PRINT: ISSN 0975-1122 ONLINE: 2456-6322
Int J Edu Sci, 3(1): 15-20 (2011)
DOI: 10.31901/24566322.2011/03.01.03

Mathematics Education in Nigeria: Gender and Spatial Dimensions of Enrolment

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KEYWORDS Gender and Spatial Patterns. Geo-political Zones. Counseling. Tertiary level of Education

ABSTRACT Mathematics is an essential course for scientific and technological development of any country. Literature indicates low enrolment of students in Mathematics Education when compared with other courses in Social Sciences and Arts, especially at the tertiary level of Education. This development is viewed with grave concern for teaching and learning of Mathematics in schools. In view of this, the study examines the spatial and gender patterns of students' enrolment for Mathematics Education in Nigerian Universities. This is with a view to identifying areas of deficiencies in order to adopt appropriate strategies in teaching and learning of Mathematics and improve the enrolment for Mathematics Education in Nigerian Universities. The study obtained data from six Universities randomly selected from each of the six geo-political zones in Nigeria. The data collected were analyzed using both the descriptive and inferential statistics. The results show significant gender and spatial differences in the enrolment for Mathematics Education in Nigerian Universities. Based on these findings, the study recommends some strategies for bridging the gap in students' enrolment for Mathematics Education. These include provision of incentives and counseling services to students at both secondary and tertiary levels of Education.

INTRODUCTION

National development is a collective responsibility, which requires the collective efforts of citizens, irrespective of diversities. The development of countries like the United States of America, China, Japan and Britain can largely be attributed to the contributions of educated male and female citizens of the nations. In Nigeria, one of the aims of establishing the Universities is to equip students with necessary skills and knowledge required for accelerated growth. Specifically, the Federal Republic of Nigeria (2004) clearly states that tertiary Education is designed to equip the citizens with high level skills required for national development. However, due to low level of women Education, Nigerian women seem to be lagging behind in terms of contributing to the political, economic and social developments of Nigeria. Imogie (2007) noted that the way the society treats the women determines the extent to which they can exhibit their potentials and contribute to national development. Earlier, Betiku (2002) stated that countries that raised the status of women educationally, socially, politically and economically generally enjoy a high standard of living, while countries where women are largely illiterate and confined to the home have a lower standard of living.

One of the factors that have contributed to disparity in the empowerment of male and female groups is gender stereotyping. Imogie (2007) observed that in Nigeria, people associate certain professions with males and regard females in "male-labeled" professions as abnormal and vice versa. For instance, in the northern part of Nigeria, many females are denied access to education, while in the eastern part, the males are the victims. The disparity in the treatment of males and females has denied the two groups access to education, which is the key to human development. Egbochuku and Alika (2008) noted that education transforms and builds in individuals the capacity to acquire appropriate information, skills and competence for personal survival and the development of the society. The researchers stressed that education closes the door to poverty, ignorance and opens the door to economic, social and political developments. The Review and Appraisal of the Beijing Declaration and Platform for Action and the Outcome Document of the Twenty-Third Special Session of the General Assembly indicated that education and training of girls and women is a human right and an essential element for the full enjoyment of all other social, economic, cultural and political rights. The Millennium Development Goals, the EFA and Dakar goals, and the Beijing Platform have consistently placed emphasis on the importance of promoting gender equality in

education and advancement of women (Women Watch 2005).

Olawoye and Salman (2008) described the education of the girl-child as an indispensable vehicle for national development. According to the researchers, education is the most veritable means of social growth; a formidable force, as well as a reliable and essential instrument for national development. The researchers noted that women are also citizens of the nation and thus deserve to acquire education, which is a powerful weapon of development. Yahaya (2004) observed that there is the need for provision of educational opportunities to Nigerian citizens irrespective of gender and other diversities. He explained further that this is necessary because both the males and the females make up the population of Nigeria and the duo have the potential of contributing positively to the development of the society.

Salman (2001) observed that Mathematics is the most dreaded subject by pupils and students. According to her, the enrolment of undergraduates in Mathematics is relatively low when compared with other courses. However, the knowledge of Mathematics is highly required in the study of social science, science and technology courses. Thus, students irrespective of gender need to be encouraged. Salman (2001) explained further that there are two categories of undergraduates of Mathematics. These are undergraduates of Mathematics Education and undergraduates studying Mathematics as a major course. The Mathematics Education undergraduates combine education with the study of Mathematics courses. Mathematics Education is a program run by Nigerian Colleges of Education and Faculties of Education of Nigerian Universities. The program involves combination of Mathematics with any of Chemistry, Physics and Statistics among others. The undergraduates running this program at the College of Education and University levels are trainee Mathematics teachers who are expected to teach Mathematics at primary and secondary school levels. These categories of undergraduates, at the completion of their program are regarded as professionally qualified teachers to handle the teaching and learning of Mathematics in Nigerian primary and secondary schools.

The 2006 Nigerian National Housing and Population Census put the population of Nigeria at 140, 003, 542 out of which about 49% are females (Federal Government of Nigeria 2007). The females constituted about 49% of the total population. Yahaya (2004) stressed that although the females constituted about 50% of the national population, they are not equitably represented in student enrolment at the institutions of higher learning in Nigeria. For instance, the workforce of the Nigerian Federal Civil Service comprises 76% males and 24% females; 17.5% of the Medical Doctors in Nigeria are women while 82.5% are men. Among the 70% of the Nigerian population estimated to be living below poverty line, over 65% are women (Federal Ministry of Women Affairs and Social Development 2006). Olawoye and Salman (2008) noted that participation of females in the study of Science, Technology and Mathematics, particularly at the institutions of higher learning has been an issue of concern in developing countries like Nigeria. The females in most cases are preferred to study courses in Social Sciences, Arts and Humanities at the institutions of higher learning. This could be attributed to the belief that Sciences, Technology and Mathematics are for the males and the few gifted ones among the females.

Research reports have also indicated gender disparity in the enrolment of undergraduates in Sciences, Technology and Mathematics. Adeyemi and Akpotu (2004) conducted a study on the trend and pattern of gender enrolment in Nigerian Universities. The study showed gap between male and female enrolment with lower female enrolment in all aspects of the Universities. The study also indicated a wide gap between science and non-science-based disciplines as well as between the northern and southern parts of Nigeria. Similarly, Oke (2000) and Salman (2001) reported low enrolment of females in science and technology related courses at the university level of education. It is observed that females take the least resistance by opting for disciplines designated as feminine such as liberal arts, education, nursing and shy away from courses in Sciences, Engineering, Medicine and Mathematics. For instance, the enrolment of undergraduates in Mathematics Education at Nigerian Colleges of Education and Universities is relatively low and this affects the annual turnout of professionally qualified teachers to handle the teaching of Mathematics in schools. An example of low enrolment in Mathematics Education in a College of Education and a University in Nigeria is presented in table1.

Table 1: Students' enrolment in mathematics education at a College of Education and a university (2003-2009)

Year	*College of education*		*University*	
	M (%)	*F (%)*	*M (%)*	*F (%)*
2003/2004	28 (96.55)	1 (3.45)	66 (70.21)	28 (29.79)
2004/2005	40 (93.02)	3 (6.98)	13 (61.90)	8 (38.10)
2005/2006	35 (92.11)	3 (7.89)	15 (68.18)	7 (31.82)
2006/2007	117 (90.70)	12 (9.30)	14 (60.87)	9 (39.13)
2007/2008	45 (88.24)	6 (11.76)	21 (70)	9 (30)
Total	265 (91.4%)	25 (8.6%)	129 (67.9)	61 (32.1%)

Sources: College of Education Lafiaji, and University of Ilorin, Nigeria

Yahaya (1999) identified the factors militating against the empowerment of Nigerian women as ignorance, illiteracy, sex stereotype, rivalry among women, religious and cultural beliefs and poor economic base. Similarly, Okebukola (2002) noted that low level of female representation of Nigerian women in science education is largely caused by factors such as the community, the home, the school and the individual. Imogie and Eraikhuemen (2008) observed that one of the major factors hindering women empowerment is low enrolment of women in science and technology courses. According to them, there is need to examine carefully not only whether women are learning or not but also what they are learning and what they are avoiding or being discouraged from pursuing.

In its National Gender Policy, the Federal Government of Nigeria (2007) indicates commitment to building a nation devoid of gender discrimination, guaranteeing equal access to political, social and economic wealth creation opportunities for women and men, and developing a culture that places premium on the protection of all including the children (Federal Ministry of Women Affairs and Social Development, 2006). In order to achieve the laudable objectives women education needs to be promoted not only at the primary and secondary school levels but also at the tertiary level. Since Mathematics Education is a critical variable in the development of any nation, this study attempts to provide answers to the four research questions.

Research Questions

The following research questions were raised for the purpose of the study:

1. What is the gender dimension of undergraduate enrolment in Mathematics Education in Nigerian Universities?
2. What is the spatial dimension of undergraduate enrolment in Mathematics Education in Nigeria Universities?
3. Is there any difference in the enrolment of undergraduates in Mathematics Education in Nigerian Universities based on gender?
4. Is there any difference in the enrolment of undergraduates in Mathematics Education in Nigerian Universities based on spatial dimension (geo-political zone)?

Research Hypotheses

Based on the last two research questions the following research hypotheses are formulated:

1. There is no significant difference in the enrolment of undergraduates in Mathematics Education in Nigerian Universities based on gender.
2. There is no significant difference in the enrolment of undergraduates in Mathematics Education in Nigerian Universities based on geo-political zone.

METHOD

The research method adopted for this study is descriptive survey. The researchers obtained data from one randomly selected university from each of the six geo-political zones in Nigeria giving a total of six universities. The north-east was represented by the Federal University of Technology, Yola, and north-west by Usmanu Danfodio University, Sokoto and north central by University of Ilorin. The south east was represented by Enugu State University, south-west by University of Ibadan and the south-south by University of Porthacourt. Data were collected on students' enrolment in Mathematics Education from each of the six selected institutions for a period of five years (2003-2009). The collected

data were analyzed with the use of frequency count, percentages and chi-square.

DATA ANALYSIS

Research Question One

Table 2 indicates that 690 (71.58%) of the undergraduates that enrolled for Mathematics Education in the selected universities are males while only 274 (28.42%) are females.

Table 2: Enrolment of undergraduates in mathematics education based on gender

	Male	*Female*	*Total*
Number	690	274	964
Percentage	71.58	28.42	100.00

Research Question Two

Table 3 indicates that the selected universities from the south east, south west and north east have the least percentages of undergraduates' enrollment in Mathematics Education between 2003 and 2009.

Table 3: Enrolment of undergraduates in mathematics education based on geo-political zone (2003-2009)

S. No.	*Geo zone*	*Total recorded students from 2003-2009*	*%*
1	NC	250	25.93
2	NE	66	6.85
3	NW	420	43.57
4	SE	29	3.01
5	SW	51	5.29
6	SS	148	15.33
	Total	964	100.00

Research Question Three (Hypothesis 1)

Table 4 indicates a chi-square analysis of undergraduates' enrolment in Mathematics Education based on gender. The table shows a computed chi-square value of 131.24 and a tabulated value of 11.07 at 0.05 alpha level. This is an indication that there is a significant difference in undergraduates' enrolment for Mathem-atics Education based on gender.

Research Question Four (Hypothesis 2)

Table 5 indicates a chi-square analysis of undergraduates' enrolment in Mathematics Education based on geo-political zone. The table shows a computed chi-square value of 707.80 and a tabulated value of 1.145, which is an indication that there is a significant difference in undergraduates' enrolment in Mathematics Education based on geo-political zone.

Table 4: Chi-square value comparing undergraduates' enrolment in mathematics education based on gender

Gender	*Observed value*	*Expected value*
Male	690	689.99
Female	274	274.01
Total	964	964

***** = Significant at 0.05 alpha level
Computed $\div^2$ = 131.24 and $\div^2$ tabulated = 11.07

Table 5: Comparison of undergraduates' enrolment in mathematics education based on geo-political zone (2003-2009)

S. No.	*Geo Zone*	*Observed*	*Expected*	*Total*
1	NC	250	160.67	410.67
2	NW	420	160.67	580.67
3	NE	66	160.67	226.67
4	SW	51	160.67	211.67
5	SE	29	160.67	189.67
6	SS	148	160.67	308.67
Total		964	964	1928

Computed $\div^2$ (707.801) > $\div^2$ tabulated (1.145)

DISCUSSION

The findings of the study corroborated earlier assertions of Salman (2001), Olawoye and Salman (2008) and Adeyemi and Akpotu (2004) that male students were more in the quantitative related courses than the females. For the 2003/ 2004 to 2007/ 2008 academic session, the ratio of male to female undergraduates in Mathematics Education is about 3:1 and this is not different from the findings of Salman (2001) and Okebukola (2002). This also confirms the findings of Okebulola (2002) that science/mathematics related courses or disciplines are "arid zones" for females. This finding may be related to the fact that science and mathematics related courses are still considered "male courses" in Nigeria.

The study also showed that across the six geopolitical zones in Nigeria, the number of undergraduates that enrolled for Mathematics Education in the selected universities is still very low when compared with the need for Mathematics teachers in Nigerian schools. Olawoye and

Salman (2008) reported that Nigerian students have negative attitude towards Mathematics related courses. This finding therefore could also be attributed to the negative attitude of Nigerian students to Mathematics, which is considered to be a difficult and an abstract course.

The study indicated a significant difference in undergraduates' enrolment in Mathematics Education based on gender. This confirms the assertion of Imogie (2007) and Salman (2001) that females are under-represented in enrolment into science and Mathematics related courses in Nigerian institutions of learning. The disparity in enrolment could be due to several factors earlier identified by Yahaya (1999, 2004), and Imogie and Okebukola (2004).

The finding of the study also showed a significant difference in the enrolment of undergraduates in Mathematics Education based on geo-political zone. The six universities selected from the six geo-political zones in Nigeria differed significantly in enrolment. This finding supports the earlier study of Adeyemi and Akpotu (2004), which indicated a wide gap between different zones in Nigeria in terms of enrolment in science and Mathematics related courses. The finding may be due to stereotype and parental influence on students' choice of subjects and careers.

CONCLUSION

The study indicated that only very few male and female undergraduates enrolled for Mathematics Education in Nigerian Universities. It also showed that male undergraduates out-numbered their female counterparts in enrolment for Mathematics Education programs. There is therefore an urgent need to address this concern in order to promote science and technological development in Nigeria, since the bedrock of all science and technological related courses is Mathematics.

RECOMMENDATIONS

Based on the findings of the study, the following recommendations are considered relevant:

- The three tiers of government in Nigeria should provide employment to Nigerian female youths who studied either Mathematics or Mathematics Education in order to encourage more females to study Mathematics.
- Mathematics teachers at different levels of Education should create a conducive learning environment for the female students to enhance their academic performance in Mathematics.
- Mathematics curricula and teaching methods should be designed in such a way that gender issues are addressed.
- Women should form networks and encourage the females to study Mathematics through award of scholarships and grants to indigent but brilliant female undergraduates studying Mathematics or Mathematics Education.
- Professional Associations such as Mathematics Teachers' Associations should feature and promote successful female mathematicians. Internal networks for the career development of the younger women who show interest in Mathematics should be develop
- Tertiary institutions in Nigeria should establish counseling centers and encourage professional counselor educators to organize guidance for female youths on career choice and relevance of Mathematics to national development. This is to erase the impression that the study of Mathematics is for the males and encourage the female youth to contribute to national development.
- Nigerian universities should give special awards to female youth who have flair for Mathematics and Mathematics Education. This could take the form of "automatic employment" or award of scholarships for further studies in areas of Mathematics.
- Seminars and workshops should be organized to enlighten parents on the need to allow their children to study courses of interest rather than being forced into "female tagged professions".
- Nigerian colleges of Education and universities should lower their cut off marks in the post UME assessments for females that apply to study Mathematics in order to improve female enrolment in the programs.

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