Influence of Internal Locus of Control on Mathematics Achievement among Students in Secondary schools in Kenya.

***Ahono Telesia Atetwe**
Jaramogi Oginga Odinga
University of Science and Technology
telesiaahono@yahoo.com

Dr. Jairo Peter Aloka
Department of Psychology & Education Foundations
Jaramogi Oginga Odinga University of Science and Technology

Calleb Owino Gudo
Department of Psychology & Education Foundations
Jaramogi Oginga Odinga University of Science and Technology

Abstract

Achievement in Mathematics has remained a challenge to many students at secondary school level in Kenya, for example students in Vihiga Sub County. Despite the government's effort in strengthening the subject, its performance is still wanting. The main objective of the study was to determine the influence of the level of Internal Locus of Control 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. Trustworthiness of qualitative data was also ensured. 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 ($r=.182$, $n=396$, $p<.05$) between internal locus of control and Mathematics achievement. The findings showed that internal locus of control predicted the achievement in Mathematics among secondary school students. The study recommended that Mathematics teachers should come up with a variety of learning strategies that would encourage students to develop internal locus of control hence, make them to start believing that they have more control over their Mathematics achievement and that teachers are guides. This would enable students to take responsibility of their learning and achieve highly in Mathematics.

Key words: ***Internal locus of control, Mathematics achievement, Kenya, students in secondary schools.***

1. Introduction

Formal education, is seen as a means of imparting and acquiring knowledge. 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. Trends in International Mathematics and Science Study (TIMSS,2011) give a picture of global achievement of students. It shows that the trends of mathematics performance for Chinese Taipei Singapore and the USA are not similar. Mathematics scores for Chinese Taipei students has bimodal distribution, Singapore has its distribution skewed to the left while USA students have mathematics performance skewed the right.

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). In Nigeria, Duze (2011) showed that students could respond correctly to 32% of tasks related to Mathematics assignments and 33% of tasks related to life skills. This showed that performance was poor in Mathematics compared to life skills, and that a very small number of students reached mastery level in Mathematics. 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). Mathematics is vital when it comes to technological literacy and high education essential for realization of Kenya's vision 2030. The vision is globally comparative and its realization is underpinned by three pillars: social, political and economic (G.O.K, 2007).

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 (Harakiewiz, 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), relatedness (Baumeister and Leary, 1995, Reis, 1994) and lastly autonomy (Decharms, 1968, 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 by Ahmad (2013) investigated Locus of Control and Achievement in the principles of microeconomics class whereby 44 out of 48 students at the University of Nevada participated in the completion of 5 questionnaires and a survey describing student characteristics. The questionnaires include: a 29-item Locus of Control Scale, a 12-item Achievement Goal Scale, a 19-item Test Anxiety Scale, a 16-item Procrastination Scale, and a 5- item Fear of Failure Scale. Using locus of control, the class was divided into two equal-sized groups of 22 students by a median split of 8.5. Those who scored 8 and below were treated as internals and those who scored 9 and above were treated as externals. The results of this study showed that internals achieved better academically, suffered less from debilitating test anxiety, scored higher on a mastery approach, spent more hours working, and tended more to be of white ethnicity than externals. The regression results show that the locus of control variable has a negative and significant effect on the exam average. The reviewed study was carried out in the field of Economics while the current study was carried out in the field of Mathematics which are totally different fields. The field of economics from which the reviewed study was done has different teaching methodologies from Mathematics teaching methodologies for the current study. The reviewed survey study used a small sample size which generated errors resulting from use of small sample size of 48students and lacked proper representation of all the population. The current study used a bigger sample size than the reviewed study, hence it was less prone to error margin, and gave a correct presentative of all respondents.

A study was carried out by Fleet (2017) at Abilene Christian University based on the Relationship of Locus of Control and Social Learning on Academic Achievement in a Supplemental Instruction Program. Study variables included high school GPAs, standardized test scores (ACT/SAT), locus of control survey pretest and posttest, BIBL 101 exam scores including final course grades, supplemental instruction attendance records, demographics, and overall first-term college GPA. This research utilized the Supplemental Instruction program, (based upon Bandura's social learning theory), as its academic intervention. The researcher wanted to find out if a student's internal or external locus of control predict academic performance. A pretest and posttest using Rotter's (1966) Internal-External Locus of Control Scale measured students' overall academic confidence. Class test scores, class final grades, and semester GPA were used to measure Supplemental Instruction program effectiveness. Locus of Control proved insignificant intervention in preparing at-risk students for the rigors of college level academia i.e. test scores, final class grade, and overall semester GPA. The study indicated that the Supplemental Instruction was highly effective intervention in better preparing at-risk students for the rigors of college level academia. The reviewed study was carried out on university students who were young adults while the current study was carried out on secondary school students who were adolescents, thus both respondents are in different developmental stages that affected the study findings.

From the reviewed studies, most of them were carried out in different contexts and not Kenyan contexts. Similarly the approaches used were either quantitative or qualitative and not mixed method approach as in the present study. The current study filled in the gaps in literature.

2.3 Goal of the Study

The study sought to determine the influence of the level of Internal Locus of Control on Mathematics achievement among students in secondary schools in Kenya.

3.0 Research Methodology

3.1 Research Design

A research design is the arrangement of conditions and analysis of data in a manner which aims to combine relevance to the research purpose with economy in procedure (Creswell, 2014).In this study, both descriptive and inferential statistics were used. Descriptive research is intended to produce statistical information about aspects of education that interests policy makers and educators. The study was anchored on Mixed Methods Approach. 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).

3.2 Study Participants

The target population was derived from Vihiga Sub-County which had 27 public secondary schools at the time the study was done. 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.

3.3 Research Instruments

This research employed the use of questionnaires and interview schedules to collect information from the respondents. The Internal Locus of Control scale questionnaire which composed of 10 items had internal consistency of $\alpha = .796$; 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.

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 sub county education office, and respective schools within the sub county by the researcher to conduct the study. Learners were given time to choose or 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. Participants were informed about the purpose of research as well as possible risks and benefits from participation in the research project (Graziano &

Raulin, 2010).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

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. Findings

The study objective was to determine the influence of Internal Locus of Control on Mathematics achievement among students in secondary schools in Vihiga Sub County. To investigate whether there was any statistical significant influence of internal locus of control on Mathematics achievement among students in secondary schools in Vihiga Sub County, the null hypothesis was tested. The null hypothesis was **"***There is no statistical significant influence of internal locus of control on Mathematics achievement among students in secondary schools in Vihiga Sub County Kenya"*.

Pearson Product Moment Correlation Coefficient analysis was used to test the hypothesis, with scores on internal locus of control as independent variable and student Mathematics achievement as dependent variable. The scores of the independent variables were computed from frequency of responses per respondents, where high scale ratings implied high perceived student internal locus of control. The dependent variable was the 2017 KCSE 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 Internal Locus of Control on Mathematics Achievement

		Internal Locus of Control	Mathematics achievement
Internal Locus of Control	Pearson Correlation	1	.182**
	Sig. (2-tailed)		.000
	N	396	396
Mathematics achievement	Pearson Correlation	.182**	1
	Sig. (2-tailed)	.000	
	N	396	396

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

The finding of the study showed that there was statistically significant, though weak, positive correlation (r=.182, n=396, p<.05) between internal locus of control and Mathematics achievement, with high level of internal locus of control associated to high student Mathematics achievement and vice-versa. Given that the relationship was statistically significant, the hypothesis that, "*there is no statistical significant influence of internal locus of control on Mathematics achievement*" was rejected. It was therefore concluded that the level of internal locus of control has positive influence on Mathematics achievement among secondary school students.

Further, to estimate the level of influence of internal locus of control on Mathematics achievement, a coefficient of determination was worked out using of regression analysis and the result was as shown in Table 4.2.

Table 4.2.
Model Summary on Regression Analysis of Influence of Internal Locus of Control on Mathematics Achievement

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.182[a]	.033	.031	.72978

a. Predictors: (Constant), Internal Locus of Control

The model in Table 4.2 shows that student level of internal locus of control accounted for 3.3% (R^2 = .033) of the variation in Mathematics achievement among the students in public secondary schools. However, to determine whether internal locus of control was a significant predictor of Mathematics achievement, Analysis of Variance (ANOVA) was done as shown in Table 4.3.

Table 4.3.

ANOVA –Influence of Internal locus of Control on Mathematics Achievement

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	7.206	1	7.206	13.531	.000[b]
	Residual	209.834	394	.533		
	Total	217.040	395			

a. Dependent Variable: Mathematics achievement
b. Predictors: (Constant), Internal Locus of Control

From Table 4.3, it is apparent that level of internal locus of control was a significant predicator of Mathematics achievement among the secondary school students [F (1, 394) = 13.531, p <.05]. This further confirms that level of student internal locus of control significantly influences student's Mathematics achievements among the secondary school students.

The qualitative data on the other hand indicated a relationship between internal locus of control and Mathematics achievement. Mathematics Teachers reported that students with low level of internal

locus of control lack self-drive and effort and so they perform poorly in Mathematics. Their responses were as shown by the exerpt below:

> *"In our school internal locus of control does not exist, in case there is then it is very minimal and this justifies why our boys and girls do not perform well in Mathematics. These students lack self-drive completely. Teachers have to put in a lot of effort for them to perform, sometimes through instilling threats and punishment". [Mathematics Teacher 9]*

The response from Mathematics teacher 9 reveals that there is a relationship between students' low level of internal locus of control and low achievement in Mathematics. Regarding academic achievement, it seemed logical that individuals with high internal locus of control achieved more academically than individuals with low internal locus of control. For example, an internal student, who studies hard and does well on a Mathematics exam, attributed their success to their own actions. These students would then continue to study hard, because their expectation to succeed in the future is established. Moreover, these students feels a positive emotional response of pride for the successes, which strengthens their expectation and their determination.

> *"We have a major challenge in that most of us need teachers to closely monitor us in order to go for remedial, do assignments in Mathematics, and extra practice. Although with force being applied by Mathematics teachers, some students perform well in Mathematics but those who resist fail" [Student, 1, FGD, 5]*

The statement of student 1, FGD 5 indicates that students with low internal locus of control may study and do well on a test, but may believe the success is due to an easy test, or luck, or a variety of other factors. This student does not attribute success to his/her own actions, and so may not consistently study.

5.0 Discussion

The study findings from descriptive statistics showed that although some students who were sampled for the study believed that they had a significant control over their achievement in Mathematics, others felt that teachers play the major role in their academics. Close to a fifth 79 (19.9%) of students who took part in the survey blamed the teachers for their woes in Mathematics. The descriptive statistics confirmed that level of student internal locus of control significantly influenced student's Mathematics achievements among the secondary school students in Vihiga sub-county. The finding from the inferential statistics showed that there was statistically significant, though weak, positive correlation ($r=.182$, $n=396$, $p<.05$) between internal locus of control and Mathematics achievement. It was therefore concluded that internal locus of control has positive influence on Mathematics achievement among secondary school students.

Again, the coefficient of determination was worked out by use of regression analysis showed that student level of internal locus of control accounted for 3.3% ($R^2 = .033$) of the variation in Mathematics achievement among the students in public secondary schools. Analysis of Variance (ANOVA) further confirmed that level of internal locus of control was a significant predicator of Mathematics achievement among the secondary school students [$F(1, 394) = 13.531$, $p < .05$].Hence, it was concluded that internal locus of control has positive influence on Mathematics achievement among secondary school students. Qualitative data analysis revealed that student

internal locus of control significantly influence Mathematics achievements among the secondary school students in Vihiga Sub-County.

6.0 Concluding Remarks

Mathematics teachers should come up with a variety of learning strategies that would encourage students to develop internal locus of control hence, make them to start believing that they have more control over their Mathematics achievement and that teachers are guides. This would enable students to take responsibility of their learning and achieve highly in Mathematics. This is because the study showed that there was statistically significant correlation between internal locus of control and Mathematics achievement, with high level of internal locus of control associated to high student Mathematics achievement and vice-versa

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