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Maths attitudes of gifted and talented girls in Mukumu girls high school, Kenya

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ABSTRACT

The study explored maths attitudes of gifted and talented students in form one, two and three of Mukumu girl High School. Eight of the nine domains of the Fennema-Sherman Mathematics Attitudes Scale (MAS) were used to survey the math attitudes of two hundred girls. The domains included; attitude towards success, mother's attitudes, father's attitudes, anxiety and motivation in learning math. K.C.P.E and present classroom/teacher scores are contrasted MAS. The study was based on Bandura's Social Learning Theory which emphasizes that much of learning of gifted and talented is mainly through observation and imitation. Questionnaire technique will be used to collect the data. Data collected was analyzed using SPSS with a predetermined alpha level of 0.5, and MANOVA. Results of the study may be used as a vehicle or catalyst for the implication of assisting children to enhance learning of the subject spawn discussion with counselors and others investigating the emotional and academic implications of the GT girls. The study recommends that policies be put in place to eliminate negative cultural teaching of mathematics through open-ended techniques.

Introduction

All of us do not have equal talents, but all of us should have an equal opportunity to develop our talent" .John F. Kennedy's words over 30 years ago echo the passion of researchers committed to gifted and talented education today. Thomas Jefferson once wrote that, ''There is nothing more unequal, than the equal treatment of unequal people.'' As Jefferson understood, equality does not represent the same concept as equity. Equality is fact, it means sameness, and it asks how similar people are to one another. Equity is a notion of fairness. In earlier times, girls did not attend because people presumed they could not grasp abstract concepts. In some areas, girls who demonstrated unusual capabilities, were feared as witches and put to death. Recently study of gifted and talented females has only been given more attention. The generalize study of giftedness began with Sir Francis Galton, who worked in 1869 examined individual differences and mental measurements. He furnished scientific proof of the prejudices that existed during his time. He invented a mental test, assessed over 9,000 participants, and reported men outperformed women on every dimension (Person, 1924). Terman studied and analyzed data for a group of student over their life- time, whereas Leta Hollingsworth simultaneously studied and developed curriculum for GT students. She believed that acceleration in homogenous groups provided an appropriate instructional program for GT children. Her instructional belief exists in programs for gifted and talented students today. Determined to dispel myths regarding women, she argued, "eminence and superior mental abilities are not identical" (Hollingsworth, 1926). Research contributions include information relative to the identification of GT learners, theories of giftedness, appropriate curriculum models, and gender differences. Studies in self-efficacy, math anxiety, and achievement of older students are prevalent in the literature (Ames, 1984; Reis, 1995). Given the current social and economic context, today's GT girl will enter work world if not out of choice, but economic necessity. She will do so in a world of uncertainties and a social context that is non-traditional (Seeley, 1987). Some doors will open; others closed (Betz & Hackett, 1 983). If we hope to open the career pipeline for GT, it is prudent to address their needs and gifts as children. GT girls constitute Kenya's largest group of gifted and talented underachievers who are highly motivated towards mathematics but lacks supports from the surroundings.

Haladyna, Shaughnessy & Shaughnessy (1983) encouraged researchers to determine the underlying causes of math attitudes. Many girls do well in math in primary school and join secondary school but after four years they score very low grades due to lack of motivation from their teachers, parents and school environment in total. This study explores the math attitudes of GT of form one in Mukumu girls using eight domains of MAS, K.C.P.E scores and present classroom marks. Researchers studying the psychology of women in the 1970s suggested that female intellectual development may adversely be affected when inconsistencies exist between intellectual excellence and traditional female sex-role expectations (Horner, 1972; Stein & Bailey, 1973).These expectations often interfere with the mathematical understating that is critical filter for entrance into careers (Sells,1973). For example, currently in Kenya C plus is a minimal requirement grade into the lowest colleges and mathematics is used to sieve out unwanted candidates. Attitudes affect studying and learning mathematics and in turn, affect learning (Tocsin & Engelhard, 1991). It is prudent to explore student attitudes toward mathematics to improve the learning of and benefit from math. Student's interactions and direct

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experiences affect attitudes (Triandis, 1971).Achievement in mathematics involve direct experiences, which provide the GT with information that affects their belief systems, feelings, and behaviors. GT girl experience the greatest difficult in schooling at key transition periods of secondary school hindering them to join careers there are require computation skills. An acute shortage of women in these fields may be attributed to poor self-concept regarding ability, as well as academic achievement In Kenya the disparities in girls performance in mathematics.

Finding balance between cognitive ability, developmental maturation, appropriate curriculum and motivational standards of GT girls is the importance of this study lies. Freeman (1979), believe individuals incorrectly presume that advanced intellectual ability implies a positive self- concept. In challenging that belief, she contends that the feeling actually fosters a sense of loneness and isolation. The stereotypical titles of, "egghead nerd" and others distress these children. Overemphasis by teachers and parents on intellectual performance actually produces a narrow orientation to life, a crippling sense of superiority, and alienation from other children (Hollingworth, 19942). They share a complex problem. When they maximize their potential, they feel different and socially penalized for acting, as though they are superior. Other children adults dislike self-aggrandizing children and as a result, their fragile sense is wounded by the social experiences, they encounter every day. They require assistance to obtain a balance view of their self-worth in a social as well as intellectual context (Janos, Fung & Robinson, 1985). Undertaking this study will lead to identifying attitudes and means of motivating GT girls in mathematics. The findings from the study will further be applied to other girls and boys who may be having similar problems.

Methodology

The study confined to Mukumu Girls because GT children have fundamental and universal characteristics and in every population, they contributed a percentage of 3-5%. Performance of GT has declined due to poor perception from the society. Different reasons contribute to poor performances as discussed in the conceptual framework.

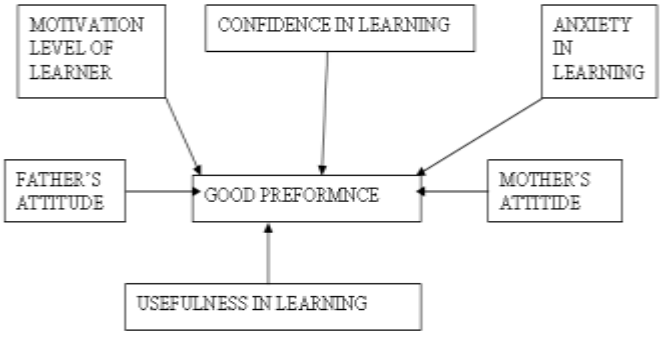

Figure 1: Model of independent and dependent variables of performance in mathematics.

The study used eight of the nine domains of the MAS as the investigative tool. Mukumu Girls' High School has 1080 students. Participants included all the students who scored above 70% in K.C.P.E, which constituted 201 students. The school, a full- time provincial boarding girl's school within mixed abilities students. When placed in a homogenous group with strong expectation of academic performance, gifted children thrive. Children thrive with high expectation. The Fennema-Sherman mathematic attitude scale (MAS) was used to measure attitude in mathematic. The scale developed in 1976 consists of nine likert typed domains that measures attitude related to the student perception of learning math. The domains are: (a) Attitudes toward success in math, (b) mother's attitudes towards math, (c) father's attitude towards math, (d) math anxiety, (e) motivation, (f)usefulness of math, (g) teacher's attitudes toward the learner, (h) confidence in learning math, and (I) math as a male domain (Broadbooks, Elmore, Pederson, & Bleyer, 1981). The definition of each scale dimension established contest validity. During the initial design phase, each author independently wrote items, the other author judged representing the dimension and the validity. The author selected items that measured an aspect of the domain and covering the range of the domain.

Researching Design

Classroom teacher administered the 96-items instrument to student on the on the same day for 30 minutes. A Fry, SMOG, and flesch-Kincaid readability study conducted on the instrument yielded a grade level readability of 3.8. Each of the students surveyed is reading at or above the fourth grade reading level. The readability study confirms appropriateness of the content for this study. Each domain contained 12 items. Six items were positive items and six were negative items. Descriptive and inferential statistics were used to analyse data.

Results

This study explored the math attitudes of 201 GT girls using the Fennema-Sherman Math Attitudes Scales (MAS).Data was collected in line with the questions:

(i)Is there any difference in scores of math attitudes of form one, two, three and four GT students on eight domains of the Fennema – Sherman Math Attitudes Scale?

Table 1 shows that means of each form varies from the other in each domain. Form two have the highest mean in attitude towards success (94.76), mother's attitude (95.63), math anxiety (83.53) and confidence in learning mathematics (90.58).Form three reflected a high mean in father's attitude (94.80) and motivation (84.76) while form one four scored highly in usefulness of the subject (95.74) and teacher's attitude (89.25) respectively. Therefore, the researcher rejects the null hypotheses that there is no significance in performance on MAS of GT.

(ii)Is there any relationship between K.C.P.E scores and math attitude of GT?

In table 2, there is significant relationship, between K.C.P.E. and MAS scores of GT students using Pearson correlations. There is high correlation of all domain with K.C.P.E scores, motivation came out as the factor highly positively correlating ($r = 0.945$). Usefulness was lowly correlated ($r = 0.707$) with K.C.P.E.

Therefore, the researcher rejects the hypotheses that there no relationship between K.C.P.E performance and performance in MAS of GT. Alternative is accepted since all correlation values are positive and more than 0.5.

(iii)How does the attitude affect the performance in mathematics among form one, two, three and four gifted girls?

Teacher's classroom scores were used to predict how attitude affects performance in mathematics. In table 2, student's attitude, father's attitude, teacher's attitude and mother's attitude indicated positive correlation. Therefore, the researcher rejected the hypotheses that there no significant relationship between the attitude of the student, parents and teachers and mathematics performance.

Data were collected on 201 of the GT students attending integrated education program at secondary school. The anxiety and motivation domain received the lowest score (58) and mean of 82.48 and 82.55 respectively indicating negative math attitudes by students who participated in the study. Anxiety and motivation emerged as significant findings. Mean scores and standard deviations are displayed in Table 3.

Total responses for surveyed population by form level. Performance in teachers test reflects the present attitude level of GT girls. Form four had the mean mark (88.63) meaning they have a positive compared to other forms.

Discussions and Conclusions

Each domain revealed specific insight related to particular attitudes. The attitude towards success domain measured the degree to which students anticipated positive or negative consequences because of their success in mathematics. The data from this study expands the findings Wilson, Stocking, and Goldstein (1993) found that math preferences might already be in place by the end of elementary school. This study confirms that by form one GT girls have specific attitudes related to mathematics. A study conducted by Miserandino (1996) investigated perceived competence and autonomy in above-average children and explored self-regulation to determine what above average children need to become oriented toward learning. Miserandino hypothesized that high ability children disengage from school if their competence or autonomy needs are unfulfilled. Investigating responses from all girls in the study indicated they do anticipate positive consequences because of success in math. This finding also concurs with conceptual understandings of Bandura's social learning theory.

Teachers have been found to believe and reinforce one of the most prevalent sex stereotypes—that males have more innate ability, while females must work harder. Fennema (1990), commenting on the role of teacher beliefs on mathematics performance, reported that, in a study she conducted with Peterson, Carpenter, and Lubinski, "teachers selected ability as the cause of their most capable males' success 58% of the time, and the cause of their best females' success only 33% of the time." They also concluded that even though teachers did not tend to engage in sex-role stereotyping in general, they did stereotype their best students in the area of mathematics, attributing characteristics such as volunteering answers, enjoyment of mathematics, and independence to males. Recent research has indicated that some teachers seem to expect less from females than they do from males, especially in regard to achievement in mathematics and science. Girls may internalize these lowered expectations very early in life to negative perception of the subject.

The confidence domain measured the confidence to learn and perform well on tasks. Data from this study supported earlier findings. Earlier studies found that even though they are successful in school, girls' confidence often remains low (Eccles, Adler, Futterman, Goff, Kaczala, Meece, & Midgley, 1985; Fennema & Sherman, 1976; Meyer & Fennema, 1990). If girls believe that they are incapable of performing well in math class, they may experience a sense of helplessness in the classroom (Covington & Berry, 1976; Dweck & Repucci, 1973). Previous research has found that some gifted girls lose, to varying degrees, their enthusiasm for learning and their courage to speak out and display their abilities. Some research and reviews of research (Arnold, 1995; Bell, 1989; Cramer, 1989; Hany,1994; Kramer, 1991; Leroux, 1988; Perleth & Heller, 1994; Reis & Callahan, 1989; Subotnik, 1988) have indicated that some gifted females begin to lose self-confidence in elementary school and continue this loss through college and graduate school.

These girls may grow to increasingly doubt their intellectual competence, perceive themselves as less capable than they actually are in mathematics, and believe that boys can rely on innate ability while they must work harder to succeed. Some of this research also indicates that girls try to avoid competition in order to preserve relationships; even if that means that they don't take the opportunity to use their skills.

Kline and Short (1991) found, in a review of the literature, that the self-confidence and self-perceived abilities of gifted girls steadily decreased from elementary grades through high school. Buescher, Olszewski, and Higham (1987) found gifted boys and girls were more alike than peers not identified as gifted except in one critical area- the recognition and acceptance of their own level of ability. Interviews with middle school gifted females revealed that girls avoid displays of outstanding intellectual ability and search for ways to better conform to the norm of the peer group (Callahan, Cunningham, & Plucker, 1994).This helplessness may lead to the phenomena of girls taking fewer high-level math courses. Gifted girls seem to be particularly vulnerable to cultural stereotyping when it comes to math. Spencer and Steel (1994), and this study suggest girls are frustrated with the difficulty of math problems. Likewise, Bandura (1986) found that frustration leads to performance impaling anxiety. Self-efficacy continues to predict performance even when the effects of anxiety are controlled. If indeed, the effect of anxiety should dissipate when self-efficacy precepts are controlled (Bandura, 1986). These two studies as well as this study demonstrate that we as educators are accountable for modeling, encouraging, and tying relevance to all aspects of mathematics for gifted students, especially gifted girls in secondary school.

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Table 1: Case of Summaries of Performance of MAS in Forms.

Case Summaries

stream (1-Form 1,2-Form two,3-Form three,4-Form four)		attitude towards success in mtath	Mother's math attitude	Father's Math attitude	Math anxiety	Motivation	Usefulness of math	Teacher's math attitude	Confidence in learning math
1	N	53	53	53	53	53	53	53	53
	Std. Deviation	6.79	7.13	8.98	12.71	11.48	7.01	11.59	13.74
	Mean	92.38	95.55	92.58	81.87	82.04	95.74	87.79	82.04
2	N	59	59		59	59	59	59	59
	Std. Deviation	6.04	6.48	8.94	13.05	11.29	7.62	12.88	10.83
	Mean	94.76	95.63	93.20	83.53	82.88	95.42	86.88	90.58
3	N	49	49	49	49	49	49	49	49
	Std. Deviation	8.25	7.27	6.45	13.11	12.48	7.86	12.63	11.20
	Mean	93.00	94.14	94.80	83.06	84.76	95.86	87.31	88.51
4	N	40	40	40	40	40	40	40	40
	Std. Deviation	7.53	7.60	7.22	12.76	11.48	8.29	10.00	13.03
	Mean	93.75	92.85	94.30	81.02	80.03	95.53	89.25	82.13
Total	N	201	201	201	201	201	201	201	201
	Std. Deviation	7.13	7.11	8.07	12.86	11.70	7.61	11.90	12.70
	Mean	93.50	94.69	93.65	82.48	82.55	95.63	87.70	86.14

Table 2: Summary of correlation among MAS

Correlations

		attitude towards success in mtath	Math anxiety	Usefulness of math	Confidence in learning math	K.c.p.e marks	Teacher's math attitude	Father's Math attitude	Motivation	Mother's math attitude	teachers /class scores
attitude towards success in mtath	Pearson Correlation	1.000	.940**	.937**	.954**	.849**	.974**	.981**	.950**	.978**	.926**
	Sig. (2-tailed)	.	.000	.000	.000	.000	.000	.000	.000	.000	.000
	N	201	201	201	201	201	201	201	201	201	201
Math anxiety	Pearson Correlation	.940**	1.000	.805**	.977**	.937**	.974**	.904**	.989**	.892**	.981**
	Sig. (2-tailed)	.000	.	.000	.000	.000	.000	.000	.000	.000	.000
	N	201	201	201	201	201	201	201	201	201	201
Usefulness of math	Pearson Correlation	.937**	.805**	1.000	.847**	.707**	.880**	.954**	.840**	.967**	.806**
	Sig. (2-tailed)	.000	.000	.	.000	.000	.000	.000	.000	.000	.000
	N	201	201	201	201	201	201	201	201	201	201
Confidence in learning math	Pearson Correlation	.954**	.977**	.847**	1.000	.906**	.992**	.922**	.974**	.916**	.951**
	Sig. (2-tailed)	.000	.000	.000	.	.000	.000	.000	.000	.000	.000
	N	201	201	201	201	201	201	201	201	201	201
K.c.p.e marks	Pearson Correlation	.849**	.937**	.707**	.906**	1.000	.893**	.803**	.945**	.788**	.968**
	Sig. (2-tailed)	.000	.000	.000	.000	.	.000	.000	.000	.000	.000
	N	201	201	201	201	201	201	201	201	201	201
Teacher's math attitude	Pearson Correlation	.974**	.974**	.880**	.992**	.893**	1.000	.939**	.974**	.937**	.949**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.	.000	.000	.000	.000
	N	201	201	201	201	201	201	201	201	201	201
Father's Math attitude	Pearson Correlation	.981**	.904**	.954**	.922**	.803**	.939**	1.000	.920**	.987**	.893**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.	.000	.000	.000
	N	201	201	201	201	201	201	201	201	201	201
Motivation	Pearson Correlation	.950**	.989**	.840**	.974**	.945**	.974**	.920**	1.000	.907**	.989**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.	.000	.000
	N	201	201	201	201	201	201	201	201	201	201
Mother's math attitude	Pearson Correlation	.978**	.892**	.967**	.916**	.788**	.937**	.987**	.907**	1.000	.878**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000	.	.000
	N	201	201	201	201	201	201	201	201	201	201
teachers /class scores	Pearson Correlation	.926**	.981**	.806**	.951**	.968**	.949**	.893**	.989**	.878**	1.000
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000	.000	.
	N	201	201	201	201	201	201	201	201	201	201

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

Table 3: Attitude towards success

	N	Mean	Std. Deviation	Minimum	Maximum
K.C.P.E. marks	201	77.42	5.21	69	100
Attitude towards success in math	201	93.50	7.13	68	100
Mother's math attitude	201	94.69	7.11	70	100
Father's Math attitude	201	93.65	8.07	69	100
Math anxiety	201	82.48	12.86	58	100
Motivation	201	82.55	11.70	58	100
Confidence in learning math	201	86.14	12.70	62	100
Usefulness of math	201	95.63	7.61	69	100
Teacher's math attitude	201	87.70	11.90	56	100
Teachers /class scores	201	79.85	9.69	60	100