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Full Length Research Paper

Effects of 5es Constructivist Instructional Strategy on Students' Interest in Senior Secondary Genetics in Gwer Local Government Area, Benue State, Nigeria

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The study investigated how the 5Es constructivist instructional strategy would improve students' interest in senior secondary school genetics in Gwer Local Government Area of Benue State, Nigeria. The design of the study was Quasi: experimental, specifically, the pretest post-test non-equivalent control group design. A sample of 147 students from four schools, out of a population of 2,183 SSII biology students. A validated 30 item Genetics Interest Inventory (GII) was the instrument for data collection. A reliability co-efficient of 0.85 was established for the GII using Cronbach Alpha method. Out of the four schools, two schools were assigned to the experimental group while the other two to the control group. The experimental group were taught genetics using the 5Es (engagement, exploration explanation elaboration and evaluation) constructivist instructional strategy while the control group were taught using the conventional (lecture) method. Mean and standard deviation were used to answer the two research questions and Analysis of Covariance. (ANCOVA) was used to test the two hypotheses at P<0.05 level of significance. The result revealed that the 5Es constructivist instructional strategy was more effective in facilitating students interest in genetics in both urban and rural schools. The study recommended among others, that the 5Es constructivist instructional strategy be adopted in our school system for teaching biology, especially genetics.

Keywords: 5Es, Constructivist Instructional Strategy, Interest, Secondary School, Genetics.

Background to the study

All over the world, scientific and technological advancement remain the yardstick for judging a country's development (Agogo 1988). This is because the acquisition of useful scientific skills, knowledge, interest and attitude can transform a society from backwardness to a scientifically, technologically and economically advanced society. The importance of science and technology and the global reliance on its processes and products in all areas of human endeavour, have made them valuable that any society or country without a good foundation in science and technology risks being alienated from the global village. However, several research reports indicate that students achieve poorly in secondary school science subjects especially biology (Okoli 2006; Ofonime 2007; Nwagbo and Obiekwe 2010).

The term biology is defined by Sorajini (2009) as the study of living things interacting with its non-living components. Biology is a fascinating study that ranges from microscopic cellular molecules to the biosphere, encompassing the earth's surface and its living organisms. Biology is a unique subject, which promotes the acquisition of specialized scientific skills and knowledge. The importance of biology in national development cannot be over emphasized, in addition to the fact that it benefits the individual and corporate organizations in numerous ways. For instance, it helps the individual to understand the functioning and working of his or her body system. Questioning superstition and maintaining good health such as knowing the importance of good sanitation, eating of balanced diet, vaccinating against infectious diseases. The knowledge of biology also prepares an individual for vocational selection such as medicine, agriculture and teaching. It promotes the understanding of the relationship of man and his environment and the interrelationship between living and non-living things in the environment (Obiekwe 2008). This supports the position of Caccavo (2005), when he said that man should study genetics for two reasons; to gain intellectual gratification that comes from

understanding natural patterns and processes and to apply that understanding to environmental problems that confront mankind. Thus, genetics occupy a central position in biology as well as school curriculum and it plays a very important role in scientific advancement that affects the lives of mankind.

However available statistics from West Africa Examination Council, Chief Examiners Reports over the years, (WAEC 2009, 2010, 2011 and 2012) on senior secondary school students' achievement in biology revealed students' poor achievement at the Senior Secondary Certificate Examination, (SSCE). Available evidence reveals that students' poor achievement in biology is the result of a poor grasp of the concepts in genetics and basic ecological concepts (Okafor and Okeke, 2006).

To Okafor and Okeke (2006), the poor achievement of students in biology examination may be related to their level of interest in genetics. This means that, the poor achievement in genetics may be indicative of lack of interest by students. Any effort to tackle the problem of poor achievement in genetics will prove abortive if the students' interest is not taken into consideration.

Interest is a subjective feeling of intentness or curiosity over something. According to Agogo (2009), interest is a fundamental factor necessary for an effective science learning. To him, interest is seen as quality that arouses curiosity that holds one's attention. It is a condition of wanting to know or learn about something or somebody. Ben (2013) found that interest is a significant factor in students' performance in chemistry (a science subject). Similarly, Hong (2003) sees interest as an excitement or feeling accompanied by special attention to something. It is an important variable in learning because when one becomes interested in an activity, he or she is likely to be more deeply involved in that activity. The enthusiasm with which students enter into any learning activity is determined by their interest in that particular activity. Students seem to learn more efficiently those things that appear to interest them. This study therefore determined how the 5Es constructivist instructional strategy would help improve students' interest in genetics.

Research questions

The following research questions were raised to guide the study.

1. What is the difference in the mean interest rating scores of students taught genetics using the 5Es constructivist instructional strategy and those taught using the lecture method?
2. To what extent is there a difference in the mean interest rating scores of students taught genetics using the 5Es constructivist instructional strategy in urban and rural schools?

Hypotheses

The following null hypotheses were formulated to guide the study and were tested at 0.05 confidence level.

1. There is no significant difference in the mean interest rating scores of students taught genetics using the 5Es constructivist instructional strategy and those taught using the lecture method.
2. There is no significant difference in the mean interest rating scores of students taught genetics using 5Es constructivist instructional strategy in urban and rural schools.

METHODOLOGY

The researchers adopted a quasi-experimental design. Four co-educational senior secondary schools were randomly selected from the twenty nine secondary schools in Gwer Local Government Area of Benue State, Nigeria. The population of the study comprised all the 2,183 senior secondary 2 students offering biology in the twenty nine secondary schools in the study area. A sample of 147 students out of the four schools, were used for the study. An instrument known as Genetics Interest Inventory (GII) that was validated by three experts, two from Science Education and the other from Measurement and Evaluation all from Benue State University; Makurdi, Nigeria, was used to collect the data. The GII consisted of thirty items. The instrument was a likert-scale designed to assess students' interest in genetics. This was assessed using five point Likert scale of Strongly Agree (SA), Agree (A), Undecided (U), Disagree (D) and Strongly Disagree (SD). The GII yielded a reliability coefficient of 0.85 using Cronbach Alpha method. It was assumed by the researcher that the use of the 5Es constructivist instructional strategy to teach genetics in senior secondary school biology could facilitate students' interest and the effect of the model might not be location sensitive.

RESULT ANALYSIS

The data collected were analyzed

Research question one

To what extent is there a difference in the mean interest rating scores of students taught genetics using the 5Es constructivist instructional strategy and those taught using the lecture method? The answer to research question one is presented in Table 1.

Table 1 reveals that the students taught using the 5Es

Table 1: Mean and standard deviation for students' Pre and Post Genetics Interest Inventory Scores in constructivist based and lecture groups.

Method	N	Pre- GII		Post- GII		Mean gain
		$\bar{X}$	δ	$\bar{X}$	δ	
Constructivist-based method	80	2.435	0.613	2.827	0.569	0.392
Lecture method	67	2.662	0.579	2.842	0.566	0.181
Mean difference		0.227		0.015		0.211

Key: $\bar{X}$ = mean scores δ = standard deviation scores.

Table 2: Mean and standard deviation for Pre and Post Genetics Interest Inventory Scores of urban and rural students in constructivist based group.

Location	N	Pre- GII		Post- GII		Mean gain
		$\bar{X}$	δ	$\bar{X}$	δ	
Urban	33	2.425	0.719	2.823	0.673	0.396
Rural	47	2.442	0.535	2.830	0.491	0.388
Mean difference		0.017		0.007		0.008

Key: $\bar{X}$ = mean scores δ = standard deviation scores.

constructivist instructional strategy had a mean interest rating scores of 2.435 and standard deviation of 0.613 in the pre-test. In the post-test, the students had a mean interest rating score of 2.827 and a standard deviation of 0.569. For the lecture method group, the table reveals a mean interest rating score of 2.662 and a standard deviation of 0.579 in the pre-test while they had a mean interest rating of 2.842 and a standard deviation of 0.566 in the post-test. Comparing pre-test and post-test gain of the two groups, it can be seen that students taught using the 5Es constructivist instructional strategy had a pre-test post-test mean gain of 0.392 while students taught using the lecture method had a pre-test post-test mean gain of 0.181. This reveals a positive difference of 0.211 in favour of the constructivist group. This shows that students taught genetics using the 5Es constructivist instructional strategy developed interest after the teaching compared to their lecture group counterparts.

Research Question Two.

What is the difference in the mean interest rating scores of students taught genetics using the 5Es constructivist instructional strategy in urban and rural schools? Answer to research question two is presented on Table 2.

From table 2, students from the urban schools had a mean interest Post-test scores of 2.823 with a standard deviation of 0.673 while those from rural schools had a post-test score of 2.830 with standard deviation scores of 0.491. The mean gain between the pre-test and post-test of students in the urban schools is 0.396 while the mean gain for the rural schools is 0.388. The difference between their mean gain is 0.008 in favour of the urban schools. This shows that students in the urban schools developed more interest in the learning than their counterparts in the rural schools, though this difference is very small.

Hypothesis one

There is no significant difference in the mean interest rating scores of students taught genetics using the 5Es constructivist instructional strategy and those taught using the lecture method.

From table 3, the results of students interest based on teaching method indicated by $F1(1,138) = 8.837$, $P = 0.003 < 0.05$ is significant. This result affirms that there is a significant difference between the mean interest rating scores of students in the 5Es constructivist-based and lecture method groups. Thus the hypothesis of no significant difference is rejected.

Hypothesis two

There is no significant difference in the mean interest rating scores of students taught genetics using the 5Es constructivist instructional strategy in urban and rural schools.

From table 4, the result of location difference as indicated by $F(1,77) = 0.004$, $P = 0.948 > 0.05$ is not significant. The result shows that there is no significant

Table 3: Test of between subjects effects for constructivist-based and lecture groups scores in genetics interest inventory.

Source	Type III sum of square	df	Mean square	F	Sig.
Corrected model	31.390a	8	3.924	35.286	0.000
Intercept	6.095	1	6.095	54.815	0.000
Pre-GII	29.684	1	29.684	266.947	0.000
Method	0.983	1	0.983	8.837	0.003*
Error	15.345	138	0.111		
Total	1227.313	147			
Corrected total	46.735	146			

Key: * = Significant at P < 0.05

Table 4: Test of between subjects effects of constructivist-based urban and rural students' score in Genetics Interest Inventory.

Source	Type III sum of square	df	Mean square	F	Sig.
Corrected model	17.508a	2	8.758	83.540	0.000
Intercept	4.314	1	4.314	41.167	0.000
Pre-GII	17.507	1	17.507	167.072	0.000
Location	0.000	1	0.000	0.004	0.948**
Error	8.069	77	0.105		
Total	664.897	80			
Corrected total	25.577	79			

Key: * * = Not significant at P < 0.05

difference between the mean interest rating scores of urban and rural students taught genetics using the 5Es constructivist instructional strategy. Thus the hypothesis of no significant difference is not rejected.

DISCUSSION

The results of the study as indicated by F (1,138) = 8.837, P = 0.003 < 0.05 has shown that students taught genetics using the 5Es constructivist instructional strategy developed more interest compared to the lecture method group. The 5Es constructivist strategy affected students' interest in genetics positively. This result is in conformity with that of Obiekwe (2008) and Dogru and Kalender (2007) who asserted that constructivist based strategy promotes students interest and understanding. This is in agreement with the findings of Okechukwu (2002) who described interest as the attraction that forces or compels a child to respond to a particular stimuli. This points out the fact that a child develops interest if a particular stimuli is attractive, arousing or stimulating. Thus using the 5Es constructivist instructional strategy in teaching genetics significantly enhanced students' interest. This implies that students interest in biology may be influenced by the instructional strategy used in the teaching process. this means that both the teacher and the learner should take interest in activities they interact with in class (Agogo, 2009).

The results also indicated by F (1,77) = 0.004, P = 0.948>0.05 did not reveal any significant difference between the interest of students in urban and rural schools. The implication of this is that the 5Es constructivist instructional strategy is not location sensitive. This corroborates Obiekwe (2008) who asserted that constructivist-based method of instruction promotes students interest and understanding. The finding may be connected to the fact that the constructivist instructional strategy directs and organizes information around different kinds of problems in order to capture students' interest, irrespective of school location.

CONCLUSION AND RECOMMENDATIONS

Based on the findings of the study, the following conclusions are made:

1. 5Es constructivist instructional strategy enhances a high level of interest among learners. Those taught using this strategy had a higher interest rating score than those taught using the traditional lecture method.
2. The 5Es constructivist instructional strategy is not location selective in its effectiveness as the outcome did not discriminate against the location of the learners.

On the basis of the findings, the following recommendations are made:

1. The 5Es constructivist instructional strategy be adopted at the secondary school level in teaching biology.
2. All those involved with curriculum development in science education should adopt the constructivist perspective in restructuring biology curriculum.
3. Workshops and seminars should be organized by Ministry of Education for in-service and practicing biology teachers to keep them a breast of the 5Es constructivist instructional strategy.

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