



EFFECTS OF MENTORING AND GENDER ON THE ACHIEVEMENT OF LOW-PERFORMING STUDENTS IN BIOLOGY

Jegade S.A¹
Olu-Ajayi F.E^{2*}

^{1,2}Department of Science Education, Faculty of Education, Ekiti State University Ado-Ekiti, Nigeria



(+ Corresponding author)

ABSTRACT

Article History

Received: 9 March 2017

Revised: 2 May 2017

Accepted: 25 May 2017

Published: 14 June 2017

Keywords

Effect

Mentoring

Gender

Achievement biology

Low-performing students

Biology.

This study investigated the effect of mentoring and gender on the achievement of low-performing students in Biology. Its main purpose was to measure the response rate of each gender to mentoring approach of science teaching. It is believed that this will assist in developing individual potentials to becoming better science learners. The study employed the non-randomized pre-test, post-test, control quasi-experimental design. The population of the study was all senior secondary school students in South West Nigeria. The sample comprised 180 Biology students (consisting of 70 males and 110 females) selected from six secondary schools through random and purposive sampling techniques. The instruments used to collect the relevant data for the study was a Biology Concept Test (BCT) which was administered as both pre-test and post-test. The instrument was validated by experts in science education and tests and measurement respectively. Its reliability was ascertained using test-retest method and a reliability coefficient of 0.72 was obtained. The experimental group was treated with a mentoring package involving Classroom Adjunct Instruction Learning Model (CAILM). Data collected were analyzed using Analysis of Covariance (ANCOVA) and Multiple Classification Analysis (MCA). It was discovered from the study that mentoring enhanced the achievement of low-performing students and that female students performed better than their male counterparts in mentoring relationship. Based on the findings of the study, it was recommended (among others) that mentoring should be used by teachers as an adjunct to normal classroom teaching for bringing up slow and poor students to improved level of performance.

Contribution/ Originality: The paper's primary contribution is that, low-performing students can improve their achievement in Biology if they can be well mentored.

1. INTRODUCTION

The recent focus on gender sensitivity in developing countries, calls for the importance of involving more female participation in national development by devising teaching methods that may encourage females in learning science. General diversity of differences in the learning outcomes of students in schools is believed by educators to be gender-related. This appears to be so when one considers the obviously low representation of females in science disciplines and professions all over the world. Male to female distribution ratio in the science classroom also paints

this picture. [Duyilemi \(2007\)](#) in a paper titled “Girl-child Education and Empowerment”, stressed that females perform less than their male counterparts in science and technology because of the inborn and societal norms and values of their gender which lower their aspiration. Market in [Jegade \(2013\)](#) resolved that there is no innate sex difference affecting the people. One sex is not more intelligent than the other and if there are innate differences in ability, they are not absolute. It is of the opinion of the researcher that every student has the capability to learn even if it has to be slowly and at his pace depending on his interest in what to be learned. This agreed with the submission of [Moemeke and Omoifo \(2003\)](#) who in a study of biology students’ ability to utilize laboratory manual with usual information processing aids to improve their achievements and attitude towards the subject found that, though males produced relatively higher mean scores than females, the mean scores were found not to be significantly different. The study resulted in the recommendation of the development of problem solving skills.

Ughamadu in [Eloebhose \(2006\)](#) had earlier found a significant male dominance in the area of thinking level and display of scientific reasoning while females resort mainly to rote memorization. Several researchers had tried to identify the factors responsible for this gap. Some of the reasons adduced are; environmental and cultural factors ([Kahle, 2004](#)) gender role stereotype ([Phipps, 2007](#)) differential expectations, genetic factors, difference in nerve condition velocity (NCV) in males and females, innate difference in visual spatial ability, differential treatment within classroom, differential socialization experiences at home and school ([Pale Baker, 2016](#)) differences in participation in science activities within and outside the school as well as gender limitations in the society.

Mentoring is a *development* relationship, and like education and training, its primary objective is learning. It is generally agreed that mentoring differs from traditional learning methods such as education and training. A major difference, however, is that mentoring involves a greater degree of partnership ([Ganser, 2006](#)). The mentor and protégé work together to set goals driven by the needs of the protégé, rather than the mentor acting as an instructor who sets the curriculum and learning objectives. Academic mentoring in secondary schools exposes students to mentors, usually teachers, who engage them in a supportive relationship based on academic tutoring and enrichment. Academic mentoring can be an asset in differentiating the curriculum for students with different needs and interests requiring extra attention by teachers. Low-performing students are students with special need, who feel inferior to their classmates due to their low-ability level and the authors opined that mentoring can be used to improve students’ academic performance, and this is why this study is aimed at finding out the effects of mentoring on the academic achievement of low-performing students in Biology.

1.1. Statement of the Problem

A critical issue that becomes a focus in the recent development is the issue of gender involvement in science learning. Female students seem to dread learning science subjects, resulting into more male scientists than females. Observations had also revealed that majority of secondary school students had lost interest in studying science subjects. This is evident in low enrolment and poor performance of the few enrollees majority of who are females. This may be due to lack of proper and adequate mentoring. Besides, most secondary school students (especially females) hold the misconception that science subjects (especially Biology) are cumbersome and difficult to learn and there seems to be no good mentors to debunk this erroneous notion and misconception among the students. Thus there is the need to investigate the effects of mentoring on the academic achievement of low-performing students in Biology.

1.2. Purpose of the Study

The main purpose of this study was to encourage through mentoring approach, the participation of male and female students in science learning and gradually change the misconception held by secondary school female students, that science subjects (especially Biology) are hard and cumbersome.

1.3. Hypothesis

The only hypothesis tested in this study was that, there is no significant difference in the Biology achievement of low-performing boys and girls exposed to mentoring activities.

1.4. Research Design

The study employed quasi-experimental design which utilizes non randomized pre – test post - test experimental and control group system.

2. METHODOLOGY

The population consisted of all secondary schools in South-West, Nigeria. The sample consisted of 180 (70 male and 110 female) low performing Biology students, (i.e. those who scored below 50 marks on the average in the school second term examination and the pretest administered on them) selected in stages. This involved random selection of three of the six states in South-West Nigeria; purposive selection of two schools from each selected state (only schools which has a Biology teacher that has, and could relate relevant information about the behavior and academic performance of his/her students from senior secondary school one till date) and selection of 30 students from each of the six selected schools through stratified random sampling technique. The students were randomly assigned to the experimental and control groups respectively.

2.1. Research Instrument

The only instrument used to collect the needed data for the study was a 60-item, multiple choice Biology Concept Test (BCT). Items of the BCT were constructed using Bloom's taxonomy. These items were used to test the ability level of the students in Biology before and after treatment.

2.2. Validation of the Instrument

The instrument was given to experts in both Science Education and Tests and Measurements for face and content validities respectively. Its reliability was ascertained using test-retest method and a reliability coefficient of 0.72 was obtained.

2.3. Research Procedure

The procedure involved four stages. These are discussed below:

Administration of pre-test: The researcher, with the help of the research assistants administered the BCT as pre-test to the sample

Process of identifying low performing students – This involves finding the average score of each student in the school examination and the BCT administered as pre-test. Every student who did not score up to 50 marks on the average was noted. All such students are referred to as *low-performers* and they constituted the experimental group for this study.

Mentoring intervention- This is made up of four sections:

(1) Acquainting with the low-performing students with the aim of identifying the main causes of low-performance in each of the students. The mentor now used the knowledge of these causes to counsel the mentees (i.e. the low-performing students) appropriately on their personal behaviour

(2) Investigation of the attitude of the low-performing students towards Biology under five headings:- (a) enjoyment of Biology (b) leisure attractions in Biology (c) career curiosity in Biology (d) knowledge about the goals of biology and (e) avoidance of Biology. Here the mentor counseled the mentees and encouraged positive attitude towards biology subject in them.

(3) Use of Biology learning resources (such as books, charts, diagrams, laboratory and improvised materials) to make learning interesting and effective. Here the mentor taught the mentees with instructional materials relevant to the topic treated in the study.

(4) Provision of electronic aided instructional guidance, CAILM to enhance easy learning-: This includes, giving the mentees audio record of the topic taught for this study to listen to at their leisure, and playing video cassette of same to them after the school hours. The researcher (or a research assistant) was physically available during the video lessons, to discuss with and answer mentees' questions on the topic taught for the study. The researcher motivated the students to wait after the school hours for the watching of the VCD supplementary instruction model. The mentee were given opportunities to call at anytime on phone or meet with the mentor when around to discuss, share experiences on how well they are fairing, ask questions on Biology and other things.

Administration of post-test: The researcher, with the help of the research assistants, again, administered the BCT as post-test to the sample. In all, the treatment lasted for six weeks.

3. RESULTS AND DISCUSSION

There will be no significant difference between the pretest and post-test achievement mean scores of low-performing boys and girls exposed to mentoring activities.

In order to test the hypothesis, achievement mean scores of male and female low-performing Biology students exposed to mentoring activities were compared for statistical significance using Analysis of Covariance (ANCOVA). The result is presented in Table 1.

Table-1. ANCOVA of gender and Achievement of low-performing Biology Students in Biology

Source	SS	Df	Ms	Fcal	Ftable
Corrected model	6869.268	2	3434.634	23.902	2.99
Covariate (pretest)	3121.329	1	3121.329	21.722	3.84
Gender	1779.873	1	1779.873	12.386	3.84
Error	25434.044	177	143.695		
Corrected Total	32303.311	179			
Total	367018.000	180			

P<0.05

Table 1 reveals that F cal (12.386) is greater than F table (3.84). The null hypothesis is rejected. This implies that there was significant gender difference in the achievement mean scores of low-performing Biology students exposed to mentoring activities.

To determine the effect of gender on the adjusted post-test achievement mean scores of low-performing Biology students, Multiple Classification Analysis (MCA) was applied. The result is presented in Table 2

Table-2. Multiple Classification Analysis of Gender and Achievement of low-performing Biology Students in Biology.

Grand Mean=43.12					
Variable + Category	N	Unadjusted Devn	Eta	Adjusted for Independent + Covariate	Beta
Male	70	7.36		4.85	
			.59		.40
Female	110	-2.83		-1.87	
Multiple R ²				.158	
Multiple R				.379	

Source: Field work 2017

Table 2 presents gender influence on adjusted post-test mean scores of low-performing students in Biology. The result shows that female students had higher adjusted post-test mean score of 47.97 (43.12+4.85) than their male counterparts who had an adjusted post-test mean score of 41.25 (43.12+ (-1.87)).

4. DISCUSSION

It was discovered from the result of the study that both gender responded well to mentoring as improved performance was recorded for both gender. However, the MCA result revealed a higher adjusted post-test mean score in female students. This implies that female students performed better than their male counterparts when mentoring was used to effect performance in the Biology. This is in agreement with the submission of Olu-Ajayi (2013) who submitted that both boys and girls have equal potential to learn even if it has to be slowly and at their respective paces depending on interest on what to be learned. The rate at which each gender responded to treatment differs from one another. The socio-cultural views of the societies constituting the study areas for this study may be contributory to this, as females are viewed as sensitive and as such, are expected to be more complying easygoing and emotional than males. This can be related to the opinion expressed by Rogers (2007) in a study on mentor, that a mentor in a close trusting relationship with a youth could validate and support the child's existing intellectual interest which may differ from one person/gender to another, encourage curiosity and motivate learning in new areas.

5. CONCLUSION AND RECOMMENDATIONS

From the findings of this study, it could be concluded that normal classroom teaching alone may not be adequate to ensure learning or good performance especially in poor and slow students, but complementing normal classroom teaching with mentoring seems to be an improved way of imparting science knowledge to students. It also has the potency of improving female students' achievement in Biology.

Based on the above, it is recommended that mentoring relationships should be encouraged in the secondary school system amongst teachers and students to improve the general performance of students. As well, normal classroom teaching should be complimented with mentoring in order to assist slow learners to learn faster

Funding: This study received no specific financial support.

Competing Interests: The authors declare that they have no competing interests.

Contributors/Acknowledgement: Both authors contributed equally to the conception and design of the study.

REFERENCES

- Duyilemi, A.N., 2007. Girl-child education and empowerment. Keynote Address Presented at Workshop for Senior Secondary School Female Student Teachers and Education Officers in Ondo South-West Senatorial District Okitipupa. Education Publication.
- Eloebhose, F.E., 2006. Differential effects of three instructional models on learning outcome of senior secondary school students in biology. An Unpublished P.hD Thesis University of Benin Nigeria.
- Ganser, T., 2006. A status report on teacher's mentoring programme in the United States. Inc Cullingford (Eds) Mentoring in teacher education: An educational perspective. England: Ashgate. pp: 33-35.
- Jegede, S.A., 2013. Students' perception of the availability and utilization of Information and communication Technology (ICT) in the teaching and learning of science subjects in secondary schools in Ekiti State, Nigeria. International Journal of Education & Literacy Studies, 1(1): 94-99. [View at Google Scholar](#) | [View at Publisher](#)
- Kahle, J.B., 2004. Will girls be left behind? Gender difference and accountability. Journal of Research in Science Teaching, 41(10): 961-969. [View at Google Scholar](#) | [View at Publisher](#)

- Moemeke, D.C. and N.C. Omoifo, 2003. The effectiveness of individualized, collaborative field work and expository learning on biology students' ability to solve problems. *Journal of Education*, 6(6): 84-94. [View at Google Scholar](#)
- Olu-Ajayi, 2013. Effects of mentoring on low-performing biology students in South West Nigeria. An Unpublished Ph.D Thesis. Ekiti State University, Ado-Ekiti.
- Pale Baker, 2016. Teaching for gender difference. National association for research in science teaching (NARST). 12100 Sunset Hills Road, Suite 130 Reston VA USA.
- Phipps, A., 2007. Re-inscribing gender binaries: Deconstructing the dominant discourse around women's equality in science, engineering and technology. *Sociological Review*, 55(4): 768-787. [View at Google Scholar](#) | [View at Publisher](#)
- Rogers, M., 2007. Peer mentoring and student success. Presentation Made at Peer Mentoring Sharing Event, York University, December 2007.

Views and opinions expressed in this article are the views and opinions of the author(s), International Journal of Education and Practice shall not be responsible or answerable for any loss, damage or liability etc. caused in relation to/arising out of the use of the content.