

The Impact of Teacher Creativity Fostering Behaviour on Students' Interest in Biology in Enugu State, Nigeria

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Abstract

The importance of creativity in education has been emphasized in recent research studies hence this study investigated the impact of teacher creativity fostering behaviour on interest in Biology among secondary school students. To achieve this objective, the study employed causal comparative (ex-post facto) design because the independent variables being investigated were pre-existing and so could not be manipulated to determine the effect on dependent variables. Two research questions and two null hypotheses were formulated to guide the study. The population of the study consisted of all the 5693 (2254 females and 3439 males) SS1 Biology students and 62 SS1 Biology teachers of all the 48 public senior secondary schools in ObolloAfor education zone of Enugu state. A sample of 270 SS1 Biology students and 24 SS1 Biology teachers from 48 schools in the zone were drawn through proportionate stratified random sampling technique. The instruments used for data collection were Teacher Creativity Fostering Behaviour Index (TCFBI) which was adopted from Copley (cited in Soh 2015) and Biology Interest inventory (BII) developed by the researcher. Cronbach Alpha statistics was used to determine the internal consistency of BAT items and a reliability coefficient of 0.80 was obtained. Mean and standard deviations were used to answer research questions while ANCOVA was used to test the null hypotheses. The results of the study found out that students who were taught by teachers of high level of creativity fostering behaviour had better interest in biology compare with those whose teachers have moderate or low creativity levels; that male students have higher interest in biology in relation to teacher creativity fostering behaviour. Favourable teaching and learning environment was, therefore, recommended in biology classroom in order to boost students' interest in biology.

Key words: Creativity, Fostering Behaviour, Interest, Biology Teacher.

Introduction

The fast-growing importance of science and technological development in Nigeria has given rise to the need for designing and implementing innovative strategies for effective teaching and learning of science and technology subjects. These subjects taught in Nigerian secondary schools include chemistry, physics technical drawing, and Biology to mention but few. Biology, which is the study of living organisms, is one of the science subjects taught in Nigerian secondary schools which attract a great number of both art and science students (Nwachukwu & Nwosu, 2007). It is a branch of natural science involving many other disciplines such as chemistry, physics, mathematics, geology and psychology. The study of Biology is essential for the nation's science and technological development especially in the areas of manufacturing and processing, food productions, and pharmaceuticals among others (Nwagbo & Okoro, 2012). The subject is also required for qualification into tertiary institutions for candidates who would want to study medicine, Agriculture, pharmacy and micro-biology and other related science courses. Based on the relevance of Biology, it is important that the interest of students in the subject would be on the increase.

Nevertheless, students' interest in Biology has been reported to be low over time. Reports from several research studies have indicated lack of students' interest in the study of Biology (Njoku & Ezinwa 2014). According to Soyibo (2010) and Obodo (2004) the interest of students is thwarted by several factors which include negative attitudes of teachers and influence of other people's attitude. Obiekwe (2008) opined that students' interest is dampened due to lack of understanding of difficult biology concepts such as genetics, ecology among others. Several researchers (Okeke, 2007; Norom, 2009; Ekon, 2013) have also attributed the low interest of students in biology to ineffective teaching methods used by teachers in teaching Biology. It is, therefore, presumed that many Nigerian biology teachers do not apply the recommended innovative science teaching methods for instructional delivery. Instead, it was noted that the Biology classroom is still dominated by teacher- centered, didactic teaching methods that do not promote interest among students. The quality of education and educational procedures, programs, efforts and achievement goals could be determined largely by interest of students. This implies that the

level of achievement of students in Biology may be determined by their interest. It is believed that any effort to remedy the problem of poor achievement in Biology will not be adequate if the students' interest is not taken into consideration. Interest is a subjective feeling of intentness or curiosity over something (Habor Peters 2001). Students tend to learn more efficiently those things that appear to interest them. Habor Peters in Ojo (2015) noted that interest is a tendency to become absorbed in experience and continue in it. Interest, therefore, involves the desire or zeal to participate in an activity or a process from which one derives some pleasure.

Students' interest in biology can be generated and sustained through motivation, relevant set of induction techniques, effective use of instructional strategies, and most especially the use of imaginative or creative approach. It is therefore the duty of the Biology teacher to use creative approach in instructional delivery to make the lesson real and interesting to students irrespective of gender. However, studies have shown compelling evidence that gender is an important factor in students' interest in Biology. In Nigeria, gender bias is still prevalent; it has persisted even in Biology classrooms (Ugwu, & Nzewi, 2015). Ugwuadu (2011) defined gender as a broad analytical concept which draws out men's roles and responsibilities in relation to those of women.

Some factors have been identified to account for differences in the male and female students' interest in Biology. Prominent among the factors identified by Okeke (2007) is sex-role stereo typing which seems to be the origin of differences between male and female achievement in science education. The study noted that many parents do not want to spend on female education because of their social or cultural status. The preferential treatment dampens students' interest and subsequently academic achievement in Biology. The school also provides a platform for channeling students into prescribed gender related activities. For instance, the grouping of subjects in schools encourages stereotypical choice of subjects. Food and nutrition for example is grouped with technical drawing, physics with home management, etc. Such grouping tends to encourage female students to choose food and nutrition and home management or arts subjects while their male counterparts will more likely choose physics and technical drawing or science subjects. While some studies (Cachia and Ferrari, 2010; Goc and Erdogan, 2011, Nwankwo and Okafor, 2014) reported a significant gender difference in students' interest in Biology other studies reported the opposite (Ogundoyin and Olatoye 2007, Okoli and Mbonu 2014). Therefore, the findings on gender difference in students' interest in Biology have been largely inconclusive. Gender implication, especially as it affects interest of students in Biology needs more verification. The present study therefore becomes necessary to further probe the gender issue in students' interest in Biology.

In general, the interest of students in Biology would depend on observable activity on the part of the teachers which will make learning in Biology classroom exciting to students, gender notwithstanding. One can deduce that one of the major reasons for low interest of students in Biology is that students are not taught in a way that promotes interest. The most popular method of remedying this situation is, perhaps, application of imaginative and innovative approaches or being creative. As Beghetto (2005) points out, creativity in education is often used but seldom defined. Creativity is connected with intellectual activity, knowledge, and thinking styles. It is a mental process involving the generation of new ideas geared towards solving a problem. To be creative means that one sees problems of life and living and proffer solution that is appropriate and probably adequate. Creative individuals are always motivated because they see the need for novel, varied and complex stimulations. Fundamentally, one who is creative according to Franken (2014), exhibits such qualities as flexibilities, tolerance to ambiguity or unpredictability.

Creativity could mean vision, resourcefulness, originality, inspiration and imagination. A creative individual can, therefore, be said to be visionary, a resourceful person who demonstrates original ideas and insights (Njoku, 2015). Such a person thinks about modernizing things and introduces novel ideas for purposes of advancement in a process or product. In other words, an innovative person is essentially a creative person. They both have the mindset to produce change for the better, to improve the quality or products or process or ideas for purposes of advancement. At the classroom level, the incorporation of teaching practices that promote creativity can lead to positive changes in students' behaviour, social skills, self-esteem, motivation and above all, students' interest in biology. Thus, teaching creatively, implementing creative approaches to develop lesson plan and engaging students with the material can boost interest on the part of the students. Although teacher creativity has been reported to have enduring impact on students' interest, studies have shown that there has not been any strong report indicating teachers' knowledge or application of creativity in Biology classrooms in Nigeria. They tend to prefer standardization over uniqueness thus promoting reproductions over understanding. Again Bartel, Nwosu cited in Ibe (2011) observed that the cultivation of creativity in our classrooms is neglected. The possibility of the Nigerian child coping with the workforce of the 21st century which requires manipulative skills, therefore, becomes questionable. The use of creativity in teaching and learning has been emphasized from many sources though mostly from foreign background. Olatoye, Ogundoyin and Ogunsonya, (2010) reported that research findings on creativity have usually come from foreign countries. Admittedly, Soh(2015) stated that research studies on creativity were carried out in developed countries such as

America, Turkey, Britain and Canada. There is the urgent need for implementing teaching practices that would boost interest and skill acquisition among our secondary school students in Nigeria.

Teachers are more capable of fostering creativity behaviour in their students if they acquire an improved understanding of the concept themselves. It is the responsibility of the Biology teacher to change thinking styles of students by encouraging creativity in the best available manner. A crucial part of encouraging creativity is related to teachers' attitudes and behaviour towards students (Dickisi, 2013). The personality, attitude and behaviour of the science teacher, therefore cast too important an impression on students' mind. Teacher creativity fostering behaviour in the context of this study, therefore, refers to teachers' ability to apply imaginative behaviour and creative approaches in teaching biology. Teachers can support the interest in their students by being models of creative attitude, solving problems in an original fashion, communicating values which foster creative mind set. Teachers with the above characteristics are described as those with high level of creativity fostering behaviour (Runco, 2007). On the other hand, Runco described teachers with practices that focus on notion acquisition and repetition as those with low level of creativity fostering behaviour. Understanding of teacher creativity fostering behaviour and their current teaching practices is thus essential in order to determine its relationship with the interest of students in biology. This becomes necessary since, according to Blumen (2002), factors related to school operations and teaching practices have an important effect on students' interest. The relationship between teacher creativity fostering behaviour TCFB and students' interest has been examined by a number of investigators. Schacter Thum and Zkfin (2006) studied the relationship between creative teaching and students' interest gains in Iran. The results show that teachers who elicited creativity in their students turned out students with high interest gains. This implies then that biology teachers should employ the art, creative attitude or behaviour in their methodology which could arouse students' interest in biology classroom.

The art or behaviour of the teacher which depict creativity fostering behaviour in the classroom have been reported. Dickisi (2013; Fleith in Dickisi (2013); Feldbusen and Treffinger, in Ozkal (2014) have reported creativity behaviour that induce students' interest in classroom setting. Cropley in Soh (2015) presented nine principles of TCFB demonstrating creativity fostering behaviour of teachers in the classroom situation as follows; Independence: encouraging students to learn independently, Integration: having a cooperative, socially, integrative style of teaching, Motivation: inspiring students to master factual knowledge so that they have a solid base for divergent thinking, Judgment: delaying judging students' ideas until they have been thoroughly worked out and clearly formulated, Flexibility: Encouraging Flexible thinking, Evaluation: promoting self-evaluation in students. Questions: taking Students' suggestions and questions seriously, Opportunity: Offer students opportunity to work with a wider variety of materials and under many different conditions, Frustration: helping students to learn to cope with frustrations and failure and show them that their ideas and concepts have value.

Statement of the Problem

Teaching and learning of Biology constitutes a crucial factor in the improvement of lives of the individuals and attainment of science and technological development especially in the areas of manufacturing and processing industries, medicine, food productions, and pharmaceuticals among others. In the light of this, it is expected that students' interest in this subject should increase. But unfortunately, previous studies have shown that students' interest in Biology is persistently low, perhaps because they are not taught in a way that enhances interest. The use of effective teaching or creativity by teachers as an enabling teaching device has been proved to enhance the interest of students in many other subject areas. In Nigeria, however, there has not been any empirical research work known to the researcher on the impact of teacher creativity fostering behaviour on students' interest in biology, especially in the secondary schools. This is because most of the research findings on creativity continue to come from advance countries which may have some peculiar characteristics. It is on the basis of these that the present study becomes very imperative in Nigerian context. Therefore, the statement of the problem posed as a question is "What is the impact of teacher creativity fostering behavior on students' interest in Biology in Nigeria?"

Research Questions

The following research questions were answered in this study

1. What are the mean interest scores of students taught by biology teachers of different levels of creativity fostering behaviour
2. What are the mean interest scores of male and female students in Biology taught by teachers of different levels of creativity fostering behaviour

Hypotheses

The following null hypotheses were tested in this study at 0.05 level of significance.

1. There is no significant difference in the mean interest scores of students taught by biology teachers of different levels of creativity fostering behaviour

2. There is no significant difference in the mean interest scores of male and female students taught by biology teachers of different levels of creativity fostering behaviour

Method

The study employed causal comparative (ex-post facto) design. Ex-post facto design is appropriate for this study since the researcher has no control over the level of the creativity fostering behaviour of biology teachers. The population of the study consists of all the Senior Secondary One (SSI) Biology teachers and students in the public schools in ObolloAfor education zone of Enugu state in the 2017/18 session.

The sample for the study consists of two hundred and seventy (270) Biology students (130 Males and 140 females). The researcher adopted proportionate stratified sampling technique for the study. Schools in the education zone were stratified into three (3) local government areas. A total of thirty (30) schools from the forty-eight (48) schools in the zone were proportionately sampled according population size as follows; 15, 5 and 10 schools from Igbo-Eze North, Igbo-Eze south and Udenu Local Government area respectively through balloting without replacement.

Teacher Creativity Fostering Behaviour Index (TCFBI) adopted from Copley (cited in Soh, 2015) and Biology Interest Inventory (BII) developed by the researcher, were used for the study. The instrument (TCFBI) was adopted to specifically determine teacher creativity fostering behaviour in biology classrooms while Biology Interest Inventory (BII) was used to determine the interest of students in biology in respect of teacher creativity fostering behaviour. The reliability value (0.96) obtained for TCFB was high enough to be used in confidence for the purpose of this study.

The TCFBI consists of nine principles or components. Three statements or activities of the teacher behaviour in Biology classroom context were written to depict those teacher behaviour consistent with each component of creativity. The items were presented in a score sheet prepared and used by the researcher. The SSI Biology teachers were then observed during their classroom teaching in intact classes in each of the selected schools for two periods of 35 minutes each per week, for five weeks. Each item or statement of the nine components scored 1 mark. The average scores of Biology teachers in the TCFB for the period of the five weeks were collected using the score sheet. Those Biology teachers who scored 70 marks and above were categorized as high, those having marks 55 to 69 as moderate and those scoring below 55 marks as low creativity teachers. Out of twenty-five (25) Biology teachers that participated in the study four (4) were high creativity teachers for scoring 70 marks and above, seven (7) were moderate and (14) were low creativity teachers at the end of the exercise. The participating Biology teachers of different levels of creativity (High, moderate and low) thereafter taught their students the selected topics: photosynthesis, mineral requirement of plants, food substances in animals, enzymes, and modes of nutrition in animals and plants at different lesson periods.

Biology Interest Inventory (BII) was designed to assess students’ interest in Biology under teachers of different TCFB levels. Assessment of Students was based on their level of interest in Biology provided on a four-point scale, namely; Very high Interest (VHI= 4, High Interest (HI) = 3, Low Interest (LI). Very low interest (VLI) = 1. Biology Interest Inventory, BII was subjected to both content and face validation in order to estimate the validity of the instruments. BII were administered to the students of the selected schools to test the reliability of the test items. The data collected after scoring the students from trial testing were used to determine the reliability of the instruments using Cronbach alpha. The reliability coefficient of 0.84 was obtained. With the reliability value of 0.84, the instrument is, therefore, appropriate for the study.

Results

Research Question One: What are the mean interest scores of students in Biology based on their teacher creativity fostering behaviour levels?

Table 1: Mean interest scores of students in biology based on different levels of TCFB levels

Creativity Level	N	Mean	Std. dev
High	90	74.43	10.49
Moderate	89	71.38	9.27
Low	90	67.16	10.12

From Table one it was discovered that the mean interest in Biology was higher for those taught by high TCFB levels (Mean = 74.43 and Std.dev = 10.49). They were followed by those taught by moderate TCFB levels

(Mean = 71.38 and Std.dev = 9.27) and those under low creativity level teachers having the lowest interest scores (Mean = 69.16 and Std.dev = 10.12). Thus, higher interest in Biology was observed for those taught high and moderate TCFB levels.

Research Question Two: What are the mean interest scores of male and female students in Biology based on their teacher creativity fostering behaviour levels?

Table 2: Mean interest scores of male and female students under different TCFB levels.

TCreativity	StuGender	N	Mean	Std. dev
High	Male	62	75.89	11.62
	Female	28	72.96	7.20
Moderate	Male	55	72.84	9.08
	Female	34	69.91	9.42
Low	Male	73	70.56	9.69
	Female	17	63.76	10.35

Note: TCreativity = Teacher Creativity; StuGender = Student gender

Data in Table 2 show that the male students based on high creativity teachers had a mean interest score of 75.89 and a standard deviation of 11.62. The females on the other hand were observed to have the mean interest score of 72.96 and a standard deviation of 7.20

The same Table indicates that male students taught by moderate level creativity Biology teachers had a mean interest score of 72.84 and a standard deviation of 9.08 as against their female counter part that had mean interest score of 69.91 and a standard deviation of 9.42. The Table further revealed that male students had the mean score of 70.56 and standard deviation of 9.69 when based on low creativity Biology teachers while their female counter part had a mean score of 63.76 and a standard deviation of 10.35. Comparing the mean interest scores of male and female students in the TCFB levels, it was observed that the male students had the highest mean interest scores than their female counter parts exposed to all the three levels of teacher creativity. This implies, therefore, that under all TCFB levels, male students exposed to TCFB techniques had the highest mean interest than their female counter parts.

Hypothesis One: There is no significant impact in the mean interest scores of students in Biology based on their teacher creativity fostering behaviour level.

Table 3: ANCOVA for testing difference in mean interest scores of students in Biology under different teacher creativity levels.

Source	Sum of Square	df	MS	F	Sig.
Corrected Model	1625.67	3	541.89	5.48	.001
EGIT	152.06	1	152.06	1.54	.216
TCrea	1598.24	2	799.12	8.08	.000
Error	26317.24	266	98.94		
Total	1426903.00	270			
Corrected Total	27942.91	269			

Note: TCrea = Teacher creativity

Table 3 above was used to test hypothesis four. ANCOVA results as shown in Table 3 revealed a significant effect of teacher creativity level (TCL) on interest scores as indicated by F value of 8.08 which is significant at 0.000 and significant at 0.05 level of probability. Hypothesis two was, therefore, rejected since there was a significant difference in the mean interest scores of students based on TCFB levels. Post- Hoc analysis was conducted in order to determine or locate the direction of the difference. This is presented in table 4.

Table 4: Post-Hoc test analysis of students' interest scores based on different levels of TCFB.

95% Confidence Interval for Difference						
TC(i)	TC(j)	MD(i-j)	Std. Error	Sig.	Lower Bound	Upper Bound
H	M	3.77	1.53	.044	.08	7.46
	L	5.10	1.50	.000	2.38	9.62
M	H	-3.77	1.53	.044	-7.46	-.08

	L	2.23	1.49	.407	-1.36	5.82
L	H	-5.10	1.50	.000	-9.6	-2.82
	M	-2.23	1.49	.407	-5.82	1.36

Note: BAT = Biology Achievement Test; INT = Interest in teacher creativity; H = High TCL; M = moderate TCL; L = low TCL; MD = Mean difference.

The results as shown in Table 4, however, shows that students who were under teachers of high creativity level had significantly higher interest in Biology, controlling for the effect of their interest test scores than students who were under teachers of moderate creativity levels (Mean Difference (MD) = 3.77, p = .044) and also students who were under low creativity level (Mean Difference (MD) = 5.10, p = .000). There was however a non-significant difference in interest in Biology between students who were thought under moderate creativity level and under low creativity level (Mean Difference (MD) = 2.23, p = .407) while controlling for the effect of their intelligence test scores.

Hypothesis Two: There is no significant impact in the mean interest scores of male and female students in Biology based on their teacher creativity fostering behaviour levels.

Table 5: ANCOVA for testing difference in mean interest scores of male and female students in biology based on different teacher creativity behaviour levels

Source	Sum of Square	df	MS	F	Sig.
Corrected Model	638.20	2	319.10	3.12	.046
EGIT	41.99	1	41.99	.41	.522
4					
StuGender	610.78	1	610.78	5.97	.015
Error	27304.70	267	102.27		
Total	1426903.00	270			
Corrected Total	27942.91	269			

Note: StuGender = Student gender

ANCOVA results as shown in Table 5 revealed a significant effect of student gender on interest in teacher creativity. This is shown by the mean difference of 0.015 which is significant at 0.000 and also at 0.05 level of significant. From the mean interest, it was found that under all the TCFB levels, male participants had significantly higher interest in teacher creativity than females. The researcher thus rejected the hypothesis.

Discussion

Results as indicated in Tables 5 show a significant difference in students’ interest based on their TCFB level. From Table 5, it was discovered that students’ interest increased when taught by High Creativity Biology teachers as indicated with a mean score and standard deviation of 74.98 and 10.49 respectively. This is followed by students taught by moderate and low creativity biology teachers. Students taught by moderate creativity fostering behaviour teachers had a mean interest score of 72 .84 and a standard deviation of 9.27 while students under low TCFB teachers had mean interest score of 69.28 and a standard derivation of 10.12.

All in all, it could be observed that TCFB had a significant impact on interest of students in Biology. A significant impact of TCFB on students’ interest was confirmed by ANCOVA result in table 10 on interest score where the calculated F value 98.94 is significance at 0.05 levels. This result is in conformity with the study of Aja (2004) which indicates a significant relationship between interest and method of instruction adopted by Biology teachers. Also, Rasras (2006) compared student-centered (creativity) and teacher centered instruction in college laboratory and the result showed that the students were more interested and appreciated science subjects in relationship to their teacher fostering behaviour level. This is not surprising because interest builds up as students interact and share ideas to solve a problem. The high mean interest score in Biology may have been because each student sees him or herself as being a partner in the problem-solving process. This boosts morale thereby boosting interest in the subject. The lower mean scores for those students taught by moderate and low creativity Biology teachers may have been because each student works for his or her own success with little or no exchange of ideas between them.

Data in Table 6 show that the male students taught by high creativity Biology teachers had a higher mean interest score of 75.89 and a standard deviation of 11.62 higher than their female counterpart with a mean interest scores of 72.96 and a standard deviation of 7.20. Male and female students taught by low creativity Biology teachers had lower interest with mean interest scores of 70.56 and 63.76 respectively. ANCOVA results as shown in table 12 revealed a significant effect of student gender on interest in teacher creativity. This is shown by calculated F value of 102.27 at 0.05 level of significance. It was found out that under all the TCFB levels, male students had significantly higher interest than females. This result conforms to several research studies which indicated significant impact of gender on the mean interest scores of students in Biology due to TCFB. Onanuga (2010) and Okoro(2012) investigating the effect of interaction patterns on students' academic achievement in Biology revealed that the interaction patterns which is an aspect of creativity positively correlated with male and female students' interest in Biology.

Reasons for significant difference in interest of male and female students (males ranking higher than females) could be linked to certain traditional beliefs which have greatly discouraged females from getting engrossed in creative ventures. Take for instance, it is on record that some cultures in Africa, particularly Nigeria, up till date still encourage their females to imbibe personality traits of docility, submissiveness, and passivity because most people believe that a woman's place is in her husband's kitchen and that her husband is her mouth piece. Conversely, the males who are meant to become leaders are trained to be independent, assertive and adventurous (Imagie, 2010). Again, it is still a common belief among Nigerians that certain subjects like physics, chemistry, Biology and other technology subjects are solely reserved for the male folks while females find themselves into nursing, teaching and art related subjects.

. Conventionally, this preferred approach dampens interest of the females because it makes them to develop fear and low self-esteem as a result. A democratic environment or setting where students are allowed freedom of associative participation, adequate learning materials and opportunity to interact with and explore environment are known to boost interest. The use of teaching strategies that promote cooperation rather than competition on science (Biology) should be adopted while those teaching techniques that reflect the pattern of male needs only should be avoided in Biology classroom. According to Giligan, Lyons and Hammer cited in Okoli (2012), this situation is not the best environment for science and technology education for both male and female students. Cooperative learning strategies have been found to enhance achievement and interest in science for both boys and girls (Okebukola as cited in Okoro, 2012).

Conclusion.

The results of the study suggest that teachers' creativity fostering behaviour can make differences in students' interest in biology. More specifically, it revealed that students whose teachers had high level of creativity fostering behavior will have better interest in biology compared with those whose teachers have moderate or low creativity levels. Evidence has also shown that male students have higher interest in biology in relation to teacher creativity fostering behaviour than their female counterpart. If Biology teachers aim to improve their students' interest, one great way to achieve this is through incorporating creativity and innovative strategies into their teaching practice.

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