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GENDERED TEACHER-STUDENT INTERACTIONS IN JUNIOR SECONDARY MATHEMATICS CLASSROOMS IN NIGERIA

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Abstract: Mathematics teachers do not remember how they interact with their students' in mathematics classrooms and also do not have ample time to reflect and analyse their pattern of interaction with the students; however, they continue interacting differently with females and males without knowing. This study aimed to investigate teacher-student interactions at junior secondary (JS3) mathematics classroom for gender bias. Mixed method research design was employed. Two instruments were used such as Interaction for Sex Equity in Classroom Teaching (INTERSECT) with a coding sheet and interviews. Six mathematics teachers, three males and three females were observed three times each. The researchers recorded 361 interactions of 180 male and 150 female students who were present in the observed classrooms. The findings revealed that males received significantly more acceptance-intellectual interactions than females did, the female learners receive significantly more remediation– intellectual interactions than males did.

***Keywords*:** Gender bias, mathematics classrooms, teacher-student interactions

Introduction

There is a global rise in the consciousness of the impact of gender issues in education (Modo, 2011; UNICEF, 2014). All over the world, gender issues have become topical due to their ripple effects on all spears of human existence (Banks, 2005; British Council, 2012; Egbe-Okpengen & Orhungur, 2012; Miller et al., 2009; Sadker & Zittleman, 2009), Nigeria is no exception. The occurrence of gender bias in teacher-student interactions in mathematics classrooms in Nigeria is subtle in nature as such teachers are not aware that biases existence. This happens on the daily basis decisions on regarding the classroom interactions of teachers with their students; where teachers have no time to reflect or think back on their interactions with students in their respective classrooms. Despite that many studies have addressed gender bias on teacher - student interactions in the classrooms (Duffy et al., 2001; Hassaskhah & Zamir, 2013; Kokas, 2012) gender bias still exist. It suffices to say that presently, gender bias is persisting in Nigeria mathematics classroom as established by Farajimakin (2010), in which, male students are favoured in the classrooms in various subjects such as mathematics, physics, science and technology. Teachers give more attention to male students than female students (Salman et al., 2011). The bias is often subtle and unintentional, but its result is harmful. Adeyemi and Akpotu, (2004), Sadker and Zittleman, (2009, 2007) claimed that gender roles difference is prevalent in Nigeria and other parts of the world. Farajimakin (2010), Mustapha (2013), affirmed categorically that gender discrimination in classrooms is still prevailing.

Literature Review

In a study of teacher–student interactions a sample of one hundred fourth, sixth, and eighth grade classrooms, the findings showed that male students consistently out-talked and as well as out-participated female students (Sadker et al., 2007). Similarly, Becker (2001) also discovered that teachers began conversation with males more than females. However, these findings are similar to those of She (2000), who found that most of the teacher-

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initiated interactions involved more male students by using Brophy-Good Dyadic Child Interaction System, she (2000) found out that 355 teacher-initiated questions, male students responded 78.7% to the teacher questions in a mathematics classroom of 50:50 sex distribution. In another study, Kaily (2015) investigates gender bias in the mathematics classrooms in the South western British Columbia Canada Christian middle school whether boys and girls receive the same kind of attention from the teachers. Quantitative analysis of observation was conducted on different teachers. A sample of eight teachers of grades six, seven and eight was used. The findings revealed that boys received 13.58% more of teacher interactions and the girls received a less behavioural type of interaction from the teachers than boys and both girls and boys receive similar amount neutral interpretations from their teachers. Unfortunately, inferential statistics were not used in Kaily (2015) and Shel (2000) studies, it is not clear whether there is significant difference between female and male teachers' interactions patterns. Therefore, there is a need for inferential statistics to determine the significant different of the teacher interactions with both male and female students.

We reviewed the study of Einarsson and Granstrom (2002) that investigated the interactions of teachers and students in the high school aiming at the effects of the teacher gender and student gender in mathematics. A total of 597 students (294 males and 303 females) and 28 male and 8 female teachers were used in the study. The observation instrument used was Interaction for Sex Equity in Classroom teaching (INTERSECT). Their findings revealed that female and male teachers interacted with males more than females. But in contrast, Jones and Dindia (2004), findings suggested that teacher interacts more with female students. More recently, Bag et al., (2014) examined female and male teachers' interaction with female and male students in preparatory mathematics lesson at State University Turkey. The instrument used was video-recorded and observation Sinclair and Coulthard's Classroom Discourse analysis model was adopted. The findings of their study suggest that there is no equal distribution between the teachers' moves in both academic and non-academic directed to male and female students in classrooms. The findings of Bag et al (2014) are contradicted by the results of Leder et al., (2014) that examined teacher-interaction with high achievers' male and female students of grades 7 and 10 in Australia which shows that teacher gives greater attention to male students with high achiever than female students with higher achievement too. Most of the studies on gendered teacher-student interactions in mathematics classrooms have been conducted in western world (Howe & Abedin, 2013). It is repeatedly suggested to explore whether these results can be reproduced in other nations.

Studies by Kechen (2007), Khine and Fisher (2003) examined teacher and pupil interactions in mathematics classroom levels at each different stage of classes in Northeast England. A modified version of INTERESCT was used to record the classrooms interactions. The findings revealed that female learners received more positive feedback from the teachers than males. Secondly, male learners are active more in the morning lessons, while in contrast, female learners get attention more in the later period of the lesson than males. The results of Kechen (2007), Khine and Fisher (2003) are contradicted with the findings of Koca (2009), Sobel et al., (2004) that indicated female and male teachers interact more with male learner more than their female counterparts. It is interestingly to note that the results of the study would have pedagogical and psychological implications which require further studies. Many of these researches on gendered teacher-student interactions in mathematics classroom has generated inconsistent findings in various studies. That is negative feedback found in females than in males but it is still unclear which female students that account for these negative feedback increased (Howe & Abedin, 2013). Previous studies on teacher-student interactions in mathematics classrooms focused on secondary and university mathematics students. This present study extends to JS 3 mathematics classes in Nigeria.

Gul et al, (2012) in their study found that teachers interact with male students which are paralleled to the findings of Shomoossi et al., (2008). However, Staverman (2012) found that in grades 7 -9 of middle school mathematics, although male teachers interact more with male learners than females, but however, female teachers interact equally with female and male learners. The findings of Gul et al, (2012) study are interested simple because of the size of the sample of 155 teachers from 21 schools, the stratified random sampling and inferential statistics analysis were used in the study. However, there is difference between the studies of Gul et al, (2012) and Staverman (2012) whether the middle female teachers are equally interacting may be as a result of either (i) weak statistical effects which could be expecting to fluctuate from studies to studies or (ii) different population of participants in the study. In sum, the findings suggested that females sometimes are receiving messages that are subtle which can affect their academic negatively.

Problem Statement

Gender bias is manifested in teacher-student interactions in mathematics classroom have a negative implication for both male and female students which may affect them from reaching their full potential (McDonnell, 2007. The occurrence of gender bias in the mathematics classrooms is subtle in nature as such, teachers are not aware of its existence. Female students are continually treated differently in mathematics classrooms besides the fact that teachers give more attention to male students than female students. Improvement of gender equity of

teachers' interaction in mathematics has been a concern of researchers. It is based on this issue that the researchers choose to ascertain the extent of gendered interactions of teachers in mathematics classrooms. In Nigeria, research on gendered teacher-student interactions in mathematics classrooms is scare, however, the small amount of studies focuses on teacher-student interactions in primary science and physics (Kalu, 2005; Oyebola, 2003). Therefore, there is a need to investigate teacher-students' interactions at junior secondary mathematics classrooms in Nigeria to proffer solutions to the differential treatment of male and female students at junior secondary school mathematics classrooms.

Purpose of the Study

This study examined teacher- student interactions patterns for any possible gender bias in junior secondary mathematics classrooms (JS3) in Abuja Nigeria. Observations of the junior secondary school mathematics classrooms are important since a lot of female students begin their first senior education experience at junior secondary (JS3) level. In addition, since these students choose their career at junior secondary school, the junior secondary school is a place to observe for any possible gender bias. Teachers' differential treatment of females in mathematics classrooms, may cause student to chance their career choice.

Research Questions

The study sought to find answers to the following research questions thus;

1.What is the proportion of the four evaluative types and two contents of interactions in mathematics classrooms?

2.Is there any significant gender bias difference between teacher-student interactions based on four evaluative types of interactions in mathematics classroom?

3. How do teachers perceive their interactions with students at junior secondary mathematics classroom?

Methodology

To achieve the purpose of the study, we adopted mixed method research design approaches. The quantitative data were subjected to descriptive and nonparametric Chi-Square test statistics. And for qualitative aspect, Miles and Huberman (1994) model was adapted for thematic analysis. A sample of (3) three males and three (3) females' mathematics were used making a total of six mathematics teachers in the three sampled schools. Two teachers are used in each sampled schools and each was observed three times for a period of two weeks, and each observation lasted 40 minutes. A total of 330 students were in these classes which comprised of females (n =150 (45.5%)) and males (n = 180 (54.5%)). The six mathematics teachers were purposively selected for the interviewed, and two research assistants were used for the data collection from the observed mathematics classrooms.

Data Collection

A modified Interaction for Sex Equity in Classroom Teaching (INTERSECT) and coding sheet form for teacher-student interactions were adapted from Duffy et al., (2001). Specifically, the current instrument involved coding teacher-student interactions, (a) evaluative type; criticism, acceptance, praise and remediation and (b) evaluative content; intellectual and conduct enable the observers to code for eight (8) potential types of interactions between the teacher and the students.

The inter-rater reliability for each category of interactions observed was calculated by using each data of observations from the two research assistants that were employed. The inter-rater reliability analyses indicated that the four areas of interactions reflected good inter-rater reliability with the kappa of 0.68 of praise, 0.72 for acceptance, 0.62 for remediation and 0.78 for criticism. The themes reliability was 0.70 using Cohen kappa which shows the overall agreement of four evaluation types of interactions during pilot testing of the study.

Data Analysis Procedure

The six (6) mathematics teachers were observed three times, and each observation lasted for 40 minutes over a period of two weeks. Descriptive statistics was employed in quantitative part for patterns of four evaluative types of interactions (remediation, praise, criticism and acceptance) in mathematics classrooms, which was computed based on two evaluative contents (intellectual and conduct) of interactions and also chi-square statistic test was used. For qualitative data, Thematic Analysis (TA) using Miles and Huberman (1994) model was adopted.

Results and Findings

Research Question 1

What is the proportion of the four evaluative types and two contents of interactions in the mathematics classrooms?

The analysis of the observational data focused on the nature of a teacher and student interactions patterns that emerged and the distribution of teacher interactions between male and female students in the mathematics classroom. In this section, Z-tests were carried out on all these interactions for teachers and students' gender in mathematics class, and a Bonferroni correction of alpha .01 was used because of the data were split by gender. This help to counteract the problem of multiple comparisons (Goldman, 2008). Female teachers ($z = 2.82$, $p < .05$) directed more of interactions toward males than females. When a teacher directed interactions to the whole classroom, Bonferroni correction for alpha .01) which indicated there was no significant student gender difference for responding to the male teacher of mathematics ($z = 2.32$, $p < .05$) female mathematics teachers ($z = 1.94$, $p < .05$). The overall sum of interactions of male teachers indicated a greater interaction toward male students than female teachers in mathematics ($Z = 4.22$, $p < .05$). Table 1 presents the values that represented the overall percentage of interactions which was directed toward females and males by both female and male mathematics teachers at JS 3 mathematics classrooms.

Table 1. Number of male and female mathematics teachers interactions toward male and female learners in mathematics classrooms

Interactions directed by Mathematics Teacher	Student	
	Male	Female
Male teacher	.74	.26
Female teacher	.63	.37

The total sum of the interactions includes four substantive interactions and two evaluative content on each of the category of interactions and definitions are given the areas of interaction in this study are; praise, acceptance, remediation and criticism with evaluative contents; intellectual and conduct. All interactions that took place between teachers and students in mathematics classrooms were analyzed (see Table 2)

Male teachers directed praise- intellectual to male students which accounted .78 and .03 to female students. There is no praise conduct to both female and male students from male mathematics teachers. Female mathematics teachers directed .32 intellectual praise- intellectual interactions to male students and .14 to female students. There is no praise-conduct interactions from female teachers to male and female students in mathematics classrooms. This also followed by acceptance-intellectual in which, male teachers directed a proportion of .32 and .36 to male and female students respectively. Male teachers only directed .03 of acceptance conduct to male students and non to female students, while female teachers directed acceptance- intellectual proportion .13 for male and .07 for female students. There is .03 acceptance conduct of interactions toward male and .02 to female students by the female mathematics teacher.

In remediation intellectual interactions, male teachers directed .12 and .23 to male and female students respectively, while .02 is directed to both male and female students on remediation conduct interactions by male teachers. And female teachers directed remediation intellectual interactions .23 and .18 to male and female students respectively and also directed remediation conduct interactions of .02 to males and .04 to female students. And on intellectual criticism interactions, male teachers directed .13 to male, .05 to female students, while .01 criticism-conduct was directed to male and non to female students. Female teachers directed intellectual criticism interactions of .34 and .25 to male and female students respectively, while .05 of conduct criticism was directed to male and .07 to female students. Overall the intellectual praise .78 is the greater proportion of interaction that was directed by male teachers to male students, and .03 was the lowest intellectual

praise directed toward female students by male teachers. While .03 acceptance conduct was directed to both male and female students which are the greater conduct while the lowest praise conduct to both male and female students and also criticism conduct. The greater proportion of female teacher intellectual was acceptance .36 to male students and zero is the lowest conduct directed by the female teacher to female students at .00. These proportion of evaluative types of interactions are showed in Figure 1.

Table 2. Proportion of evaluative type interaction in mathematics by gender of student and gender of teacher

Interactions		**Mathematics teacher**	
		Male	**Female**
Praise towards			
Male students			
	intellectual	.78(100)	.32(18)
	conduct	.00(0)	00(0)
Female students			
	intellectual	.03(4)	.14(8)
	conduct	.00 (0)	00(0)
Acceptance toward			
Male students			
	intellectual	.32 (41)	.36(20)
	conduct	.03(4)	00(0)
Female students			
	intellectual	.13(16)	.07(4)
	conduct	.03 (4)	.02(1)
Remediation toward			
Male students			
	intellectual	.12(15)	.23(13)
	conduct	.02(2)	.02(1)
Female students			
	intellectual	.23(30)	.18(10)
	conduct	.02(3)	.04(2)
Criticism toward			
Male students			
	intellectual	.13(17)	.34(19)
	conduct	0.01(1)	.05(3)
Female students			
	intellectual	.05(7)	.25(14)
	conduct	.00(0)	.07(4)

Note. Proportions were calculated within each of the four groups in mathematics and gender of student. The values in the round brackets are observed frequencies. There are 180 males and 150 females in these observed classrooms.

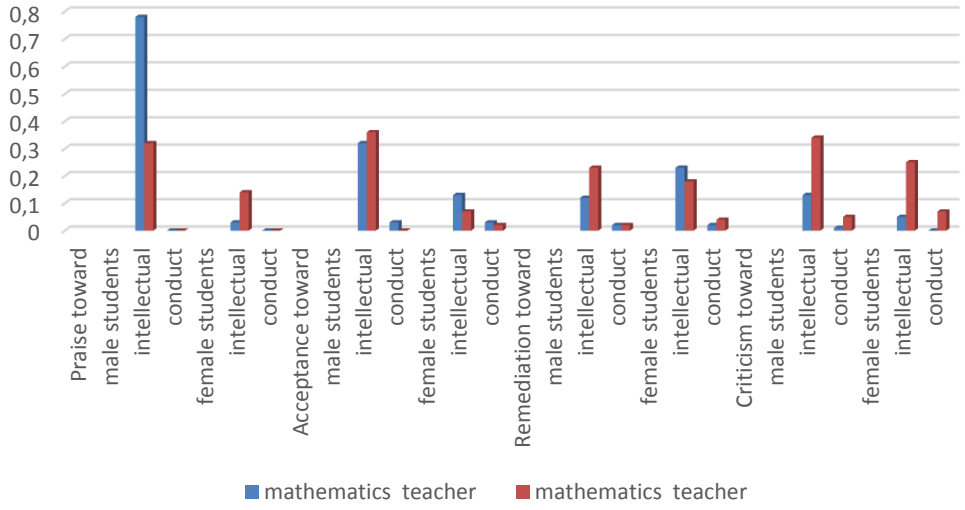

Figure 1. Proportion of evaluative type interaction in mathematics by gender of students and gender of teachers

Discriminant analysis was employed in order to see if teachers' gender, the gender of students and mathematics are differentiated the types of the evaluative teacher to student interactions of praise, remediation, acceptance, and criticism. Function one indicated a significant different between four evaluative types of interactions Λ = .86, $p < .05$. Therefore, function one is associated with students gender r = .73 and it accounts for 73% of the variance between types of interactions in mathematics classrooms observed. Females received more remediation than males, whereas males received praise, acceptance and criticism more than their female counterparts as showed in Figure 2.

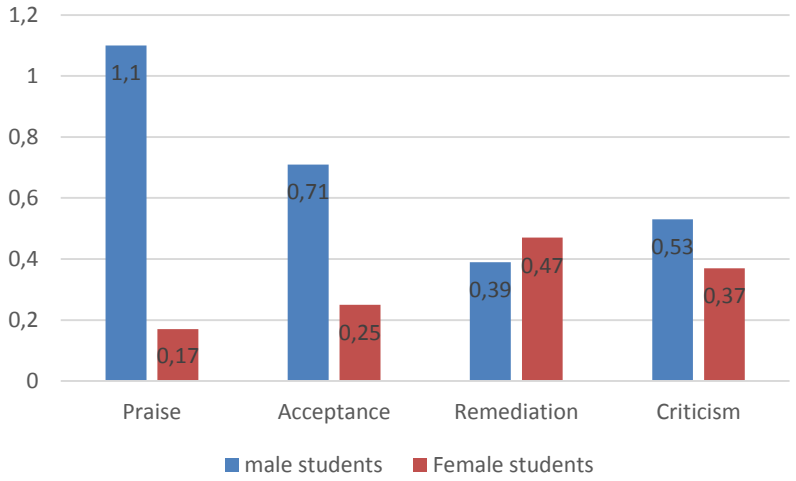

Figure 2. Proportion of teachers' evaluative type interaction in mathematics by gender of students

Research Question 2

Is there any significant gender bias difference between teacher-student interactions based on four evaluative types of interactions in mathematics classroom?

Discriminant function was used to determine the effect of teacher gender and mathematics on evaluative types of interactions. It was revealed that male teachers used more praise than female teachers $\chi 2$ (1, N = 104) = 7.42; $p < .05$. Acceptance was used more by male teachers than female mathematics teacher $\chi 2$ (1, N= 65) = 4.73; $p < .05$. In remediation, male teachers used more than their female counterparts $\chi 2$ (1, N = 50) = 3.42; $p < .05$. On one hand, criticism was used more by female teachers than male teachers $\chi 2$ (1, N = 40) =1.74; $p > .05$. It was found that praise was directed toward males significantly than females $\chi 2$ (1, N = 118) = 8.12; $p < .05$. Acceptance was directed significantly more toward male students than directed toward their female students $\chi 2$ (1, N =65) = 4.64; $p < .05$. Remediation was directed toward female students significantly more than male students $\chi 2$ (1, N = 45) = 1.13; $p > .05$. Criticism was directed toward male student significantly more than toward female students $\chi 2$ (1, N = 40) = 1.10; $p < .05$. It was found that 93% of the interaction were intellectual and 7% of the interaction was conducted which was based on four evaluative types of interactions such as praise, acceptance, remediation and criticism as shown in Figure 3.

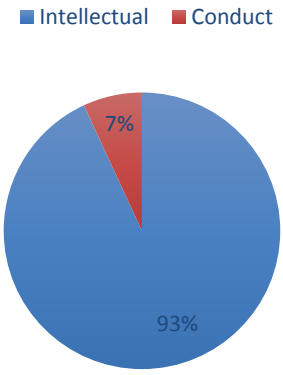

Figure 3. Frequency of evaluative content of interactions of teachers with gender

Discriminant analysis was also conducted in order to see if students' gender, teacher gender, and differentiated of evaluative content of teacher- student interactions. The function indicates a significant differentiation among four evaluative content of interactions, which, is $\Lambda = .96$, $p < .05$ and the function is associated with mathematics $r = .84$ and accounts for 84% of the variance between evaluative content of teacher -student interactions in which intellectual interactions 93% than 7% of conduct interactions in mathematics classes. Chi-square analysis was carried out to determine the differences in how 8 types of evaluative interactions were used. It was revealed that the type of interaction is depending on the gender of student $\chi 2$ (8, N= 361) = 11.72; $p < .05$. Males received significantly more acceptance-intellectual interactions than females, $z = 4.23$, $p < .05$. Female students receive significantly more remediation– intellectual interactions than male students did, $z = 5.46$, $p < .05$ and male students received more criticism- intellectual interactions than female students' $z = 4.92$, $p < .05$. Female students received significantly more acceptance-conduct interactions and remediation-conduct interactions than male students, $z = 3.48$, $p < .05$.

Research Question 3

How do teachers perceive their interactions with students at junior secondary mathematics classroom?

The categories are created from the interviewed data from teachers that participated in this study. The interview question was "do you feel that male and female students need to be treated differently in your mathematics classroom If yes why and how? The data from the interviews represented a coalescence of data into patterns of behaviours. These categories are grouped into two themes of mathematics classroom interactions. The themes are; Teacher academic attention and interactions and Gendered differential treatment by teachers include different types of interaction which is related to teacher and student roles in mathematics classrooms

Themes 1: Teacher Academic Attention and Interactions

Teacher- student interactions in mathematics classrooms are important factors in behavioural and academic outcomes for both male and female students. For effective teacher- student interactions are essential for promoting long time success in mathematics at junior secondary 3. This includes acceptance, remediation, praise and criticism intellectual from the teachers to male and female students in their mathematics classes. Either male or female student who received negative attention from teachers has increased the problem emotionally and disruptive behaviours. Male students received more attention from both male and female teachers than female students in which is in all cases is academic attention. Participants are of the view as showed that;

> *"I give attention to the most intelligent male students since the student always…questions and … in my class I do not see that to be bad after all the male are doing… than the female students in mathematics and…"* (Male teacher).

Another participant with the similar view to (male teacher), this is illustrated below;

> *"You see…if whether a male student is not doing well in your class you need to tell him to work harder… same when the student is good in mathematics I…that is very good of … keep it up. This will the student to encourage and strive to see he answer questions often in the class" (*Female teacher).

The data suggested that a need for given attention to those with difficulties in their work by encouraging and monitor them in the classrooms. Thus a participant pointed that female students seemed not to be doing well in the subject which likely is, as a result, less attention is given to them, thus a female participant has this to say;

> *"Hmmm…after the female student answer the questions incorrect… as a teacher I …the female student seems not to…serious which they need to work hard so as a teacher I need to give those female students attention and also using eye contact to female students in the class…" (*Male teacher*).*

The mathematics teachers reacted positively to only those students that are good in their classes irrespective of the student gender. It is also noted that the boys and girls behave differently in their classroom from what is expected from them by the teachers.

> *"I think you need to improve your answer Janet... we want to know how you got that solution unlike the answer Audu gave which is better understandable. In this case, one does not need to… them the same because …These are the things you will notice when you are teaching"* (Female teacher).

Theme 2: Gendered differential treatment by teachers

The audio tape recording of teachers' interviews in mathematics classrooms at junior secondary mathematics classrooms in Nigeria on differential treatment of male and female students was an appropriate tool to create awareness and reflection on gender bias treatment among male and female learners by their teachers. The intention of the interviewer was to determine the existence of gender bias in mathematics classrooms in terms of teacher-student interaction based on four evaluative types and two evaluative contents of interactions. Some teachers during the interview critically analysed their own behaviour and thought about using alternative approaches for the treatment of male and female students in their classrooms in the future. Here are some examples that were presented.

> *"In my class when a male student is good in mathematics I… the student to feel really happy with the answer he has given. You … really good in mathematics. The praising of the student should focus on the effort the students has accomplished. This will help the student to work more hard to prepare for the next class or examination. It also helps the student to see the link between the efforts he has invested in a task which has improved his academic performance in mathematic" (Male teacher)*

Another participant pointed that male students are found of disturbing and distracting the attention for those want to learn and therefore their treatment is different from that of female students. An example for differential treatment as;

> *"Ahaha… am…know the male student are found of disturbed the whole I thereby reprimand them more since the female students are always quietly and attentive. I do praise appreciate the female students for … Hmmm…hmm, the male students are always making noise and moving from… and I need to treat that student differently"* (Male teacher).

In additional, there are views from participants on teachers been harsh to female students simply because they are not able to answer questions in mathematics classroom.

> *"Wow! I'm... overreacting on female students that do not answer my…. In class. Some female students are saying that I'm harsh … which i think I am not but just because they seem not to like mathematics. I do tolerate them a lot. Well… with the boys, there is no need to be harsh to them they are good in mathematics. But I still appreciate any girl that is good in my class. I have to say to good female student "Mary you are making me proud … of doing well unlike the other girls"* (Male teacher)

Students are treated as an individual, not as girls or boys; the boys and the girls do not receive the same treatment on the basis of discipline, and boys received more punishment and detentions than girls, this was due to the facts that boys are more indiscipline in behaviour and as well inadequate in working pattern; This is an example from the interviewees;

> *"Yes, in fact, I treat them differently because I did that when John was disturbing mathematics class and not when Bola does the same... Its right, I think because John is found of doing that almost in every mathematics class, the male students are distracted more than the female students…there are some students that you always prefer. But you do not need them to know because all are equal before the school rules and regulations"* (Female teacher).

It is somewhat not surprising despite the perceptions of female students about the teacher's behaviours towards them, some teachers that were interviewed in junior secondary mathematics classrooms, reiterated that they do not treat both girls and boys equally in their mathematics classrooms. Some of the teachers were very clear that they give unequal treatment thus;

> *"Oh … there is difference in my teaching of males or females … I enjoy teaching mathematics and I have experience and skilled. Different treatment of girls and boys…yes, I know about it"* (Female teacher)

Some participants supported the different treatment of male and female students in mathematics classrooms which may be unintentional by teachers which they are not aware of. Thus,

> *"Am … not aware of treating females differently to males. Having …. said that, I do not … know if that happened without my knowing which is not intentional. So…am not aware … it, which it can be possible"* (Male teacher)

In the broader perspectives most teachers have the belief that they are giving equal treatment to both male and female students in the mathematics classroom in order to support the students learning, but it has been observed

that it is very rarely to achieve. In most of our school's male students appear to dominate the classrooms interactions, and while the female students participate more in teacher-student interactions which are supporting learning. Mathematics teachers that participated in this study provided an insight into the different treatment of male and female students in mathematics classroom in Nigeria. The combination of the classroom observations and interviews reveal that the content of gender bias in teacher-student interactions exist in mathematics lessons, which the result may limit the female self-esteem and lower their achievement in mathematics.

Discussion of Findings

The results obtained from the classrooms observations on four evaluative types and two evaluative content of interactions in Table 3 shows that both male and female teachers at junior secondary mathematics classes in Nigeria directed praise intellectual (.78, .32), acceptance –intellectual (.32, .36), criticism-intellectual (.13, .34) and remediation intellectual (.12, .23) towards male students' more than female students in mathematics classrooms. These findings are commensurate with past literature which reveals that male students received all intellectual evaluative types of interactions than the female student from both male and female teachers (Duffy et al., 2001; Jones & Dindia 2004; Kaily 2015). The findings further reveal that female teachers directed more criticism –conduct (.07) and remediation–conduct (.04) towards female than male students in mathematics classrooms. The results are inconsistent with previous literature, which shows that female teachers directed less criticism –conduct and remediation-conduct to female students than male students in mathematics classroom (Einarsson & Granstrom, 2002; Eriba & Achor, 2010; MCDonnell, 2007). In this current study, female students received fewer interactions than male students from both male and female mathematics teachers which are commensurate with the study of (Hassaskhah & Zamir, 2013; Author, 2015). The finding shows there is a significant different between male and female teachers direct four evaluative types and two content of interactions more towards male students than female students.

Triangulation of the Findings of quantitative and qualitative

This section of the study used (classroom observations) quantitative statistical analyses to confirm or reject the existence of gender bias in teacher-student interaction based on four evaluative types and evaluative contents of interactions and mathematics textbooks. In addition, interview data based on these evaluative types and evaluative contents on gender bias (qualitative data analysis) was used to explore other gendered bias on teacher-student interactions in mathematics classrooms which has not been earlier theorised. Combining the classroom observations findings with the interviews results have conceptually stronger than using only single data for the existence of gender bias in teacher-student interactions in mathematics classrooms setting at junior secondary mathematics classroom in Nigeria.

Combining the quantitative and qualitative data represented one can conclude that is differential treatment occurring in teacher-students' interactions in mathematics classrooms based four evaluative types and two evaluative content of interactions. Although the two categories of teacher-students' interactions are interrelated in a consistent pattern of teacher-student interactions which male and female teachers, certainly treat them unequally. Teachers in the study treated the male and female student differently in all four evaluative type and evaluative contents of interaction in mathematics classroom (criticism, acceptance, remediation and praise). Generally, the difference in treatment is negative ways for male and female teacher give more attention to male students.

Conclusion

In sum, there is differential treatment of male and female students by both female and male teachers in mathematics classroom at junior secondary mathematics classroom in FCT Abuja Nigeria. The findings of the study revealed that the gender of the student affects their interaction with the mathematics teacher. Male and female mathematics teachers' interaction with more male students in the four categories of interactions than with female students at junior secondary school (JS3) mathematics classrooms. For male and female students to experience equal treatment by their teachers in mathematics classrooms, there must be gender equity in her educational system. Equal treatment can only be achieved the moment the notion of females is being inferior to males is eliminated. Female students should be given their own desire recognition to actualise their dreams and potential. Both new and old mathematics teachers need to go for training and retraining on the issue of gender equity on yearly basis in order to create awareness among mathematics teachers. The results of this study revealed that teachers at junior secondary three (JS3) mathematics classrooms are not aware of gender bias exhibited toward male and female students in their interaction.

The qualitative findings of research question 1a reveal that both male and female teachers give more interaction to the most intelligent students in mathematics irrespective of their sex, which is in line with the findings of Shomoossi et al., (2008) reports that only intelligent students received more interaction in the classroom. The findings are also consistent with previous studies Beam et al., (2006), Brandell and Staberg (2008), Cameron (2005) and Myhill (2002). These results suggested that male students do not generally monopolise mathematics classroom interactions. There is gender bias in mathematics classrooms as demonstrated through teacher to student interactions by observations and interviews. The reasons why female and male teachers are interacting with males more may be due to the fact that male students interact more in mathematics classrooms than female students. Secondly, it could be due to the notion that mathematics is a male domain, and the cultural belief of some part of Nigeria is that any female that is good in mathematics is termed "smarter" as such, no man will want to marry that lady. This study could be extended to senior secondary mathematics classroom to investigate the patterns of gender difference of interactions between teachers and their students.

Recommendations

Based on the findings of this study, future study is required to examine other factors that may likely cause teacher – student interactions in mathematics classrooms which may explain gender differences in teacher-student interactions patterns in mathematics.

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