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Effects of Cooperative Learning Instruction On Students' Achievement In Biology

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### ABSTRACT

The study investigated the effects of cooperative learning instruction on students' achievement in biology in Aguata education zone of Anambra State. Two research questions guided the study. Quasi-experimental design of pretest post test comparative group design which did not involve control group was used. 360 SSII biology students formed the sample (180 males and 180 females) which was drawn from six secondary schools out of thirty government owned secondary schools in Aguata education zone. Purposive sampling technique was used for the study. Six (6) secondary schools (2 males, 2 females and 2 co-educational) were purposively sampled and were exposed to experimental treatment of cooperative, competitive and individualistic learning instruction. Each variable served, as a control to the other. Data was collected using Biology Achievement test (BAT) which was constructed by the researchers. BAT content validity was ensured by a test blueprint, while face validity was ensured by two biology educators and one expert in measurement and evaluation from the science Education. department, university of Nigeria, Nsukka. The reliability coefficient of BAT was established using Kuder-Richardson 20 (K - R 20). Mean and standard deviation was used to answer the research questions while Analysis of covariance (ANCOVA) as used to test the null hypotheses. Result showed among others that cooperative learning instruction affected students' achievement in biology more positively than competitive and individualistic learning instructions. Also, the mean achievement scores for the male students were consistently higher than that of the female students in the three groups. Recommendations and conclusions were highlighted.

Keywords: Cooperative learning, students, achievement, Biology.

### INTRODUCTION

Biology has a lot to contribute towards the development of the nation when properly taught. The search for a more effective approach to the teaching and learning of biology for better performance of students has persisted over the years. Researchers [1]; [2]; [3] have made several efforts towards designing techniques and methods for more effective teaching of biology; since poor achievement and poor skills acquisition has persistently been reported especially at the senior

secondary certificate examination result, [4],. A number of techniques and methods for diverse situations in the classroom have been suggested. The need to inculcate in the learner creative abilities, improve their self-esteem, eliminate difficulties while learning and make them active participants in the classroom has given rise to tremendous interest of the educators towards developing teaching methods that can capture the above mentioned qualities, some innovative methods have been

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www.idosr.org suggested. They include: cooperative learning, [5] and [6].

Cooperative learning is a teaching instruction in which small groups of students of different ability levels, gender and ethnic groups use a variety of structured learning activities to study a subject. Each member of a group is responsible not only for learning what is taught but also for helping group mates to learn, [7]. There are three types of student interaction patterns or learning instructions available in the classroom. These include:

• Cooperative learning instruction

• Competitive learning instruction and

• Individualistic learning instruction [7].

Cooperative learning instruction is an instructional strategy in which students work together in small groups usually (4-6) members and are rewarded for their performance as a group. [8]. In a cooperative learning situation students' achievement is goal positively correlated; when a student achieves his/her goal, all other students with whom he/she is cooperatively linked achieves their goals [8] [9] defined cooperative learning as instructional strategy in which learners work together in small group in such a manner that each member of the group can participate in a clearly collective task; and engage in discussion with one another, while participating in authentic learning activities relevant to real life, that encourage them to teach one another, [10].

Some distinctive characteristics of the cooperative learning instruction as noted by [10] include:

• Students show a strong sense of inter-dependence and work towards a mutual goals.

• There is regular face-to-face interaction among members which promotes instructional and socialization outcomes.

• Students working in small mixedability groups, usually share ideas and make suggestions for possible solution to a given problem.

• There is appropriate use of interpersonal and small group skills, [10]

[11], further pointed out that cooperative learning strategy promotes group cohesion, peer support, social inter-dependence psychological health, self-esteem and active mutual involvement in learning.

Competitive learning instruction is described as a situation where students' achievement is goal negatively correlated, when one student achieves one goal, all others with whom, one is competitively linked failed to achieve their goals [12]. Thus, a person seeks an outcome that is personally beneficial, but is detrimental to the others whom one is competitively linked. The competitive learning structure therefore which individuals is one in are rewarded. when one achieves а maximum reward. It is described as being "oppositional" because students have a stake in ensuring that their classmates do not learn more than they do, [12]. [8], explained that competitive spirit motivates students to strive to attain the best grade among their peers.

Also, when moderately applied, healthy competition correlates positively with achievements.

Buttressing the need for completive interaction, [13], suggested that in a society that is highly competitive, students must be able to function in "survival of the fittest" world. [13]. explained further that ambition. success, drive, and motivation are all related to situation in which there is competition. A classroom of a large class size is seen as a place where one must struggle to out-perform the rest and emerge singly as the best in the class [14].

Competition, therefore acts as reinforcement. [7], remarked that so far that the level of competition antagonism is not too high, performance appears to be improved, but where the stakes are very high, children opt out or resort to Individual cheating. learning instruction: individualistic learning instruction is а self-instructional technique. This afford one the use of learning materials consisting of some instructions, provision for responses, feedback and test (exercises), to study alone [11]. An individual learning situation was described by [15] as a situation in which student is unrelated to the goal achievement of other students. Thus, a person seeks an outcome that is personally beneficial, ignoring as irrelevant, the goal achievement efforts of other participants in the situations.

According to [15], some advantages derived from individualized instruction include:

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• Learners proceed at their own pace.

It encourages personal study.

• Students participate actively in the learning process.

• Feedbacks are provided promptly.

• It tends to reduce students anxiety.

These innovative teaching and learning strategies may be more efficacious in engendering students' learning outcome in biology than conventional teaching method. Conventional teaching method is described as teacher-centred and didactic, where learners simply listening and copying of notes take place [16]. The situation of poor achievement in biology provide a case for investigation by looking at the relative effects of cooperative learning instruction on achievements of male and female students in biology. The reason is that there is a common belief that science carries masculine image, [17]. This means that people attribute scientific activity more male on than female students [18]. The claimed poor achievement in biology need further investigations to ascertain how females will perform along side with male counterparts with the use of cooperative learning instruction in the context of teaching and learning of biology.

Some research studies by a number of educational psychologist [18][19], showed a contradictory conclusions in terms of specific roles of these three learning instructional strategies namely. Cooperative, learning instruction, competitive and individualistic learning instructions [20].[19] reported that

individual reward structure promotes higher achievement than group reward structure. [20], stated that the inter group competition promotes higher achievement; while [7], maintained that inter-group competition is not a necessary condition for high achievement. Okoye and Onwuachu From the foregoing the major question now is, how can cooperative learning instruction served as an improved and effective instructional strategy that can enhance students' improved achievement in biology.

## **RESEARCH QUESTIONS**

2.

The following research questions were asked to guide the study

- 1. What is the effect of cooperative, competitive and individualistic learning instructions on the mean achievement scores of students in biology?
- What is the mean achievement scores in biology of male and female students exposed to cooperative, competitive and individualistic learning instructions.

#### Hypotheses

Two null hypotheses guided the study.

HO<sub>1</sub>: There is no significant difference on the mean achievement scores in biology of students subjected to cooperative, competitive and individualistic learning instructions.  HO<sub>2</sub>: There is no significant difference in the mean achievement scores of male and female students in biology due to differential effect of cooperative, competitive and individualistic learning instructions.

# **Research Method**

The research design, adopted was quasi experimental design of pretest post-test non-equivalent comparative group design [21]. All the groups are given the experimental treatment there is no control group. Each variable served as control to the other. This design was adopted because subjects were not randomly assigned to groups insteadintact classes were randomly assigned to the experimental groups. According to [22] the diagrammatic sketch of the design is:

Group 1:	$0_{1} X_{1} 0_{2}$
Group 2:	$0_{1} X_{2} 0_{2}$
Group 3:	$\mathbf{O}_{1} \mathbf{X}_{3} \mathbf{O}_{2}$

Where:	$0_1 = $ stands for pre-test						
	$0_2 = $ stands for post-test						
	<b>X</b> <sub>1</sub>	=	stands	for			
cooperative treatment							
	<b>X</b> <sub>2</sub>	=	stands	for			
competitive treatment							
	X <sub>3</sub>	=	stands	for			
individualistic treatment							

The area of the study was Aguata Education Zone of Anambra State. The population of the study consisted of all the senior secondary (SSII) biology students numbering, 4,023 biology students in thirty (30) government – owned secondary schools of Aguata education zone. The sample of the study

consisted of 360 SSII biology students (180 males and 180 females) which was drawn from six schools out of thirty government owned secondary schools in Education zone. Aguata Purposive sampling technique was used for the (6) secondary study. Six schools (2males, 2 females and 2 coeducational) were purposively sampled. Biology Achievement Test (BAT) was used as instrument for data collection. BAT was developed by the researchers, it consisted of 20 multiple choice objective questions which was selected from the topics of the study in SSII biology curriculum. BAT was face validated by two lecturers of Science Education and one lecturer in Measurement and Evaluation from University of Nigeria, Nsukka. For face

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validation, the lecturers were asked to assess the instrument in terms of purpose of the study, clarity of expression, suitability of the items and accuracy of answers. The suggestions of the validators were used for amendments where necessary. For the content validation table of specification were used in generating the items. The reliability of BAT was determined using Kuder-Richardson 20 (K - R 20) method which gave the coefficient of internal consistency to be 0.81 which was high enough for the study. Data were analyzed using mean and standard deviation to answer the research questions while Analysis of covariance (ANCOVA) was used to test the null hypothesis at 0.05 level of significance.

# Experimental Procedure

six biology regular teachers one from each school were used for the study. Pretests were administered on the students in the six schools to determine initial group equivalence. The study involved the use of intact classes to ensure that regular class period was not attended. Three instructional approaches were employed, namely: cooperative. competitive and individualistic learning instructions. These three approaches were identical in terms of content coverage, time and mode of evaluation. The only difference was the instructional activities.

In a cooperative class, the teacher gave the students task to perform (after dividing them into four or five groups). The students were allowed to communicate their ideas and findings as members of the group. At the end, the groups were rewarded based on the group performance. In a competitive class, instructional activity was the same except that students do not share ideas or skills or communicate during the course of instruction, rather students struggle to outperform the entire members of the class and emerge singly as the best in the class.

In an individualistic class, students are not divided into groups as in cooperative and competitive classes. Students are made to work alone as a member of the class without cooperating or competition with one another. Students rewarded are according to individual performance and not as a group.

These three learning instructions which were used as experimental treatment on students lasted for four weeks. The

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cooperative,	competi	itive	and
individualistic	learning	instruc	tions
were compared	in terms o	of their ef	fects
on achievement	of studen	its in bio	logy.
Each variable s	erved as o	control to	the

Okoye and Onwuachu other. The teacher administer the posttest which were reshuffled and printed on a coloured paper to give it a different look.

# Results

The findings of the study were presented sequentially, according to the research questions and hypotheses.

**Research question 1:** What is the effect of cooperative competitive and

individualistic learning instructions on the mean achievement scores of students in biology?

Table 1:	Mean	Gain	Scores	of	Students	on	three	groups	of	learning	instructi	onal
straggles												

Experimental group	Ν	Pre-test X	SD	Post-test	SD	Gain
				Х		score
Cooperative groups	120	10.750	2.925	16.050	3.089	5.300
Competitive group	120	10.050	2.53	12.191	2.26	2.141
Individualistic group	120	9.975	2.68	11.750	2.47	1.775

The result in table 1 shows that the mean gain scores of cooperative group which was 5.300 was higher than those of competitive group which was 2.141 and that of individualistic group which was 1.775. This implies that cooperative

learning instruction enhances learning more than competitive instruction while individualistic instruction was the least in enhancing learning with the mean achievement gain score of 1.77.

#### **Research question 2:**

What is the mean achievement scores in biology of male and female students

exposed to cooperative, competitive and individualistic learning instructions.

Experimental	N	Gender	Pre-test	Post-test	SD
groups			Х	Х	
Cooperative	60	Male	12.2131	17.3833	5.17
	60	Female	10.6417	14.7167	4.08
Competitive	60	Male	$1\ 0.7648$	13.2667	2.50
	60	Female	8.0461	11.1167	3.07
Individualistic	60	Male	9.4229	12.8500	3.43
	60	Female	6.332	10.6500	4.52

Table 2: Mean Achievement Scores of male and female students in Biology exposed to cooperative, competitive and individualistic learning instructions.

The result in table 2 shows that in each of the three learning instructions that

male students performed higher than their female counterparts. For instance

in cooperative group male students scored 12.6417, while in competitive group male students scored 10.7648 and female students scored 8.0461 while in individualistic group male students scored 9.4229 and female students scored 6.1332. Besides, both male and female students in cooperative group scored higher than those in competitive and individualistic groups. This implies that cooperative instruction enhances learning more than the competitive and individualistic instruction.

### Hypotheses

**H0**<sub>1</sub>: There is no significant difference on the mean achievement scores in biology of students subjected to cooperative, competitive and individualistic learning instructions.

 $HO_2$ : There is no significant difference in the mean achievement scores of male and female students in biology due to differential effect of cooperative, competitive and individualistic learning instructions.

The scores of the three groups of students in instructional learning strategies were subjected to Analysis of covariance and the summary of the result is presented in tables 3.

Table 3: Analysis of covariance (ANCOVA) results of students' Overall Achievement Scores due to differential effect of three learning instructions and Gender (used to answer  $H0_1$  and  $H0_3$ )

Source of variation	Sums of	df	Mean square	F-value	Sign	
	square					
Corrected models	2543.229	6	424.870	117.550	.000	
Intercept	1014.592	1	1014.592	281.467	.000	
Pretest	703.141	1	703.141	195.065	.000	
Experimental	1053.149	2	526.575	146.065	.000	
Gender	55.867	1	55.867	15.498		
Expt. Gender	9.699	2	4.850	1.345		
Error	127789.000	353	3.60			
Total	67789.00	360				
Corrected total	3815.664	359				

## Significant at P < 0.05

The result in table 3 reveals that there is a significant difference in the mean achievement scores of students subjected to the three learning instructional strategies namely: cooperative, competitive and individualistic. The result also confirmed that there is a significant difference in the mean achievement scores of male and female students due to differential effect of three learning

instructional strategies. This is indicated by the calculated F - value at 15.498 which is significant at 0.05 level of significance. Therefore, gender is a significant factor in students' achievement in biology due to the three learning instructional strategies. The null hypothesis of no significant difference in the mean achievement scores of male and female students in biology was rejected.

# DISCUSSION OF FINDINGS

The result in table 1 and 2 showed that students in cooperative group achieved higher gain-scores than students in competitive and individualistic groups. Students in competitive group had slightly higher gain achievement score that those in individualistic group. Although it was shown that the three learning instructional strategies enhanced achievement in biology, the result tends to favour co-operative group more than the other groups. This agrees with the findings of [22] which stated that co-operative learning is considerably more effective than competitive group. The higher achievement gain score in cooperative was because it involved students' active participation in the class. The students always are active in sharing ideas and skills with one another. This made it possible for them to relate the new knowledge to what they already know thereby reducing students' dependent on role memorization. Thus, students become more motivated and interested in the task and this led to high

Therefore, achievement. making cooperative learning instruction to have more positive effective in enhancing and facilitating students' achievement in biology than competitive and individualistic learning instructions. The result also indicated that gender is significant factor students' а in achievement in biology due to subjection to three learning instructional strategies. This revealed that the achievement scores of the male students in the three groups were consistently higher than those of their female counterparts. This finding agrees to a large extent with the studies of [23] and [21] on achievement of male and female students in biology due to effect of learning instructional strategies. Similar results were obtained by other researchers [5] and [2] which reported that males always perform better than females in biology.

# CONCLUSIONS

The findings of this study led to the conclusion that cooperative learning instruction affected students' achievement in biology more positively than competitive and individualistic

learning instructions. In addition that the mean achievement scores for the males were consistently higher than that of the females in the three groups.

## RECOMMENDATIONS

Based on the findings of this study, the following recommendations were made:

 Biology teachers should incorporate cooperative learning instruction which is more learner-centred in teaching biology than other groups of learning instructional strategies. This is because it has more positive effect in enhancing and facilitating students' achievement in biology than competitive and individualistic learning instructions.

 Relevant authorities (Ministry of Education, Science Teachers' Association of Nigeria, and other

professional bodies) should organize seminars, workshops conferences and in-service training to train teachers on the Okoye and Onwuachu use of cooperative learning instructional strategy in teaching biology.

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