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Gender Stereotypes on Biology Practical Pedagogy: A Student-Teachers` Perspective

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Abstract
This study examines ideas of pre-service teachers on goals of biology practical in three purposely selected Colleges of Education. To this end, A researcher designed questionnaire which was adapted titled 'views of pre-service teachers on biology practical' to elicit information, and findings of a survey administered to 405 pre-service teachers revealed divergent views with gender stereotypes on laboratory manual, e-learning and biology practical and with chi-square statistical tool used to analyze the research questions and results presented.
Keywords: Pre-Service Teachers, Teacher Education, Biology Education, Gender Stereotypes, Laboratory Practical, Laboratory Teachers

INTRODUCTION

There is a growing body of literature on laboratory practical as a pedagogical strategy and its effect on students' achievement much of which had been descriptive, analytical and contextual. Application of the scientific knowledge has been used to improve the standard of living of mankind in its entire ramifications (Daramola , 2004), and we know science as 'A body of knowledge, a way of investigation or method and a way of thinking in the pursuit of an understanding of nature' (Author and Omosewo , 2006). Therefore, to invigorate the major developments and reforms in science teacher education and curriculum, research into laboratory implementation strategies as well as learning experiences in the laboratory has become imperative. It is needless to stress the fact that Laboratory practical work constitutes an integral part of science thus, making it an issue of concern to science teachers, to explore certain specific ways of improving and also modifying it as an instructional strategy. All with a view to allaying the witty discovery in literatures like; Clark (1988), Egglestone (1993) where teacher education has been seen as viable period that enable pre-service teachers to determine, create a lasting impression, discover biases and grab conceptions and these experiences of pre-service teachers as students majorly determines their approach to teaching and the beliefs they eventually and lastingly hold rather than the professional training received. Given that Larsson (1986); Koballa et al.(2000) asserted that student-teachers mostly teach as they have been taught. It follows therefore that Pre-service teachers if adequately guided on learning can be made to learn better and create authentic ability to learn relevant and significant classroom practice so as to effectively transfer training to practice (Santagata & Angelici, 2010; van Es & Sherin, 2002).

Nevertheless, there is insufficient research to examine the effectiveness scientific processes involved in biology laboratory practical work in teacher education curriculum, its objectives and the connection for proper transfer of pre-service teacher training to classroom practice. It is this serious gap in the literature that is hoped to be spanned by this study.The importance of practical science was further stressed by Wolnough and Allsop (1985), they both said that nothing can be learnt in science adequately without experiments as against the erroneous ideas that science exist only to be learned, hence, it helps teachers break away from the orthodox or dramatic method of science teaching as well as helping the students to move away from rote learning, as experiments helps to confirm what we have learnt previously from a lecture or text book or by mere observation on the field, particularly, during field trips by helping student to be in contact with learning and to acquire scientific skills and techniques, because practical work and experiments make learning meaningful and interesting to students.

The place of practical in teaching science cannot be over emphasized, little wonder why Al-Naqbi and Tairab (2005) Opined that practical work has helped students in knowledge acquisition, like Daramola (1983), and Ogunniyi (1977), advocated earlier that science, which would be taught in secondary schools, should be technologically oriented, which means to teach science with its practical application which strengthens the fact that in recent times, science teaching has taken a new trend Science belonged to the laboratory as cooking belongs to the kitchen and gardening to a garden. This is the state where science teaching is best done in the laboratories. Ndu (1980), also emphasized the practical teaching of science by saying that meaningful learning of science cannot be achieved without practical aspect of science stressing that science disciplines are not only the acquisition of facts but also embrace the processes. Woolnough (1994) also found that majority of secondary school teachers indicated that about 40% to 80% of the class time was spent in practical activities. Hodson (1996) in his own work, classified the reasons given by teachers for engaging in practical work into five major categories like to motivate learners by stimulating interest and enjoyment, teaching laboratory skills, to enhance learning of scientific knowledge, give insight into scientific methods, develop certain scientific methods, these

coincides with the classification of practical work reported by Gott, Welford, and Foulds (1988) when they identified five types of practical works like, inquiry practical, investigative practical, skill practical, illustrative practical, and observational practical.

Although Awoyomi (1983) stated that some practical scientific experiences may be acquired in everyday life, the most important part of the experience is through practical work which gives the student the appreciation of the spirit of science. Therefore, there is no adequate substitute for retention of facts and which also makes learning more permanent because, practical work closely linked with theoretical work help to maximize opportunity to practice those scientific methods.

While much has been written on the importance of Biology practical, as an instructional strategy scarce attention had been given to the philosophical process in which pre-service teachers develop their instructional pattern, identify preconceptions and form their own picture of what teaching is and is not.

Purpose and Research Questions

The purpose of this research study is to determine the views of the pre-service teachers about the objectives of biology practical and to determine how the teachers view the content and nature of laboratory activities.

The study intends to answer the following research questions:

Q1: Scrutiny on laboratory personnel

- What are the views of male and female pre-service teachers on their laboratory personnel?

Q2: Scrutiny on Implementation Strategy

- What are nature and content of laboratory activities as viewed by male and female pre-service teachers

Background and Related Literature

Gender and the Views of Biology Teachers

Gender is normally referred to as a set of characteristics that humans perceive as distinguishing between male and female entities, extending from one's biological sex, in humans to one's social role or gender identity (Wikipedia, 2011). Gender in the determination of social outcome and health is highly essential and it cannot be separated from biology or from other social, culture, ethnicity, culture, age and economic class (United Nations, 1995). The concept of "sex" and "gender" are a face of the nature culture, debate, presuming that sex cannot be changed; But Gender which is constructed can be changed. Given that it is the society that creates lines of action as stereotypes for levels of gender stating their various expectations of them and inculcating same in members from childhood which will in no doubt encourage or discourage potentials (Witt, 1997).

Gender equity in recent times is now becoming subtle and complex in the issues raised from it, it is not possible to fully reap the dividend of education in an environment where gender discrimination stereotype thrives, since this affect thorough and equal.

Some literatures like Kahle (1993), She (2000) illustrated several instances and research evidences of gender stereotypes and societal and cultural belief held by teachers during classroom discussions and interactions, relative preferential treatment for males in asking of question, observation of students when to allow them ask questions and the level of thinking expected from the male gender as it has been observed to be higher revealed in the higher level of questions they were asked. In fact, some researchers found out that it was stereotypically instilled in some females to never imagine them capable of reasonable discovery Sadker and Sadker (1994), the likes of these erroneous stereotypes might impair the attention and enthusiasm females have for discovery and guided discovery learning or laboratory work in the whole sense of it. These had since led to efforts on the part of researchers to examine the influence it has on academic achievement, learning portfolio, attitude of student to classroom subjects, conceptions held and subsequent enrolment for certain courses like Sciences, technology, Engineering, and Mathematics (STEM).

Psychologists have also proposed that biological explanations of behavior by arguing that social construction may have a biological origin and only 20.5% of the natural sciences and 5.8% of the engineering work force in the United States of America were represented by women but in Nigeria Nwosu (2002) opined that women play vital roles in sustainable development both at national and international levels, hence we should encourage them to compete favourably in the field of science.

Ferreira, (2004) Conducted an exploratory survey to determine whether secondary school students have certain preferences regarding the biology they study at school and whether learners for co-educational or single-sex schools hold the same opinions. The instrument used was a survey schedule of two sections each of which comprises 15 items and 10 items respectively with a total number of 384 grade II students as subjects in co-educational and single-sex schools. He found out that male and female students in single-sex schools appear to be satisfied with the amount of practical work they do, however males in co-educational schools were of the opinion that they do not do enough practical work this preference may be gender related because almost all male learners irrespective of their school enjoy practical work on animals and females enjoy practical work on flowers. However there is scarce research evidence to ascertain the role of this stereotype, influence and its effect on

biology laboratory instruction activities as well as practical

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Method

Participants

The Universe of the study consists of Pre-service teachers from year third and fourth year from three unique Nigerian Colleges of Education participated in this study aimed at assessing their views on Laboratory practical courses they offer. A sample of 138 male student-teachers, and 267 female student-teachers making a total of were used for the study

Out of all the students that showed interest, third and fourth year students were selected using stratified random sampling technique (Patton, 1990) since they had gone on teaching practice and had a bit of experience on teaching biology

The entire process was repeated fortnightly in successive sessions, with 30 participants of the same education course (disciplines), at the same time in their studies and drawn from the same population pool as the previous participants. This generated data for 405 pre service teachers in total, 138 male student-teachers, and 267 female for the researcher designed questionnaire, whose reliability was determined by the test-retest method on the 30 students with reliability coefficients (r), 0.784, 0.765, and 0.788 for the three sessions respectively.

Instrument

The Views of Pre-service Teachers on Biology Practical VPTBP was administered to all 405 student-teachers.
The VPTBP composed two broad sections this 31 item, 3 group VPTBP scale which adopts the Likert (1932) format ranging from "1 strongly agree to 4 strongly disagree" carefully elicited personal information such as age sex and Pre-service teachers views, this scale was chosen because of its adaptation, adequacy, brevity, but mostly, its comprehensiveness in measuring an external construct of teacher and Technician efficacy. In this study Pre-service teachers were acquainted first with the scale thus, they had a clear understanding of each item while answering it.
The research questions were answered alongside with the research hypotheses and the hypotheses were tested using Chi-square statistical tool.

Results

Research Question 1:

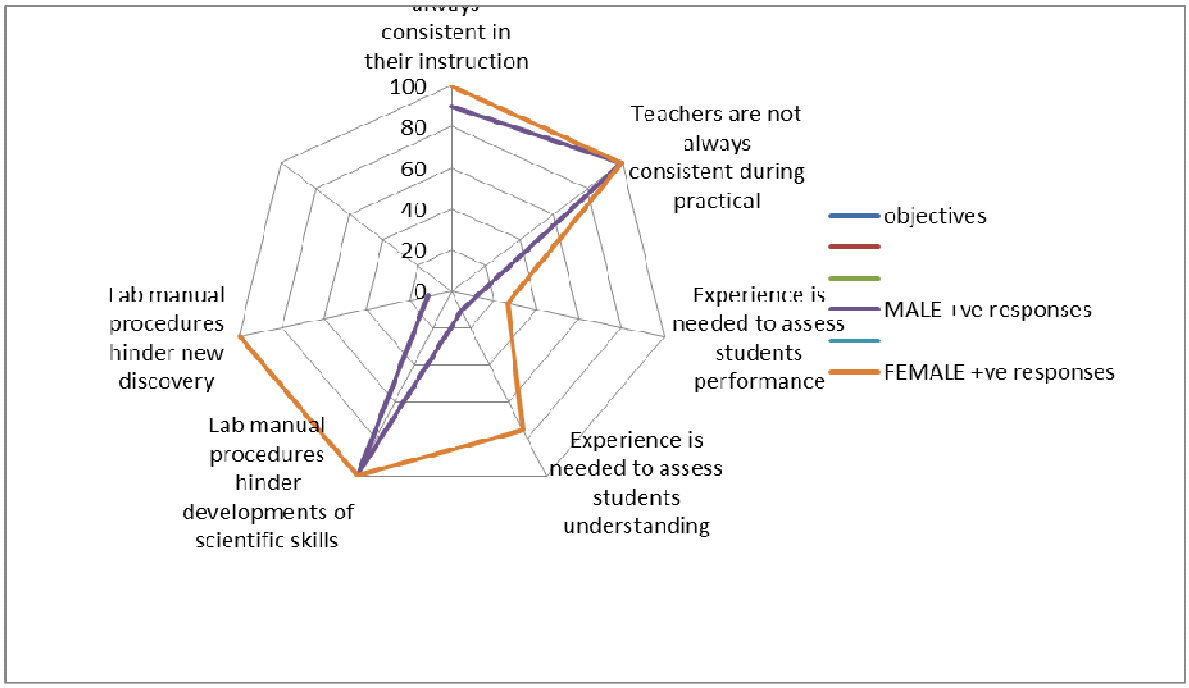
What are the views of male and female pre-service teachers on their laboratory personnel?
And a null hypothesis set for the research question was:
H_{01}: There is no significant difference between the views of male pre-service teachers and their female counterparts on their laboratory personnel.
The analysis of the result obtained was summarized in table 1

Table 1: Chi-Square Analysis of the Responses of views of Male and Female biology pre-Service Teachers on their laboratory personnel

S/No	Variable	Responses SA	A	D	SD	Total	X^2 table	Remark
1	Male	17.57 (119.35)	65.43 (52.85)	37.43 (32.32)	17.52 (6.11)	138	7.82	(S) Ho_2 Rejected
2	Female	332.7 (230.92)	89.57 (102.19)	57.43 (62.53)	12.63 (21.83)	267		
	Total	350.27	155	94.8	17.41	405		

Chi-square df(3) 47.349
degree of freedom df is 3, chi-square calculated was 47.349 and the table value is 7.82 P value 0.000<0.05
From the table, Chi-square calculated was 47.349 greater than the table value and the p value is 0.000 less than 0.05 which means that there is a significant difference and the null hypothesis is therefore rejected.

LABORATORY PERSONNEL	MAMALE	FEMALE
Teachers are always consistent in their instruction	89.86	100
Experience is needed to assess students' performance	11.59	26.26
Experience is needed to assess students' performance	10.57	75.28
Lab manual procedures hinder developments of scientific skills	98.78	99.5
Lab manual procedures hinder new discovery	10.86	100



Research Question 2:

What is the nature and content of biology practical as viewed by pre-service teachers?

the null hypothesis set for the above question was

H_{02}: There is no significant difference between the views of male pre-service teachers and their female counterparts on the nature and content of biology practical

The analysis of the result obtained was summarized in table 3

Table 3: Chi-Square Analysis of the Responses of views of male and female biology pre-service teachers on the nature and content of biology practical.

S/No	Variable	Responses SA	SA	A	D	Total	Table X^2	Remark
1	Male	31.31 (29.99)	56.69 (45.19)	57.34 (40.09)	15.56 (19.49)	138	7.82	(S) Ho_1 Accepted
2	Female	56.69 (58.01)	75.94 (87.44)	60.31 (77.56)	26.3 (57.30)	267		
	Total	88	132.63	117.65	86.7	405		

degree of freedom df is 3, chi-square calculated is 5.894 and the table value is 7.82 but the p value is 0.207

chi-square df(3)=5.894,

p value is 0.207>0.05

From Table2 the chi-square value calculated which was 5.89 while the table value chi-square was 7.82 at 0.05 alpha level of significance the chi-square calculated was less than the chi-square table value it means there was no significant difference between the views of male pre-service teachers and their female counterparts on nature and content of biology practical therefore, the hypothesis (H_{02}) was accepted.

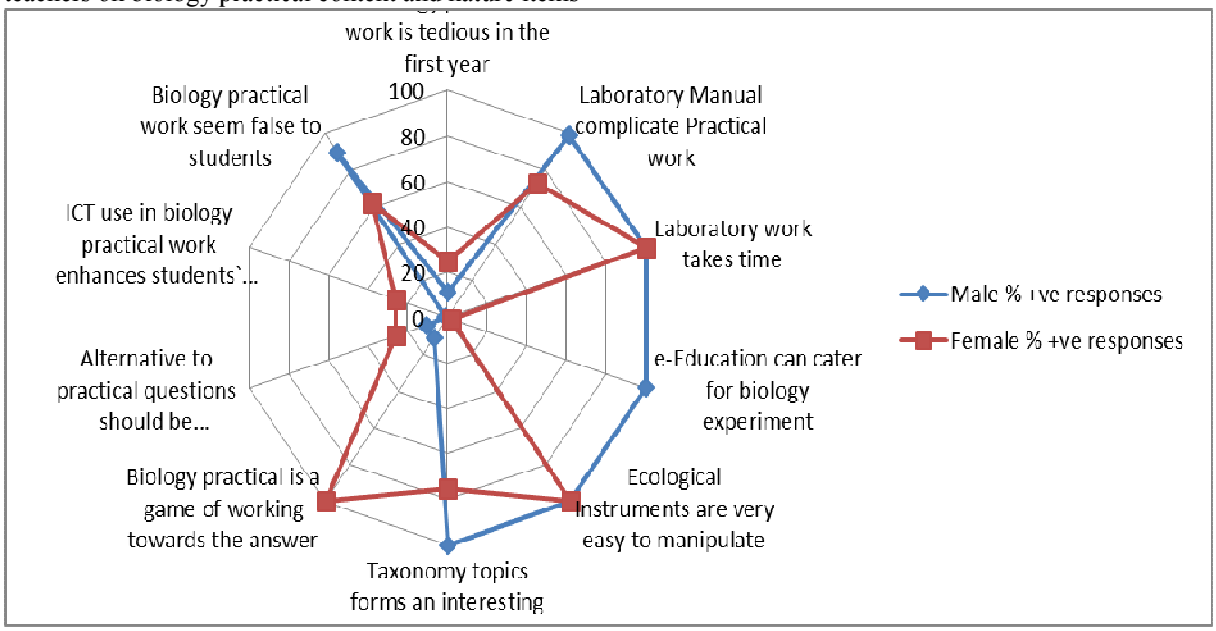
Table 4: The percentage positive responses of Pre-Service teachers on content and nature of biology practical

Contents and Nature of Lab Practical	Male [a]	Female [a]
Biology practical work is tedious in the first year	11	25
Laboratory Manual complicate Practical work	99	73
Laboratory work takes time	100	100
e-Education can cater for biology experiment	100	2
Ecological Instruments are very easy to manipulate	100	100
Taxonomy topics forms an interesting part of practical work	100	75
Biology practical is a game of working towards the answer	11	100
Alternative to practical questions should be encouraged	11	26
ICT use in biology practical enhances students` achievement	1	26
Biology practical work seem false to students	90	62

a is the % positive responses

Fig. 2

A graphical representation of Table 4 is shown in Fig. 2 percentage views of male and female Pre-service teachers on biology practical content and nature items



Discussions

These were striking views on laboratory work and personnel in biology as regards gender and difference observed in the views of Pre service teachers cannot be attributed to chance as these results on the views of Pre-service teachers suggest that students might not appreciate the pedagogic value of problem solving skills being developed in laboratory practical work as shown in Fig 1which substantiate the assertion of Högström, Ottander, & Benckert (2008) that laboratory procedure arranged for students make it focus solely on the manuals rather than making out time to develop their own thinking skills on concepts and problem solving. As at the time of this study, Male students consider practical work not to be tedious but do not favour meaningful learning and motivation. This might not uphold some previous studies like (Högström et al., 2006; Wellington, 2000) that reported that stated objectives for laboratory work could be related to understanding as well as to motivation, interest and practical skills.

King & Wallace (2005) expressed the low rating of objectives that relates to the development, and verification of skills scientific processes and principles which had however been considered immensely important by most students and might not be unconnected to gender.

There was no significant difference in the overall views Pre-service teachers on the nature and content of biology practical work. Female pre service teachers consider Biology Practical an hindrance to new discovery conventional laboratory manuals as they seem to view it as a mere game of working towards the answer as stated in the laboratory manuals that even complicate practical work, they seem to be carrying out steps described in the manuals in subliminal with taking and within the stipulated time which substantiate suggestions in previous research literature that the “cookbook” or “recipe” style laboratory exercises might not achieve much as an higher institutional approach of instruction. (Lawson et al., 2000).

The data presented here drawn from a relatively large study of student-teachers view of the Content and

Nature of Laboratory Practical suggests that there are no significant difference in the views of male and female student-teachers. However, it is worth reflecting on the gendered nature of the data presented here which suggests that males have a higher level of preference for an e-learning procedure of biology practical which may not be inconsistent with a number of literature on stereotypic view that posits men being more predisposed to use computers and new media like (Dorman, 1998; Kayany and Yelsma, 2000).

It is noteworthy to say that a very high percentage of male student-teachers (Pre-service) e-education cater for biology experiments though most student generally had uncertainties about the possibility of ICT use to enhance achievement in biology, a finding which supports also literature like Tezci (2009), Garland & Noyes (2004), Çelik & Bindak (2005), to assert that gender as a variable could be molded by experience among other factors on the use of ICT. Therefore, lack or inadequate experience of pre-service teacher on student performance evaluation could be a factor.

Based on the findings of this study, it is recommended that:

Conscious effort should be made toward the incorporation of electronic media into biology experiments and laboratory practical work to make it appealing to the male gender of this age. Students-teachers should be accorded the benefit of self-discovery by making the objectives of practical work stated in the laboratory manuals, explicit and flexible enough to allow guided discovery on the part of learners.

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