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EFFECT OF NOMINAL GROUP TECHNIQUE OF BRAINSTORMING ON THE ACHIEVEMENT OF SECONDARY SCHOOL BIOLOGY STUDENTS IN ANAMBRA STATE, NIGERIA

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Abstract

Poor performance of students in examinations is most times blamed on use of inappropriate teaching methods. Consequently, the search for appropriate methods for classroom instruction has continued to engage the attention of researchers. Hence, this study was aimed at investigating the 'Effect of Nominal Group Technique of Brainstorming on the achievement of Secondary School Biology students in Anambra state Nigeria'. Two research questions and two hypotheses guided the study. The quasi-experimental study adopted a pre-test post-test non-equivalent control group design. The sample consists of 80 Senior Secondary Two (SS 11) biology students from two intact classes randomly drawn from two co-educational schools. One class was assigned experimental group and the other control. An instrument tagged Biology Achievement Test was validated and used for data collection. Its reliability co-efficient was 0.72. Results showed that Students taught using Nominal Group Technique (NGT) performed significantly better than those taught using Lecture method and there was no significant difference in biology achievement test scores of male and female students taught using NGT. The

paper therefore concluded that Nominal Group Technique enhanced achievement of biology students irrespective of gender.

Keywords

Achievement, Biology, Brainstorming, Nominal Group Technique

1. Introduction

One of the greatest challenges facing Nigeria today is a teaming population of unemployed youths most of them young graduates. If young people are trained at secondary school level to acquire some skills like the ability to generate ideas (brainstorming) and become creative, the problem of unemployment could be half way solved. This is because a lot of them would have been employers of labour rather than waiting for government or someone to employ them, notwithstanding their level of education (Ainley & Fleming, 2004). According to Olehi (2005), creating something out of nothing does not occur as a result of one having only a great intelligence but is achieved mostly when an individual has the ability to generate ideas, that is brainstorm. Brainstorming is a useful tool to promote creative thinking and develop solutions to problems. According to Bilal-Adel (2012), it is a thinking process by which students are asked to develop ideas or thoughts that may seem out of place or not important at first. The facilitator (science teacher) ensures that there is no criticism as this can dampen creativity in the initial stage of brainstorming session. The ideas generated by the students are listed and all should be considered important as each is a possible solution.

Brainstorming has five techniques which include Free Form Brainstorming, Round Robin Brainstorming, Mind Mapping Brainstorming, Pencil and Paper Brainstorming and Nominal Group Techniques. This study is concerned with Nominal Group Technique (NGT). NGT is a structured form of brainstorming that results in the generation and prioritizing of ideas. It reduces the dominance of outspoken individuals and encourages participation by everyone. It is used in problem solving session to encourage creative thinking without group interaction at the idea generation stage. At this stage, each member of the group writes down his or her idea which are then discussed and prioritized one by one by the group. Nominal Group Technique uses a procedure that encourages creativity and discourages criticism, thus preventing the domination of discussion by a single person. Thus, it encourages the more passive group members which are mainly the low ability learners, to participate thereby stimulating the students' interest.

Critical thinking and inductive reasoning components of nominal group technique are of vital importance in teaching and learning of science subjects like biology. By virtue of the importance of biology as a school subject, there is need for its effective teaching and learning to

bring about better performance and skills acquisition. The importance of effective teaching and learning of biology notwithstanding, it still appears that students learning outcome in it over the years has not yet been encouraging (Maduabum, 2004; Ogunleye, 2006). Ogunleye (2006) asserts that for some years now, the percentage of students who obtained credit pass in biology at West African Senior School Certificate Examination (WASSCE) in Nigeria has remained low. Also statistics from May/June 2007 – 2012 Senior Secondary School Certificate Examination by WAEC shows that the percentages of candidates who passed WASSCE at credit level and above (grade 1-6) in biology were 15.99 in 2007, 31.39 in 2008, 31.39 in 2009, 38.75 in 2010, 36.56 in 2011 and 31.81 in 2012 (Osuafor & Okonkwo, 2013). This failure rate has been attributed to a number of factors including the use of inappropriate teaching methods. There is need for students to make sense of what they are taught and asked to learn. Due to role dominance of teachers in lecture method, the students are not engaged in critical thinking and this leads to rote learning with little transfer of knowledge. Knowing well that students are not empty bottles that need to be filled by their teachers, they still have little knowledge that can be clarified and built upon. There is therefore the need for serious research on pedagogical methods that will adequately develop students' potential, assess and improve their achievement. Brainstorming is an innovation in education which has been found to improve the performance of the students in Mathematics and Computer (Walid, 2013). It has also improved students development of creative skill in Home Economics (Bilal-Adel, 2012). Could it also enhance the achievement of students in biology as evidence to this effect from literature was not available to the authors? Thus, the main purpose of this study was to investigate the effect of nominal group technique of brainstorming on the academic achievement of biology students. Gender effect on students' achievement in biology when taught with nominal group technique was also of interest in this study.

1.1 Research Questions

The following research questions guided the conduct of the study:

1. What are the mean achievement scores of students taught biology with nominal group technique (NGT) and that of those taught using lecture methods?
2. What are the mean achievement scores of male and female students taught using NGT?

1.2 Hypotheses

Two hypotheses were stated and tested at 0.05 alpha level of significance. These are:

1. There is no significant difference between the mean post-test scores of students taught Biology with nominal group technique and those taught with lecture method.

2. There is no significant difference between the mean achievement scores of male and female students taught using nominal group technique.

2. Method

The study adopted a quasi-experimental, non-equivalent control group design. The study was carried out in Awka education zone of Anambra state, Nigeria. Anambra state is one of the 36 states of Nigeria and is located in the South-eastern part of the country. It lies approximately between latitudes $05^{0}48^{1}$ and $06^{0}51^{1}$ North of the equator, and between longitudes $06^{0}38^{1}$ and $07^{0}13^{1}$ east of the Greenwich meridian. The inhabitants are mainly civil servants and traders.

2.1 The population of the study consists of all Senior Secondary Two (SS2) Biology students in 53 Public co-educational Secondary Schools in Awka Education Zone of Anambra state numbering 2256 (1253 females and 1003 males) enrolled for 2014/2015 academic session (Data from the Research and Statistics unit of Awka Education Zonal Office).

2.2 The sample consists of eighty (80) SS2 students drawn from two schools out of the 53 co-educational secondary schools in the study area. By tossing of coin, one school was assigned experimental group and the other control group.

Data were collected using a teacher-made test tagged Biology Achievement Test (BAT). BAT was validated by three experts, two in Science Education and one in Measurement and Evaluation. Reliability was established using Kuder Richardson 21 (KR-21) and this yielded a coefficient of 0.72. BAT has a total of 25 multiple choice questions set on Adaptation, Pollution and Conservation. Students were given pre-test after which they were subjected to treatment which lasted for four weeks. Thereafter, there was post-test. Mean and standard deviation were used to answer the research questions while the hypotheses were tested using t-test and Analysis of Co-variance (ANCOVA).

3. Result

Research Question 1

What are the mean achievement scores of students taught biology with nominal group technique (NGT) and those taught using lecture methods?

Table 1: *Pre-test and post test mean achievement scores of students*

Source of Variance	N	Pretest		Posttest		Mean Achievement
		Mean	SD	Mean	SD	Gain
Experimental(NGT)	38	12.87	3.16	17.32	3.66	4.45
Control(Lecture)	42	11.90	3.45	14.78	3.95	2.88

Table 1 shows that the mean gain score of students in experimental group (4.45) is higher than that of the control group (2.88) with a mean difference of 1.57. This implies that NGT enhances students' achievement in Biology concepts more than the lecture method.

Research Question 2

What are the mean achievement scores of male and female students taught biology using NGT?

Table 2: *Pretest and Posttest mean achievement score of male and female students taught using NGT*

Gender	N	Pretest		Posttest		Mean Gain
		Mean	SD	Mean	SD	Gain
Male	20	13.12	3.33	17.71	3.59	4.59
Female	18	12.61	3.54	16.93	4.08	4.32

Table 2 shows that the males scored slightly higher than the females with a difference of 0.27.

Hypothesis 1

There is no significant difference between the mean post-test scores of students taught Biology with nominal group technique and those taught with lecture method.

Table 3: *ANCOVA Analysis of Biology Achievement Scores between the Groups*

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	716.525[a]	2	358.263	61.163	.000
Intercept	151.777	1	151.777	25.912	.000
Pretest	555.662	1	555.662	94.864	.000
Group	28.418	1	28.418	4.852	.031
Error	451.025	77	5.857		
Total	21202.000	80			
Corrected Total	1167.550	79			
a. R Squared = .614 (Adjusted R Squared = .604)					

Data presented in Table 3 show that the p-value (0.031) is less than the alpha value (0.05). Therefore, the null hypothesis is rejected. This implies that there is a significant difference between the mean achievement scores of students taught Biology using the nominal group brainstorming technique and those taught using lecture method.

Hypothesis 2

There is no significant difference between the mean achievement scores of male and female students taught using nominal group technique.

Table 4: *The t-test Analysis of Biology Achievement Scores of Students Taught with NGT based on Gender*

Variable	Gender	N	Mean	Std. Dev	df	T	P
Achievement score	Male	20	17.40	2.854	36	.171	.865
	Female	18	17.22	3.541			

The result in table 4 shows that the t-value (0.171) is not significant since the p-value (0.865) is greater than the alpha value (0.05), hence the null hypothesis is retained. This means that the mean achievement scores of male and female students taught Biology using nominal group brainstorming method did not differ significantly.

4. Discussion

The findings have shown that the students taught Biology using brainstorming (NGT) performed significantly better in Biology Achievement Test (BAT) than those taught with lecture method. The difference may be as a result of NGT providing an opportunity for students to take active role in building their own knowledge (Okebukola, 2005). It may also be as a result of new useful ideas and creative thinking that the technique impacted to the students. The result from the lecture method of teaching suggested that the method used is unlikely to develop adequate content understanding in Biology in our secondary schools. Hence, the students in the treatment group have significant higher gain in their content understanding than those in the control group. Also, the ANCOVA analysis indicated that there is a significant difference between the treatment and control groups. This result is not surprising because NGT encourages students to move from one level of understanding to another as they think out the solution to their problem. Hence, one would be in a position to say that the students taught using NGT shifted in their level of understanding as they construct their own knowledge of biology concepts.

The gender issue in science has been very controversial as some study go in favour of boys while some in favour of girls. The result of this research shows that there is no significant difference in the performance of male and female students taught Biology using NGT. This is in line with the findings of Arigbabu and Mgi (2004) and Bilesanmi-Awoderu (2006). The slight mean difference of 0.27 in mean gain score in favour of male students may be as a result of the assertion made by Bontemp and Halzewood (2003) that female students display more apprehension than the male students, and so may have been a little nervous about the task of NGT. It also goes to nullify the popular notion that biology is a feminine subject and so girls perform better in it than boys.

5. Conclusion

This study has revealed that Nominal Group Technique of brainstorming has a lot to offer as regards students' achievement in Biology as in some other science subjects like mathematics, computer and home economics as earlier stated. In fact, NGT has demonstrated its effectiveness in increasing meaningful learning in Biology because it is an activity-oriented approach which boosts the students generation of ideas and solutions to problems of learning. It is evident that all students, irrespective of gender benefit from it. The findings further confirms that when students participate actively and take control of their learning process, meaningful learning takes place and achievement is enhanced.

6. Recommendations

In view of the efficacy of the NGT of brainstorming approach¸ the following recommendations were made:

- Biology teachers should de-emphasize the sole use of conventional methods (for example, lecture method) in delivery of biology lessons and adopt the more student-centered approaches especially NGT.
- Science teachers should be encouraged through curriculum designing to employ NGT more often in teaching and learning of science in general and biology in particular especially as it has been proved to favour both boys and girls in academic achievement.
- Teacher educators in higher Institutions should help to inculcate the use of this instructional approach into the student-teachers so that they can always employ it in their classrooms when they become professional teachers.

- Classroom teachers should also be trained on the use of NGT through seminars, conferences, support supervision and journal publications to improve their competencies in the use of brainstorming strategies.

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