# EFFECT OF CO-OPERATIVE LEARNING AND PEER-TEACHING STRATEGIES ON STUDENTS ACADEMIC ACHIEVEMENT AND INTEREST IN BIOLOGY IN ISHIELU LOCAL GOVERNMENT AREA OF EBONYI STATE

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Abstract: This study investigated the effectiveness of cooperative learning and peer-teaching strategies on students' achievement and interest in Biology in Ishielu local government area of Ebonyi State. Two research questions and two hypotheses were formulated to guide the study. The research work was quasi-experimental design type, specifically the non-achievement control group design. Two hundred and eighty three (283) biology students drawn from nine co-education public schools within the Ishielu local government area of Ebonyi State were used for the study. Simple random sampling technique was applied in choosing the schools as well as assigning each of the teaching approaches to the sample schools. The cooperative learning and peerteaching groups were the experimental groups while the conventional teaching groups were group were treated as the control group, validated Biology Achievement Test (BAT) and Biology Interest Inventory (BII) were administered to the students as pretest and posttest for the collection of data. Biology Achievement Test (BAT) had reliability index of 0.86 while Biology Interest Inventory (BII) had reliability index of 0.83. Mean and standard deviation were used to answer the research questions while analysis of convance (ANCOVA) was used to test the hypotheses of 0.05 level of significance. The study revealed that teaching approach used in difficult biology concepts is significantly responsible for the poor performance of students in senior secondary schools biology. It revealed that more of cooperative learning should be used as it has better effect on students' interest and achievement in learning difficult biology concept than the peer-teaching it was therefore recommended that workshops and seminars should be organized for teachers on the use of cooperating and peer-teaching in biology instructions.

Keyword: Skill Acquisition, Job Effectiveness, Principals, Secondary Schools

# Introduction

Biology is a subject offered at Senior Secondary Schools in Nigeria takes a central position in science and biotechnology. Biology is generally referred to as the study of life. According to Ude and Ezugwu (2018) the nature of biology as a science subject makes it activity based and one that involves a creative process with a lot of techniques and methods to make discoveries and developing of theories easy. Many teaching methods are already in use while some are evolving. Some are content focused and teacher-centred while others are process-focused and learner-centred. The processfocused and learner-centred methods and strategies such as cooperative and peer-teaching are innovative strategies where the role of the biology, teacher is that of a guide and facilitator of science learning as against the dispenser and disseminator of scientific knowledge.

Cooperative learning strategy is a teaching method in which the learners work cooperatively in groups to handle specific tasks or problems. To accomplish

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the task assigned to each group, every member not only endeavours to participate in order to understand and master the process involved but also, ensures that every other member of the group does the same. This is because the failure of any member is the failure of the entire group.

Cooperative learning is theoretically based on the work of learning psychologists like Jean Piaget and Jerome Brunner who proposed that children actively construct knowledge in a social context (Conway, 2023). The teacher therefore should create room for cooperation amongst students for effective crossfertilization of ideas. No child learns effectively in isolation. The teacher, who adopts the cooperative learning strategy organizes the students in small groups of four or five members. Each group should be heterogeneous in ability and socio-cultural background, members working jointly through a given instructional assignment until every member understands and completes successfully the assignment. Often times, one particular student is made the head to teach the other students and that is where peer-teaching comes in.

Peer-teaching is another innovative instructional strategy in which groups of children under the guidance of the teacher work together through child, the peer teacher, providing assistance and instruction to others, the peer students. Peer-teaching is theoretically based on the conceptions of the cognitive theorists like Vygotsky who proposed the zone of proximal development. The proposal points to the child's ability to profit from interaction with more competent peers (Igbo, 2014).

The teacher who adopts the peer-teaching strategy will identify the high, middle and low achievers amongst the students. The high achievers are used as the peer-teachers and middle and low achievers are assigned in their small numbers to the peerteachers for instruction and assistance. The teacher prepares the lesson plan and reviews it for the peerteachers in sequential order. The teacher also trains the peer-teacher on how to inform, reward and relate to the students.

Both the cooperative learning and peer-teaching are child-centred instructional approaches, which is an approach recommended on the National Policy on Education for teaching sciences (Federal Republic of Nigeria, FRN 2014). Researchers have found in different occasions the two approaches effective in tackling instructional problems (Anaekwe, 2009, Igbo, 2004, Okebukola, 2007, ..... (2015) found cooperative learning effective in tackling the problem of large class in mathematics ..... (2018) investigated the effects of students' interaction patterns on cognitive achievement, retention and interest in chemistry. The investigation found cooperative learning efficacious. Igbo (2014) found peer-teaching effective in improving the achievement of disabled students in integrated science. Would the peer teaching also be effective in improving the achievement of normal school students in Biology? Hence the need to explore the effect - two child-centred instructional approaches cooperative learning and peer-teaching on students' achievement and interest in some perceived difficult biological concepts so as to probably improve students' performance in Biology and avert the problem of poor achievement and interest in Senior Secondary School Biology.

Interest is an aspect of effective domain and a construct that has to do with ones readiness to like or dislike something. It could be aroused in individual by activity that tends to satisfy the individuals' needs (Geoscience, 2007). There are a lot of difficult concepts and abstraction in Biology as a subject which can easily lead to low or lack of interest among students. Njoku (2003) and Dambata (2009) maintained that low interest leads to poor achievement in biology. Ezeliora ( ) specifically noted that the conventional lecture method

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commonly used in teaching Biology is boring and un-interesting, so performance and interest in biology concept as genetics, evolution, photosynthesis etc.

Since the convectional teaching method persistently used by biology teachers (Amaefule, 2002; Ezeliora, 2003) cannot permeate the difficult biology concepts which manifest in perennial poor students achievement, the researchers therefore deemed it necessary to study the effect of cooperative learning and peer teaching strategies on student achievement and interest in some difficult biology concepts.

# **Statement of the Problem**

The importance of biology to humanity cannot be overemphasized. Real understanding of this subject can improve the health of the society and prolong life expectancy of individuals. A lot of problems are militating against teaching and learning of biology in secondary schools especially in Ishielu local government area of Ebonyi State. Many instructional approaches have been proffered by psychologists like Brunner, Piaget, Gagne, for improved achievement and interest in biology. Adequate students' cooperation and interactions are needed for learning and transfer of learning in biology concepts, which are mainly difficult and abstract. Such cooperation and interaction are found in the cooperative learning and peer-teaching This study therefore investigates the strategies. effect of cooperative learning and peer-teaching strategies on students achievement and interest in biology in Ishielu local government area of Ebonyi State.

# **Purpose of the Study**

The main purpose of this study is to investigate on the Effect of Cooperative Learning and Peerteaching Strategies on Students' achievement and interest in Biology in Ishielu local government area of Ebonyi State. Specifically, the purpose of the study was to determine;

- 1. Achievement level of students in some difficult biology concepts in senior secondary schools when taught using cooperative learning and peer-teaching.
- 2. Interest level of students in some difficult biology concepts in senior secondary schools when taught using cooperating learning and peer-teaching strategies.

# **Research Questions**

The following research questions guided the study;

- 1. What are the mean achievement scores of students' taught some difficult biology concepts like genetics using cooperative learning?
- 2. What are the mean achievement scores of students' taught some difficult biology concepts like evolution using peer-teaching?
- 3. What are the mean achievement scores of students' taught some difficult biology concepts using conventional method?

# Hypothesis

The study was guided by the following null hypothesis tested at 0.05 level of significance:

- 1. There is no significant difference in the mean achievement scores of students taught some difficult biology concepts using cooperative learning and peer teaching.
- 2. There is no significant difference in the mean interest scores of student taught some difficult biology concepts using cooperative learning and peer teaching.

# Methodology

Quasi-experimental design, specifically nonequivalent control group design was adopted in this study to determine effectiveness of cooperative learning and peer teaching strategies on students achievement and interest in biology in Ishielu local government area of Ebonyi State.

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The population of the study is one, two hundred and three (1,203) SS II students of Biology in the thirty (30) public secondary schools in Ishielu local government area of Ebonyi State. This population is for 2020/2021 academic session (Ebonyi State School Board, 2021). Two intact classes were selected from each of the two (2) randomly drawn schools in the Local Government Area. Coeducational schools were used to ensure that subjects-male and female students were equally involved in the experiment since gender was an important variable of the study. Schools for the study were drawn using purposive simple random sampling technique.

Biology Achievement Test (BAT) and Biology Interest Inventory (BII) were validated by the three experts: two from Science Education and one from Measurement and Evaluation. Reliability index of 0.98 was calculated for Biology Achievement Test (BAT) using Kudder – Richardson formula 20 (K-R, 2D) while reliability index of 0.93 was calculated for Biology Interest Inventory (BII) using Cronbach Alpha Reliability Coefficient.

Research questions were analyzed using mean scores and standard deviation while the null hypotheses were tested with analysis of covariance (ANCOVA), at 0.05 alpha level of significance.

# **Experimental Procedure**

Pretests were administered on the three groups using the Biology Achievement Test (BAT) and groups using the Biology Interest Inventory (BII) on the first day of the experiment. Actual experiment was conducted by the regular Biology teacher in each of the sample schools using the lesson plans developed by the researchers for each group. The teacher explained to the students the features and practice of peer-teaching and cooperative learning. The students learnt in their groups. In the control group, the teacher only use the conventional (lecture) method of teahcing. The experiment lasted for five weeks a day after the treatment, post-tests were administered on the subjects using the same Biology Achievement Test (BAT) and Biology Interest Inventory (BII) as in pretest.

### Results

**Research Question 1**: What are the mean achievement scores of students taught some difficult Biology concepts using cooperative learning, peer-teaching and conventional teaching method?

Table 1: Mean achievement scores and standard deviations of students in pre-tests and post-tests due to treatments;

Treatme	Pre-Test		Post Test		No	of
nt Group					Stud	ent
					S	
	Me	Standa	Me	Standa	Me	
	an	rd	an	rd	an	
		Deviat		Deviat	Gai	
		ion		ion	n	
					Sco	
					re	
Peer-	23.	11.33	55.	14.99	32.	10
teaching	00		62		62	0
Cooperati	30.	10.80	62.	17.05	31.	
ve	44		28		84	90
teaching						
Conventi	22.	4.70	44.	9.33	21.	
onal	98		94		96	93
teaching						

Table one shows that students taught using cooperative learning had the highest mean achievement score of 30.44 in the pretest, with standard deviation of 10.80. Students taught using peer teaching had mean achievement score of 23.00 in the pretest, with standard deviation of 11.33. While those taught using conventional teaching method had the least mean score of 22.98 in the pretest, with standard deviation of 4.70.

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In posttest, students taught using cooperative learning had the highest mean score of 62.28 followed by students taught using peer teaching score of 55.62. Students taught using conventional teaching method had at least mean score of 44.94. The students' mean gain for the peer teaching group was 32.62. For the cooperative learning it was 31.84, while for the lecture method groups were 21.96. Therefore, the peer teaching approach had the highest mean gain.

**Research Question 2**: What are the mean interest scores of students taught some difficult Biology concepts using cooperative learning, peer teaching and conventional teaching method?

**Table 1:**Mean interest scores and standarddeviations of students' scores in pretests and post-<br/>tests due to treatments.

Treatme	Pre-Test		Post Test		No	of
nt Group					Stud	ent
					S	
	Me	Standa	Me	Standa	Me	
	an	rd	an	rd	an	
		Deviat		Deviat	Gai	
		ion		ion	n	
					Sco	
					re	
Peer	37.	9.27	64.	10.73	26.	10
Teaching	80		14		34	0
Cooperati	38.	9.97	71.	1.05	328	
ve	61		44		3	90
Learning						
Conventi	42.	12.86	49.	11.31		
onal	36		84		7.4	93
(Lecture)					8	
Teaching						

Table two shows that students taught using conventional teaching method had the highest mean interest score of 42.36 in the pretest. Students taught using cooperative learning had a mean interest score of 36.61. While those taught using peer teaching had the least mean interest score of 37.80 in the pretest. There was the highest deviation of scores from the mean interest score in the conventional method group followed by the cooperative learning group and the least deviation was in the peer teaching group.

In the post-test, students taught using cooperative learning had the highest mean interest score of 71.44 while students taught using peer-teaching had a mean interest score of 64.14. Students taught using conventional teaching method has the least mean interest score of 49.84. The students' mean scores were 32.83, 26.34 and 7.48 for the cooperative learning group, peer teaching group and lecture method group respectively.

The high mean interest score, for the cooperatives learning and peer teaching is suggestive of the fact that the two strategies were effective in developing students' interest in learning difficult biology concepts. It also means that the cooperative learning is more effective than the peer-teaching in developing students' interest in learning difficult biology concepts. This is because in the post-test, the mean gain interest score for the cooperative learning was higher than that of the peer teaching as seen in table two above.

# Hypothesis 1

There is no significant difference in the mean achievement scores of students taught some difficult biology concepts using cooperative learning, peer teaching and conventional teaching method.

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Tuble 5. That yes of covariance of stadents post demovement inclument and gender.							
Source	Types of square	Df	Mean square	F	Significance		
Corrected model	19155.0519	6	3192.509	17.332	.000		
Receipt	63480.618	1	63480.618	344.634	.000		
Achievement	4170.798	1	4170.798	22.643	.000		
Treatment	9631.422	2	4815.711	26.144	.000		
Gender	201.926	1	201.926	1.094	.296		
Gender	295.346	2	147.673	.802	.450		
Error	50838.475	276	184.197				
Total	902148.000	283					
Corrected Total	69993.527	282					

<b>Table 5</b> . Analysis of covariance of students post achievement treatment and gend
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(R Squared = 274 (Adjusted R Square = 258).

Table three shows that the difference in mean achievement scores between the groups taught using the different teaching strategies in the covariates is significant since the worked F ratio of 26.144 is significant at P<0.000. The difference in the mean achievement scores between the treatment groups is therefore significant at P<0.05. Therefore, it can be concluded that the Null hypothesis I is rejected. The difference in the mean achievement scores of students taught some difficult biology concepts using cooperative learning, peer-teaching and conventional method is significant and not by chance.

# Null Hypothesis 2

There is no significant difference in the mean interest scores of students taught some difficult biology concepts using cooperative learning, peer-teaching and conventional teaching method.

Source	Types of square	Df	Mean square	F	Significance
Corrected model	31689.2499	6	5281.541	58.970	.000
Inter opt	32561.162	1	3256.162	363.552	.000
Interest	8698.364	1	8698.364	97.119	.000
Treatments	26163.967	2	13081.988	146.063	.000
Gender	198.212	1	198.212	2.213	.138
Treatment gender	78.043	2	39.022	.436	.647
Error	24719.649	276	89.564		
Total	1139554.000	283			
Correct Total	56408.898	282			

(R Squared = 274 (Adjusted R Square = 258).

Table four (4) shows that the difference in mean interest scores of students between the groups taught using the different teaching strategies is significant since the F ratio of 146.063 is significant at P<0.000. The difference is the mean interest scores between the treatment groups is therefore significant at

P<0.05. Therefore it can be concluded that the null hypothesis II is rejected. They observe difference in the mean interest scores of students taught some difficult biology concepts using cooperative learning, peer-teaching and conventional method is significant and not merely by chance.

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# Discussion

The result obtained from the investigation of effectiveness of cooperative learning and peerteaching strategies on students' achievement and interest in biology In Ishielu Local Government Area revealed that peer-teaching vielded a significant difference on students' achievement in in some difficult biology concepts than conventional (lecture) teaching method. It also revealed that cooperative learning yielded a significant difference on students' achievement in some difficult biology concepts than the conventional teaching. The implication is that either of the cooperative learning or peer-teaching both of which are child centred strategies could be applied to achieve goals of biology education in some difficult biology concepts. This is in line with Nnaka (2006) who called for a shift from the conventional method of teaching to innovative strategies in teaching science, technology and mathematics for effectiveness.

The two strategies are learner-centred and more active than the conventional teaching method. Students can learn the difficult biology concepts when they are actively involved (Conway, 2001). The result is also in line with the National Policy on Education (FRN, 2014), which stressed that the teaching of biology should be centred on the learner for maximum self-development and self-fulfillment. The practical nature of most difficult biology concepts apart from practical activities also demands active participation of the learned which the conventional teaching method does not usually provide lecture method encourages role learning (Aamaefule, 2014) which is not suitable for learning the abstract difficult biology concepts. Therefore, the abstract nature of the most difficult concepts could be minimized in the process of leaning those concepts by using more pragmatic and effective teaching strategies as the cooperative learning and peer teaching.

On the other hand, table two indicates that cooperative learning yielded a significant difference on students' achievement in some difficult concepts than peer teaching. This also buttresses the effectiveness of learner's activities participation in learning in learning some difficult biology concepts. Whereas the cooperative learning involved the cooperation and full participation of each member of the group in learning the concepts, the peer-teaching involved a brilliant member of the group teaching others. Therefore, there is partial active participation of learners in the peer-teaching strategy. This is suggestive of the fact that cooperative learning should be made use of in teaching difficult concepts more frequently than the peer teaching for better results in realizing biology education goals. In the final analysis, the results on table four confirm the fact that instructional approaches play major role in realizing the educational goals of Biology Education in secondary schools. Each of cooperative learning and peer teaching is effective in enhancing achievement in difficult biology concepts with cooperative learning relatively more efficacious.

Table two shows vividly that peer teaching cooperatively enhanced students interests in learning some difficult biology concept than the conventional teaching method. The table also is indicative of the fact that the cooperative learning was cooperatively more effective in enhancing students' interest in learning some difficult biology concepts than both the peer teaching and the lecture method.

The active nature of cooperative learning and peer teaching impressed the students. They took interest in the discussion, analysis and problem solving in difficult biology concepts. This participation increased their interest in biology despite the difficult nature of the concepts. Taking interest in biology is a positive first step towards better performance in achievements tests. This idea agrees with Njoku (2003) who posited that capturing

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students' interest is a necessary precondition for improved students' achievement in biology.

### Conclusion

Bothe cooperative learning and peer teaching had been proved efficacious in enhancing students' achievement in some difficult biology concepts but the cooperative learning yielded a better result. This means that in an effort to achieve set objectives of biology education in senior secondary schools, the difficult biology concepts should be taught using more of the cooperative learning than peer-teaching. The conventional (lecture) teaching method had been proved to be ineffective in enhancing students' achievement in some difficult biology concepts. Therefore, the set objectives of biology education will be difficult to achieve using the conventional method.

In the area of interest, both cooperative learning and peer teaching had been proved in this study to be efficacious in enhancing and maintaining the students' interest in leaning difficult biology concepts. However, the cooperative learning yielded a better significant result. Therefore to capture and sustain, students' interest in difficult biology concepts, more of cooperative learning should be applied. It is therefore the belief of the researchers that students' achievement and interest in biology will improve in Ishielu Local Government Area of Ebonyi State.

From the finding of this study, it is recommended Teacher Education Institutions that should emphasize and incorporate cooperative learning and peer teaching into the biology teacher education curriculum in tertiary institutions of learning. The essence is to make the two teaching approaches popular to would be teachers who would apply them in teaching difficult biology concepts when they get Curriculum planners should also to the field. recommend the use of cooperative learning and peerteaching in school biology curriculum for teaching the difficult concepts. There should be periodic workshops and seminars for biology teachers to upgrade their knowledge of pedagogical innovations. **References** 

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