Influence of Parenting Styles and Self-Concept on Students’ Achievement in Mathematics: A Case Study of Kaplamai Division, Trans Nzoia County, Kenya

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Abstract

Students in Kenya seating for the Kenya Certificate of Secondary Education Examinations (K.C.S.E) have been performing dismally in Mathematics. This trend has raised many questions that catapulted us into this research. This study was designed to respond to the current public outcry as to why mathematics had massive failure at K.C.S.E. We linked the influence of parenting styles and self concept to the massive failure in mathematics. The researchers have employed a casual comparative research design since they were interested in the cause and effect of the poor performance. Quantitative research methodology was adopted where a total of 214 students responded to the questionnaires that had been piloted and their reliability obtained. The data collected was analyzed using means, standard deviations, Pearson product moment correlation coefficient (PPMCC), t-test and one way analysis of variance (ANOVA). It was realized that authoritative and authoritarian parenting styles as well as self concept have significant influences on students’ achievement in Mathematics. The researchers argue that all stakeholders in Mathematics education should strive to foster positive self concept of students and make attempts to eradicate stereotyped roles which promote gender disparity in Mathematics achievement.

Key words: K.C.S.E, Comparative research, Quantitative research, PPMCC and ANOVA.

1. Introduction

In recent years, Mathematics has been posting poor results as indicated in the Kenya National Examinations Report (K.N.E.C, 2015) despite being a compulsory subject both at the primary and secondary level of education and being a basic requirement to any of the prestigious courses at the university including Medicine and engineering. The mean score of the results has been exemplified in Table 1 and Figure 1. Mathematics as an expression of the human mind reflects the active will, the contemplative reason and the desire for aesthetic perfection. Its basic elements are logic and intuition, analysis and construction, generality and individuality (Richard and Herbert, 1996). The list of subjects that borrow from mathematics in the Kenyan 8-4-4 educational curriculum has grown to include Physics, Chemistry, Biology, Agriculture and Business Studies. Stakeholders in the education sector in Kenya have been concerned about the poor performance in science subjects and notably mathematics over the years. Students’ performance in mathematics and science subjects in examinations administered by the Kenya National Examination Council has remained below expectation. This has been exemplified in the table 1 and figure 1.
Table 1: K.C.S.E mean scores of Mathematics from the year 2000-2014

|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|

As shown in Table 1, mathematics has posted poor results over the years and hence need to investigate the factors that lead to such a performance. Graphically, we can represent this as;

![Graphical representation of Mathematics mean scores from 2000-2014.](image)

This situation, (as shown in table 1 and figure 1), does not favour Kenya in its effort toward developing a scientific and technological culture. More often than not, teachers are blamed for the poor performance and even when the blame is directed to a student, explanation is offered only in terms of the students' cognitive and intellectual ability.

Various studies have identified areas of difficulty in the learning of mathematics at various levels (Cramer, Post and delMas, 2002; Kato, Kamii, Ozaki & Nagahiro, 2002; Harries & Suggate, 2006; Harries & Barmbey, 2007). Indeed Brown, Brown, and Bibby (2008) observed that in many countries, many students do not enjoy school mathematics and seek to avoid it later. Mathews and Pepper (2005) note powerful reasons for not continuing with mathematics. This includes lack of enjoyment and a belief that the subject is boring, for both high attaining as well as low attaining students. These studies consider performance in mathematics from the perspective of school factors therefore externalizing it. In this case the role of individual students in mathematics achievement is ignored. Little or no consideration is given to the fact that the student's perception of self in mathematics can affect ones achievement in Mathematics. Little attention too is paid to the fact that parenting could influence ones’ performance in the subject. As at now, knowledge of how certain human factors relate to ones achievement in mathematics is not well known. A gap exists in understanding the possible relationship between certain human attributes such as self- concept, parenting and the individuals’ evaluation of self -efficacy in the performance of mathematics at the secondary school level. This study makes an attempt to contribute towards filling the existing gap by establish the role of internal processes such as self- concepts (academic and mathematics self-concepts) on students’ achievement in mathematics.
Most studies conclude that there is a relationship between self-concept and academic achievement. Maritim (1979) reported that self-concept was a strong predictor of academic achievement and those pupils who thought highly of their abilities significantly out achieved those who had low perception of their abilities. He further points out that on all achievement variables investigated, boys performed better than girls. Maqsud (1983) asserts that it is important for educators in Africa to bear in mind that self-concept is essential in facilitating quality education and teachers can play a great role in this area. Loxley's (1981), findings indicated that 68% of achievement in mathematics is explained by school factors. Schiefelbein and Simmons (1981) found out that out of 13 observations, the social status of parents was a significant predictor of achievement in ten of the observations. Mwangi's study (1983), found two variables to be significantly related to achievement in mathematics; the availability of teaching materials and availability of resources.

Maritim (1979), in Misigo (1998), asserts that pupils personality characteristics help to explain differential performance among children. Therefore, consideration of the pupil’s performance cannot be separated from their personality. This study investigated personality of students as manifested in their self concept and its influence on achievement in mathematics. Commenting on child rearing Shiundu, (1990) observes that the challenges of child moulding is a parental responsibility and that failure of parents to inject the right dose of life expectations in a child results in future problems for the child for example, failure of the child to mix well in society. He further points out that though the parents feed, clothe and care for their children, they do little to strengthen their children’s character. Lack of strong character according to him makes the child a push over for the forces outside the family. Shiundu focused on the role of the parent as a provider of basic needs for the child’s education, survival, security, facilities and guidance. The most recent study done to investigate the reasons for dismal performance in mathematics is one done by Sifuna, Manyali, Sakwa and Mukasia (2016), where they linked poor mathematics performance to methodology applied by teachers. They argued that the approach applied in teaching of mathematics is purely teacher centered which leads to low retention. The researchers advocated for Simulation in which they believe strongly from their results that it may improve the performance in mathematics. There is, however, scanty information on the relationship between parenting and achievement in Mathematics.

The researchers of this paper were therefore of conviction that studying factors determining achievement in mathematics should begin from the learner who is an important player in the learning process, without whom learning is impossible. The learner cannot be exonerated from the blame game whose focus is poor achievement in mathematics. This study therefore attempted to focus mathematics achievement on the learner as opposed to external factors. The learner is not only affected by the environment but he/she positively or negatively affects the environment (Bandura, 1986). In the light of the learner being a central player in academic achievement, this study sought to understand how self-concept of the learners and parenting styles relate to achievement in mathematics among secondary school students. As earlier mentioned, this is a comparative research and researchers were much interested in the cause and the effect of the poor performance in mathematics.

2. Statement of the problem
Mathematics performance in the national examinations has puzzled many scholars and this study has linked the poor performance to the parenting styles and the self-concept in mathematics. Seemingly, there is no known study that has been done to investigate the role
played by parenting neither styles nor the self concept in mathematics. The researchers intended to fill this gap by studying the above variables in relation to mathematics performance. The following null hypotheses were tested at an alpha level of 0.05. H₀₁: Self –concepts have no significant influence on students’ achievement in mathematics. H₀₂: Parenting styles have no significant influence on students’ achievement in mathematics.

3. Objectives of the study
This study was basically based on the following two objectives;

a) To determine the influence of self-concepts on student’s achievement in mathematics.

b) To investigate the influence of parenting styles on student’s achievement in mathematics.

4. Methodology
A causal-comparative design was adopted. This is because the study was concerned with explaining and predicting the relationship between independent and dependent variables. It specifically investigated the influence of parenting styles and self concept on students’ academic achievement in Mathematics. Such issues are best investigated through a causal comparative design; the design enables the researcher to investigate the influence of independent variables on the dependent variable without manipulating the independent variables. The causal comparative design entails examining naturalistically occurring treatments. For the purpose of this study the causal comparative design enabled the researchers to determine the influence of parenting styles and self concept on students’ achievement in mathematics.

The method of data collection that was adopted was use of a questionnaire that was piloted and its reliability achieved. The statistical tools used were calculation of means and standard deviations to show how the respondents’ scores varied. Pearson product – moment correlation coefficient (r) was used to determine the extent of association between two variables. The t-test for independent samples and one way Analysis of Variance (ANOVA) were used to determine how great the differences between two means were. Significance of r, t and ANOVA were tested at an alpha value of 0.05.

5. The Sample population
The target population consisted of 5,671 secondary school students in Kaplamai Division from 20 secondary schools. The sample was drawn from 11 schools, 3 same sex and 8 co-educational schools selected from the 20 schools. The sample consisted of 214 participants where the schools were selected using stratified sampling while the participants were selected randomly selected. A big sample was chosen for accuracy as stipulated by Sifuna et al. (2016).
6. Instrumentation

The study made use of students’ KCSE examination results and questionnaires.

6.1 Examinations

Previous scores of students were used in this study, the examinations they sat were reliable. We verified reliability of the examination by using Kurder-Richardson 21 formula.

\[
KR21 = \left[ \frac{n}{n-1} \right] \times \left[ 1 - \frac{M \times (n-M)}{n \times \text{Variance}} \right]
\]

Our calculated KR21 was found to be greater than 0.7 as stipulated by Frekel et al., (2011)

6.2 Questionnaires

We equally prepared questionnaires of which we obtained the reliability by Cronbach's alpha as since it is superior to Kurder –Richardson 20 formula. This is because it can be used with continuous and non dichotomous data. Cronbach's alpha can again be used for testing with partial credit and for questionnaires using a Likert scale. We found out that,

Given variables \( x_1, \ldots, x_k \) and that our \( x_0 = \sum_{j}^{k} x_k \), then Cronbach’s alpha is defined by

\[
\frac{k}{k-1} \left( \frac{\sum_{i \neq j}^{k} \text{cov}(x_i, x_j)}{\text{var}(x_0)} \right) = \frac{k}{k-1} \left( 1 - \frac{\sum_{j=1}^{k} \text{var}(x_j)}{\text{var}(x_0)} \right)
\]

in this case, we let our \( x_j = t_j + e_j \) where \( t_j \) and \( e_j \) are independent of each other. We also let \( x_0 = \sum_{j=1}^{k} x_j \) and \( t_0 = \sum_{j=1}^{k} t_j \) then one can easily calculate the reliability of \( x_0 \geq \alpha \) where \( \alpha \) is cronbach’s alpha. We calculated our \( \alpha \) and it was higher than 0.7 which is the standard set \( \alpha \) value.

7. Results and discussion

This study obtained information from a total of 214 respondents and thus the following sections present the research results and subsequent discussions.

7.1 Demographic Information of Respondents

The demographic information of the respondents obtained provided parameters that supported the study. The sample was drawn from 11 schools, 3 same sex and 8 co-educational schools selected from 20 schools in Kaplamai Division. In each school, only Form 3 students participated in the study. The sample consisted of 214 participants consisting of boys and girls selected from 850 Form 3 students. As already mentioned, the schools were selected using stratified sampling while the participants were selected randomly. Each school provided 20 participants whose selection reflected the proportion of girl and boys in each class. Table 2 shows the population sample and school categories.
Table 2: Number and Percentage of Study Sample by Categories

<table>
<thead>
<tr>
<th>School category</th>
<th>No. of schools Sampled</th>
<th>Sampled %</th>
<th>No. of schools in Division</th>
<th>No. of students sampled</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single sex (Girls)</td>
<td>2</td>
<td>100</td>
<td>2</td>
<td>34</td>
</tr>
<tr>
<td>Single Sex (Boys)</td>
<td>1</td>
<td>100</td>
<td>1</td>
<td>34</td>
</tr>
<tr>
<td>Mixed</td>
<td>8</td>
<td>47</td>
<td>17</td>
<td>146</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>11</strong></td>
<td><strong>55</strong></td>
<td><strong>20</strong></td>
<td><strong>214</strong></td>
</tr>
</tbody>
</table>

Each school provided participants who responded to the students’ self concept questionnaire SSCQ and the parenting styles rating scale SPSR. In the selection of participants, consideration was given to the proportion of girls and boys in the population, there were more girls (112) than boys (102) in the population. Representations in the sample reflect the proportion of each gender in the population.

### 7.2 Students’ Academic Self Concept and Achievement in Mathematics

The first objective of this study was to investigate the influence of self-concept on students’ achievement in mathematics. Two types of self-concepts were investigated; academic self-concept and mathematics self-concept. To achieve this objective, self-concept of respondents was computed from responses to a 27 item questionnaire on self-concept. The respondents were then classified into those with positive and negative self concepts. The respondents’ mathematics achievements were obtained from computing a mean mark for a year using recorded marks in the teachers’ mark books. Means, Pearson correlation coefficient (r) and t-test were used to determine the significance of relationships between variables and to test the hypothesis.

Out of the 214 respondents who participated in the study, 42% had positive academic self-concept, 48.6% had a negative academic self-concept while 9% were neutral. The respondents with positive academic self-concept posited a mean mathematics score of 50.3 while those with negative academic self-concept had a mean of 35.8. Those with a neutral academic self-concept had a mean score of 39.5. Table 4.1 shows means and standard deviations of mathematics achievement versus academic self-concept of respondents.

Table 3: Means and Standard Deviations of Mathematics Achievement among Respondents

<table>
<thead>
<tr>
<th>Academic self concept</th>
<th>N</th>
<th>M</th>
<th>S.D</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive</td>
<td>90</td>
<td>50.3</td>
<td>6.7</td>
<td>42.1</td>
</tr>
<tr>
<td>Neutral</td>
<td>20</td>
<td>39.5</td>
<td>5.5</td>
<td>9.3</td>
</tr>
<tr>
<td>Negative</td>
<td>104</td>
<td>35.8</td>
<td>5.34</td>
<td>48.6</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>214</td>
<td></td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

The results in the table show that mathematics mean score of students with positive academic self-concepts is higher than that of students with negative academic self-concept.
7.3 Students’ Mathematics Self Concept and Achievement in Mathematics
Data analysis showed that 38.3% of respondents had positive mathematics self-concept, with a mean mathematics mark of 33.24. Respondents with negative mathematics self-concept were 44.9% and 16.8% had neutral mathematics self-concept. Table 4.2 shows achievement in mathematics for respondents with positive and negative mathematics self-concepts.

Table 4: Comparison of Mathematics Self-Concept with Achievement in Mathematics

<table>
<thead>
<tr>
<th>Mathematics Achievement</th>
<th>Academic self concept</th>
<th>N</th>
<th>M</th>
<th>S.D</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive</td>
<td>82</td>
<td>33.24</td>
<td>6.27</td>
<td>38.3</td>
<td></td>
</tr>
<tr>
<td>Neutral</td>
<td>36</td>
<td>22.3</td>
<td>5.3</td>
<td>16.8</td>
<td></td>
</tr>
<tr>
<td>Negative</td>
<td>96</td>
<td>21.56</td>
<td>5.17</td>
<td>44.9</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>214</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The results on the table shows that mathematics mean scores for students with positive mathematics self-concepts is higher than that of students with negative mathematics self-concepts. Figure 2 provides a summary of relationships between academic self-concept, mathematics self-concept and achievement in mathematics.

To find out whether there was significant differences in mathematics mean scores of students with positive self-concept and negative self-concept, the following hypothesis was tested at an alpha level of .05. HO₁: Self – concepts have no significant influence on students’ achievement in mathematics.
in mathematics. The Pearson correlation coefficient \( r \) was computed to determine relationship between variables. While t-test was used to determine the difference in mathematics mean scores for students with negative and positive self- concepts. Academic self – concept versus achievement in mathematics yielded \( r = 0.64, t=11.54, df =192 p < 0.05 \).

Mathematics self- concept versus achievements in mathematics, \( r = 0.73, t =14.80, df=192 p<0.05 \); Academic self concept versus mathematics self concept \( r = 0.85, t=22.36, df =192 p<.05 \).In terms of the coefficients of determination \( r^2 \) the relationship between achievement in mathematics versus academic self- concept; mathematics self- concept, yielded \( r^2 =0.4096 \) and \( 0.533 \) respectively. The relationship between academic self- concept versus mathematics self-concept yielded \( r^2 =0.723 \). These results show that 41% and 53.3% of the student’s achievement in mathematics is determined by the student’s self-concept and mathematics self-concept respectively. Academic self- concept positively influences mathematics self- concept by 72.3%. Table 4.3 shows the results of data analysis for self-concepts and students achievements in mathematics.

### 7.4 Parenting Styles and Students’ Achievement in Mathematics

The second objective of this study was to investigate the influence of parenting styles on students’ achievement in mathematics. To achieve this objective, parenting styles for respondents were analyzed from the responses in the questionnaire and their mean mathematics scores were computed. There were 214 participants in the study, 36.9% were under authoritative parents, 30.4% under authoritarian parents, 19.1% under permissive and 13.6% under neglectful parents. These results show that majority of the respondents’ mostly experienced authoritative and authoritarian parenting styles. Few respondents experience permissive and neglectful parenting styles.

After analyzing the mean mathematics scores for respondents under various parenting styles, the following mean scores were obtained: authoritative = 24, authoritarian = 22, neglectful = 15 and Permissive = 20. From these findings, it was observed that authoritative and authoritarian parenting styles yielded higher mathematics mean scores: (24 and 22) respectively than those under permissive and neglectful parenting styles (20 and 15) respectively. This suggests that students under authoritative and authoritarian parenting styles are better achievers in mathematics compared to those under permissive and neglectful parenting styles.

To find out whether there was significant differences in mathematics mean scores for students under various parenting styles, the following hypothesis was tested.

**H02**: Parenting styles have no significant influence on students’ achievement in mathematics. The t- test was used to determine the difference in mathematics means scores for students. The following t- values were obtained, authoritative parenting versus students’ achievements in mathematics \( t = 7.51, df =77 \) at \( p \leq 0.05 \); authoritarian parenting versus students’ achievements in mathematics \( t = 5.23, df = 63 \) at \( p \leq 0.5 \); neglectful parenting versus students’ achievements in mathematics \( t = 1.13, df = 27 \) at \( p \leq 0.5 \); permissive parenting versus students’ achievement in mathematics \( t = 1.75, df = 39 \) at \( p \leq 0.5 \). Table 4.4 shows parenting styles against students’ achievements in mathematics.
Table 4: Comparison of Parenting Styles with Achievements in Mathematics.

<table>
<thead>
<tr>
<th>Parenting styles</th>
<th>N</th>
<th>t=c.v</th>
<th>df</th>
<th>t=t.v</th>
</tr>
</thead>
<tbody>
<tr>
<td>Authoritative</td>
<td>79</td>
<td>7.51</td>
<td>77</td>
<td>2.00</td>
</tr>
<tr>
<td>Authoritarian</td>
<td>65</td>
<td>5.23</td>
<td>63</td>
<td>2.00</td>
</tr>
<tr>
<td>Neglectful</td>
<td>29</td>
<td>1.13</td>
<td>27</td>
<td>2.00</td>
</tr>
<tr>
<td>Permissive</td>
<td>41</td>
<td>1.75</td>
<td>39</td>
<td>2.02</td>
</tr>
</tbody>
</table>

The results from the table show that parenting styles have significant influence on students’ achievement in mathematics. From the obtained results, it was concluded that there are significant differences between mathematics mean scores for students under the four parenting styles. On the basis of these findings, authoritative and authoritarian parenting styles have significant influences on student’s achievements in mathematics. Consequently the null hypothesis $H_0$ was rejected.

For the purpose of determining the relationship between each parenting styles and respondent’s achievement in mathematics the Pearson correlation coefficient ($r$) was computed. The following ($r$) indices were obtained for the four parenting styles: Authoritative ($r = 0.65$), authoritarian ($r = 0.55$), neglectful ($r = 0.21$) and permissive ($r = 0.301$). In the four cases, the results indicated strong positive relationships between authoritative, authoritarian parenting styles and achievement in mathematics. However neglectful and permissive parenting reported a weak correlation with achievement in mathematics.

Authoritative parenting style yielded a strong positive correlation coefficient ($r=0.65$) with achievement in mathematics. The coefficient of determination ($r^2$) for the relationship between parenting styles versus student’s achievement in mathematics yielded values as follows: authoritative $=0.423$, authoritarian $=0.3025$, neglectful $=0.0454$ and permissive $=0.0906$. This result shows that 42.3% and 30.3% of the student’s achievement in mathematics is influenced by authoritative and authoritarian parenting styles respectively. On the contrary, only 4.54% and 9.06% of the student’s achievement in mathematics may be attributed to neglectful and permissive parenting styles respectively which were not significant.

8. Conclusion

The following conclusions were made based on the research findings.

1. Parenting styles influenced students’ performance in mathematics. Respondents under authoritative and authoritarian parenting styles had higher positive correlations with achievement in mathematics. ($r = 0.65$ and 0.55) respectively. That the influence of neglectful and permissive parenting styles was not significant.
2. Students’ self-concepts (academic and mathematics self-concepts) have significant influence their achievement in mathematics. Those with positive self-concepts performed better in mathematics than those with negative self-concepts.
3. Parenting styles significantly influenced students’ self-concept; authoritative and authoritarian parenting styles had a strong positive influence on the respondents’ self-concepts. The influence of neglectful and permissive parenting styles was negative.
9. Recommendations
This study makes the following recommendations based on the findings and conclusions;

• There is need for both parents and teachers to be good role models and to communicate positively in order to provide the children with positive feedback on their mathematics achievement and other social skills. This is essential for improving their self-concept and achievement in mathematics. Parents should employ mainly authoritative and authoritarian parenting styles in caring for their children because they have a positive influence on students’ self-concept and mathematics achievement. On the contrary, permissive and neglectful parenting styles have a negative influence on students’ achievement in mathematics and on students’ self-concepts.

• Parents and teachers should either minimize or avoid giving negative feedback which generates and perpetuates negative self-concepts among students.

• Teachers should make a deliberate effort to care for students so that they meet their cognitive, emotional and psychological needs. This may translate into higher academic achievement or better achievement in mathematics.

• Parents should be cautious in their duty of parenting by avoiding permissive and neglectful parenting styles if they wish to see their children meet academic challenges. Instead, they should adopt authoritative and authoritarian parenting styles, which are associated with the development of instrumental competency in students.

• Individual students should reduce or avoid negative self-evaluation which consequently undermines their achievement in mathematics. There is a positive relationship between all measures of self perception and academic achievement (Jones & Grieneeks, 1970). Students should emulate good role models within their environment and beyond and shun bad models.

Acknowledgement
The authors would like to pass sincere gratitude to James Sifuna of the Computational and Theoretical Physics Group (CTheP) from Masinde Muliro University of Science and Technology, for allowing us to use resources owned by CTheP and equally for finding time to go through our manuscript. Support from Prof. Khaemba Ongeti of Moi University is also acknowledged.
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