EFFECTS OF GUIDED PHYSICS LABORATORY METHOD OF TEACHING ON GENDER ACQUISITION OF LABORATORY SKILLS

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Abstract

The disparity in performance in physics between male and female physics students is a matter of concern to science educators. This study is therefore aimed at finding out the effect of guided laboratory method of teaching physics may have on student's acquisition of laboratory skills. 480 remedial physics students were used for this study comprising 240 males and 240 females. The study revealed that the effect of gender was significant in their acquisition of laboratory skills, the study also revealed that the guided laboratory method of teaching physics has a higher facilitating effects on males than their female counterparts in cognitive comparative and observational skills. The facilitating effect of this method of teaching physics is seen to be comparable on the acquisition of manipulative and communicative skills. Teachers of Science in general and physics in particular should guide against the methods they used when teaching the subject so as not to promote this disparity in physics students' performance in any circumstance.

Introduction

The current concent of science education is the way the sciences should be taught so as to bring about the expected outcome. Among the different attempts to bring a positive change in physics students' performance, is the use of laboratory teaching method. As has been acknowledged by many authorities (Onwioduokit, 1989; Mboto, 1990; Agba, 1992), the laboratory method of teaching physics promotes the development of certain abilities in physics students among which are computerization of experience, problems- solving abilities, and the understanding of physics concepts in particular and the science in general.

Abdullahi (1982), believe that, laboratory work is desirable because of its ability to yield some desirable skills such as the ability to plan and analyse practical problem-solving. It also enhances the interpretation of results of experiments and the drawing of logical inferences and conclusions. Unfortunately, the school system today adopts the cookbook type of laboratory practices which does not help in the development of cognitive skills in the learners. This cookbook type of practical work operates according to the dictates of societal and cultural practices, which does not allow for free mind and creative ventures.

For the development of the expected free minds in learners, laboratory practices should be guided. It is obvious that learning is better acquired when learning activities are guided by the teacher than when they are presented to the learners through the story-telling or expository approach (Gagne, 1965). He

further maintains that before any instruction or teaching begins, the instructional or teaching objectives must be stated in behavioural terms to guide the teacher or instructor. This is intended to give the teacher and learner a focus in all the class activities.

The guided laboratory is identical to guided learning, but differs significantly in that the guided laboratory requires a sequential arrangement of instructions on how the learners can arrive at the expected goal. It has to do with regularly directing the learners as to what they are expected to do at each stage of the instruction; that is "Connect A to B; record the reading of C; replace B with D; record the reading of C etc. This laboratory approach equips the learner with the means of gaining knowledge through active participation in the teaching / learning process. As a result of the advantages of the guided laboratory, this study is designed to study the significant difference, (if any) which this laboratory approaches would make between male and female physics students.

Gender, a psychological term used to describe male or female human beings also describes the behaviour and altitude expected of an individual on the basis of being born either male or female (Bassow, 1991). Killer (1991), considers the embracive nature of gender as a cultural contrast, developed by the society to differentiate between the role, behaviours, mental and emotional characteristics of the males and females When compared to their role expectations in any rated engagement.

According to Onyemelukwe (1995), sex difference in the performance of boys and girls in some school subjects could be attributed to a variety of factors among which are teaching methods, gender and attitude. On likening laboratory skills to Bloom's taxonomy of educational objectives, Oriaifo (1986), asserts that, males are superior to females, not only in cognitive performance in the sciences but also in the psychomotor and affective components.

It is therefore, the task of this study to determine the effect (if any) of guided laboratory on gender acquisition of laboratory skills.

Statement of the Problem

The problem that necessitates this research work is the observed differences in students' performance in science practical examinations in any standard examinations like West African Senior School Certificate Examinations (WASSCE), and National Examinations Council (NECO) between male and female physics students.

Purpose of the Study

This study was designed to investigate whether the guided laboratory method of teaching physics can improve on the levels of acquisition of laboratory skills: cognitive, observational, manipulative, computational and communicative by male and female Physics students.

Significance of the Study

This study will be significant in several ways, thus it will:

i) Guide the science teachers in general and Physics teachers in particular on the choice of a teaching method(s) that will not be bias to any of the sexes.

ii) Enable science teachers to re-orient their teaching method as not to favour any particular sex.

iii) Enable the teachers to decide on a method when a particular skill is required.

Research Area

This study was carried out in Cross River State of Nigeria using the Remedial physics Students of Cross River University of Technology, Akamkpa Campus.

Population of study/Sample

Out of a population of 600 Remedial Science Students, 480 of them were used as sample for this study at 240 males and 240 females. This study was delimited to remedial science students only, and also to live laboratory skills variables.

Research Questions

The following questions were asked to direct the investigation of this study:

1) Do there exist any significant difference in the levels of Physics student's acquisition of laboratory skills attributable to method of teaching and gender.

Research Hypothesis

1. There do not exist any significant difference in Physics student's levels of acquisition of laboratory skills attributable to method of teaching and gender.

Instrument

A multi-choice 50 test item was developed by the researchers. This instrument was face-validated by experts and colleagues in the Department of Curriculum and Instructional Technology. This instrument was pilot tested and with Kuder-Richardson (KR) formular 21, the reliability index of the instrument was administered on the class after teaching them using the laboratory method.

Data Analysis ____

The mean (X) and the Standard Deviation (SD) were computed from the test score generated from the instrument developed by the researchers. These allowed for the computation of t-test analysis. The data generated was equally used for the ANOVA analysis.

Table 1: t-test Comparison of Means Scores of Male and Female Students Exposed to Guided-Laboratory With Respect to Acquisition of Laboratory Skills

Comparison N	X	SD	t-cal	t-crit	P<.05
Male 240	51.58	9.41			
			3.62	1.96	Significant
Female 240	48.50	9.32			

Table 1 shows that, there exists a significant difference between male and female students' in their performance; with the males having a higher mean score. It also shows a calculated t-value of 3.62. Consequent upon the fact that the calculated t-value of 3.62 is greater than the critical value of 1.96 the hypothesis, that no significant difference in students' acquisition of laboratory skills when taught Physics using guided laboratory is therefore rejected. This implies that the method of teaching Physics has serious implications on students' abilities to acquire laboratory skills.

Table 2: One Way Analysis of Variance of Gender Acquisition of Laboratory Skills Attributable to Guided Laboratory

Comparison	Source of Variation	df	SS	MS	F	Decrement At P<.05
Cognitive skills	Between groups	1	51.73	51.73		
	Within groups	478	2446.77	5.12	10.10	Significant
	Total	479	2498.50			
Observational skill	Between groups	1	50.01	50.01		Significant
	Within groups	478	2508.19	5.29	9.53	
	Total	479	2658.20			
Manipulative skills	Between groups	1	0.01	0.01		
	Within groups	478	2453.83	5.13	0.02	Not Significant
	Total	479	2453.83			
Computational skills	Between groups	1	53.21	53.21		
	Within groups	478	2913.16	6.59	8.73	Significant
	Total	479	2966.37			
Communicative skills	Between groups	1	0.48	048		
	Within groups	478	3150.65	6.59	0.07	Not Significant
	Total	479	3151.13			

As shown in Table 2 above, guided laboratory makes a significance difference in students' acquisition of cognitive skills, observational and computational skills, but no significant difference was observed in manipulative and communicative skills. This implies that the influence of gender is

comparable or about so in students acquisition of manipulative and communicative skills.

Since majority of the skills have significant differences, the hypothesis is further investigated using a t-test comparison of mean scores.

Table 3: t-test Comparison of Means Scores of Male and Female Physics Students Exposed to Guided Laboratory With Respect to Acquisition of Laboratory Skills

Comparison	Sex	.N	X	SD	t.cal	t.crit	Decrement At P<.05
Cognitive skills	M	240	9.10	2.29	22.55	1.65	Significant
	F	240	8.47	2.22			
Observational Skills	M	240	X.4X	2.0	22.52	1.65	Significant
	F ■	240	7.87	2.3(i			
Manipulation Skills	M	240	1 1.71	1.38	4.39	1,65	Significant
	F	240	1 ! .60	2.16			
Computational Skills	M	240	7.96	4.12	36.03	1.65	Significant
	F	240	6.72	2.24			
Communicative Skills	M	240	10.90	2.99	8.50	1.65	Significant
	F	240	10.54	2.87			

Since the calculated t-values of 22.55 for cognitive skills, 22.52 for observational, 4.39 for manipulative, 36.03 for computational and 8.50 for communicative skills are greater than the critical value of 1.65, this hypothesis is rejected. This implies that gender difference has serious implications on students' acquisition of laboratory skills.

Discussion

From the findings of this study, the data in Table 1, shows that gender has serious implications on students' acquisition of laboratory skills. It also shows that males are more facilitated by the use of guided laboratory than females. This agree with Finn (1980), Ato (1986), Inyang (1989), Ansa (1990),

Leller (1991) and Mboto (1992), works on gender and academic performance of science students.

Similarly, data in Table 3 also shows that there exist significant differences between males and females' levels of acquisition of laboratory skills in all the five skills used for this study namely cognitive, computational, observational, manipulative and communicative skills. For manipulative and communicative skills, the levels of acquisition are comparable or almost so; implying that males and females are equally facilitated or almost so, by the guided laboratory method of teaching laboratory Physics because no significant differences exists.

Science teachers in general should, as a matter of fact, adopt this method of teaching sciences as much as possible for maximum learning to take place in the learners.

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