

Interactive Effect of Gender, Mode of Schooling and Orientation Instructional Strategy On Secondary School Students' Performance in Biology in Ekiti State

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Abstract:

The study examined interactive effect of gender, mode of schooling and orientation instructional strategy on secondary school students' performance in biology in Ekiti State. The study adopted pre-test, post-test quasi-experimental design. The population of the study consisted of all SS2 students offering Biology in Ekiti state. The sample comprised 200 students offering Biology and was selected through multi-stage sampling procedure. Biology Achievement Test (BAT) was used for data collection. It consisted of two sections A and B. The validity of the instrument was ascertained by experienced Biology teacher and experts in Tests and Measurement. The reliability coefficient of 0.83 was obtained for BAT using split-half alpha reliability. The research procedure was in three stages: the pre-treatment stage, the treatment stage and the post-treatment stage. The data collected were analyzed using inferential statistics. The hypotheses were tested using Analysis of Covariance (ANCOVA) statistics at 0.05 level of significance. The findings of the study revealed that the use of orientation before and after the teaching of Biology is a good strategy to enhance students' achievement in Biology. However, male students performed significantly higher than their female counterparts in Biology after orientation while day schools' students exposed to orientation achieved significantly higher than boarding schools' students in

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Biology. It was recommended that orientation instructional strategy in public school settings should be broadly conceived and involve a coordinated team approach in order to meet the needs of a diverse population of students irrespective of their gender and mode of schooling.

Keywords: Biology, Gender, Mode of Schooling, Orientation Instructional Strategy, Performance,

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Introduction

From discovering cures for diseases, to creating innovative technologies, to teaching us to think critically, science has become an indispensable feature of modern society. Therefore, in the world of today, science has become a dominant cultural factor (Abubakar, et al., 2012). Biology is the science of life. The science of biology is rapidly expanding and it has permeated most aspects of our economic/public life. Biology occupies a central position in the science world and it is the gateway to professions like; medicine, pharmacy, dentistry, nursing, sanitary inspection, agriculture and a host of others. In spite of the obvious importance and the fact that biology is an interesting subject that relates to human life, it is still a puzzle why the performance of secondary school students remains poor in the subject. Most parents, educators and professionals have expressed their deep concern over this existing problem. It has now become necessary therefore to consider that every individual is unique and differences exist among students with respect to readiness for reception of knowledge, readability and the rate of absorption of materials which may depend on the gender and possibly, the mode of schooling (boarding or day) among many factors that can be considered. Although there have been many reasons and explanations given for this situation and even many recommendations proposed, little has been achieved in bringing about the much desired and much needed effective learning of Biology by the Senior Secondary School students.

The research of Geary (2008) showed that male and female students actually learn differently. Keeping male and female in the same classroom does not make female to excel as they ought to. The reason behind this may be that male simply volunteer to answer questions which may be related to female competition value nature. Anderson (2004) posited in the group which he has studied and found that the brain of the female and male sometimes respond differently to the same experience, apparently through the action of sex hormones. Sex hormones can also contribute to sex differences and achievement in the type of environment factor and the type of experience within those factors that male and female seek. Arnold (2006) said sex hormones and perhaps more direct genetic influence can influence the way in which the brain respond to environmental input and the type of environmental input an individual seeks. In another way, it cannot be assumed that the different experience of boys and girls, men and women are driven only by cultural factors (e.g. sex role), even with the same experience it cannot be assumed that cognitive and brain development of boys and girls will be the same. In fact, biologically there is sex difference in responsiveness (in term of cognitive and brain development).

Lubinski (2004) noted that gender difference in vocational interest is especially striking among gifted youth. He concluded that for every gifted woman in her twenties, who is working towards or who aspires to earn an advance degree in Mathematics, Engineering or the Physical Sciences, there are eight equally talented men.

In modern society, this gender difference appears to contribute to the sex difference in the relative attractiveness of Mathematical-intensive careers. More generally, it appears that gifted girls are more interested in careers that involve living things such as Biology and Medicine as opposed to inorganic things as Physics and Engineering whereas gifted men show the opposite pattern on average.

This gender difference could appear to be the continuation of an object versus people orientation that emerges in infancy and is evident in the play patterns and social motives of men and women (Geary, 2008). He further argued and presented evidence to support this argument that most of these gender differences have evolved by means of sexual selection and are reflection of the different reproductive strategies of women and men. No doubt, the different issues affecting the education of the women can be readily evidenced in the interest of girls in Biology.

Popoola (2002) was of the opinion that Science, Technology and Mathematics are masculine (while girls are very good in English spellings, writing and Arts) and thus male students' performance in the subject like Mathematics tends to be better than that of their female counterparts. According to Ogunboyede (2000), fewer members of the girls applied to study course related to science than the boys. Though, over years, girls' enrolment in schools at all levels has gradually risen yet they still comparably lag behind their male counterparts.

Several reasons have been advanced; distraction by and towards boys, which leads to lack of concentration, the desire by the girls to attract attention to them (seduction), the tendency for girls to be taken care of by the boys and to exhibit their weakness, the tendency to "give up" in the face of difficulties and so on. This shows that somehow, co-educational school system has not solved the problems it was to solve and that rather than foster intellectual growth of girls, it becomes an obstacle to their development. It could be concluded that girls show very little interest in Science and science related courses, a situation which account for their tendency to rather opt for the literary discipline such as techniques of sewing, embroidery and secretariat work.

Furthermore, researches have equally indicated that gender influences student's academic achievement. For example, Kolawole (2007) investigated on the effects of cooperative and competitive learning on academic performance of students. The result, among other things, revealed that boys performed significantly better than girls in both learning strategies. Ogunboyede (2000) opined that women have always perform excellently well in the position they found themselves. This is due to their watchword of honesty, transparency, accountability in handling both human and material resources. But the fact is that the percentage of these women that have been privileged in these science courses are still very small compared to the number of them in our society and schools. Oloyede (2004) also found that boys perform better in numerical ability and problems solving than girls.

Frempong and Ayia (2006) observed that female students are less successful in learning Biology, due to their low interest and confidence in learning Biology and their low academic expectation. According to them, girls initially have more positive attitudes towards Biology than boys do, but as they continue in school, girls' attitudes become more negative. Falebita (2007) while analyzing students' performance in WASCE and NECO found no significant difference in the performance of male and female students especially for those from single-sex schools. The study investigated whether the gender (male or female) or mode of schooling (day or boarding) of students will have effect on their achievement in Biology when exposed to orientation.

Orientation gives better information that enhances students' energy and drives to learn effectively and achieve to their potential at school. Taiwo (2012) defined orientation as an information which enables an individual to know himself/herself as a separate being, where

one is in space, where one wants to move into in space, and how to get to that place. The seemingly lack of interest and commitment to learning of biology can then be attributed to lack of proper orientation. No one has ever achieved anything without a dream attached to a burning desire (Maps, 2003). Learners must be taught how to learn because learning how to learn frees one's dependency on others for knowledge. This supports a popular adage that; "give a person an idea and you enrich his life; teach a person how to learn and he can enrich his own life" (Webb, 2006).

The findings so far cannot allow generalization on gender and academic achievement. There is still need to research more; to consider divers variables like mode of schooling (day/boarding school) and the subject concerned among others. The study examined interactive effect of gender, mode of schooling and orientation instructional strategy on secondary school students' performance in biology in Ekiti State.

Research Hypotheses

The following null hypotheses were generated from research questions.

1. There is no significant difference between the achievement of male and female students in Biology before and after orientation.
2. There is no significant difference between the achievement of day and boarding students in Biology before and after orientation.

Research Method

The study adopted pre-test, post-test quasi-experimental design. The population of the study consisted of all SS2 students offering Biology in Ekiti state. The sample comprised 200 students offering Biology and was selected through multi-stage sampling procedure. Stage one involved the selection of five Local Government Areas across the three Senatorial Districts in Ekiti State through stratified random sampling technique. The second stage involved the selection of five schools from the selected Local Government Areas through purposive random sampling technique because the type of school in respect of gender and mode of schooling (day/boarding) were considered. . The third stage involved the selection of 40 Biology students from each of the five selected schools using purposive random sampling techniques. The last stage involved the selection of 20 male and 20 female students using stratified simple random sampling technique.

Biology Achievement Test (BAT) was used for data collection. It consisted of two sections A and B. Section A consists of student's bio-data while section B contains 20 objective questions drawn from the scheme of work for Senior Secondary School two to measure achievement in Biology. Each question has four options from which the students are required to choose the correct answer. The validity of the instrument was ascertained by experienced Biology teacher and experts in Tests and Measurement. The reliability coefficient of 0.83 was obtained for BAT using split-half alpha reliability. The research procedure was in three stages: the pre-treatment stage, the treatment stage and the post-treatment stage.

The data collected were analyzed using inferential statistics. The hypotheses were tested using Analysis of Covariance (ANCOVA) statistics at 0.05 level of significance.

Results

Hypothesis 1: There is no significant difference between the achievement of male and female students in biology before and after orientation.

Table 1: ANCOVA of the difference between Biology achievement of male and female students before and after orientation

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	8945.280 ^(a)	4	194.463	11.219	.034
Covariate	5172.936	1	5172.936	298.554	.000
Group	3348.862	2	176.256	10.169	.040
Gender	2470.832	1	123.542	7.127	.045
Gender * Group	786.825	2	196.706	11.348	.037
Error	52.000	40	17.333		
Total	22,852.000	45			
Corrected Total	8997.280	44			

a R Squared = .994 (Adjusted R Squared = .906)

Table 1 showed that the interactive P-value (0.034) is less than 0.05 level of significance. This means that there is a significant interactive difference for group and sex. Also, there is a significant main difference in the achievement of students between the groups (before and after orientation) as P-value (0.00) is less than 0.05 level of significance. Furthermore, there is significant main difference in the performance of male and female students as P-value (0.037) is less than 0.05 level of significance. The F-calculated (7.127) was significant because the p-value of 0.045 is less than 0.05 level of significance. Based on these findings, the null hypothesis is rejected. This means that there is a significant difference between the Biology achievement of male and female students before and after orientation.

In order to investigate the direction of the difference observed between the Biology achievement of male and female students before and after orientation, Scheffe post-hoc test was carried out.

Table 2: Post-hoc test of students' gender

Sex	Mean Difference	Alpha
Male	66.56	13.95
Female	41.78	

P>0.05 (significant)

The result in Table 2 showed that the male mean score (66.56) was higher than the female mean score (41.78). The alpha value (13.95) which shows the level of difference between male and female performance was very high. This implies that male students performed significantly higher than their female counterparts in Biology after orientation.

Hypothesis 2: There is no significant difference between the achievement of day and boarding students in Biology before and after orientation.

Table 3: ANCOVA of the difference between Biology achievement of day and boarding School students' before and after orientation

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	11746.020(a)	4	255.348	5.440	.043
Covariate	571192.851	1	571192.851	5457.257	.000
Group	6062.595	2	319.084	7.049	.025
School Type	2355.161	1	117.758	4.125	.036
School type * Group	1474.367	2	368.592	3.522	.015
Error	314.000	40	104.667		
Total	718445.000	45			
Corrected Total	12060.020	44			

a R Squared = .974 (Adjusted R Squared = .575)

Table 3 shows that the interactive P-value (0.043) is less than 0.050. This means that there is a significant interactive difference for group and school system. Also, there is significant main difference in the achievement of students between the groups (before and after orientation) as P-value (0.00) is less than 0.05 level of significance. Furthermore, there is significant main difference in the achievement of day and boarding school students as P-value (0.015) is less than 0.050. The F-calculated (4.125) was significant because the p-value of 0.045 is less than 0.05 level of significance. Based on these findings, the null hypothesis is rejected. This means that there is a significant difference between the Biology achievement of day and boarding students before and after orientation.

In order to investigate the direction of the difference observed between the Biology achievement of day and boarding school students before and after orientation. Scheffe post-hoc test was carried out.

Table 4: Post-hoc test of Day and Boarding Students' Achievement

School System	Mean Score	Alpha
Boarding	44.11	5.33
Day	68.90	

P>0.05 (significant)

The result in Table 4 shows that the day students mean score (68.90) was greater than the boarding students mean score (44.11). The alpha value (5.33) shows the level of difference between boarding and day students' achievement as high. This implies that day schools' students exposed to orientation achieved significantly higher than boarding schools' students in Biology.

Discussion

The study further revealed significant difference in the achievement of male and female students in Biology before and after orientation. Male students performed significantly higher

than their female counterparts in Biology before and after orientation. Anderson (2004) in one of his studies found that the brain of the female and male sometimes respond differently to the same experience, apparently through the action of sex hormones. It could be concluded that girls show very little interest in science and Biology-related courses, a situation which account for their tendency to rather opt for the literary discipline such as techniques of sewing, embroidery and secretariat work.

A significant difference was found in the study between day and boarding school students before and after orientation. Day schools students exposed to orientation achieved significantly higher than boarding schools students in Biology. Boarding school system has lost its effectiveness due to inadequate monitoring and supervision. Students in the boarding school no longer concentrate on their studies and the aftermath is poor performance in their studies especially in science-related subjects (Ola & Egbon, 2001).

Conclusion and Recommendation

Based on the findings of this study, it was concluded that the use of orientation before and after the teaching of Biology is a good strategy to enhance students' achievement in Biology. However, male students performed significantly higher than their female counterparts in Biology after orientation while day schools' students exposed to orientation achieved significantly higher than boarding schools' students in Biology. Orientation in public school settings should be broadly conceived and involve a coordinated team approach in order to meet the needs of a diverse population of students irrespective of their gender and mode of schooling.

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