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## **Comparative Effects of Individualized and Cooperative video-Based Instructional Strategies on Secondary School Students' Achievement in Biology in Makurdi Metropolis, Benue State, Nigeria**

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**Abstract:** This study was designed to determine the comparative effects of individualized and cooperative video – based instructional strategies on secondary school students' achievement in Biology in Makurdi Metropolis, Benue State, Nigeria. Three research questions were asked and three hypotheses were formulated and tested. The study adopted a quasi – experimental design of non – randomized pretest posttest control group type. The population of the study is one thousand and seven (1,907) while the sample of eighty four (84) SS1 students was drawn from two secondary schools using multistage sampling technique. In each of the schools intact classes were randomly assigned to individualized video – based instructional strategy and cooperative video – based instructional strategy. The research instrument, Biology Achievement Test (BAT) was developed, validated by five experts, trial-tested and used for the study. The reliability of BAT was calculated using Kuder-Richardson formula 21 ( $K-R_{21}$ ) and was found to be 0.68. Mean and standard deviation were used to answer the research questions, while Analysis of covariance (ANCOVA) was used to test the hypotheses at 0.05 level of significance. Findings reveal that individualized and cooperative video – based instructional strategies are effective in improving students' achievement in ecology. However, cooperative video – based instructional strategy is more effective than individualized video – based instructional strategy. There is also statistically significant difference between the mean scores of male and female students when taught ecological concepts using individualized and cooperative video – based instructional strategies in favour of cooperative video-based instructional strategy. It was therefore recommended that Biology teachers in secondary schools should adopt cooperative video –based instructional strategy for teaching Biology.

**Keywords:** Cooperative, Individualized, Video Based, Instructional Strategies, Achievement.

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### **Introduction**

Biology is the life science that deals with the study of life. It refers to a combined set of life science dealing with expansion, development, reaction, responses, reproduction, and the interrelationship of living and non-living things in our environment (Umar, 2011). The teaching and knowledge of Biology equip students with the necessary skills that are useful in solving their day-to-day problem of life (Ityokyaa&Adejoh, 2014). The knowledge of Biology has contributed so much, by making life comfortable for people, promote health and control many diseases, increase in food production with the aid of genetic engineering (Eunice, Khatet&Ondigi2014., Ityokyaa&Adejoh, 2014). Biology is central to science and technology and it is indispensable in the fields of medicine, agriculture, brewery, petro-chemical, pharmacy, biochemistry, microbiology, and psychology among others (Umoke&Nwafor, 2014). It is obvious that no student intending to study these disciplines can do without Biology.

In spite of the importance of the knowledge of Biology for the socio-economic development of a country, achievement in Biology at West African Examination Council (WAEC) which is offered by senior secondary school student has been poor over the years. The implication of this failure in education is that Nigeria is having a serious shortage of manpower in science and technology-related fields. This may affect Nigeria's vision to become one of the 20 industrialized nations in the world by the year 2020 (Gambari, Yaki, Gana, &Ughovwa 2014).

This poor achievement could be attributed to a number of factors such as lack of school facilities, lack of qualified Biology teachers, Biology students' negative attitude to Biology, Biology language difficulties, Biology teachers' interpersonal behaviors in Biology classes, lack of Biology students' motivation and interest, congested Biology classroom, overloaded Biology syllabus and poor instructional strategies used in teaching Biology (Kareem, 2003; Onwirhiren, 2005; Ahmed, 2008).

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Following the observed teaching and learning of Biology in Nigeria education that is mostly characterized by the chalk and talk method of instruction which is ineffective in giving students the opportunity to learn the useful skills and the poor academic achievement in Biology, one wonders if the high failure rate is not an indication of the instructional strategies used in the schools? If Biology teaching and learning is not adequately assessed, and reformed then it becomes doubtful if Nigeria will meet up with its challenges of globalization (Ndirika&kanu, 2012). For instance, in the submission of Usman (2009); Duze (2011) and Yahaya (2012), the standard of education in Nigeria is declining.

The declining rate of education, especially Biology education might hinder the achievement of its objectives. The cardinal objectives of the Biology syllabus are to prepare pupils to acquire: adequate laboratory and field skills, to ensure meaningful and relevant knowledge, to inculcate the ability to apply scientific knowledge to everyday life in matters of personal and health and agriculture, and to inculcate reasonable and functional scientific attitudes. These objectives can be achieved or hindered by the types of instructional strategies employed. Therefore, in order to achieve these objectives in the Senior Secondary School level, very effective, motivating and interactive instructional strategies need to be employed.

In this 21st century where children live in a technological world, motivating and captivating strategies should be encouraged. This will enable students to learn, understand Biology concepts and promote their involvements in the teaching and learning process. Some of these promising instructional strategies are technological ways of teaching using video-based instruction, cooperative learning, and individualized instructional strategy among others.

Technological ways of teaching come in many forms and is expanding rapidly in our nation and there is a push for schools to keep up with this technology. The use of technology in secondary school is becoming significant because it equips students with skills and prepares them for life in the real world (Perry, 2013). The benefit of using technology as stated by (Perry 2013; Okoyefi&Nzewi 2012) is as follows; Learning of Biology can be enhanced with images, video and sound; different types of learners can be reached through the use of technology; it promotes students commitment to learning; it enhances motivation and interest and it makes Biology lessons more exciting.

Technological ways of teaching Biology include video – based instruction (VBI), Computer- Assisted Instruction (CAI), multimedia instructional strategy (MIS) among others. The use of videos to instruct Biology in the classroom is a step in the right direction toward implementing and taking advantage of the available technology (Perry, 2013). The use of video can stimulate

interest, motivate learners to learn, it brings the real world experiences to the classrooms, and it conveys a sense of immediacy and feeling of participation (Chinna& Dada,2013).

The use of video-based instruction is relevant for both homogenous and heterogeneous set of learners. This means that video gives students the opportunity to develop, interact and share their ideas with friends, which can be done through cooperative learning where a small group of students works together to achieve set goals and it can also give the opportunity to students to learn at their own pace and thereby individualizing instruction.

Therefore, individualized instructional strategy refers to those classroom practices of teaching which recognize the uniqueness of each student's learning. Olatoye, Aderogba, &Aanu (2011) describe individualized instructional strategy as a method of instruction in which content; instructional materials, and speed of learning are based upon the capabilities and interests of each learner.

Nonetheless, cooperative learning contrasts individualized learning because student works together and are organized in small groups. Cooperative learning is an instructional strategy where students are organized in to small groups of three to five members so that they can work collectively to maximize their own and each other's learning. The small group is made up of heterogeneous groups of students working collectively to accomplish a common goal; this implies that, the group is made up of both male and female students.

Review of studies shows inconsistency on results of male and female students on achievement in Biology. Research reports are not explicit on the effect of gender on achievement. Gender is a concept used to distinguish femininity and masculinity from biological sex. It is said to be one of the factors affecting students' socio-cultural and academic achievement. Zember&Blume (2011) report that most studies indicated that female achieves better than male students in schools. Mobark (2014) found no significant difference in academic performance of male and female students. Pandian (2004) reported that gender (male and female) in cooperative video – based instructional strategy improved higher than their counterpart. Orora, Keraro, &Wachanga (2014), Nnorom (2015) whose results showed that the gender in experimental group improved in their achievement. Studies conducted on gender showed that there are inconsistencies on the conclusions reached by the previous researchers. This study, therefore, inquires that if these strategies, individualized and cooperative video-based were used, which of the gender would improve upon their achievement in Biology?

### **Objectives of the Study**

The purpose of the study was to determine the comparative effects of using individualized and cooperative video based

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instructional strategies on secondary school students' achievement in Biology. The specific objectives were to;

1. determine the effect of individualized and cooperative video-based instructional strategies on achievement scores of students in Biology.
2. determine the effect of individualized and cooperative video-based instructional strategies on male students achievement scores in Biology.
3. determine the effect of individualized and cooperative video-based instructional strategies on female students achievement scores in Biology.

## Research Questions

The following research questions were raised to guide the study:

1. What are the mean achievement scores of students taught Biology using individualized and cooperative video-based instructional strategies?
2. What are the mean achievement scores of male students taught Biology using individualized and cooperative video-based instructional strategies?
3. What are the mean achievement scores of female students taught Biology using individualized and cooperative video-based instructional strategies?

## Hypotheses

The following hypotheses were formulated for the study and tested at 0.05 level of significance:

**H<sub>01</sub>:** There is no significant difference in the mean achievement scores of students taught Biology using individualized video-based and cooperative video-based instructions.

**H<sub>02</sub>:** There is no significance different in the mean achievement scores of male students taught Biology using individualized and cooperative video-based instructional strategies.

**H<sub>03</sub>:** There is no significant difference in the mean achievement scores of female students taught Biology using individualized and cooperative video-based instructional strategies.

## Methodology

The study adopted a quasi-experimental of non-randomized pretest posttest control group, non-equivalent group design. The study was carried out in Makurdi Local Government Area of Benue State.

The population of the study is 1,907 Senior Secondary School I (SS I) students in Makurdi metropolis. The sample of this study consist of 84 SS I students, 44 male

and 40 female students. A multi-stage sampling technique was employed to select the sample for this study. Purposive sampling was used to select two schools from the twenty-five schools. The schools were chosen based on the following criteria; such as, they have at least one graduate teacher in Biology, they have computer that are made available for students' use, the students and teachers are computer literate.

From the purposive sampling that was carried out, only four schools met the criteria. From the four schools that met the criteria; two schools were randomly selected for the study. Also, using simple random sampling, intact classes in each of the two schools were randomly assigned to individualized video-based instructional strategy and cooperative video-based instructional strategies

A researcher-constructed Biology Achievement Test (BAT) was used for data collection. The videos used are in the form of educational video Package from YouTube and were shown to students in addition to individualized and cooperative instructions. The package contained eight lessons based on topics in ecology.

The instrument was validated by two Biology educators and three experts in Measurement and Evaluation, Guidance and counseling from University of Agriculture Makurdi, Benue State for face and content validity. A trial test was carried out and analyzed using Kuder-Richardson 21 formula ( $K-R_{21}$ ). The reliability coefficient of the BAT was 0.68.

In order to effectively test the hypotheses for this study, BAT was administered in each of the two schools used for the study. The researcher and the research assistants administered the pretest (BAT) to all SS I Biology students in the two schools before the treatments, thereafter, the two research assistants taught the ecology concepts. The teaching period lasted for four weeks after which a post-BAT was administered. The mean and standard deviation of the students' scores in the test was used to answer the research questions, to determine the level of observed differences while the hypotheses were tested at 0.05 level of significance using analysis of covariance (ANCOVA).

## Results

**Research question 1:** What are the mean achievement scores of students taught Biology using individualized video-based instruction (IVB) and cooperative video-based Instruction (CVB)? The answer to this question are presented in Table 1

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**Table 1. Mean Achievement Score and Standard Deviation of Students Taught Using IVB and CVB Instructional Strategies**

| Group                   | N  | Pre-BAT   |      | Post-BAT  |      | Mean gain |
|-------------------------|----|-----------|------|-----------|------|-----------|
|                         |    | $\bar{X}$ | S.D  | $\bar{X}$ | S.D  |           |
| Individualized          |    |           |      |           |      |           |
| Video-Based Instruction | 47 | 17.06     | 4.04 | 21.15     | 4.27 | 4.09      |
| Cooperative             |    |           |      |           |      |           |
| Video-Based Instruction | 37 | 19.83     | 3.40 | 27.05     | 5.60 | 7.22      |
| Mean diff.              |    | 2.77      |      | 5.90      |      | 3.13      |
| Total                   | 84 |           |      |           |      |           |

In Table 1, the mean post BAT of individualized video – based group is 21.15 with a standard deviation of 4.27, while the mean post BAT for cooperative video – based group is 27.05 with a standard deviation of 5.60.

**Hypothesis 1:** There is no significant difference in the mean achievement scores of students taught Biology using individualized video-based instruction and cooperative video-based instruction. The result to this hypothesis is presented in Table 2

**Table 2: Result of ANCOVA on Achievement Scores for Students Taught Ecology Using IVB and CVB Instructional Strategies.**

| Source          | Type III Sum of Squares | df | Mean Square | F      | Sig. | Partial Squared | Eta |
|-----------------|-------------------------|----|-------------|--------|------|-----------------|-----|
| Corrected Model | 721.972 <sup>a</sup>    | 2  | 360.986     | 14.874 | .000 | .269            |     |
| Intercept       | 1936.369                | 1  | 1936.369    | 79.788 | .000 | .496            |     |
| Pretest         | .071                    | 1  | .071        | .003   | .957 | .000            |     |
| Groups          | 639.916                 | 1  | 639.916     | 26.368 | .000 | .246            |     |
| Error           | 1965.778                | 81 | 24.269      |        |      |                 |     |
| Total           | 50069.000               | 84 |             |        |      |                 |     |
| Corrected Total | 2687.750                | 83 |             |        |      |                 |     |

a. R Squared = .269 (Adjusted R Squared = .251)

In Table 2, the significance value for achievement score across the two instructional strategies is 0.00 which is less than the alpha value of 0.05 level of significance. Therefore, the null hypothesis is rejected.

**Research Question 2:** What are the mean achievement scores of male students taught Biology using individualized and cooperative video-based instructional strategies? The answer to this question is presented in Table 3

**Table 3: Mean Achievement Scores and Standard Deviation of Male Students Taught With IVB and CVB Instructional Strategies.**

| Gender                 | N  | Pre-BAT   |      | Post-BAT  |      | Mean gain |
|------------------------|----|-----------|------|-----------|------|-----------|
|                        |    | $\bar{X}$ | S.D  | $\bar{X}$ | S.D  |           |
| IVB Strategy with Male | 27 | 17.19     | 3.40 | 21.52     | 3.98 | 4.33      |
| CVB Strategy with Male | 17 | 20.59     | 4.03 | 28.47     | 6.32 | 8.08      |
| Mean diff.             |    | 3.40      |      | 6.95      |      | 3.75      |
| Total                  | 44 |           |      |           |      |           |

In Table 3, the means post BAT for individualized video – based male students is 21.52 with a standard deviation of 3.98 while the mean post BAT scores for cooperative video – based male students is 28.47, with a standard deviation of 6.32. The mean difference between both groups is 6.95 and the mean gain is 3.75 in favour of CVB.

**Hypothesis 2:** There is no significance different in the mean achievement scores of male students taught Biology using individualized and cooperative video-based instructional strategies. The result of this hypothesis is presented in Table 4

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**Table 4: Result of ANCOVA of Achievement Scores for Male Students Taught Ecology Using IVB and CVB Instructional Strategies**

| Source          | Type III Sum of Squares | df | Mean Square | F      | Sig. | Partial Squared | Eta |
|-----------------|-------------------------|----|-------------|--------|------|-----------------|-----|
| Corrected Model | 553.197 <sup>a</sup>    | 2  | 276.598     | 11.318 | .000 | .356            |     |
| Intercept       | 570.085                 | 1  | 570.085     | 23.328 | .000 | .363            |     |
| Pretest         | 49.014                  | 1  | 49.014      | 2.006  | .164 | .047            |     |
| Gender          | 303.334                 | 1  | 303.334     | 12.412 | .001 | .232            |     |
| Error           | 1001.962                | 41 | 24.438      |        |      |                 |     |
| Total           | 27333.000               | 44 |             |        |      |                 |     |
| Corrected Total | 1555.159                | 43 |             |        |      |                 |     |

a. R Squared = .356 (Adjusted R Squared = .324)

In Table 4, the sig value for both individualized and cooperative video-based instructional strategies male students is 0.001. Since this value is less than the alpha value of 0.05 level of significance, the null hypothesis is not accepted.

Research Question 3: What are the mean achievement scores of female students taught Biology using both individualized and cooperative video-based instructional strategies? The answer to the this research question is presented in Table 5

**Table 5: Mean Achievement Scores and Standard Deviation of Female Students Taught Using IVB and CVB Instructional Strategies**

| Gender                            | N         |       | Pre-BAT   |       | Post-BAT |      | Mean gain |
|-----------------------------------|-----------|-------|-----------|-------|----------|------|-----------|
|                                   | $\bar{X}$ | S.D   | $\bar{X}$ | S.D   |          |      |           |
| IVB Strategy with Female Students | 20        | 16.90 | 4.80      | 20.65 | 4.68     | 3.75 |           |
| CVB Strategy with Female Students | 20        | 19.20 | 2.71      | 25.80 | 4.80     | 6.60 |           |
| Mean diff.                        |           | 3.30  |           | 5.15  |          | 2.85 |           |
| Total                             | 40        |       |           |       |          |      |           |

In Table 5, the mean post BAT scores for individualized video – based female students is 20.65 with a standard deviation of 4.68, while the means post BAT of cooperative video – based female students is 25.80 with a standard deviation of 4.80. The mean difference score of both groups is 5.16 and the mean gain for both group is 2.85.

Hypothesis 3: There is no significant difference in the mean achievement scores of female students taught Biology using both individualized and cooperative video-based instructional strategies. The result of this hypothesis is presented in Table 6

**Table 6: Result of ANCOVA of Achievement Scores for Female Students Taught Ecology Using IVB and CVB Instructional Strategies**

| Source          | Type III Sum of Squares | df | Mean Square | F      | Sig. | Partial Squared | Eta |
|-----------------|-------------------------|----|-------------|--------|------|-----------------|-----|
| Corrected Model | 267.438 <sup>a</sup>    | 2  | 133.719     | 5.810  | .006 | .239            |     |
| Intercept       | 846.219                 | 1  | 846.219     | 36.769 | .000 | .498            |     |
| Pretest         | 2.213                   | 1  | 2.213       | .096   | .758 | .003            |     |
| Gender          | 230.227                 | 1  | 230.227     | 10.004 | .003 | .213            |     |
| Error           | 851.537                 | 37 | 23.015      |        |      |                 |     |
| Total           | 22695.000               | 40 |             |        |      |                 |     |
| Corrected Total | 1118.975                | 39 |             |        |      |                 |     |

a. R Squared = .239 (Adjusted R Squared = .198)

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Table 6 revealed that the sig value for both individualized and cooperative video-based instructional strategies female students is 0.003 which is less than the alpha value of 0.05 level of significance; the null hypothesis is therefore not accepted.

### Discussion

The data presented in Table 1 provided answer to research question one. The finding revealed that individualized and cooperative video – based instructional strategies are effective for improving students' achievement, but cooperative video – based instructional strategy was more effective. The reason for the effectiveness of both individualized and cooperative video – based instructional strategies may be due to the video that the students are exposed to which is one of the technological ways of instruction. Videos can motivate and enhance engagement of students thereby improving meaningful learning and achievement in Biology. This is in line with the finding of Perry, (2013) which reported that learning of Biology can be enhanced with video.

Analysis of covariance was used to test hypothesis one, Table 2, F – calculated value for treatment was 26.368, a significance of 0 .000 at 0.05 level of confidence was obtained. This confirmed that there is a significant difference between the mean scores of students taught using individualized video – based instruction and those taught using cooperative video – based instruction. The finding is in agreement with the report of Gambariet *al.*, (2013) which states that cooperative video – based instruction enhanced students' achievement compared to individualized video – based instruction in mathematics

The answer to research question two was provided by Table 3. The finding revealed that the mean achievement score of male students taught using cooperative video – based was higher compared with the male students taught using individualized video – based instruction. At the same time, analysis of covariance was employed for testing hypothesis two in table four. The F – calculated value for gender was 12.412 with a significance of 0.001 at a level of significance of 0.05 confirming that there is significance different in the mean achievement scores of male students when taught Biology using individualized and cooperative video – based. Similarly, the answer to research question three was provided by table five. The finding also revealed that the mean achievement score of female students taught with cooperative video – based was higher compare to female student taught with individualized video – based. At the same time, analysis of covariance was employed for testing hypothesis three in Table six. The F – calculated value for groups was 10.004 with significance of 0.003 at a level of confidence of 0.05, confirming that there is significant difference in the mean achievement scores of

female students taught Biology using individualized and cooperative video – based.

These finding implies that both gender (male and female) in cooperative video – based instructional strategy achieved higher than the gender in individualized video – based instructional strategy. This finding is similar to the finding of several other studies that have investigated the effect of gender on achievement of male and female students in science (Biology inclusive) and other fields. For instance, Pandian (2004) reported that gender (male and female) in cooperative video – based instructional strategy improved higher than their counterpart. This finding is similar to that of Sani (2015), Ororaet *al.* (2014), Nnorom (2015) whose results showed that the gender in experimental group improved in their achievement. Hence, these findings confirmed that when male and female students are exposed to innovative instructional strategies like cooperative video – based instructional strategy, under the same environmental conditions and taught by the same teacher, their academic achievement will not differ significantly.

### Conclusion

The following conclusions were arrived at based on the findings of the study:

1. The findings of this study provided another empirical evidence that cooperative video – based instructional strategy enhances students' achievement. The study found out that cooperative video – based instructional strategy is more effective in improving students' achievement in ecology concept than individualized video – based instructional strategy.
2. The study also revealed that male and female taught ecology using cooperative video – based instructional strategy achieved higher than the male and female taught ecology using individualized video – based instructional strategy. Therefore, the effectiveness of cooperative video – based instructional strategy on students' achievement in ecology does not depend on gender. Students recorded higher achievement in ecology concepts when cooperative video – based instructional strategy was used for instruction irrespective of gender. This result therefore shows that cooperative video – based instructional strategy is a gender friendly instructional strategy for teaching Biology.

### Recommendations

The following recommendations were made based on the findings of the study

1. Biology teachers should adopt cooperative video – based instructional strategy for teaching Biology in order to encourage social interaction, active engagement and self-motivation among learners.

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2. Curriculum planners should consider incorporating cooperative video – based instructional strategy into Biology curriculum for teaching Biology when next they are reviewing the curriculum.

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