

**EAST AFRICAN JOURNAL
OF EDUCATIONAL
RESEARCH
AND POLICY (EAJERP)**

ISSN 1997-7255

Vol. 10, December, 2014

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AND POLICY

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Published by:
Higher Education Research and
Policy Network (HERPNET)

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**COMPARISON OF STUDENTS' PERFORMANCE IN BIOLOGY
BETWEEN MIXED AND SINGLE SEX SENIOR SECONDARY
SCHOOLS IN OWO, ONDO STATE, NIGERIA**

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Abstract

The paper investigated the performance of students' academic performance in mixed and single-sex senior secondary schools in Owo, Ondo State, Nigeria. It examined gender and school type as predictors of Student's performance in the Senior School Certificate Examination (SSCE) conducted by West African Examinations Council (WASC) using May/June 2012 Examination results. Ex-post facto design was adopted, since the data

collected were already available without any manipulation. A purposive sampling technique was used to select three schools. A total number of three hundred and twenty eight (328) students' results in West African Senior School Certificate examination conducted in 2012 were utilized. The data obtained were analysed using descriptive statistics of frequency count and percentages, and t-test inferential statistics. Hypotheses were tested at 0.05 level of significance. The study revealed that there was no significant difference in the Biology students' academic performance of male students in mixed and single-sex secondary schools because both schools had the mean scores of 2.22 and 1.58 respectively, which fell within the mean grade level of fair performance. Though female students from single-sex school did not perform well compared to their counterparts in male single-sex school; however, there was no significant difference in the performance of male and female students in mixed school because ($t = -.091$) schools are greater than p-value ($p > 0.05$). This implies that significant difference does not exist between the Biology performance of male and female students in mixed secondary schools and also between students from single-sex schools. Based on the findings of this study, it was recommended that parents should not discourage their children from going to either of the schools because both are effective in producing brilliant students. Proprietors of schools should also try to establish single-sex schools since students' performance in single-sex school differs significantly in the sampled schools. School owners are also encouraged to monitor learning achievement in schools; provide schools with adequate facilities and other fringe benefits so as to encourage and motivate students to learn more effectively and efficiently, thereby improving students' academic performance.

Key Words; Mixed School, Single-Sex School, Performance, Comparison and Gender.

Introduction

Science can be seen as part of everyday life, on the basis that it exists all around us. Science is an inter-disciplinary course of study comprising of diverse subjects such as Biology, Chemistry, Physics and Engineering. Biology is one of the core science subjects in Nigeria Secondary Schools (Federal Republic of Nigeria (FRN), 2004). It is no longer a requirement for secondary school students to offer one science subject as a part of the core subjects because of the recent changes in the new Senior Secondary School Curriculum That listed the new core subjects to be English Language, General Mathematics, Computer Science, and one Trade or Entrepreneurship subject. In view of this, Abimbola (2013) asserted that 'how do we then produce a scientifically literate society devoid of ignorance and diseases?

Biology as a subject encompasses every part of human development and the knowledge of it is indispensable as a child develops. Success in Biology is hinged on educating individuals that will produce good and better performance in Biology. The study of Biology in senior secondary school can equip students with useful concepts, principles and theories that will enable them face the challenges before and after graduation.

Biology is one of the various subjects that explain science. The subject forms a pre-requisite for pursuit of careers in medicine, pharmacy, food science, science laboratory technology and agriculture among others in the University. Biology is a subject that cut across every aspect of human life; starting from conception till death. Adegbite (2005) defined biology as the basic science that deals with the study of living things. This subject attempt to understand the teeming diversity of life on earth, a diversity of level we are all part of.

The influence of school type on acquisition of science practice skills between male and female students also need to be investigated in term of their performance in Biology. Mixed

schools are schools comprising of both gender (male and female) while single sex schools are referred to as schools of a single gender of either male or female. The issue of gender and gender stereotyping infuse every aspect of human endeavour. Okeke (2007) observed that the consequences of gender stereotyping cut across social, economic, political and educational development, especially in the areas of science and technology. Ogunneye and Lasisi (2008) reported that more ladies are found in Biology and Chemistry than in Physics departments of higher learning. The study conducted by Onasanya, Ahmed and Adefuye (2011) also showed a significance difference between the male and female cognitive achievement in Biology. Based on the report of these researchers, there is therefore the need to investigate the disparity in the performance of biology students in mixed and single-sex secondary schools.

According to Mburu (2013), proponents of single-sex schools argue that these schools allow girls to flourish in a way that coeducational schools may not. Unlike mixed school, single-sex schools allow each sex to exploit freely in their separate schools. Some studies indicate that girls in schools with single-sex programs achieve higher learning, display more self-confidence and leadership skills, and enter male-dominated fields at a higher rate (Ferrara, 2005; Smyth, 2010). Studies have also shown that girls in single-sex classes are actually more likely to act outside of traditional gender roles which they may be shy of doing when with their opposite sex. Boys might also feel freer to engage in pursuits they wouldn't have considered at a mixed school based on the fact that it is a feminine role and not a conventional masculine characteristics. While single-sex schools would therefore allow some boys to transcend the gender roles that are typically assigned to them, mixed classrooms were found to reflect and reproduce sex inequalities found in larger society because it encourages cross sex students groupings and creating collaborative.

According to Hyde and Allison (2014), separating boys and girls in different classrooms or schools, could increase students' achievement and academic interest. Gender differences and psychological characteristics relevant to learning ability and students' achievement are substantial and biological in nature. Single-sex schools have a higher percentage of graduates who attended four year colleges and a lower percentage of graduates who attended two year junior colleges than coeducational schools. The positive effects of single-sex schools remain substantial, even after taking into account various school-level variables such as teacher quality, the student-teacher ratio, the proportion of students receiving lunch support, and whether the schools are public or private (Park, Behrman & Choi, 2012).

In a paper presented at the presidential forum on education, Ezekwesili (2006) stated that "we want a new education sector that would deliver sound education, give our students access to quality education that is relevant in today's market". It is ideally expected that products of Nigerian Schools should show clearly that having acquired commendable degree of education, they should be creative and use their educational experience to improve the society. The inability of learners to proceed to higher educational institution is one of the consequences of mass failure. This is the reason why stakeholders in education are curious to investigate the causal factors associated with the problem.

Researchers like (Okoli, 2011; Musa, 2011; Adetunji and Oladeji, 2007) had adduced the observable problem on a number of factors. Among these factors are the kind of school attended, system of operation in the secondary school in terms of ownership, school location, teachers' competence and poor teaching method. In spite of the importance and popularity of Biology among Nigeria students, performance at senior secondary school level had been poor (Ahmed, 2008).

According to UNESCO (2007) and Riordan (2008) policymakers in many education ministries are debating the value of coeducational classes vis-a-vis single-sex education. In single sex education, all learners are either girls or boys. The heart of most debate is whether girls will be safer and get a better education if they learn only with other girls or in mixed classes with boys. Thus, this study compared the academic performance of student's in Biology in mixed and single-sex senior secondary schools in Owo Local Government Area of Ondo State, Nigeria using the students' WASSCE results.

Specifically, the research found out:

1. The difference in the performance of male students in mixed and single-sex secondary schools in Biology.
2. The difference in the performance of female students in mixed and single-sex secondary schools in Biology.
3. The difference in the performance of biology students in mixed secondary schools.
4. The difference in the performance of biology students in single-sex secondary schools.

Research Questions

1. What is the performance of male students in mixed and single-sex secondary schools in Biology?
2. What is the performance of female students in mixed and single-sex secondary schools in Biology?
3. Does any significant difference occur between the performances of Biology students in mixed secondary schools?
4. Does any significant difference occur between the performances of Biology students in single-sex secondary schools?

Research Hypotheses

HO₁: There is no significant difference between the performances of Biology students in mixed secondary schools in Owo Local Government, Ondo State, Nigeria.

HO₂: There is no significant difference between the performances of Biology students in single-sex secondary schools in Owo Local Government, Ondo State, Nigeria.

METHODOLOGY

The study is a descriptive research of the ex-post facto type, since the data collected were already available without any manipulation. The target population comprised all the Biology students that took part in the West African Senior School Certificate examination conducted in 2012 from the selected schools. A purposive sampling technique was used to select three schools: one mixed, one male single-sex and one female single-sex schools. A total number of three hundred and twenty eight (328) students' results in West African Senior School Certificate examination conducted in 2012 were utilized. The instrument was validated in the Department of Science Education to ensure the adequacy and full authenticity of the content. The data obtained were analyzed using descriptive statistics of frequency count and percentages, and t-test inferential statistics. Hypotheses were tested at 0.05 level of significance.

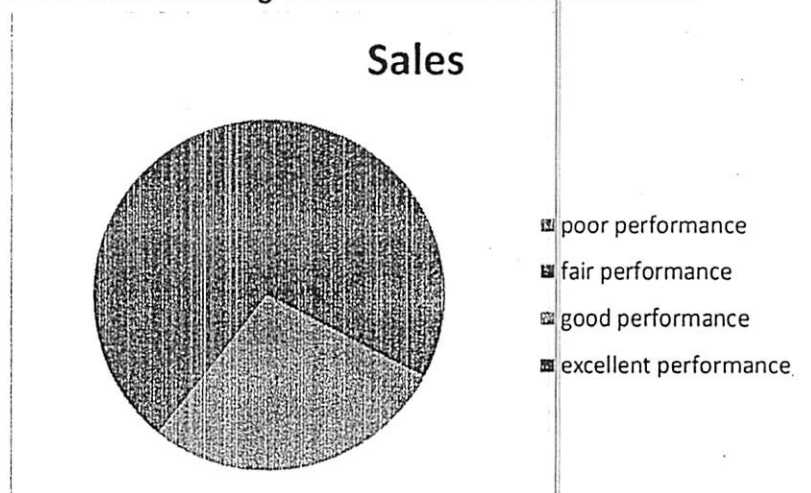
Results**A Pie chart showing the distribution of mean scores**

Table 1
Distribution of mean scores

Mean	Remark
<1.5	Poor performance
>1.5 – < 2.5	Fair performance
< 2.5 - < 3.5	Good performance
3.5 above	Excellent performance

Research Questions 1: What is the performance of male students in mixed and single-sex secondary schools in Biology?

Table 2: Percentage and frequency distribution of male students' performance in mixed and single-sex secondary schools in Biology

Mixed School				Single-Sex School			
Grade	Frequency	Percent %	Cumulative Percent %	Grade	Frequency	Percent %	Cumulative Percent %
0-39	12	33.3	33.3	0-39	61	55.0	55.0
40-49	9	25.0	58.3	40-49	36	32.4	87.4
50-59	10	27.8	86.1	50-59	14	12.6	100.0
60 above	5	13.9	100.0	60 above	0	0.0	100.0
Mean	2.22			Mean	1.58		

Table 2 shows the performance of male students in mixed and single-sex secondary schools students in Biology. The table revealed that more than half of the students in single-sex school failed Biology at the fail grade level with 55.0percentage. It also recorded that none of the male students in single-sex school passed within the grade range of distinction level while only five students passed in mixed school. This indicates none of the two school type has really performed well in Biology. Based on the results showing the mean score of 2.22 and 1.58 for mixed and single-sex schools respectively which is within 2.5 fair performance mean rating. This implies that both schools can be ranked fair performance in Biology. Hence it can be concluded that both schools have fair performance in Biology.

Research Questions 2: What is the performance of female students in mixed and single-sex secondary schools in Biology?

Table 3: Percentage and frequency distribution of female students' performance in mixed and single-sex secondary schools in Biology

Mixed School				Single-Sex School			
Grade	Frequency	Percent %	Cumulative Percent %	Grade	Frequency	Percent %	Cumulative Percent %
0-39	11	24.4	24.4	0-39	78	70.3	70.3
40-49	12	26.7	51.1	40-49	29	26.1	96.4
50-59	14	31.1	82.2	50-59	4	3.6	100.0
60 above	8	17.8	100.0	60 above	0	0.0	100.0
Mean	2.42			Mean	1.33		

Table 3 revealed a very poor performance of female students in Biology for single sex school students. Female students in Mixed school had 17.8% pass at distinction level while none of the female students of single sex school passed at the distinction grade level, though they performed equally well with the mixed school students at the pass grade level. The mean score of female students of mixed school (2.42) fell within the range of fair performance while the mean score of the female single-sex students fell within the range of poor performance. Hence it can be concluded that female students in mixed schools performed better in Biology than their counterparts in single-sex school who had 1.33 mean score.

Research Questions 3: Does any significant difference occur between the performances of Biology students in mixed secondary schools? This is translated to the corresponding

hypothesis which states that: H_{O1} : There is no significant difference between the performances of Biology students in mixed secondary schools Owo Local Government, Ondo State, Nigeria.

Table 4: *t*-test analysis showing the difference between the Biology performance of students in mixed secondary school

	Mixed school	N	Mean	Std. Deviation	Df	t	Sig
Performance	Male	39	3.64	2.580	79	-0.09	0.32
	Female	42	3.69	2.290			

NOTE: NS = Not Significant, S = Significant at 0.05. Remark: 0.32 is S, H_{O5} is not rejected.

Table 4 shows that the df (79) with t-value of -0.091 shows a significant difference at 0.32 level of significance which is greater than p-value ($p > 0.05$). Hence, the researcher did not reject the H_{O1} , which stated there is no significant difference between the performances of students in mixed Secondary School. The mean score for both genders as shown in the table does not significantly differ from each other. This result implies that significant difference does not exist between the performance of male and female students in mixed secondary school.

Research Questions 4: Does any significant difference occur between the performances of Biology students in single-sex secondary schools? This is translated to the corresponding hypothesis H_{O2} which states that: There is no significant difference between the performances of Biology students in single-sex secondary schools in Owo Local Government, Ondo State, Nigeria.

Table 5: *t*-test analysis showing the difference in the performance of students in single sex secondary schools.

	Single-sex school	N	Mean	Std. Deviation	Df	T	Sig
Performance	Boys only	121	1.90	1.344	245	3.01	0.00
	Girls only	126	1.46	.927			

NOTE: NS = Not Significant, * = significant at 0.05. Remark: 0.00 is S, H_0 is rejected.

Table 5 revealed the test for significant difference between the performances of secondary school students of male only single-sex school and female only single-sex school. The table revealed that $df (245) = 3.01$ shows a significant difference which is less than P -value ($P < 0.05$). Hence, there exists a highly significant difference between the two variables tested and the null hypothesis four stated above is been rejected.

Discussion

The findings from this study revealed that male students from mixed schools performed better than those in single-sex school. Although, male students in single-sex also performed well, hence, school type does not determine students' achievement in Biology. It was also observed that female students in mixed school performed better than their counterparts in single-sex school. However, the basis for female students' performance in single-sex schools may be because of their inability to collaborate share ideas with their opposite sex. It supports the study of Mburu 2013, who found out that that in mixed schools there is a hidden pressure towards gender stereotyping in the classroom.

It was also found out that significant difference does not exist between the performance of male and female students in mixed school because the t-value showed a level of significant Of 0.32 which is greater than p-value ($p > 0.05$). Hence, the hypothesis was not rejected. This supports the findings of Tobias (2003) and Babajide (2010) which revealed that gender has no significant influence on students' achievement in science. This result is contrary to the submission of Yoloye (2004), Ezirim (2006) and Whalen (2012). The results of this hypothesis may be because of the fact that male and female are equally intellectual and gender does not in any way determine ones academic attainment, therefore mixed school is beneficial to both gender.

Findings further revealed that the $df (245) = 3.009$ shows a significant difference that is lesser than P-value ($P < 0.05$) in the single-sex schools. Hence, there exists significant difference between the two variables because boys' single-sex school performed better than the girls' single-sex school. Therefore, H_0 was rejected. Whalen, (2012) affirmed that differences in gender have been associated with various tendencies in how students take in information, process information and communicate their ideas. A study conducted by Onasanya, Ahmed and Adefuye (2011) buttresses this finding because it asserted that a significant difference existed between the cognitive achievement of male and female students in Biology. Though Tobias (2003) asserted that gender does not determine ones potential but Yoloye (2004) and Ezirim (2006) observed that gender has influence on science achievement. Thus, it can be deduced that social interaction among students of the same sex has influence students' intellectual efficiency because both schools are single sex school.

Conclusion

It could be concluded from the major findings and discussion that male students in mixed and single sex school have performed fairly in Biology. This indicates that both schools performed equally. Hence, the performance of a student may not be determined by the kind of school attended rather by his or her self-construction of knowledge.

Even though it was found out that there was no significant difference in the achievement of male and female students in mixed secondary school; there was significant difference between the performance of students in males' only and females' only single-sex secondary schools in Biology. There exist significant differences between the two variables tested. Hence, single sex school has significant influence on students' performance because boys were also found to perform better in single sex schools than their female counterparts in the sampled schools.

Recommendation

Based on the findings from this study the following recommendations were made:

In order to solve the problem of poor achievement and enhance students' performance in Biology, students should not be discouraged from going to either of the mixed or single-sex school because both are effective in producing good academic outcome.

Proprietors of single-sex schools are encouraged to monitor learning achievement in schools; especially female single-sex school.

Both male and female students should be given equal consideration and be provided with adequate facilities and other fringe benefits so as to encourage and motivate students to learn more effectively and efficiently thereby, improving students' academic performance.

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