
Effect of Academic Setting on Junior Secondary School Students' Achievement in Mathematics in
Kogi Central, Kogi State

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ABSTRACT

This study investigated into the effects of academic setting on male and female junior secondary school students' achievement in mathematics in Kogi Central, Kogi State. An ex-post-facto design was used and sample consisted of two hundred (200) JSS III students from five classes from four schools selected by cluster sampling technique from all junior secondary schools with a total population of 4,398 students in Kogi Central. One hypothesis was formulated to direct the study. Data collected from sample schools were analyzed using Two Way Analysis of Variance (ANOVA) at $P \leq 0.05$ level of significance. The result indicated that: There are significant differences in the mean academic achievement scores of students in the three academic settings (single-sex school, coeducational school setting with single sex classes and coeducational school setting with mixed sex classes) in favour of single-sex school. Also, gender difference in students' academic achievement is not significant. It is concluded among others that single-sex school students performed significantly higher than their counterparts in the other two school settings. It is recommended among others that the government at local, state and federal level should endeavor to establish more single-sex schools to cater for qualitative mathematics education for boys and girls at junior secondary school level.

Keywords: Single sex schools, coeducational schools, Gender, Achievement

INTRODUCTION

Mathematics teaching in Nigerian schools has continued to generate a great deal of interest as it occupies a central place in the Nigerian educational system. The importance of mathematics to nation building has led the Federal Government of Nigeria to make it a core subject to be offered by secondary school students in Nigeria as stipulated in the National Policy on Education (FRN, 2013). Nationwide, mathematics is taught in junior secondary school, yet majority of the students enrolling in junior secondary school see it as a hard nut to crack. This situation according to Okafor (2008) has been attributed to teachers' methods and strategies of teaching and the type of school attended with respect to gender (academic settings) among others. It is the purpose of this study to determine what effect do academic settings have on the mathematics achievement of boys and girls in junior secondary school.

An academic setting could be categorized into a single sex and mixed sex or co-educational. The former being the practice of conducting education where male and female students attend

separate classes in separate schools while the later implies a system of education where males and females are educated together in the same class in a school (Riordan, 2010). Moreover, some co-educational schools are attempting to make the most of the advantages of both single sex and co-educational schooling by introducing separate classes for girls and boys. Some educationists see this as the optimal solution, as it offers the academic advantages of single sex education and the social advantages of co-educational schools. It was originally introduced in an attempt to assist girls to achieve in male-dominated subjects like mathematics, and is now being used to address underachievement of female students (Nwosu & Omeje, 2012).

For years, a question many educators, parents, and researchers have been asking is whether or not it is academically beneficial to teach boys and girls together in a mixed sex school or separately in a single sex school. The relative merits of both systems have been the subject of debate (Riordan, 2010). There has been renewed interest in the extent to which single-sex and coeducational schools affect children's academic development. Several studies are now available which compare the educational achievement of children attending single sex and coeducational secondary schools. In general the results of these studies have been inconsistent, with some studies providing support for the benefits of coeducation (Marsh, 2011; Marsh, Smith, Marsh & Owens, 2013), others supporting single-sex education (Astin, 2010; Lee & Bryk, 2014), and yet others find no achievement differences between children attending single-sex and coeducational schools (Miller & Dale, 2009; Cocklin, 2015). This issue has been further complicated by claims that school type may have a differential effect on girls and boys achievement, with boys tending to perform better in a coeducational school environment, while girls tend to fare better in a single-sex school environment (Finn, 2016). It is in the light of this background that an attempt is made to investigate effect of academic settings on academic achievement in mathematics among male and female junior secondary school students in Kogi Central, Kogi State, Nigeria.

Nationwide, mathematics is taught in junior secondary school, yet majority of the students enrolling in junior secondary school see it as a hard nut to crack. Top on the list of factors identified by researchers for this state of affairs is the type of school attended (school setting) and methods of instruction adopted by mathematics teachers in the study of mathematics. It is an issue under debate as pointed out by Cocklin (2015) as to whether segregating boys and girls into single sex schooling environment or their interaction in a mixed sex school setting where they are educated together can be helpful in improving students' achievement and positive academic aspiration in mathematics. It was on this note that the study investigates the effect of academic setting on male and female Junior Secondary School Students Achievement in Mathematics in Kogi Central, Kogi State, Nigeria.

Objectives of the Study

The objective was to investigate the effect of academic setting on junior secondary school students' achievement in mathematics in Kogi Central, Kogi State. Specifically, therefore, this research intends to:

1. determine in which academic setting (single-sex school, coeducational school with single-sex classes and coeducational school setting with mixed sex classes) do males students achieve best

2. find out in which academic setting (single-sex school, coeducational school with single-sex classes and coeducational school setting with mixed sex classes) do females students achieve best

Research Questions

To guide the study, the following research questions were raised for answering.

1. In which of the academic setting (single-sex school, coeducational school with single-sex classes and coeducational school setting with mixed sex classes) do male students achieve best?
2. In which of the academic setting (single-sex school, coeducational school with single-sex classes and coeducational school setting with mixed sex classes) do female students achieve best?

Null Hypotheses

From the research questions, this null hypothesis was formulated and tested at 0.05 level of significance:

Ho₁: There are no significant differences in the mean achievement scores of male and female students taught mathematics in single-sex school, coeducational school with single-sex classes (Coed. single-sex) and coeducational school setting with mixed sex classes (Mixed sex).

RESEARCH METHODOLOGY

The study used ex-post facto design which involves collection of existing data from documentary source in all the sample schools. The data collected for the study were the result of the students' academic achievement from their Junior Secondary School Certificate Examination (JSSCE). Mathematics achievements of male and female students in the three academic settings (single-sex school, coeducational school with single-sex classes and coeducational school setting with mixed sex classes) for junior secondary school were compared to determine if differences exist.

The target population of this study comprised all the 42 public junior secondary school three (JSSIII) students from Central senatorial zone of Kogi State for 2016/2017 academic session with a total number of 4,398 students (2,704 males & 2,278 females) as contain in the school list and students' population obtained from Kogi State Teaching Service Commission (KSTSC, 2017).

Junior secondary schools in Kogi central senatorial zone exist in cluster of single-sex school (male single-sex and female single-sex), coeducational school with single-sex classes and coeducational school setting with mixed sex classes. One school was randomly selected from each cluster. One class among classes in the male single-sex school consisting 40 students and One class among classes in the female single-sex school consisting 37 students were randomly selected, one class among classes from coeducational school setting consisting 28 male and 26 female students was randomly selected and two classes (male class consisting 36 students and female class consisting 33) were randomly selected from coeducational school with single-sex classes. This amounted to 200 sample size for the study.

The data collected were results of Junior Secondary School Certificate Examination (JSSCE) of JSS III students for 2016/2017 session. These were collected by the researcher from the

assessment record in all the sample schools' examination office which were pooled together and segregated based on academic setting and gender.

The data were analyzed by means of Statistical Package for the Social Sciences (SPSS) version 20 to test for significance. Mean and standard deviation were used to answer the research question while the formulated null hypothesis was tested using two way analysis of variance (ANOVA) and Scheffe's Test.

RESULTS

The data obtained with respect to the study were analyzed by means of descriptive and inferential statistics to answer the research questions and test the null hypothesis respectively as follow:

Research Question 1: In which of the academic setting (single-sex school, coeducational school with single-sex classes and coeducational school setting with mixed sex classes) do male students perform best?

To analyse data to answer this research question, mean and standard deviation of male students' test scores in male single-sex, male coed single-sex and males in coeducational school settings were calculated as presented in Table 1.

Table 1: Summary of Mean Achievement and Standard Deviation of Male Students Scores in the Three School Settings

| School setting | N | Mean (\bar{x}) | SD |
|----------------------|----|--------------------|------|
| Male single-sex | 40 | 49.12 | 2.98 |
| Male coed single-sex | 36 | 35.63 | 6.12 |
| Male coeducational | 28 | 37.04 | 5.61 |

The result in Table 1 shows that the mean achievement score of male students are 49.12, 35.63 and 37.04 in male single sex, male coed single-sex and male coeducational school setting respectively. This indicates that they exhibit best achievement in male single-sex academic setting with lowest standard deviation 2.98, indicating higher academic competition in mathematics than in the other two academic settings. However, it was observed that male students in coeducational school setting performed better than those in single-sex classes in coeducational school setting.

Research Question 2: In which of the academic setting (single-sex school, coeducational school with single-sex classes and coeducational school setting with mixed sex classes) do female students perform best?

To analyse data to answer this research question, mean and standard deviation of students' test scores in female single-sex, female coed single-sex and female in coeducational school settings were calculated as presented in Table 2.

Table 2: Summary of Mean Achievement and Standard Deviation of Female Students' Scores in the Three School Settings

| School setting | N | Mean (\bar{x}) | SD |
|------------------------|----|--------------------|------|
| Female single-sex | 37 | 47.54 | 3.02 |
| Female coed single-sex | 33 | 36.01 | 5.98 |
| Female coeducational | 26 | 38.79 | 5.04 |

The result in Table 2 shows that the mean achievement score of female students are 47.54, 36.01 and 38.79 in female single sex, female coed single-sex and female coeducational school setting respectively. This indicates that they exhibit best achievement in female single-sex academic setting with lowest standard deviation 3.02, indicating higher academic competition in mathematics than in the other two academic settings. They also performed better in coeducational school setting than in single-sex classes in coeducational school setting. This implies that apart from single-sex academic setting, coeducational school settings is more viable for female students in the study of mathematics than when organised into female single-sex classes within a coeducational school setting.

Hypotheses Testing

H₁: There are no significant differences in the mean achievement scores of male and female students taught mathematics in single-sex school, coeducational school with single-sex classes (Coed. single-sex) and coeducational school setting with mixed sex classes (Mixed sex). The result of data analysis to test this hypothesis is presented in Table 3.

Table 3: Two - Way Analysis of Variance (ANOVA) of Male and Female Students Mean Achievement score in the Three School Settings

| Source | SS | Df | MS | F-value | P-value | Remark |
|---------------------------|-----------|-----|--------|---------|---------|--------|
| Academic Setting | 1709.17 | 2 | 854.59 | 3.53 | .017 | S |
| Gender | 209.54 | 1 | 209.54 | 0.86 | .213 | NS |
| Academic Setting X Gender | 587.42 | 2 | 293.71 | 1.21 | .146 | NS |
| Error | 27635.34 | 114 | 242.42 | | | |
| Total | 186714.25 | 119 | | | | |

* Significant at $P < 0.05$

** Not Significant at $P > 0.05$

The result in Table 3 showed significant outcome $P = 0.017 < 0.05$ level of significance with respect to academic setting. This imply that there are significant difference in the mean achievement scores among students taught mathematics in the three academic settings (single-sex school, single-sex classes in coeducational school and coeducational school setting with mixed sex classes). There was also a revelation of insignificant difference $P = 0.213 > 0.05$ and $P = 0.146 > 0.05$ level of significance with respect to gender and academic setting – gender interaction

respectively. This implies that there was no significant difference in the mean achievement scores between male and female students and no significant interaction between academic setting and gender. However, Scheffe's Test Methods was used to analyse data to test for where significant difference in students' mathematics achievement occur among the three academic settings as presented in Table 4.

Table 4: Scheffe's Multiple Comparison Test on the Mean Achievement Scores of Students in the three School Settings

| (I) Academic Settings | (J) Academic Settings | Mean Difference (I-J) | Std. Error | P-value | Remark |
|-------------------------|-----------------------|-----------------------|------------|---------|--------|
| Single-sex | Coed. Single-sex | 12.51* | 1.413 | .021 | S |
| | Mixed-sex | 10.41* | 1.082 | .013 | S |
| Coed. Single-sex | Single-sex | -12.51* | 1.413 | .021 | S |
| | Mixed-sex | -2.10 | 1.118 | .151 | NS |
| Mixed-sex | Single-sex | -10.41* | 1.082 | .013 | S |
| | Coed. Single-sex | 2.10 | 1.118 | .151 | NS |

* Significant at $P < 0.05$

** Not Significant at $P > 0.05$

The multiple comparisons in the post hoc analysis in Table 4 showed that significant difference in students mean achievement scores exist ($P = 0.021 < 0.05$) between students in single-sex school and coeducational school with single-sex classes and ($P = 0.013 < 0.05$) between students in single-sex school and coeducational school with mixed sex classes in favour of single-sex school in each case. However, significant difference in students means achievement scores do not exist ($P = 0.151 > 0.05$) between coeducational school with single-sex classes and coeducational school with mixed sex classes.

DISCUSSION

The result from the two-way Analysis of Variance (ANOVA) in Table 3 shows that significance difference was established between the achievements among students in the three academic settings (single-sex school, coeducational school with single-sex classes and coeducational school with mixed-sex classes), but the difference in gender and academic setting-gender interaction were in significant. Consequently, the post hoc analysis by Scheffe's test in Table 4 specifically revealed existence of significant differences between students in single-sex and coeducational school with single-sex classes and between single-sex and coeducational school with mixed sex classes, but significant difference did not exist between students in coeducational school with single-sex classes and coeducational school with mixed sex classes.

The significant difference established in Table 4 between the achievement of students in single-sex and coeducational school with single-sex classes and between single-sex and coeducational school with mixed sex classes in mathematics in favour of single-sex school in each case could be attributed to the fact that students' distractions by the opposite sex in

coeducational school setting make them to be less focused on the lesson. These findings was inconsistent with results obtained in Marsh (2011) who in his study revealed that students in single-sex schools did not performed significantly higher than those in coeducational school settings. However, it was inconformity with the study of Lee and Bryk, (2014) who pointed out that the mean scores of students was significantly higher when they were taught in single-sex schools than when taught in mixed-sex schools.

Furthermore, the no significant gender achievement difference in Mathematics between male and female students and on academic setting – gender interaction suggests that academic setting cannot have a considerable effect on gender in mathematics achievement which is consistent with results obtained in the studies of Lee and Lockheed (2012) who found no significant gender gap between mathematics scores of Nigerian boys and girls in single-sex school but at variance with that of Bassey, Joshua, and Asim (2015) who in their study concluded that there existed significant gender difference in students' mathematics achievement in favour of males in Nigeria.

CONCLUSION

Based on the findings of this study, the following conclusions are drawn:

1. Students in single-sex school performed significantly higher than their counterparts in the other two school settings.
2. The difference between the mean score of students in coeducational school with mixed sex classes and those in coeducational school with single-sex classes was not significant but students in coeducational school with mixed sex classes are ahead.
3. Academic setting has no considerable effect on gender in mathematics achievement.
4. The difference between the mean achievement scores of male and female students in mathematics did not differ significantly.
5. Both male and female students performed best in single-sex school setting.

RECOMMENDATIONS

Based on the findings from the study, the following recommendations are made:

1. The government at local, state and federal level should endeavor to establish more single-sex schools to cater for qualitative mathematics education for boys and girls at junior secondary school level.
2. The existing single-sex senior secondary schools at all level of governance should be rehabilitated and provided with adequate qualified mathematics teachers and good teaching facilities to facilitate sound mathematics education for our teaming male and female children.
3. The coeducational junior secondary schools should be properly funded, provided with their needs such as qualified teachers, good teaching-learning earthmosphere and constant monitoring to improve students' achievement in mathematics.
4. Non-governmental organizations, communities and religious body who wish to establish schools should establish more of single-sex secondary school than coeducational ones.

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