

Influence of Efficacy Expectation on Mathematics Achievement among Students in Secondary Schools in Kenya

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Abstract

Achievement in Mathematics has remained a challenge to many students at secondary school level in Kenya, for example students in Vihiga Sub County. While most studies have focused on: school related factors, subject related factors and teacher related factors as predictors of students' achievement in Mathematics, Very scanty literature is available on the Efficacy expectations, an indication that this area has minimally been researched. Despite the government's effort in strengthening the subject, its performance is still wanting. The main objective of the study was to measure the influence of efficacy expectation on Mathematics achievement among students in secondary schools in Vihiga Sub-county. The Self-determination theory informed the study. The study adopted Mixed Methods approach and the Sequential Explanatory Design was used. The study targeted 1483 form four students, 35 Mathematics teachers, and 27 teacher counsellors. A sample size of 445 students, 11 Mathematics teachers, and 9 teacher counsellors were selected using stratified random, purposive and purposive sampling techniques respectively. Quantitative data was collected using a Students' Questionnaire while qualitative data was collected using interviews from students, teacher counsellors and Mathematics teachers. Students' achievement was assessed using K.C.S.E Exam results of the year 2017. Reliability of the questionnaire was ensured by Cronbach's alpha and a coefficient of alpha >0.7 was reported. Normality of data was tested by using Kolmogorov-Smirnov and Shapiro-Wilk (W) tests. Descriptive statistics such as frequencies and percentages were used to analyze quantitative data from questionnaires, while inferential statistics such as Regression Analysis and Pearson correlation coefficient were used to analyze quantitative data. On the other hand, thematic framework was used to analyze Qualitative data. The study found that there was statistically significant, though weak, positive correlation ($r=.142$, $n=396$, $p=.005$) between self-efficacy of expectation and Mathematics achievement. The findings showed that self-efficacy of expectation predicted the achievement in Mathematics among secondary school students. The study recommended that the Kenya Institute of Curriculum Development should consider developing curriculum with Self efficacy expectations in them for use in institutions of learning. This would enable students to change their sum total behavior thus improving their achievement. This is because the study reported that self-efficacy expectation has positive influence on Mathematics achievement among students in secondary schools.

Key words: Efficacy expectation, Mathematics achievement, Kenya, Secondary schools.

1. Introduction

Formal education is a means of imparting and acquiring knowledge. This is done through teaching and learning within the school. The school system empowers the students with necessary knowledge and skills for an effective living in the society. It is expected that classroom learning be translated into solving problems in real life situation. UNESCO (2006) stated that the worldwide drive for “Education for all” lays emphasis on literacy in science and mathematics. Mathematics comes out clearly as a core subject to be learned. Atherton (2010) observed that Mathematics knowledge plays a crucial role in understanding contents of other subjects such as Chemistry, Physics, Biology and Geography, and related the importance of mathematics to the scientific, industrial, technological and social progress of a society. Despite its usefulness, students’ achievement in Mathematics has been poor (Reddy, Van der Bergs, Jansey Van Rensburg & Taylor, 2012). According to Kurgat and Tanui (2013), performance in Mathematics has generally been poor in Kenyan schools yet it’s a core subject in the curriculum, a good performance in it implies good performance in secondary education. Mathematics is an important school subject that is associated with more academic and career opportunities (Kosgey, 2013). According to Korir and Kemboi (2013), students’ personal effort made significant contribution to the students’ Mathematics achievement. Poor academic achievement in Mathematics has been reported in Kenya (KNEC, 2016).

2. Theoretical Framework and Literature Review

2.1 Theoretical Framework

This study was guided by self-determination theory (SDT) developed by Deci and Ryan in 1971 (Harackiewicz, Barron, Elliot & Thrash, 2002). SDT is an approach to human motivation and personality that uses traditional empirical methods while employing an organismic metatheory that highlights the importance of humans’ evolved inner resources for personality development and behavioral self-regulation (Ryan, Kuhl & Deci, 1997). It deals with peoples’ inherent growth tendencies and innate psychological needs that are the basis of their self-motivation and personality integration as well as conditions that foster those positive processes. Inductively using the empirical process, three needs are identified: the needs of competence (Harter, 1978, White), relatedness (Baumeister and Leary, 1995) and lastly autonomy (Deci, 1975). Self-determination theory addresses the energization issues as well as the direction issue. The theory informed the present study in that when applied to the realm of education is concerned with promoting in students, an interest in learning, a valuing of education and a confidence in their own capacities and attributes.

2.2 Literature Review

A study carried out by Shkullaku, (2013) explored gender differences in Self-Efficacy and academic performance among Albanian students from two major universities in Tirana, Albania. The data was collected from 180 students (102 females and 78 males) selected from first, second and third level studies. Both universities and participants were selected randomly. A questionnaire was used to measure Self-Efficacy and the Grade Point Average GPA of the first semester to measure the academic performance of the participants. The data was analyzed using descriptive and inferential statistics. The Pearson correlation coefficient was used to see the relationship between Self-Efficacy and academic performance. T-test was used to compare male and female participants in Self-Efficacy and academic performance. The results of the study showed that there was a significant difference between males and females in Self-Efficacy. There was no difference between males and females in academic performance. Also, a significant relationship was found between the students’

Self-Efficacy and academic performance (Shkullaku, 2013). The reviewed study used a smaller sample size while the present study adopted a relatively larger sample size of participants. Small sample get increasingly further away from entire population hence leading to a large standard deviation which would lead to less accurate results. The current study curbed the reviewed study gap by use of a larger sample size hence it led to more accurate results than the reviewed study.

A research conducted by Goulao, (2014) examined the relationship between the academic Self-Efficacy of an adult learners group in an online learning context with their actual performance indicated that students' level of Self-Efficacy is high (average=45) and a significant relationship exists between Self-Efficacy and Academic Achievement ($r=0.286$, at 0.05 level). The study aimed to evaluate the relationship between self-concept of a group of students in online context and their Academic Achievement. Data were collected from 63 students of both genders, with average age of 42 years old, selected from the first years of their undergraduate studies. An adapted questionnaire was used to measure Self-Efficacy ($\alpha=.908$) and their performance analyzed in academic course specifics. The data was analyzed using descriptive and inferential statistics. The Pearson correlation coefficient was used to see the relationship between Self-Efficacy and academic performance (Goulao, 2014). The small sample size as used in reviewed study had uncoverage biasness which was caused by non-response. Using all public schools in the current study area increased the sample size and reduced on uncover age biasness hence it filled gaps in the reviewed study literature. Again, the study was carried out on adult learners of 42 years old, while the current study was done on secondary school students age between 17 -18 years hence differences in age gap would influence study findings.

A study was done by Ochieng' (2015) whose main purpose was to determine the relationship between 'Self-Efficacy' and 'Academic Achievement' from a Mathematical perspective among secondary schools in Kenya. The study was carried out in Nyakach Sub-county. The study determined the level of Self-Efficacy, the relationship between Self-Efficacy and Academic Achievement and gender perspective between self-efficacy and Academic Achievements among male and female students in secondary school students. The study applied quantitative research design using descriptive research method. The target population was secondary school students in Nyakach County. The sample was 390 secondary school students. The results showed that Self-Efficacy levels and Academic Achievement of the students are average. The study findings indicated that those with high Self-Efficacy perform better in Mathematics more often than those with lower Self-Efficacy. The researcher recommended that there is need to explore the issue of Self -Efficacy as a predictor of Academic Achievement. The reviewed study used quantitative methods only which provided a narrow dataset, hence the current study used mixed research methods in order to provide a means of testing one source of the information against the other source and this helped in explaining any discrepancy within the study findings.

A study was carried out by Moturi, (2012) on the relationship between Self-Efficacy and academic performance in Mathematics and English language among secondary school students in Nyamira District. The study employed both quantitative and qualitative research techniques. Participants were selected through purposive and simple random sampling procedures. A study sample of 240 female and male students from public secondary schools was selected. Pearson Product Moment correlation, one-way ANOVA and t-test were used in data analyses. The results indicated no significant relationship between Self-Efficacy and general academic performance, $I = -.030$, $p>.05$. No relationship was found between Self-Efficacy and performance in English language, I

$=.066 > .05$. Study evidence indicated that there was a relationship: between Self-Efficacy and performance in Mathematics, $I = .13$, $P < .05$, Self-Efficacy and type of school, $F(2, 237) = 6.2$, $p < .05$. The results also showed no significant relationship between: gender and Self-Efficacy, $t(238) = -.895$, $p > .05$ and a significant relationship was found between gender and performance in Mathematics, $t(238) = 1.6$, $p > .05$. The reviewed study was carried out in Nyamira County which is a study area with different socioeconomic status compared to the current study area of study – Vihiga County. Moreover, the reviewed study used a smaller sample size which caused biasness, unlike the present study which adopted a relatively larger sample size of participants to reduce results' biasness.

Another research study was conducted by Onkundi, (2014) to determine whether academic performance could be predicted on the bases of the constructs; locus of control and academic Self-Efficacy in three schools from Nyamaiya Division, Nyamira County, Kenya. The study adopted a correlation research design and both descriptive and inferential statistics were employed to analyze the data. Three schools were sampled using stratified random sampling. Using simple random sampling, 150 students were sampled. Two research instruments-an Academic Self-Efficacy Scale (ASES) and a modified Crandall's Intellectual Achievement Responsibility (IAR) questionnaire were used in data collection. IARQ was used to measure participants' locus of control and the ASES to measure Self-Efficacy. Scores on academic performance were obtained through document analysis by computing mean scores from three consecutive end-of-term examinations results English, Kiswahili and Mathematics. The relationship between independent variables and dependent variable were tested using Pearson Product Moment Correlation coefficient. The relationships among the three variables were determined using the multiple regression and F- test analysis at 0.05 alpha levels (Onkundi, 2014). The reviewed study used a smaller sample size of 150 respondents which resulted in voluntary response biasness due to limited number of respondents unlike the present study which used a relatively larger sample size of 435 respondents to curb the gap in reviewed literature.

2.3 Goal of the Study

The study sought to measure the Influence of Efficacy Expectation on Mathematics Achievement among Students in Secondary Schools in Vihiga Sub County

3.0 Research Methodology

3.1 Research Design

The study was anchored on Mixed Methods Approach. According to Creswell (2014), in mixed method the researcher collects and analyses data, integrates findings and draws inferences using both quantitative and qualitative methods in a single study. Mixed methods was used because questionnaire alone is a less efficient method to be used in studies that aim to investigate given social contexts (Creswell, 2014). On the other hand, interview as a typical qualitative tool is useful and efficient in gathering and exploring in-depth social insights and perceptions on complex social phenomena (Mugenda, 2013).

This study adopted the Sequential Explanatory Research design. Sequential explanatory design lays priority on to the quantitative data, and the findings are integrated during the interpretation phase of the study. It is an important design that help explain, interpret or contextualize quantitative

findings and help examine in more detail unexpected results from a quantitative study (Creswell, 2014). The current study involved collecting and analyzing quantitative and then qualitative data in two consecutive phases within one study. Priority was given first to the quantitative data collection and analysis in the study, after which the researcher went back to the field to collect qualitative data and analyzed hence, (QUAN-qual) notation (Creswell, 2014). The sequence of the data collection and analysis, and the stages in the research process for both the quantitative and qualitative data was connected and the results were integrated.

3.2 Research Participants

A study population is a collective term used to describe total quantity of cases of the type subjected to the study (Creswell, 2014). If this population is broadly defined, generalizability is maximized and confidence level is easily obtained because the sample is distributed in the same way as the population. Vihiga Sub-County has 27 public secondary schools with 1 boys' school, 3 girls' schools and 23 mixed schools (Vihiga sub county academic committee, 2015). A total of 1483 registered form four students who sat KCSE of the year 2017 comprised the study target population. The study population also comprised of 35 Mathematics teachers, 27 teacher counsellors and the 1483 form four students. The Quantitative information about efficacy expectations was obtained through questionnaires from students, while qualitative data about the same was obtained through interviews from students, Mathematics teachers, and teacher counselors.

3.3 Research Instruments.

Reliable data depends on the precision of research instruments to be used. Therefore to have reliable data, suitable instruments necessary to provide high accuracy for generalization was used. This research employed the use of questionnaires and interview schedules to collect information from the respondents. Quantitative data was collected using a Students' Questionnaire while qualitative data was collected using interviews from students, teacher counsellors and Mathematics teachers. Students' achievement was assessed using K.C.S.E Exam results of the year 2017. A pilot study was carried out in three of the schools in Emuhaya sub-county. Reliability of the questionnaire was ensured by Cronbach's alpha and a coefficient of alpha >0.7 was reported. The efficacy expectation scale questionnaire which composed of 10 items had internal consistency of $\alpha = .782$; an indication that the instruments had adequate reliability for the study. In-depth interview schedules were administered to students, teacher counsellors, and Mathematics teachers in every school.

3.4 Data Collection Procedures.

The researcher visited the sampled schools personally. Quantitative data was rigorously collected from students using questionnaires. Creswell & Plano (2010) notes that "Respondents can be helped to overcome difficulties with questions, and that personal persuasion and reminders by the researcher can ensure high response rate." The researcher introduced herself to the school's head teachers before seeking further permission to meet and administer the questionnaires to the various respondents. The researcher then organized, analyzed the data collected, drew valid conclusions from it and presented the findings. The researcher thereafter went back to the field and collected qualitative data by administering interviews to students, teacher counsellors, and Mathematics teachers in every school

Ethical considerations protect the rights of participants by ensuring that participants are treated with respect and sensitivity beyond what may be required by law (Patton 2002, Radnor, 2005). To adhere

to ethical issues permission was sought from the university in writing to conduct research with which the researcher sought for the permit to do the same before conducting the research. Again permission was sought from the Vihiga sub-county education office, and respective schools within the sub-county. The researcher identified herself to the students and gave them clear information of what the study was all about. Learners were given time to decide whether they would take part in the study or not by agreeing to sign consent forms. After their consent, data gathering tool was administered. The respondents were encouraged of their cooperation in participating in the study and that their responses were to be treated with utmost confidentiality. The respondents were assured of anonymity by concealing their identities.

3.5 Data Analysis

Researchers have asserted that data analysis involves the ordering, structuring and giving meaning to the mass of data collected (Cresswell, 2014). In this study, data analysis was done in two parts namely; Quantitative data analysis and Qualitative data analysis. Data gathered was loaded into the statistical package for social science (SPSS) Version 22 software for statistical analysis. Data file was created in SPSS to compile data from students' questionnaire on Internal Locus of Control as well as students' achievement from their respective achievement tests scores. The quantitative data was analyzed by both descriptive and inferential statistics. Statistical techniques such as percentages, frequencies, Mean, Pearson's product-moment Correlation coefficient, and regression analysis were used. Confirmation of study findings were further done using ANOVA and scatter plot. Qualitative data was analyzed thematically depending on the themes arising from respondents' responses to interview schedules.

4.0 Findings

The study objective was investigated by use of descriptive and inferential statistics. Descriptive statistics was used to explore the level of self-efficacy expectations while inferential statistics helped to investigate the influence of student self-efficacy expectations on Mathematics achievement. To investigate whether there was any statistical significant influence of self-efficacy of expectation on Mathematics achievement among students in secondary schools in Vihiga Sub County, the null hypothesis was tested. The null hypothesis tested was: *There is no Statistical significant influence of self-efficacy of expectation on Mathematics achievement among students in secondary schools in Vihiga Sub County.* To do this, a Pearson Product Moment Correlation Coefficient was computed, with scores on self-efficacy as independent variable and student Mathematics achievement as dependent variable. The scores of the independent variables were computed from frequency of responses and converted into continuous scaled data by computing mean responses per respondents, where high scale ratings implied high perceived student self-efficacy. However, the dependent variable was the 2017 KSCE student scores in Mathematics. The p-value was set at .05, the null hypothesis was rejected when the p-value was less than .05 but it was accepted when the p-value obtained was greater than .05. Table 4.1., shows the correlation analysis results in SPSS output.

Table 4.1.
Influence of Self-Efficacy of Expectation on Mathematics Achievement

		Efficacy Expectations	Mathematics achievement
Efficacy Expectations	Pearson Correlation	1	.142**
	Sig. (2-tailed)		.005
	N	396	396
Mathematics achievement	Pearson Correlation	.142**	1
	Sig. (2-tailed)	.005	
	N	396	396

** . Correlation is significant at the 0.01 level (2-tailed).

The finding of the study showed that there was statistically significant influence, though weak, positive correlation ($r=.142$, $n=396$, $p=.005$) between self-efficacy of expectation and Mathematics achievement, with high level student self-efficacy of expectation resulting into enhanced student Mathematics achievement and vice-versa. Given that the relationship was statistically significant, the hypothesis that, “*there is no statistical significant influence of self-efficacy of expectation on Mathematics achievement*” was rejected. It was therefore concluded that self-efficacy of expectation has positive influence on Mathematics achievement among secondary school students.

In addition, to estimate the level of influence of self-efficacy of expectation on Mathematics achievement, a coefficient of determination was computed. This was done using of regression analysis and the result was as shown in Table 4.2.

Table 4.2.
Model Summary on Regression Analysis of Influence Self-Efficacy of Expectation on Mathematics Achievement

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.142 ^a	.020	.018	.73466

a. Predictors: (Constant), Efficacy Expectations

The model shows that student self-efficacy of expectation accounted for 2.0%, as denoted by coefficient $R^2 = .020$, of the variation in Mathematics achievement among students in public secondary schools. However, to determine whether self-expectancy was a significant predictor of Mathematics achievement, Analysis of Variance (ANOVA) was computed as Table 4.3.

Table 4.3.

ANOVA –Influence of Self-Efficacy of Expectation on Mathematics Achievement

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4.389	1	4.389	8.133	.005 ^b
	Residual	212.651	394	.540		
	Total	217.040	395			

a. Dependent Variable: Mathematics achievement

b. Predictors: (Constant), Efficacy Expectations

From Table 4.3, it is evident that self-efficacy of expectation was a significant predictor of Mathematics achievement among the secondary school students [$F(1, 394) = 8.133, p = .005$]. This further confirms that student self-efficacy of expectation significantly influence Mathematics achievements among the secondary school students.

The correlation between students' achievement and efficacy expectations supports the conclusion made from qualitative data from Mathematics teacher 7 as indicated by excerpt below:

“A good number of our students have low levels of efficacy expectations. This has negatively affected their performance in Mathematics”
[Mathematics Teacher, 7]

The response from Mathematics teacher 7 reveals that Student self-efficacy of expectation significantly influence Mathematics achievements among the secondary school students.

5.0 Discussion

Based on the objective of the study, learners are aware that Efficacy expectation has an influence on their Mathematics achievement. However, they do not naturally put it in use during their Mathematics learning sessions and in their homework in order to improve their achievement.

The correlation between students' achievement and efficacy expectations supports the conclusion made from qualitative data that student self-efficacy of expectation significantly influence Mathematics achievements among the secondary school students. The findings are in agreement with Cassidy (2015) who found a significant positive correlations between the General Academic Self-Efficacy Scale and achievement and that Self-Efficacy was a strong predictor of academic performance. Metofe, Gardiner, Walker & Wedlow, (2014) showed that self-efficacy was positively and significantly correlated with academic performance.

6.0 Concluding Remarks

From the findings of the study, the researcher recommended that for school systems, Kenya Institute of Curriculum Development should consider developing curriculum with self-efficacy of expectations in them for use in institutions of learning. This would help to foster hard work and enable students to change their sum total behavior, thus improving their achievement in Mathematics. Mathematics teachers should also inculcate positive self- efficacy expectations among students and teacher counselors should inculcate person centered techniques in students to enhance self-efficacy of expectation. This would help build positive self-efficacy in Mathematics among students. This is because the study reported that self-efficacy of expectation has positive influence on Mathematics achievement among secondary school students.

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