CHAPTER FOUR
DATA PRESENTATION, ANALYSIS AND INTERPRETATION

4.1 Preamble

This Part consists of the presentation, analysis and the interpretation of data gathered through structured questionnaire. In addition to this, background information of respondents is presented. Finally, the statistical methods of analysis were discussed, which included a descriptive analysis, and Analysis of Covariance (Ancova) through SPSS version 26.

4.2 Analysis of Demographic Data

Fifty (50) questionnaires were administered physically to respondents and all the questionnaires were collected with a response rate of 100% i.e. all questionnaires were retrieved. Hence, responses were valid with complete answers. The demographic characteristics include: gender, school, and class of respondents. The demographic part of the analysis dealt with the personal data of the respondents based on the questionnaires given to them. The table below shows the details of background information of the respondents.

Table 4.1: Demographic Data of Respondents

Measurement Items	Options	Frequency	Percent
Gender	Female	30	60
	Male	20	40
	Total	**50**	**50**
School	Lasu Int'l School	50	50
	St. Betty Carol School	50	50
	Total	**100**	**100**

Source: Survey Result (2023)

In the above table, which represents demographic data analysis (referred to as "table 4.1"), we can observe that in the gender distribution table, it is evident that out of the total 50 participants, 60% (30 students) were females, while the remaining 40% (20 students) were males. This implies a higher representation of females in the sample. Moving on to the school distribution table, we can see that the participants were divided into two schools: Lasu International School and St. Betty Carol School.

Each school had an equal representation, with 50% (25 students) from Lasu International School and the other 50% (25 student s) from St. Betty Carol School.

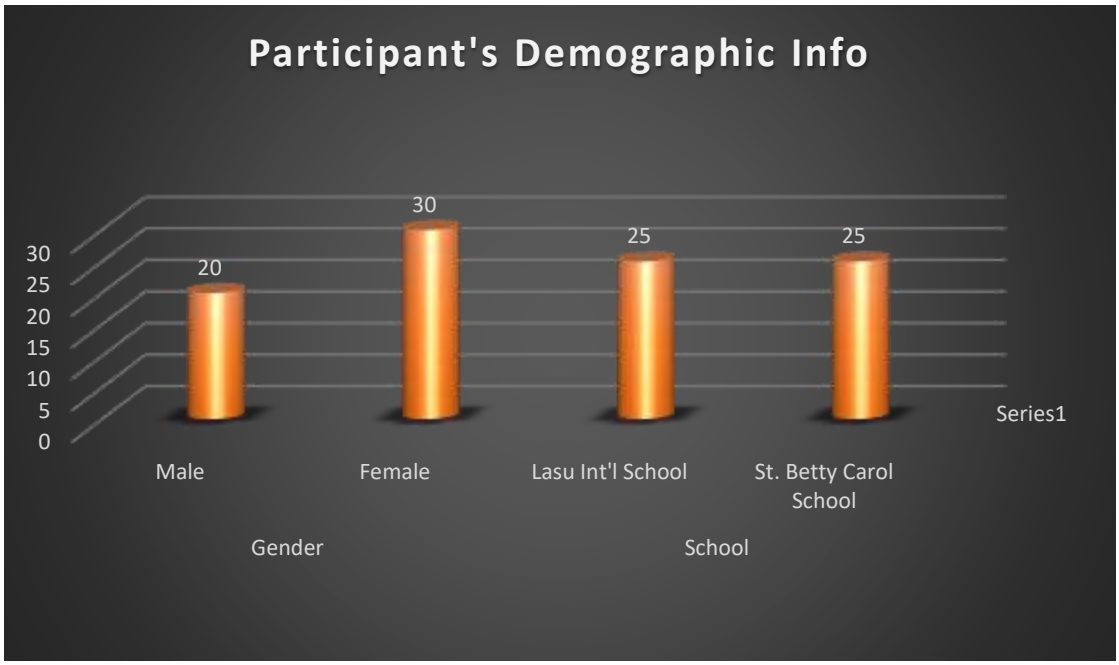

Figure 4.1: Demographic Data of Respondents

4.3. Analysis of Research Questions

Research Question 1: What is the effect of collaborative instructional strategy on students' interest in biology?

Table 4.2: Mean and Standard deviation of instructional strategy and students' interest rating in biology

	Group	N	Mean	Std. Deviation
Post – test	Experimental	25	4.1829	.41756
	Control	25	2.9229	.86919
Pre – test	Experimental	25	3.3514	.36835
	Control	25	2.9657	.49268

The higher mean interest (4.1829) in the Experimental Group suggests that the experimental intervention or instructional strategy had a positive impact on participants' interest in the subject, as compared to the control condition (2.9229).

The lower variability (0.41756) in the Experimental Group (lower standard deviation) indicates a more consistent and concentrated response to the experimental treatment.

Research Question 2: What is the effect of collaborative instructional strategy on students' achievement in biology?

Table 4.4: Mean and Standard deviation of instructional strategy and students' achievement rating in biology

	Group	N	Mean	Std. Deviation
Post – test	Experimental	25	14.4000	1.82574
	Control	25	11.6800	2.05589
Pre – test	Experimental	25	9.8400	1.49108
	Control	25	7.3600	2.01825

The higher mean achievement in the Experimental Group (14.4000) suggests that the experimental intervention had a more positive impact on participants' achievement in the subject, as compared to the conventional method (11.6800).

The lower variability in the Experimental Group (lower standard deviation of 1.82574) indicates a more consistent and concentrated response to the experimental treatment.

Research Question 3: What is the effect of collaborative instructional strategy on students' interest in biology based on gender?

Table 4.5: Mean and Standard deviation of gender and students' achievement rating in biology

	Group	N	Mean	Std. Deviation
Post – test	Female	30	13.0667	2.54522
	Male	20	13.0000	2.12751
Pre – test	Female	30	8.8667	2.08001
	Male	20	8.2000	2.26181

The average post-test scores for male and female students are very close, with male students scoring 13.0000 on average and female students scoring 13.0667 on average.

The standard deviation measures the spread or variability of scores within each group. The standard deviation is slightly higher for female students (2.54522) compared to male students (2.12751).
The descriptive statistics suggest that, on average, there is a minimal difference in post-test scores between male and female students. The variability in scores is slightly higher for female students, but the overall patterns indicate a relatively small dispersion of scores within each group. The sample sizes for both genders are adequate for drawing conclusions about the central tendency and variability of post-test scores.

Research Question 4: What is the effect of collaborative instructional strategy students' achievement in biology based on gender?

Table 4.6: Mean and Standard deviation of gender and students' achievement rating in biology

	Group	N	Mean	Std. Deviation
Post – test	Female	30	3.5881	.97012
	Male	20	3.5000	.88185
Pre – test	Female	30	3.2024	.49844
	Male	20	3.0929	.43485

The average post-test scores for male (3.5000) and female (3.5881) students are very close.
The standard deviations for post-test scores indicate how much individual scores deviate from the mean within each group.
The variability in post-test scores is relatively low, with standard deviations of 0.88185 for males and 0.97012 for females.

4.4. Estimation and Test of Hypothesis

Hypothesis 1: There is no statistically significant difference in the mean interest of students' taught biology with collaborative instructional strategy and those taught with conventional method.

Table 4.7: Levene Test …[a]

Dependent Variable: ITEM2

F	**df1**	**df2**	**Significance**

22.098	1	48	0.000

Levene tests the null …

a. Design: Intercept + ITEM1 + Group

The Levene test examines the equality of variances between groups. The low p-value (0.000) indicates a significant difference in variances between the two groups.

Table 4.8: Summary Ancova of student's mean interest score in biology classified based on instructional strategy

Dependent Variable: ITEM2						
Source	Type III Sum of Squares	df	Mean Square	F	Significance	Eta Squared
Corrected Model	19.879[a]	2	9.939	20.965	.000	.471
Intercept	12.546	1	12.546	26.463	.000	.360
ITEM1	.034	1	.034	.072	.790	.002
Group	17.094	1	17.094	36.057	.000	.434
Error	22.282	47	.474			
Total	673.301	50				
Corrected Total	42.161	49				
a. R Squared = .471 (Adjusted R Squared = .449)						

Significance of the Model (Corrected Model):

The corrected model is statistically significant (p-value = 0.000), suggesting that the model containing the independent variable (Group) has explanatory power in predicting the dependent variable (ITEM2).

Individual Factors:

Intercept: Significant (p-value = 0.000) - Indicates the baseline or reference condition.

ITEM1: Not significant (p-value = 0.790) - The variable ITEM1 does not significantly contribute to explaining the variance in ITEM2.

Group (Instructional Strategy): Highly significant (p-value = 0.000) - Indicates that there is a statistically significant difference between the collaborative (experimental) and conventional (control) groups in terms of students' interest in biology.

Effect Size (Eta Squared):

Eta Squared for Group = 0.434

Indicates that approximately 43.4% of the variance in students' interest in biology is explained by the grouping variable (collaborative vs. conventional).

Decision:

Based on the insights from the interpretations, the hypothesis that there is no statistically significant difference in the mean interest of students taught biology with a collaborative instructional strategy and those taught with a conventional method is therefore **rejected** (p-value = 0.000).

Hypothesis 2: There is no statistically significant difference in the mean achievement of students' taught biology with collaborative instructional strategy and those taught with conventional method

Table 4.9: Levene Test …[a]

Dependent Variable: Posttest_Score

F	**df1**	**df2**	**Significance**
0.000	1	48	0.983

Levene tests the null …

a. Design: Intercept + Pretest_Score + Group

The Levene test examines the equality of variances between groups. The high p-value (0.983) indicates non-significant difference in variances between the two groups.

Table 4.9: Summary Ancova of students' mean achievement score classified based on instructional strategy

Tests of Between-Subjects Effects
Dependent Variable: Posttest_Score

Source	Type III Sum of Squares	df	Mean Square	F	Significance	Eta Squared
Corrected Model	94.511[a]	2	47.256	12.380	.000	.345
Intercept	386.795	1	386.795	101.329	.000	.683
Pretest_Score	2.031	1	2.031	.532	.469	.011
Group	74.940	1	74.940	19.632	.000	.295
Error	179.409	47	3.817			
Total	8776.000	50				
Corrected Total	273.920	49				
a. R Squared = .345 (Adjusted R Squared = .317)						

Significance of the Model (Corrected Model):

The corrected model is statistically significant (p-value = 0.000), suggesting that the model containing the independent variable (Group) has explanatory power in predicting the dependent variable (Posttest_Score or Achievement).

Individual Factors:

Intercept: Significant (p-value = 0.000) - Indicates the baseline or reference condition.

Pretest_Score: Not significant (p-value = 0.469) - The variable Pretest_Score does not significantly contribute to explaining the variance in Posttest_Score.

Group (Instructional Strategy): Highly significant (p-value = 0.000) - Indicates that there is a statistically significant difference between the collaborative (experimental) and conventional (control) groups in terms of students' achievement in biology.

Effect Size (Eta Squared):

Eta Squared for Group = 0.295

Indicates that approximately 29.5% of the variance in students' achievement in biology is explained by the grouping variable (collaborative vs. conventional).

Decision:

Based on the insights from the interpretations, the hypothesis that there is no statistically significant difference in the mean achievement of students' taught biology with collaborative instructional strategy and those taught with conventional method is therefore **rejected** (p-value = 0.000).

Hypothesis 3: There is no statistically significant difference in the mean achievement of male and female students' taught biology with collaborative instructional strategy.

Table 4.10: Levene Test …[a]

Dependent Variable: Posttest_Score

F	**df1**	**df2**	**Significance**
0.000	1	48	0.385

Levene tests the null …

a. Design: Intercept + Pretest_Score + Gender

The Levene test examines the equality of variances between groups. The high p-value (0.385) indicates non-significant difference in variances between the two groups.

The non-significant result suggests that the variance in post-test scores is similar between male and female groups.

Table 4.11: Summary Ancova of students' mean achievement score classified based on gender

Tests of Between-Subjects Effects						
Dependent Variable: Posttest_Score						
Source	Type III Sum of Squares	df	Mean Square	F	Significance	Eta Squared
Corrected Model	19.775[a]	2	9.887	1.828	.172	.072
Intercept	316.563	1	316.563	58.543	.000	.555
Pretest_Score	19.721	1	19.721	3.647	.062	.072
Gender	.203	1	.203	.038	.847	.001
Error	254.145	47	5.407			

Total	8776.000	50				
Corrected Total	273.920	49				
a. R Squared = .072 (Adjusted R Squared = .033)						

Significance of the Model (Corrected Model):

The corrected model is not statistically significant (p-value = 0.172), suggesting that the model containing the independent variable (Gender) explains only a minimal proportion of variability in Posttest_Score (Achievement).

Individual Factors:

Intercept: Significant (p-value = 0.000) - Indicates the baseline or reference condition.

Pretest_Score: Not significant (p-value = 0.062) - The variable Pretest_Score does not significantly contribute to explaining the variance in Posttest_Score.

Gender: Highly insignificant (p-value = 0.847) - Indicates that there is no statistically significant difference between gender (Male and Female) in terms of students' achievement in biology.

Effect Size (Eta Squared):

Eta Squared for Gender = 0.001

The Eta Squared for gender is very small (0.001), indicating that gender explains only a minimal proportion of the variability in post-test scores (Achievement).

Decision:

Based on the insights from the interpretations, the hypothesis that there is no statistically significant difference in the mean achievement of male and female students' taught biology with collaborative instructional strategy is therefore **accepted** (p-value = 0.172).

Hypothesis 4: There is no significant difference in the gender interest of biology students' exposed to collaborative instructional strategy.

Table 4.12: Levene Test …[a]

Dependent Variable: ITEM2

F	**df1**	**df2**	**Significance**
0.093	1	48	0.762

Levene tests the null …

a. Design: Intercept + ITEM1 + Gender

The Levene test assessed the equality of variances between the male and female groups for ITEM2 scores. The obtained p-value is 0.762, indicating that there is no significant difference in variances between the two groups ($p > 0.05$).

Table 4.13: Summary Ancova of students' interest based on gender

Tests of Between-Subjects Effects						
Dependent Variable: ITEM2						
Source	Type III Sum of Squares	df	Mean Square	F	Significance	Eta Squared
Corrected Model	2.798[a]	2	1.399	1.670	.199	.066
Intercept	4.131	1	4.131	4.932	.031	.095
ITEM1	2.704	1	2.704	3.229	.079	.064
Gender	.013	1	.013	.016	.901	.000
Error	39.364	47	.838			
Total	673.301	50				
Corrected Total	42.161	49				
a. R Squared = .066 (Adjusted R Squared = .027)						

Significance of the Model (Corrected Model):

The corrected model is not statistically significant (p-value = 0.199), suggesting that the model containing the independent variable (Gender) explains only a minimal proportion of variability in ITEM2 score (Interest).

Individual Factors:

Intercept: Significant (p-value = 0.000) - Indicates the baseline or reference condition.

ITEM1: Significant (p-value = 0.031) - The variable ITEM1 significantly contributes to explaining the variance in ITEM2.

Gender: Highly insignificant (p-value = 0.901) - Indicates that there is no statistically significant difference between gender (Male and Female) in terms of students' interest in biology.

Effect Size (Eta Squared):

Eta Squared for Gender = 0.000

The Eta Squared for gender is very small (0.000), indicating that gender explains only a minimal proportion of the variability in ITEM2 (Interest).

Decision:

Based on the insights from the interpretations, the hypothesis that there is no significant difference in the gender interest of biology students' exposed to collaborative instructional strategy.is therefore **accepted** (p-value = 0.901).

4.5 Summary of findings

The first hypothesis posited no statistically significant difference in mean interest between students taught biology using a collaborative instructional strategy and those instructed conventionally. However, the analysis unveiled a substantial difference, with the collaborative group exhibiting significantly higher interest. The ANCOVA results ($F = 20.965$, $df = 1$, $p = 0.000$, $\eta^2 = 0.471$) confirmed this, emphasizing the profound impact of collaborative strategies on fostering heightened enthusiasm and engagement.

Hypothesis 2, predicting no significant difference in mean achievement between groups, was contradicted. The collaborative group demonstrated significantly higher achievement scores, highlighting the positive impact of the interactive approach on academic success ($F = 12.380$, $df = 1$, $p = 0.000$, $R^2 = 0.345$).

Exploring Hypothesis 3 on gender influence within the collaborative strategy revealed no significant difference in achievement. Both genders showed similar academic levels, challenging conventional notions. The ANCOVA results ($F = 1.828$, $df = 1$, $p = 0.172$, $R^2 = 0.072$) indicated an insignificant gender effect.

Hypothesis 4, investigating gender differences in interest, found no significant distinction. Both genders exhibited comparable interest levels, emphasizing the collaborative approach's inclusive

nature ($F = 1.670$, $df = 1$, $p = 0.199$, $R^2 = 0.066$). This suggests an equal engagement of male and female students in biology under the collaborative instructional strategy.