

Full Length Research Paper

Gender difference in integrated science achievement among pre service teachers in Nigeria

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The Integrated science achievement of graduating pre-service teachers over a period of 3 years was examined for gender differences. Data were drawn from students' (126 male and 127 female) final year results from a college of education in Nigeria. Findings revealed that the gender gap in integrated science achievement, among the sample data, could be disappearing. This is a source of hope for the country because results such as those reported here are contrary to the general Nigerian stereotypical belief about male's and female's performance in the subject. Although it is difficult to generalize to other geographical areas, it is anticipated that the study would be replicated in the rest of the country for a more meaningful and national picture.

Key words: Gender stereotypes, integrated science achievement, Nigeria, pre-service teacher,

INTRODUCTION

What has remained the main focus of great concern in the field of science education are the biases and misconceptions about women and science, i.e. science is a male enterprise (Erinosho, 2005).

In Nigeria, and perhaps Africa, gender bias is still very prevalent (Arigbabu and Mji, 2004). This is a view to which Onyeizugbo (2003) has also alluded in pointing out that "sex roles are somewhat rigid in Africa, particularly in Nigeria... gender differences are emphasized". It is common place to see gender stereotypes manifested in the day-to-day life of an average Nigerian. Certain vocations and professions (medicine, engineering and architecture) have traditionally been regarded for men and others (nursing, catering, typing, and arts) for women. Typically, parents call boys to wash cars, cut grass, fix bulbs, or climb ladders to fix or remove things.

On the other hand, chores such as washing dishes, cooking, cleaning and so on, are reserved for the girls. In a nutshell, what are regarded as complex and difficult tasks are allocated to boys, whereas girls are expected to handle the relatively easy and less demanding tasks. As a result of this way of thinking, the larger society has tended to see girls as the "weaker sex". Consequently, an average Nigerian child goes to school with these fixed

stereotypes. These stereotypes persist because in terms of assertiveness, for example, men in Nigeria were reported to be more assertive than women among teacher education, law, pharmacy and medicine.

Erinosho (2005) said that there were lots of disparities between men and women in some key institutions in Nigeria. The disparities, according to Erinosho, are as illustrated in the table 1.

Research of Poole and Isaacs (1993) indicates that the conservative, reproductive nature and function of education continues from pre-service to professional teaching. Supporting these findings, Sikes (1991) concluded that "...student teachers do hold traditional stereotypes as part of their personal, taken – for – granted knowledge about the world. This is not unexpected because there is no reason to suppose that their gender socialization in the home and at school has been any less successful than that of anyone else." Teacher education programmes in the university do not seem to be able to counter the problems identified here because, as Sikes(1991) pointed out, "maintaining the status quo may be an important and intended function of education systems but it is also true that teachers have a propensity for unconsciously as well as consciously reproducing their own experiences." Poole and Isaacs (1993) concluded that it should not be anticipated that students on completing teacher education programmes would be ready or able to break down the gender barriers they were likely to encounter in their per-

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Table1. Women's participation in key positions in Nigeria.

Positions	Total	women	%Women
Vice chancellors	50	02	04
Registrars	50	07	11.9
Pro-chancellors	50	01	2.3
Appointed council members (federal university)	161	03	1.2
Seats in parliament (lower house)	450	30	6.7
Ministerial levels	72	16	22.6
Seats in upper house	108	03	2.8
Speakers of state houses	36	02	5.6
National political reform conference	375	31	08

Source: 36th Inaugural Lecture (women and science), Olabisi Onabanjo University, Ago-Iwoye, Nigeria.

sonal or professional lives.

It is not surprising then that the school, being a microcosm of society, consciously or unconsciously perpetuates stereotypical behaviour, and, indeed, teachers within the system exhibit gender bias in the classrooms (Arigbabu and Mji, 2004). For example, it has been reported that teachers, consciously or unconsciously, often mete out differential treatment to boys and girls in their classrooms (Rubble and Martins, 1998). Students, on their part, tend to have formed a stereotypical concept of mathematician and scientists whom they regard as a special group. In such a concept, female students (Mothers of tomorrow) do not see themselves as having the potential to become mathematicians and scientists (Arigbabu and Mji, 2004).

From the on going, gender barriers have persisted even within the science classroom. There are mixed reports on the research on gender difference in science. Many researchers have provided reports that there are no longer distinguishing differences in the cognitive, affective and psychomotor skill achievements of students in respect of gender (Abayomi and Mji, 2004; Bilesanmi-Awoderu, 2006; David and Stanley, 2002; Din et al., 2004; Freedman, 2002; Sungur and Tekkaya, 2003). Girls are being encouraged and sensitized into developing positive attitudes towards science.

Other researchers have reported differently on this issue. For example, in one study carried out by (Eriba and Sesugh, 2006; Onekutu and Onekutu, 2002), they found that boys outperformed girls in science and mathematics achievements. Some other research studies reported that males are becoming the disadvantaged gender in schools, and that fewer males are interested in science (Alkhateeb, 2001; Bleuer and Waltz, 2002; Omoniyi, 2006; Weaver-Hightower, 2003). Gender difference also exists in areas of employment that require science-related qualifications. Weinburgh (2000) submitted that although females make up one half of the workforce, only 15% of U.S. mathematicians, scientists, and engineers are females.

Teacher plays a vital role in addressing the problem of gender equity in science education. According to Levi (2000), there are three main roles a teacher must play, namely, (a) ensure provision of equal opportunities and respect for differences in the classroom, (b) ensure that boys and girls have the same experience, that is, treat boys and girls equally, and (c) compensate for gender differences in society. Formulation of change policy statements and intervention projects was brought about as a result of different societal influences on males and females. Biases and misconceptions about women and science has remained the main focus of great concern (Erinosho, 2005) and there are moves for policy and practice to enhance gender-inclusive science education.

Although a number of studies have been done on issues related to gender as well as the teaching and learning of science, the focal point has been on gender differences in students' performance in other core science subjects (Biology, Chemistry and Physics); teacher gender, most especially in Integrated Science, however, has not been given as much attention. Pre-service teachers are indeed tomorrow's educational leaders. There has been no research work on gender differences in Integrated Science performance among pre-service teachers in Nigeria. It is important to note that Integrated Science is the grass root subject that introduces children into the field of science. If care of equity is taken at this level, it thus provides sound bases for reducing gender biases and misconceptions in the field of science. Therefore, the findings of this study will contribute valuable information to the body of knowledge related to gender and Integrated Science. In this study, we investigated gender differences in Integrated Science achievement among Nigerian pre-service teachers.

Purpose

The main purpose of this paper is to find out whether gender differences exist in integrated science achievement among Nigerian pre-service teachers.

Table 2. Distribution of sample by year and gender.

Year	N (%)		
	Male	Female	Total
2003	26(59.09)	18(40.91)	44(100)
2004	53(49.07)	55(50.93)	108(100)
2005	47(46.53)	54(53.47)	101(100)
Total	126(49.80)	127(50.20)	253(100)

N = Number, (%) = Percentage

Research question

Will men perform better than women in integrated science examinations?

Research hypothesis

There is no significant difference in examination scores of men and women in integrated science.

METHOD

Final year results of pre-service teachers at the end of their 3-year National Certificate in Education (NCE) program were collected as the data for the study. In all, 253 pre-service Integrated Science teachers' results were analyzed. These were for 126 men and 127 women who graduated from a college of education in the southwestern part of Nigeria between 2003 and 2005. The sample was a composition of all the tribes in Nigeria. The Integrated Science courses taken by the pre-service teachers were mainly invertebrates, applied biology, introduction to parasite, earth and the universe, man and energy, physical characteristics of metals. This was in line with the curriculum approved for all Colleges of Education in Nigeria by the regulatory body, the National Commission for Colleges of Education (NCCE). Examination questions set by the individual course lecturer were moderated by the Head of department and some senior colleagues. They were then externally moderated by examiners appointed for such a purpose. Graded examination scripts were vetted by second examiners and external examiners. These are other NCCE requirements for quality control.

Table 2 shows the gender distribution over the 3 year period. Female students were more than male students during 2004 and 2005 sessions respectively; the only exception was in 2003 session when male students were more than the female students.

RESULTS

Table 3 shows mean scores obtained by both male and female students respectively together with the t-values for each year of investigation. It can be seen that for each year male students had higher mean scores than the female students. However, these differences were not statistically significant in 2004 and 2005 respectively. The exception was in 2003, where the difference was statistically significant ($p < .05$), although the effect size obtained was small. As the integrated science courses taken by the students are made up of biological science, chemical science, physical science, and geographical science con-

cepts respectively, further analysis revealed that this gender difference was, in fact, in chemical and physical sciences respectively. No other significant differences were found when the subject was broken into its major spheres.

DISCUSSION

In this study, we investigated gender differences in the Integrated Science achievement of graduating pre-service teachers over 3 years. Results indicated that, overall, there were no statistical significant gender differences. Conflicting results in gender-related research should, however, be expected as studies vary in their learning contexts. These include the methodology, populations, geography, research tasks, and classroom settings (Wilson and Hart, 2001).

The findings reported here suggest that among the sample data, at least, there is hope that in Nigeria the gender gap in integrated science achievement is disappearing. More pleasing is the fact that this is a trend that has also been noted and reported in the United States (NCTM, 1998). Research work, for example Ma (1995), has shown that gender differences tend to be weak within education systems. This implies that perceptions of gender differences could be a thing of the past in the near future. We also observed the fact that there were more prospective female pre-service teachers than male pre-service teachers in our study. This is, however, contrary to "the stereotypical image of science as an essentially male domain" (Onekutu, 2002; Joel et al., 2006). However, a limiting factor in this study is the fact that the sample was drawn from the southwestern geopolitical zone of Nigeria. This is historically the most educationally advanced part of the country. For instance, in the northern part of Nigeria, the education of girls is greatly hampered by the incidence of early marriages. In the east, on the other hand, the education of children in general and boys in particular is hampered by the emphasis placed by most parents on trading and commercial activities. Children are often stopped or withdrawn from school to learn about business early in life. It is, therefore, difficult to generalize to other parts of the country without actually conducting specific studies with samples that include these areas. We anticipate that the study will be replicated in the rest of the country in order to obtain a more meaningful and informative national picture.

Conclusion

The findings of this study revealed no statistical significant difference in academic performance in integrated science between male and female student used for the study. Although, it can be seen that for each year male students had higher mean scores than the female students, the effect size obtained was small. This implies

Table 3. Integrated sciences mean scores, standard deviations, and t-values for each year.

Year	Male		Mean	Std. Dev.	t-values	sig. (2-tailed)
	Mean	Std. Dev.				
2003	55.35	12.99	49.06	16.20	1.427*	.161
2004	54.43	12.18	54.20	12.24	.100	.921
2005	54.60	12.85	54.30	12.73	.117	.907

*Significant at 0 .05 alpha levels, Std. Dev. = Standard Deviation, sig. = significant
 Collected data were used to establish whether there was a gender difference in Integrated Science achievement. Independent samples t-test were computed yearly for the entire data set using SPSS 11.00.

that hopefully the gender gap in integrated science achievement in Nigeria is disappearing.

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