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Gender Bias in Primary School Mathematics Textbooks in Nigeria

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Abstract

Mathematics textbooks are embedded with bias in favour of male characters which affects the self-esteem and self-confidence of female students. The study examines gender bias in primary schools mathematics textbooks in Nigeria. Content Analysis approach that involves the Descriptive Statistics tool was used to count the number of male and female and gender neutral characters. The frequency and percentage of male and female gender characters, and gender neutral characters were calculated. The findings of the study revealed that there is gender bias in favour of more male characters with prejudice to female ones in the two textbooks, especially more so in primary 5 mathematics textbook than primary 6. Based on the findings of the study, it was recommended that there is the need to create awareness of the existence of gender bias in mathematics textbooks through workshops and seminars for teachers, curriculum planner, policy makers and authors.

Keywords

Gender Bias, Gender Neutral Character, Content Analysis, and Mathematics Textbooks

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1. Introduction

Gender bias in learning materials such as textbooks has been a global issue in research over the years both in developed and undeveloped countries (Oyebola, 2003; Carthon, 2003; McDonnell, 2007; Plumm, 2008; Mustapha, 2012; Ghavbavi and Mousavi, 2012; Zilimu, 2014). Mathematics textbooks are important instruments used in teaching and learning at all levels of education in Nigeria. The textbooks are used by both teachers and students, and are equally powerful representations of the curriculum and the pedagogical practices at all levels of education. Moroava and Novotna, (2013) argued that mathematics textbooks are embedded with gender discrimination in the form of stereotypical roles, omissions, or degradations. As such Tiertz, (2007) argued that the instructional materials should balance gender representation in illustrations and texts that will help male and female students to relate to the materials presented.

The gender biased representations in textbooks continue to exist despite the (CEDAW) condemnation of textbooks that have stereotypical on gender roles as reported by Mkuchu, (2004). In addition, Brugeilles and Cromer, (2009) observed that bias is embedded in the content of the texts and pictures. Just like other studies, Davies, (1995) pointed that gender bias created a view to male activities being of primary importance and the greatest value, while female activities are marginalised which made them invisible or downgraded.

Modibe (2012) argued that textbooks need to be reviewed with gender perspectives in order to provide balance and gender sensitive education to all children. He further emphasized that authors of textbooks should be fully be aware of the negative effects of stereotypes and gender bias to students when writing a textbook.

Students spend most of their lives in school using mathematics textbooks. They learn basic skills and also formulate attitudes and behaviour from what they have read

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in the textbooks. Sadker and Zittleman, (2007) found out that 75% of a child's class work and 90% of the homework are from the textbooks and the teachers' decisions are based on the textbooks contents. Khurshi et al., (2010) confirmed what Bahiyah *et al*., (2008) said that a pupil reads more than 32,000 pages of textbooks from elementary to high school level and internalize what they read, and see that there are suitable potentials and attitudes that are associated with masculine and feminine qualities through family socialization.

2. Literature Review

Gharbavi and Mousavi, (2012.) argued that biased depictions of male and female stereotypes makes students believed that what is normal for a woman and the same for the man because of what people in society believe. Therefore, it will be out of place for female students who should decide to do what the society expects with regard to what is considered males' work.

In other studies, Shah, (2012) in Pakistan, Chanzanagh *et* al., (2011) in Iran and Lee and Collins, (2009); Mineshima, (2008) in Hong Kong investigated gender representation in English Language textbooks. The researchers both used content analysis. The results revealed that there are more male characters than female characters in both texts and illustrations in English textbooks in Pakistan and Iran. In contrast, the findings of Lee and Collins, (2009) and Mineshima, (2008) in English language textbooks in Hong Kong indicated that there is an equal number of male and female characters in textbooks thereby a ratio of 1.1.14. This may likely be due to the cultural awareness and cultures and beliefs of the three nations.

In similar studies, Tang *et al*., (2010); Sunar, (2011) determine gender representation in mathematics and science textbooks in China and the UK. Their results show that there were 515 (55.3%) male and 416 (44.7%) female characters in the four volumes of mathematics textbooks used. Similar findings of the results revealed that Science textbooks have 87% male characters and 23% female characters that appeared both in texts and illustrations. They concluded that there is gender bias in both mathematics and science textbooks used in China and the UK.

Mohamad et al., (2012); Amini & Birjandi, (2012); Mustapha, (2012); Mukudan and Nimehcisalem, (2008); Oyebola, (2003) examined gender representation in Malaysia English languages and Nigerian English language, social studies and Primary science textbooks. The findings revealed that all the four textbooks are embedded with gender bias against female characters in the texts and illustrations. These results mean that there is gender bias on the ground as a reality.

3. Statement of the Problem

Gender bias in school mathematics textbooks in Nigeria is of great concern to both mathematics educators as well as researchers. Teachers depend solidly on the textbooks whereby their decisions on what to teach are taken from the textbooks (Fouls, 2010). Deshler and Burroughs, (2013) reported that whenever teachers used gendered texts in their classrooms, students may feel that such is done deliberately because of their gender. Blumberg, (2007) argued that gender bias in textbooks and teachers differential treatment of students who have not been given adequate attention by scholars.

There is gender imbalance in science, technology and mathematics (STM), which is still reflected in Nigerian mathematics textbooks (Odebode, 2010). There are other studies on gender bias on other subjects such as social studies, primary science textbooks Oyebo, (2003), English language textbooks (Mustapha, 2012; 2013) in Nigeria, but there are little or no studies on analysing gender representation in primary 5 and 6 mathematics textbooks in Nigeria. This study was sparked from the recent studies done on gender representation in learning materials in a junior secondary school in Nigeria (Mustapha, 2012).

Nigerian textbooks do not have equal gender representation including in mathematics textbooks and in science, technology and mathematics (Odebode, 2010). Most recent past studies Carthon, (2003) revealed that gender bias in textbooks may influence students' perceptions of who they are, how they should, and may also affects their achievements and career choices.

4. Purpose of the Study

The purpose the study was to examine Primary 5 and 6 mathematics textbooks to determine whether there is gender bias in male and female characters, and gender neutral characters. Another purpose is to create awareness for teachers about gender bias issues in learning materials which has a negative impact on both male and female students.

What is the extent of gender bias in Primary 5 and 6 mathematics textbooks currently used in public schools in terms of male and female neutral characters?

5. Methodology

In this study, two mathematics textbooks for primary grades 5 and 6 were used to determine whether there is gender bias in male and female characters and gender neutral characters. These textbooks are the most frequently used in public primary schools in the Federal Capital Territory (FCT)

Abuja-Nigeria as identified by the Educational Research Centre (ERC) Abuja. The two textbooks Modular Mathematics for Primary 5, and MAN Primary Mathematics (Universal Basic Education Edition were written by different authors. The reliability of the instrument was 94%.

Representation according to Jodelet, (1989) is a form of knowledge that is developed and shared socially with the practical aim, contributing to the construction of a reality that is common to social whole. According to Brugeilles and Cromer, (2009) representation is not the true reflection of reality, since it also reveals a shaping or an ordering of reality that aims not only to explain an established social order, but also to legitimate it.

In this study, the content analysis approach was adopted, which involves descriptive statistical frequency and percentages. Content analysis simply means what is content in a message. It is seen as a method in which the contents of message form the basis for drawing inferences and conclusions about content (Nachmias and Nachmias, 1976).

6. Data Analysis

The data analysis included tallies for the existence and frequency of gender characters and amount of gender neutral characters, which were calculated according to the numbers of occurrences per module by unit of mathematics textbooks and percentage were calculated in each of the two mathematics textbooks used in this study. The modular mathematics textbook of primary 5 used in FCT Basic primary schools has 30 modules of which 19 representing 63.33% of the modules do not have human characters in the texts, while 11 (36.67%) modules have human characters. This means that the greatest part of this mathematics text book does not contain human characters. Each of the modules was examined for male, female and gender neutral characters in the text to ascertain the extent of gender inequity. The results of the analysis are presented in Table 1

In module 3 of the mathematics textbook, there is a total of 53.85% of male characters, 34.61% of female characters and 11.54% neutral characters used. In conclusion, there is gender imbalance of characters in favour of males. Therefore, there is gender inequity in module 3. In other words, male characters are predominately in the textbook, but with only few female and neutral characters.

The analysis in Module 4 indicates there is an imbalance of male, female and neutral characters of 25% respectively against 50% male characters. The results of module 5 consisted of 45.45% of male characters, 42.42% female characters and 12.12% neutral characters. We concluded that gender inequity was manifested in the module in favour of males. Analysis of module 6 on the topic addition and subtraction indicated that 14 characters representing 45.16% of male, 32.26% female characters and the rest 25.58% for gender neutral characters were used.

Table 1. Summary Results of Gender bias Modular Mathematics for Primary 5 Revised Edition.

Chapter	Topic	Frequency and percentage of individual and collective characters in the text						Total	
		Male		Female		Neutral			
		Freq.	%	Freq	%	Freq	%	N	%
Module 3	Decimal fraction	14	53.85	9	34.61	3	11.54	26	100
Module 4	percentages	12	50.00	6	25.00	6	25.00	24	100
Module 5	Ratio	15	45.45	14	42.42	4	12.12	33	100
Module 6	Addition & Subtraction	14	45.16	10	32.26	7	25.58	31	100
Module 9	Division	5	41.67	1	8.33	6	50.00	12	100
Module 11	Ratios & percentage revision	16	55.17	8	27.59	5	17.24	29	100
Module 12	Simple problems on percentages	21	60.00	3	8.57	11	31.43	35	100
Module 13	Open sentence	3	50.00	2	33.33	1	16.67	6	100
Module 14	Money	25	69.44	3	8.33	8	22.22	36	100
Module 19	Weights	3	17.65	8	47.06	6	35.29	17	100
Module 20	Average speed	15	60.00	4	16.00	6	24.00	25	100
Grand total		143	51.19	68	24.82	63	22.99	274	100

Source: Modular Mathematics for Primary 5 (2010)

It is important to note that in Module 9 the results show that neutral characters in the text are predominately with 50% while 41.67% and 8.33% represents male and female characters respectively. We can conclude that there is gender equity in this very particular modul out of 11 modules that have human characters.

The results of analysis of module 11 shows 55.17% of male character in the text, 27.59% of female characters while 17.24% of neutral characters. It can be concluded that the module is dominated by male character than female characters and it uses few gender neutral characters. This mean there is gender inequity in the module.

Analysis of module 12 shows that 60%, 8.57% are male and female characters respectively, while 31.43% gender neutral characters. It can be concluded there is no gender equity. This means that male characters dominate the module in the texts.

Also, 50% of male characters, and 33.33% of female characters are present in the text, while there is a total of 16.67% gender neutral characters. This means gender inequity is manifested in favour of the male characters.

The results of the analysis of module 14 and 19 shows that 69.44%, 17.65% representing male characters, 8.33%, 47.06% representing female characters in modules 14 and 19. While 22.22% 35.29% are gender neutral characters for the two modules. The last module has more gender neutral characters than the first. It means that gender inequity is manifested in the two modules only that gender neutral characters are more in the second module than the first.

The topic on average speed in module 20 indicated that there were 60% male characters, and 16% female characters while 24% represented gender neutral characters in the texts of the last module that have human characters. This means that male characters are preponderant and implies that gender inequity is manifested.

Table 2 shows the number of frequencies of gender bias in characters of males, female and gender neutral that is found in the Grade 6 MAN Primary Mathematics textbook used in FCT primary schools. It has 28 modules, of which 16 (57.14%) represent human characters in the text, while 12 (42.86%) modules do not have human characters. This means that the greatest part of the mathematics text book contains human characters. Each of the modules is examined for male, female and gender neutral characters in the texts to ascertain the extent of gender inequity. The results of the analysis are presented in Tables 2.

In module 3, the analysis results show that 3 (100%) representing gender neutral characters, and there are no male or female characters. This means there is gender equity in the module and the reason can be that the author of the module may be aware of the gender equity issue in mathematics. Furthermore, module 4 shows that 60 male characters representing 61.22%, 20 (20.41%) and 18 (18.37%) of female and gender neutral characters. The results show there is gender bias in favour of males in the module.

Module 5 shows 3 (27.27%) both male and female characters and 5 (45.45%) gender neutral characters in the texts. This means there is a balance between male and female characters present in the particular module. In other words, there is gender equity in the texts; the reason can be that the author of the unit is aware of the gender equity issue in mathematics. Similarly, module 6 has the highest percentage of male characters consisting of 70.83%, and 15.28% of female characters while 13.89% for gender neutral characters. This therefore means gender inequity is demonstrated in this module.

The analyses of modules 7 and 9 results show that there are 8 (88.89%; 6 (50.00%) males characters and 1 (11.11%; 6 (50.00%) gender neutral characters. This implies that gender bias in the characters is in favour males and there is no single female character in the units. However, the author used equal number of the gender neutral and male characters 6 (50%) in the second module unlike the first. The results of module 11 representing 21 (70.00%) male characters, 4 (13.33%) female characters and 5 (16.67%) gender neutral characters. This means that gender bias is in favour of male characters in the texts. It implies that gender inequity is demonstrated in the module 11 of grade 6 mathematics textbook.

Table 2. The Results of the Extent to which Gender Inequity manifesting in Teaching and Learning Mathematics at Basic Education in Nigeria in terms of Mathematics Textbooks by Individual and collective Characters in the Texts.

Chapter	Topic	Frequency and percentage of individual and collective characters in the text						Total	
		Male		Female		Neutral			
		Freq	%	Freq	%	Freq	%	N	%
Module 3	Demography	-		-		3	100	3	100
Module 4	Ratio & percentages	60	61.22	20	20.41	18	18.37	98	100
Module 5	Percentages	3	27.27	3	27.27	5	45.45	11	100
Module 6	addition & subtraction	51	70.83	11	15.28	10	13.89	72	100
Module 7	Multiplication of number	8	88.89	-	-	1	11.11	9	100
Module 9	Division	6	50.00	-	-	6	50.00	12	100
Module 11	Ratios & percentage revision	21	70.00	4	13.33	5	16.67	30	100
Module 12	Order of operations	10	66.67	3	20.00	2	13.33	15	100
Module 13	money	33	73.33	6	13.33	6	13.33	45	100
Module 17	Capacity	3	100	-	-	-	-	3	100
Module 18	Weights	4	40.00	4	40.00	2	20.00	10	100
Module 19	Time & speed	11	78.57	2	14.29	1	7.14	14	100
Module 20	Open sentence	12	92.31	1	7.69	-	-	13	100
Module 22	Heights & distances	5	100	-	-	-	-	5	100
Module 26	Statistics 1	15	41.67	12	33.33	9	25.00	36	100
Module 27	Statistics 2	4	22.22	2	11.11	12	66.67	18	100
Grand total		246	62.44	68	17.26	80	20.30	394	100

Source: Grade 6 MAN Primary Mathematics (Universal Basic Education Edition)

In modules 12 and 13 the results of the analysis shows 10 (66.67%); 33 (73.33%) representing males characters, while 3 (20.00%) represent female characters, while there are 6 (13.33%) females characters and 2 (13.33%); 6 (13.30%) neutral characters in the text. This means there is gender inequity in the two modules that is in favour of male characters. However, module 17 shows 3(100%) are male characters in the text without female ones, nor gender neutral characters in the module. Analysis of modules 18 and 19 presents that 4 (40%); 11 (78.57%) males characters, 4 (40%); 2 (14.29) females characters and 2 (20%); 1 (7.69%) neutral characters in the text. This shows that there is gender inequity in the units.

The results of an analysis of modules 20 and 22 indicates that 12 (92.31%); 5 (100%) represent males characters, and 1 (7.69%) female characters. This means there is gender bias in favour of males in both modules. In the same manner, modules 26 and 27 on statistics 1 and 2 shows that 15 (41.67%); 4 (22.22%) are males characters, 12 (33.33%); 2 (11.11) are females characters and 9 (25%); 12 (66.67%) are gender neutral characters in the texts of modules 26 and 27. This means there is gender inequity is in favour of males and to some extent gender neutral characters are used.

Table 2 analysis shows that, 246 (62.44%) represent male characters, while; 68 (17.26%) represent females' characters and 80 (20.30%) represent gender neutral characters used in MAN Primary Mathematics Book 6. This shows that there is gender bias in the textbook in favour of male characters. Furthermore, the pattern shows gender bias is more in Grade 6 mathematics textbooks than that of Grade 5. The reason can be that as the students become increasingly mature, gender inequity in the texts may not have a negative effect on their interest and attitude in mathematics with respect to gender used in the text.

7. Discussions

The results in Tables 1 and 2 revealed there is gender bias representation in the mathematics textbooks, which conforms to the results of Oyebola, (2003); Tietz, (2007); Mustapha, (2012, 2013); Habiba Binti Ismail *et al*., (2011); Bahiyah et al, (2008) which is in favour of male characters. These results are from subjects such as English language, Social studies, Accountancy, primary science textbooks. On the other hand, the findings are contrary to the findings of Carthon (2003) in which the characters were in favour to females. However, it is interesting to know that the pattern that shows gender bias in favour of male characters increases as student move from primary 5 to 6. The reason may be that the students are becoming more mature, and so the gender bias representation in mathematics textbooks may not have any negative impact on mathematics achievement and career choices related to mathematics.

8. Implications and Conclusions

Base on the findings of this study, we propose some implications for teachers and policy makers. For example we recommend that Federal Ministry of Education in collaboration with Nigerian Education Research Development Council (NERDC) should organise workshops, seminars for not only mathematics teachers but other teachers in various subjects, as well as authors and publishers to sanitize them about gender bias in the learning materials and also in the classroom settings.

In conclusion, tittle attention has been paid in analysing mathematics textbooks. Our findings are similar to the most recent findings of content analysis on gender characters and gender roles in English language, social studies, primary science, and accounting textbooks by other scholars. Recognizing the negative impact of stereotyping on school textbooks (Carthon, (2003) we recommend that further study could examine the gender representation in primary level 3 and 5 mathematics textbooks.

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