can identify the sources of their sense of inefficacy, (iii) analyse the differences between teaching efficacy and personal teaching efficacy in order to determine needs of various teachers, (iv) develop school programmes to help new teachers deal with the role transition from student teaching to full-time classroom instruction, (v) providing teachers with accurate feedback regarding their performance, (vi) assessing the social norms and incentive in the school organisation that may enhance or impede teachers' organisational involvement, (vii) evaluating administrative leadership styles to determine how they may affect teacher involvement in decision making, (viii) encouraging collegial approaches to personal and organisational problem solving, and (ix) providing teachers with skills and opportunities to interact more effectively with parents. These strategies can help teachers improve their efficacy beliefs about teaching, which appears to be related to motivation and achievement in mathematics.

Conclusion

The findings of this study showed that male students had a significantly better motivation to learn mathematics than female students. Therefore, mathematics teachers should put more effort to ensure that both boys and girls are equally motivated. There was no significant difference

in motivation to learn mathematics between rural and urban students and this is remarkable. Teachers' self-efficacy significantly contributed to the prediction of motivation to learn mathematics among secondary school students. Therefore, it emerges that teachers' self-efficacy plays an important part in the development of students' motivation to learn mathematics among secondary school students in Kenya.

REFERENCES

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

_____ 199□. Self-efficacy. □n □.S. Ramachaudran □d.□, *Encyclopedia of Human Behaviour* □ol. □, pp. 71-81. □cademic Press, New □ork.

_____ 1997. *Self-efficacy: The exercise of control*. □ .H. □reeman and □ompany, New □ork.

_____ □□□6. □uide for constructing self-efficacy scales. □n □. Pa□ares and T. □rdan □□ds.□, *Self-efficacy beliefs of adolescents* pp. □□7-□□7. □nformation □ge, □reenwich □T.

_____ C. Barbaranelli, G.V. Caprara and C. Pastorelli. □□□1. Self-efficacy beliefs as shapers of children's aspirations and career tra□ectories.*Child Development*. 7□□1□ 187-□□6.

Bembenutty, H. □□□7. Teachers' self-efficacy and self-regulation. *Academic Exchange Quarterly*. 11□1□. 1□□-161.

Biehler, R.F., and J. Snowman. 1997. *Psychology Applied to Teaching* □8th □d.□ Houghton Mif□in □ompany. New □ork.

Brophy, J. □□□□. *Motivating Students to Learn*. □awrence □rlbaum □ssociates. Mahwah NJ.

Bruce, C.D., I. Esmonde, J. Ross, L. Dookie, and R. Beatty. □□1□. The effects of sustained classroom-embedded teacher professional learning on teacher efficacy and related student achievement. *Teaching and Teacher Education*. □6. 1□98-16□8.

Caprara, G.V., C. Barbaranelli, P. Steca, and P.S. Malone. □□□6. Teachers' self-efficacy beliefs as determinants of □obsatisfaction and students' achievement□□ Study at the school level. *Journal of School Psychology*. □□. □7□-□9□.

Cockcroft, W.H. 198□. *Mathematics Counts: Report of the committee of inquiry into the teaching of mathematics in schools*. HMS□, □ondon.

Dembo, M.H. and S. Gibson. 198□. Teachers' sense of efficacy □□n important factor in school improvement. *The Elementary School Journal*. 86□□□. 17□-18□.

Driscoll, M. □□□□.*Psychology of learning for instruction*. □llyn and □acon. □oston.

Gibbs, C. □□□□. *Effective teaching: Exercising self-efficacy and thought control of action*. Paper presented at the annual conference of the □ritish □ducational Research □ssociation. □□eter. □ngland.

Hoy, A.W., and H.□. Davis. □□□6. Teacher self-efficacy and its in□uence on the achievement of adolescents. □n□. Pa□aresand T. □rdan □□ds.□*Self-efficacy beliefs of adolescents* □pp. 117-1□7□. □nformation □ge. □reenwich, □T.

Huitt, W. 2001. Motivation to learn: An overview. *Educational Psychology Interactive*. Retrieved April 19, 2009. from http://Chiron.valdosta.edu/ whuitt/col/motivation/ motivate.html

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

Keller, J. 2006. Development of two measures of learner motivation (version 060222). Available from John Keller at jeller@arcsmodel.com

Kie. 2002. *Secondary education syllabus* (Vol. II). Kenya Institute of Education. Nairobi.

Klassen, R.M., V.M.C. Tze, S.M. Betts, and K.A. Gordon. 2010. Teacher efficacy research 1998-2009: Signs of progress or unfulfilled promise? In press.

KNEC Statistics. 2009. Kenya national examinations council statistics. 1999-2008. Available from info@knec.ac.ke.

Meece, J.L., E.M. Anderman and L.H. Anderman. 2006. Classroom goal structure, student motivation, and academic achievement. *Annual Review of Psychology*. 57. 487-503.

Middleton, J.A., and P.A. Spanias. 1999. Motivation for achievement in mathematics: Findings, generalizations, and criticism of the research. *Journal for Research in Mathematics Education*. 30 (1). 65-68.

Ormord, J.E. 2006. *Educational psychology* : *Developing learners* (5th Ed). Pearson Education Inc. New Jersey.

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

Singh, K.S. 2010. Reflection of competency among teachers on students' learning. *Indian Psychological Review*. 74 (4). 211-216.

Skaalvik, E.M., and S. Skaalvik. 2010. Teacher self-efficacy and teacher burnout : A study of relations. *Teaching and Teacher Education*. 26. 1059-1069.

Stipek, D. 1998. *Motivation to learn* (3rd Ed.). Allyn and Bacon. Boston.

Tella, A. 2007. The impact of motivation on students' achievement and learning outcomes in mathematics among secondary school students in Nigeria. *Eurasia Journal of Mathematics, Science and Technology*. 3(2). 149-156.

Tschannen-Moran, M., and A.W. Hoy. 2001. Teacher efficacy: Capturing an elusive construct. *Teaching and Teacher Education*. 17. 783-805.

Tschannen-Moran, M., A. Woolfolk-Hoy and W.K. Hoy. 1998. Teacher efficacy: Its meaning and measure. *Review of Educational Research*. 68(2). 202-248.