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Full Length Research Paper

Gender inequality in science achievement among senior secondary school students in Makurdi Metropols

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Over the years there exists gender inequality in science achievement among senior secondary school students the world over. It is observed that the males score higher than the females in science and science- related examinations. This has created a big psychological alienation or depression in the minds of female students towards science and science- related subjects. This paper attempted to find out if sex differences exist in calculating reacting masses from a set of chemical equations among secondary school students in Makurdi metropolis. A Calculation Achievement Test (CAT) was administered to thirty students randomly selected from Government secondary school, North- Bank, Makurdi. The t-test statistic for independent samples was used to analyse the data obtained. The study established that boys performed better than girls on the achievement test. Recommendations to address the gender disparity in students' performance in chemistry were made. These include: teaming up of chemistry and mathematics teachers to ensure integrative learning, transfer and application of knowledge among the females by giving them more attention/time during classes.

Key Words: Gender, Achievement, Reacting Masses and Chemical equation.

INTRODUCTION

Achievement test results over the years have shown an ever increasing gap between the performances of boys and girls in chemistry at senior secondary school level (Onekutu, 2002). In fact, girls now tend to ignore the subject all together. This has resulted to a situation where there are more boys than girls doing chemistry at this level.

As a result, chemistry classes and science classes in general are dominated by boys while the girls go into reading languages and Arts. The perceived low achievement of girls in chemistry is an unpleasant development as it spells doom for those of them who would like to pursue careers in the sciences. This is because a pass at credit level in chemistry is required at Senior School Certificate Examination (SSCE) for admission into science programmes in the universities.

Many researches have been carried out about the underachievement of females in the sciences. These include those of Inesman (1949), Duncan (1989), and Greenfield (1996). They found that male students were superior in the sciences than their female counter parts. According to Tsado (1987), Gipps (1994), O'Connor (2001), as boys and girls grew up, the differences they have in achievement in other subjects tend to diminish except in the sciences, and mathematics.

The fear of Mathematics is often transferred to Chemistry, which involves one form of calculation or the other (Obande, 2003). However, it is not all aspects of Chemistry that involve calculations. It is mostly topics in Physical Chemistry and the Kinetic theory of gases. Williams and Jacobson (1990) agree that in early school years there is no difference in the achievement of boys and girls in the sciences but that in the higher classes,

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the boys perform better than the girls in the areas that have to do with calculations. Mott (2002) opined that to be able to communicate appropriately in science, one needs the ability to use graphs, symbols and diagrams. All these are in mathematics and this seems to be where the girls have fallen short.

Gabel and Sherwood (1984) were however, not in total agreement with the above statement and claimed that underachievement of students in calculating reacting masses from chemical changes was not due to the fear of mathematical content, but due to the fact that majority of the students did not understand the basic concepts involved in the study of the topic. According to UNESCO (1998), local customs and values have been developing in girls and they are so deeply ingrained that women themselves often subscribe to them and play a subservient role in the society. Lie and Sjoberg, (1984) observed that invincible rules within the society have provided what is feminine and what is masculine.Hence, science in most cultures is defined as a masculine domain (Onekutu, 2002). The situation today has degenerated such that girls now completely see Science subjects as a male- only endeavour, preferring to go for other subjects.

It is therefore very important to pick up one of these mathematically inclined chemistry aspects from the Secondary School curriculum in an achievement test based on the area. The researchers chose calculation of reacting masses from chemical equations because of its importance in the chemical industry and chemistry.

STATEMENT OF THE PROBLEM

For many years now, there seems to be a trend in the performance of girls and boys in Senior Secondary School Chemistry where girls have not been performing as well as boys. Most of the time, girls tend to simply avoid doing science related subjects. Calculation of reacting masses of substances from chemical equations in most cases is seen by students at this level as one of the most difficult even though it is very central to the understanding of many concepts which involve calculations in chemistry as a whole. The topic is generally seen by students as complicated and uninteresting to study. It is against this background that the paper is set out to find out if sex differences exist in calculating reacting masses from chemical equations among secondary school students in Makurdi metropolis.

PURPOSE

The main purpose of this paper is to find out whether gender differences exist at Senior Secondary School in calculating reacting masses from chemical equations.

CONCEPTUAL FRAMEWORK

The term gender is often used to indicate the distinction between human beings on the basis of masculinity and feminity in relation to their expected roles. Keller (1991) sees gender as a cultural construct which; distinguishes the roles, behaviour, mental and emotional characteristics between the male and the female. To Shettima (1996), gender is a socially defined status as roles and actions ascribed to women and men so as to distinguish who they are, what is expected of them by the society and how they relate to each other for meaningful coexistence. This meaningful coexistence is influenced by the education of both men and women because education is believed to “play a great role in furthering social solidarity and integration in the society” as noted by Durkhein in Ogunnika (1985).

A lot of people speculate without research verification that chemistry is a masculine school subject. Callahan , Glennon and Mullis (1975), for example, are of the opinion that gender differential in chemistry achievement is biological and especially genetic in terms of spatial visual ability which put male ahead of female on advantage. This is not particularly acceptable to Maccoby and Jackline (1974).They advanced that cognitive ability which is a *sine quanon* for higher chemistry achievement, does not correlate with gender differences and could not favour one sex than the other. Onibukun (1979) agreed with Jackline that there was no statistical difference in the performance of boys and girls on quantitative and other aptitude tests on chemistry problems. Keller (1985) noted that even little children at early stage of life are of the opinion that the science and more so chemistry calculations are for men. This was discovered when his five-year old son, whose mother was a scientist commented that ‘science was for men’. Keller concluded that women lack the strength, vigour and clarity of mind for an occupation that properly belongs to men.

RESEARCH QUESTION

Will boys perform better than girls in calculating reacting masses from chemical equations?

RESEARCH HYPOTHESIS

There is no significant difference in achievement test scores of boys and girls in calculating reacting masses from chemical equations.

METHODS

The target population for this study was chemistry students in coeducational secondary schools in Makurdi metropolis. A representative sample of thirty (30) was randomly selected from Government Secondary School, NorthBank. The Hat and draw sampling technique was adopted in selecting the school and the

students. Students' terminal results of science class for the previous term was used in selecting them. From this, a set of thirty students of comparable ability was obtained. After every four names, the fifth student was picked, until, fifteen boys (15) and fifteen (15) girls were picked.

The instrument used for data collection was a Calculation Achievement Test (CAT). It contained a set of fifteen (15) objective test questions. Objective form of test was used so as to increase the number of questions the students could be tested on within the time available. The purpose of the test was to identify areas of difficulties in calculation of reacting masses from chemical equations among students. The instrument was validated by two chemistry teachers from Government Secondary School, North Bank, Makurdi, two chemistry lecturers from Chemistry Department and two Senior Lecturers in science Education from the Benue State University, Makurdi. They attested to the adequacy of the items for the purpose. The instrument was administered by the researchers personally to the students after two periods of forty-five minutes each.

RESULT

Since the calculated t-value of 3.02 was greater than the critical t-value of 2.05 at 0.05 level of significance, the null hypothesis that there is no difference in the achievement test scores of boys and girls in calculating reacting masses from chemical equations were rejected. This follows that boys do better than girls. (Table 1 and Table 2).

Table 1. Scores of Respondents Obtained from the Test

S/NO	Scores obtained out of 15 mks	
	Boys	Girls
1	12	6
2	10	11
3	13	9
4	8	7
5	11	10
6	9	8
7	7	7
8	13	13
9	11	8
10	12	8
11	13	7
12	9	8
13	10	10
14	12	8
15	9	10

Table 2. T-test of Mean Difference in Performance of Boys and Girls in Calculating Reacting Masses from Chemical Equations.

	N	X	df	T
Boys	15	10.6	28	3.02
Girls	15	8.7		

P< 0.05 df=28, t = 3.02 critical value = 2.05

DISCUSSION

The results have shown that boys perform better than girls in chemistry problem solving which requires the use of mathematics. This is in line with the views of Williams and Jacobson (1990), who documented that boys perform better than girls on items that have to do with calculations. The masculinity of science is another reason that girls tend to give when avoiding the subjects at school and those that do it tend to perceive science as a difficult subject with little relevance to their future, which, of course, accounts for their poor performance. In addition to this Lie and Sjoberg (1984) pointed out that local customs and values powerfully discourage women from going into science and those that do, do not strive for achievement. Onekutu (2002) also added that science in most cultures is defined as a masculine domain.

As a result of this, there are fewer girls opting for chemistry at the Senior Secondary School level and for, the few who dare to do the subject the dropout rate is alarmingly high. This has translated into gender disparities in receipt of university degrees in the Sciences and a short supply of manpower in science related disciplines. This short fall of scientific personnel has led many observers to suggest that unless the participation of women is encouraged, the much needed manpower required for technical and scientific development will be grossly inadequate in the very near future. This is in agreement with Sells (1973) who noted that science subjects taught at the Secondary School level have continued to act as a filter that prevents young women from gaining opportunities into science and technology related jobs.

The findings of this study do not strongly agree with that of Gabel and Sherwood (1984) who concluded that the problem students encounter in the calculation of reacting masses was not as a result of the Mathematics content, being insurmountable to them but as a result of the fact that the students did not have a good knowledge of the concepts involved in the study of the topic.

This aspect was taken into consideration, as before the test was administered to the students, two lessons on the said topic were taught, to avoid the issue of students not having the conceptual understanding involved in the topics.

The result of this study also indicates that the female students are capable of doing chemistry as reflected in the difference between the mean scores of boys and girls.

RECOMMENDATIONS

On the basis of the findings of this study, the following recommendations were made:

1. Chemistry teachers should team up with the mathematics teachers in their schools to ensure integrative learning, transfer and application of knowledge.
2. Teachers of chemistry at Senior Secondary School should give more attention to the female students during lessons so as to encourage them put in their best, as they are capable of solving chemistry problems.
3. More attention should be given to the teaching and learning of integrated science which serves as a pivot in the learning of scientific concepts across several science disciplines at the Junior Secondary School.
4. Schools should organize workshops for secondary school girls featuring women who have excelled in sciences to deliver papers, in order to encourage them and as well disabuse the minds of those who consider science as a masculine domain.

CONCLUSION

Mathematics content is a major variable responsible for the continued underachievement of girls in determining reacting masses from chemical equations and chemistry in general. The under enrolment rate of girls in the sciences could be traced to this factor.

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