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Characteristics of Females Studying Mathematics-Based Courses in Some Universities in Uganda

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Abstract: The study found out the characteristics of females who studied mathematics-based courses in some universities in Uganda. The study adopted the descriptive survey design with simple percentages used in analysing the data. One validated instrument (FSMRCQ) was used in collecting data for the study. The subject of the study was made up of 1000 female students studying mathematics related courses in some universities in Uganda. Results showed that the parent/guardian background and occupation, perceptions of mathematics teachers (male and female), students interest and performance in secondary school mathematics predispose girls to study mathematics related courses as parents/guardians were interested in the performance of their wards in mathematics and that female students can perform as good as male students in sciences and mathematics. It was recommended that policy makers and government should take into consideration these characteristics in order to encourage females to enroll in mathematics related courses in higher institutions.

Key words: Mathematics-based courses, Universities in Uganda, perception of mathematics teachers, students interest, female students

INTRODUCTION

There is a great deal of current interest in sex equity issues in mathematics education. This stems from the findings of Brophy (1985) that the mathematics achievement of female students is equal to that of male students for the first several years of schooling but then gradually falls relatively further behind throughout the junior and high school years. There is a wide range of factors which researchers like Bozimo and Bajah (1987) and Agholor (1994) have identified as influencing the level of representation of women in science and mathematics in Africa. These factors can be aggregated into four clusters: community, home, school and individual. Traditionally, the Nigerian indeed the African woman is assigned the role of managing the home front while the man is out all day winning bread for the family. In view of the important role of education in the development of science and technology, the persistently low enrolment in science, particularly the physical and applied sciences in secondary and tertiary institutions, these disparity and concern have aroused the scientific interest of science educators, researchers and policy makers Hadin, Hilderbrand and Klein (Raimi and Adeoye, 2003). Of greater concern is the under representation of females in scientific studies and careers Brush (Iroegbu, 1998; Raimi and Adeoye, 2003). This is a direct indication and under utilization of female talents which in turn affects the progress of scientific and technological development of nations. Efforts have and are still being made to get to the root of this problem.

In addition, there appears to be an ongoing debate in educational circle especially in Nigeria as to whether or not females are being discriminated against in terms of educational opportunities (Raimi and Adeoye, 2003). As at 2003, the number of females who proceed beyond secondary school level is <30% of the total number of school enrolment. Of this few, the number who pursue careers in the science and mathematics related courses are extremely low (Raimi and Adeoye, 2003). Majority of the girls no longer study mathematics and those who do continue to attain lower achievement scores than boys (Raimi and Adeoye, 2003). A number of researches have also been carried out in the past on the effect of gender many of which revealed that males tended to perform better than females especially with spacial and numerical problems while females perform better than males in verbal task (Hanish, 1985). Many other studies revealed no significant cognitive differences in science and mathematics (Burton, 1979; Oyedeji, 1996). Low participation of women in applied science and mathematics could be attributed to gender factor alone. Burton (1979) attributed part of these to affective factors that science and mathematics are seen as masculine subjects. The effect of gender on students learning outcome in mathematics and science is still a major point

of debate among educators. This is due to the conflicting nature of results from researches that focus on gender and mathematics. For instance, Okpala (1998) and Raimi and Adeoye (2003) have found significant gender-group difference in favour of boys. Studies such as that of Iroegbu (1998) do not establish such differences or at most found gender group difference to some levels of education and for some science topics only. Other studies have also reported the scarcity of girls and women in science and technology across African countries like Nigeria (Balogun, 1994; Oyedeji, 1996; Raimi and Akinyemi, 1997; Iroegbu, 1998; Okpala, 1998), Sierra-Leone (Raimi and Adeoye, 2003). Science and technology are seen as subjects which lead one to become an engineer, doctor, pharmacist, technologist or scientist working in a laboratory, since these professions are viewed to be male dominated, hence, few girls chose to study science with a view to taking up careers in science and technology related professions. In the early days of Western education in Nigeria, science subjects were not taught in girls schools. Instead subjects like hygiene, home management or domestic science and perhaps Biology were taught in girls' schools while boys offered a wide range of courses in the fields of engineering and medicine with subjects like Chemistry, Physics, further Mathematics, all of which were regarded as male preserves. The selectivity of choice of subjects for school certificate and in tertiary institutions was as a result of socialization and stereotyping that some occupations are feminine and others masculine. Gender stereo typing is still very much with us today and it may well serve as an inhibiting factor to science and mathematics education of girls and women (Balogun, 1994).

Gender differences in mathematics achievement appears to be due primarily to differences in beliefs about the relevance and importance of mathematics and in enrolment in mathematics courses which in turn are associated with differences in sex-role development that occur in responses to experiences in the society at large rather than to grossly discriminatory treatment by mathematics teachers (Brophy, 1985). Many research findings have lent support for the discrepancies between male and female students in mathematics achievement. Onibokun (1980) established a significant difference in the level of achievement motivation of boys and girls in favour of boys. Adigwe (1992) also investigated sex differences in chemical problem-solving achievement of Nigerian secondary school Chemistry students. For the study, he used 100 males and 100 females who were exposed to Chemistry achievement test after they had been taught using problem-solving. The result indicated that there were significant differences in achievement in favour of male on all the skills investigated. Balogun and Olanrewaju found that female students proved to be better problem-solvers than their male counterparts. Alebiosu (1998) found no significant interaction between the two sexes as far as achievement is concerned. Several studies have found that female students are less likely to attribute mathematics success to their own high ability and more likely to attribute failure in mathematics to low ability Esan (1999). On the basis of a review of number of studies concerning gender differences in Mathematics anxiety, there are evident differences between males and females in Mathematics anxiety and that researcher need to examine the reason females are more anxious about Mathematics than their male counterparts. However, the study conducted by Hyde *et al.* (1990) reached a different conclusion. They found that gender differences are small in size but that when differences do exist, females show more anxiety than males.

Many studies have been carried out in the past on factors affecting the performance of students in Mathematics at the different levels of our educational system. Prominent among the factors identified are poor instructional methods (Esan, 1999); fear of Mathematics and lack of problem solving abilities (Adeloye, 1999). With this, it appears that method of instruction, anxiety and gender shortcomings are still very much with us in African learning environment and are still militating factors to Mathematics education. The present study is interested in gender influence (especially on those female characteristics that predisposes them to taking mathematics related courses at tertiary levels) on the learning of mathematics in African educational setting where science and mathematics has masculine image and the traditional attitude of the society towards the education of children as to invest more on the education of boys than girls. This differential investment and other factors have resulted in unequal access in favour of boys to education, health and employment. With this, it appears that gender shortcoming is still very much with us in African learning environment and it may be a militating factor to science and mathematics education of girls (Erinosho, 1994). These researches however focus on the achievement of students as a whole and not on the females in particular hence the need to carry out more researches on the characteristics of females studying mathematics-based courses in some universities in Uganda and see whether the problems are local or universal.

MATERIALS AND METHODS

Rationale for the study: The rational for this study is based on the premise that there are not many girls in mathematics-based courses such as Pure and Applied

Mathematics, Physics, Applied Science, Science Education and Engineering and there are germane reasons that bother on national development that necessitates that this trend should change. Furthermore, there are efforts made by educators, government and non-governmental agencies, researchers, teachers to engage more girls in mathematics related courses, yet the gap between the male to female in such courses is still very wide.

Purpose: The research is an explorative research conducted to find out what factors social, psychological, personality and cultural variables that predispose girls to study mathematics based courses in some Ugandan universities. The need to focus on girls in particular is because their physiological and psychological dispositions to mathematics are very different to that of boys. Thus, there should not be more of the issue of comparing them with boys in research but finding out how to best motivate and improve their achievement based on their peculiar characteristics.

Research questions: The study sought answers to the following research questions:

- Do parent/guardian background and occupation predispose girls to study mathematics related courses in tertiary institutions?
- Do the perceptions of mathematics teachers (male and female) predispose girls to study mathematics related courses in tertiary institutions?
- Do students interest and performance in secondary school mathematics predispose girls to study mathematics related courses in tertiary institutions?
- What are the gender stereotypic behaviours that predispose girls to study mathematics related courses in tertiary institutions?

Study design: The study adopted the descriptive survey design using ex-post facto type. This is because the researcher had no direct control over the independent variables as they had manifested already.

Population: The population for the study were female students in some public and private universities in Uganda like Makerere University, Kyambogo University, Bugema University, West Ankole University, Christian University-Mukono, Mountain of the Moon University Fort Portal, Kabale University-Kabale, Mbarara University of Science and Technology and Kampala International University who are studying the following courses Mathematics (Pure, Applied and Education), Physics (Pure, Applied and Education), Engineering (all fields), Pure and Applied Sciences. From the questionnaires that were administered, one thousand (1000) were retrieved from the various universities covered.

Instrument: The main instrument used to collect data is a questionnaire named Female Students Studying Mathematics Related Courses Questionnaire (FSMRCQ) which has various parts covering the variables in the study. The variables include personality type, locus of control, gender stereotypic behaviours, parental influence and background, perception of mathematics teachers, type of school attended. The instrument was validated using Cronbach alpha coefficient and the calculated value was 0.67.

RESULTS AND DISCUSSION

The results of the findings showed that most of the students 510 (51%) were studying applied sciences like Pharmacy, Medicine, while 280 (28%) were studying science education like Mathematics, Biology, Chemistry, Physics and Integrated science, 140 (14%) were studying various engineering courses like Mechanical, Civil, Electrical, Water, Computer and Information Technology, Building, Industrial Ceramics and 70 (7%) were studying pure and applied mathematics. These results showed that most of the respondents do not like the pure and applied science-based courses but preferred the medical and related disciplines. This is in agreement with the findings of Balogun (1994), Oyedeji (1996), Raimi and Akinyemi (1997) and Iroegbu (1998). Amara, (Raimi and Adeoye, 2003) who reported the scarcity of girls and women in science and technology across African countries.

The age range of the students was between 18 and 39 years. Socially, most of the students 620 (62%) were extroverts while 380 (38%) were introverts. This is in consonance with Letth (1973) who opined that extroverts do better on more ambiguous tasks in loosely structured learning situations whereas introverts are more successful in closely guided sequences of learning. He also asserted that the success of extroverts and introverts in school learning situations is related to the methods of instruction used and argues for the possibility of adapting teaching methods to different kinds of pupils. The blood groups of the students who are in the O groups were 690 (69%) while the A group types were 140 (14%), the B group were 110 (11%) and the AB group were 60 (6%). This is not in agreement with Bendow and Bendow (1984) who found out that blood type did not relate to intellectual precocity. Do parent/guardian background and occupation

predispose girls to study mathematics related courses in tertiary institutions? The following results answered this question. Majority of the students 750 (75%) lived with both parents, while 120 (12%) students lived with their mother only and 80 (8%) lived with their father only with 50 (5%) students living with their guardian. Most of the students 730 (73%) classified their parents to be democratic while 140 (14%) classified their parents to be autocratic and 120 (12%) classified their parents to be the laizze fair type. The fathers educational background of the students revealed that 420 (42%) had first degree, 250 (25%) had secondary education, 190 (19%) had higher degrees, 90 (9%) had primary education only, while 50 (5%) had no formal education. The mothers educational background of these students showed that 380 (38%) had first degree, 240 (24%) had secondary education, 150 (15%) had higher degrees, 110 (11%) had primary education while 120 (12%) had no formal education. These results vividly revealed that the parents of the respondents were averagely educated and as such had a good knowledge of educating their wards. They know the importance of education and as such could be responsible for encouraging their wards to achieve better than themselves. On the occupation of the parents/guardian from the father's side, the results showed that 310 (31%) were bankers, engineers, lecturers or lawyers; 240 (24%) were industrialists, business men or philanthropists; 270 (27%) were secondary school teachers, clergymen, police officers or small businessmen; 70 (7%) were tailors (fashion designers), drivers or barbers while 110 (11%) had no jobs. For the mother's occupation, the results showed that 350 (35%) were secondary school teachers, police officers and clergy women; 290 (29%) were bankers, engineers, lecturers and lawyers; 100 (10%) were industrialists and philanthropists; 90 (9%) were drivers, tailors (fashion designers) and hairdressers while 170 (17%) had no jobs. On the parents/guardian interest in mathematics the results showed that 500 (50%) were high, 390 (39%) were fair and 110 (11%) were low. This showed that the parents had interest in mathematics. On the area of parents/guardian area of profession, most of the parents/guardians' profession were mathematics related 630 (63%) while 370 (37%) were not mathematics related. The summary of the findings showed that the parent/guardian background and occupation predispose girls to study mathematics related courses in tertiary institutions. On the type of secondary school attended, 570 (57%) went to girls only while 430 (43%) went to mixed school. The average class size above 60 students in a class was 400 (40%), between 41-60 students was 300 (30%), between 25-40 students in class was 270 (27%) and <25 students in class was found to be 30 (3%). The number of arms of each class showed that for >3 arms, there were 260 (26%), 3 arms were 250 (25%), 2 arms were 300 (30%) and an arm was 190 (19%). The results showed that majority of the students went to girls school only and the class size of the school was large. This in effect can affect the performance of students because the teacher will not be able to give individual attention to students because of large class. This is in agreement with Bennett (1987) that smaller classes result in increased student teacher contact; smaller classes appear to result in greater achievement gains for students with lower academic ability and for those who are economically or socially disadvantaged; classroom management improves in smaller classes (fewer discipline problems); smaller classes result in higher teacher moral and reduced stress; individualization is more likely to occur in smaller classes and very small classes of five or fewer students produce considerable higher achievement.

Do the perceptions of mathematics teachers (male and female) predispose girls to study mathematics related courses in tertiary institutions? The results of the following findings answered this question. On the number of teachers that are available to teach, the results showed that 470 (47%) had no mathematics teacher in their schools, 320 (32%) had one mathematics teacher for all the classes, while 210 (21%) had one mathematics teacher for each class. There were 460 (46%) male and female mathematics teachers available in some schools, 410 (41%) male mathematics teachers available in some schools and 130 (13%) female mathematics teachers in some schools. The students opinion about the competence of their mathematics teacher revealed that 950 (95%) of their mathematics teacher were very good in mathematics and only 50 (5%) were weak in mathematics. Furthermore, the results revealed that the students view of their mathematics teacher showed that 700 or 70% of their teachers knows mathematics well and teaches well, while 250 or 25% of their teachers teaches well but weak in mathematics and 50 or 5% knows mathematics but teaches badly.

The results also showed that the students perception of their female mathematics teachers revealed that 540 or 54% of their female mathematics teachers are not as good as their male mathematics teachers. The results showed that 360 or 36% of the respondents perceived that their female mathematics teachers are as good as their female mathematics teachers while 70 or 7% were of the view that their female mathematics teachers are better than their female counterpart. On the perception of how good female mathematics teachers are compared to their male counterparts in the subject matter, many of the

respondents (690 or 69%) agreed that the female mathematics teachers are not as good as their male counterparts while 310 or 31% of the respondents do not agree with this. On the question of why most female teachers don't have good teaching methods, 570 or 57% of the respondents do not agree with this view while 430 or 43% were in support of this assertion. These results showed that female mathematics teachers have good teaching methods. On whether female mathematics teachers are better in mathematics because they are easy to approach, 530 or 53% respondents do not agree with this while 470 or 47% strongly agree with this assertion. This showed that even though female mathematics teachers are easy to approach, they are not better than their male counterparts. Most male students 570 (57%) find female mathematics teachers approachable than male mathematics teachers. From the results before, the perceptions of mathematics teachers (male and female) predispose girls to study mathematics related courses in tertiary institutions.

Do students interest and performance in secondary school mathematics predispose girls to study mathematics related courses in tertiary institutions? The findings below answered the question. Majority of the students 710 (71%) general performance in secondary school was very good while 240 (24%) was fair and only 50 (5%) was very poor.

This is an indication that generally the students performances were not bad at all. Most of the students performances in mathematics were very bad, as 700 (70%), while 300 (30%) of the students performances in mathematics were good. Many 720 (72%) of the students interest in mathematics were good while few of them 280 (28%) do not have interest in mathematics. Many 680 (68%) of the students interest and attitude towards solving mathematics problems were poor while few 320 (32%) of them had good interest and right attitude towards solving mathematics problems.

Many 560 (56%) of the students interest and attitude towards applying mathematics concepts to solve everyday life problems is good, while those who do not have the right attitude in applying mathematics concepts to everyday life problems are 440 (44%). Generally, majority 720 (72%) of the students best subject in secondary school were science subjects like mathematics, Chemistry, Physics, Biology, while some 180 (18%) of the students best subjects were arts subjects. Very few 100 (10%) of the students best subjects were social science subjects. The results generally showed that students interest and performance in secondary school mathematics predispose girls to study mathematics related courses in tertiary institutions.

What are the gender stereotypic behaviours that predispose girls to study mathematics related courses in tertiary institutions? This question was answered with the following findings:

When asked whether they can compete with any student in their level in secondary school mathematics, majority 870 (87%) of the students confirmed that they can compete with any of their colleagues in mathematics while only 130 or 13% said they cannot compete with their colleagues in mathematics. Many 580 (58%) of the students believed that male students are better than female students in science and mathematics while 420 or 42% do believed that female students are better than male students in science and mathematics. Majority (820(82%)) of the students believed that female students can withstand the rigour of mathematics in higher institutions, while 180 or 18% believed that female students cannot stand the rigour of mathematics in higher institutions. Majority 920 (92%) of the students believed that female students can perform as good as male students in sciences and mathematics, while only 80 or 8% believed that female students cannot perform as good as their male counterparts in sciences and mathematics. The results further showed that male students are better in mathematics and science related jobs than female students according to the respondents of the students 600 (60%). These results agrees with the findings of Hanish (1985) that males tended to perform better than females especially with spacial and numerical problems while females perform better than males in verbal task. The results also showed that there is no job a man can do that a woman cannot do as per the respondents of the students 760 (76%), while 240 (24%) responded that there are jobs a man can do that a woman cannot do.

Many of the students, as 630 (63%) believed that their performance in secondary mathematics were low because of some factors beyond their control while 370 or 37% believed that their performance in secondary mathematics were not low because of some factors beyond their control. Few 180 (18%) of the students hate mathematics because their teachers and parents did not encourage them while majority 820 (82%) of the students do not hate mathematics because their teachers and parents don't encourage them. Majority 910 (91%) of students do not believe that they could have done better if they are male children while only 90 or 9% believed that they could have done better if they have been male children. Many 700 (77%) of the students believed that they would have done better if they studied well while 300 or 23% believed otherwise. These results agrees with that of Burton (1979) who attributed part of these to affective factors that science and mathematics are seen as masculine subjects.

CONCLUSION

The findings from the study have clearly shown that many of the females prefer to study the medical and related disciplines and do not like the pure and applied science-based courses. There may be the social status factors that may be responsible for this. Parents/guardians were more interested in the performance of their wards as can be seen in their interest in mathematics related profession. The perception of female/male teachers by the respondents gives an indication of the performance of the students in mathematics as some of them prefer male mathematics teachers to their female counterparts. Generally, the students believed they can perform better than their male counterparts. It is therefore recommended that these characteristics exhibited by females who go on to study mathematics related courses in universities in Uganda should be taken into consideration by the stakeholders in education in order to encourage females to study these courses. This may encourage females and increase their enrolment in tertiary institutions.

REFERENCES

Adeloye, J.A., 1999. Towards a realistic participation of women in technological education in the 21st century and beyond. Guidance Factor JOWICE, 3: 109-113.

Adigwe, L., 1992. Casual Inference is Non–Experimental Research. University of North Caroline Press, Chapel Hill, pp: 240–244.

Agholor, R.N., 1994. Motivating African girls to study science. Proceeding of the International Conference on Science Education in Developed Countries, Jan. 3-7, Jerusalem, Israel.

Alebiosu, K.A., 1998. Effect of two cooperative hearing models on Senior secondary school students learning outcomes in chemistry. Ph.D. Thesis, University of Ibadan.

Balogun, T.A., 1994. Gender Issues in the Teaching of Science, Technology and Mathematics. In: Perspectives on Women in Science and Technology in Nigeria, Erinosho, S.Y. (Ed). Sam Bookman Educational and Communication Services, Ibadan, pp: 36-41.

Bendow, C.P. and R.M. Bendow, 1984. Biological correlates of high mathematical reasoning ability. Prog. Brain Res., 61: 469-490.

Bennett, S., 1987. New dimension in research on class size and academic achievement. University of Wisconsin, Madison. http://www.eric.ed.gov/ERICWebPortal/custom/portlets/recordDetails/detailmini.jsp?_nfpb=true&_&ERICExtSearch_SearchValue_0=ED288854&ERICExtSearch_SearchType_0=no&accno=ED288854.

Bozimo, H.I. and S.T. Bajah, 1987. Low participation of girls in STM education strategies for redress. Report of the National Workshop on Promoting STM Among Girls and Women in Nigeria, pp: 45-54.

Brophy, J., 1985. Sex difference in problem solving as a function of problem context. J. Educ. Res., 65: 451-452.

Burton, G., 1979. Regardless of sex. Mathematics Teacher, 72: 261-270.

Erinosho, L., 1994. Perspectives on Women in Science and Technology in Nigeria. Sam Bookman, Ibadan.

Esan, A.O., 1999. Effects of cooperative and individualistic problem–solving strategies on students learning outcomes in secondary school mathematics. Ph.D. Thesis, University of Ibadan, Ibadan.

Hanish, D.L., 1985. Cross-natural difference in mathematics and achievement among 17 year olds. J. Educ. Dev., 6: 223-244.

Hyde, J.S., E. Fennema, M. Ryan, L.A. Frost and C. Hopp, 1990. Gender comparisons of mathematics attitudes and effects. A meta–analysis. Psychol. Women Q., 14: 299-324.

Iroegbu, T.O., 1998. Problem based learning instructional strategy and numerical ability as determinants of senior secondary students achievement in Physics. Stud. Curriculum, 2: 54-56.

Letth, G.O.M., 1973. The effects of extroversion and methods of programmed instruction on achievement. J. Educ. Res., 15: 150-153.

Okpala, P.N., 1998. Student factors as correlates of achievement in physics. Phys. Educ., 6: 361-365.

Onibokun, O.M., 1980. Achievement motivation, disparity between boys and girls in a Nigerian setting. West Afr. J. Educ., 21: 108-112.

Oyedeji, O., 1996. Assessing gender factor in some secondary mathematics textbooks in Nigeria. Zimbabwe J. Edu. Res., 8: 45-53.

Raimi, S.M. and F.A. Adeoye, 2003. Gender differences among college students as determinants of performance in integrated Science. Afr. J. Educ. Res., 8: 41-49.

Raimi, S.M. and S.A. Akinyemi, 1997. Parental socio-economic status and pupils sex as determinants of achievement in primary science. Being a Paper Presented at the 1st National V\Conference FCE Osiele, Abeokuta, Nigeria.