CHAPTER 4: DATA PRESENTATION, ANALYSIS, AND DISCUSSION

4.1 INTRODUCTION

This chapter focuses on discussing the data analysis and the data findings. Systematically the following headings were arrived at; organising and summarising data; findings and discussion. The findings are summarised in the chapter.

This chapter presents the analysis and discussion of findings of the study that investigated the use of Art Integrated Learning to find an effect of academic achievement and enhance conceptual understanding of mathematics in a Grade 10 mathematics AIL classroom.

The findings are analysed using the literature noting whether these are consistent with or divergent from the existing body of knowledge. Findings were presented under each research question posed in Chapter 1 as follows:

- What are teacher views of Art Integrated Learning in the mathematics classroom?
- What is the Effect of Art Integrated Learning on Academic Achievement in Mathematics of 10th Grade Students?

4.1.1 RESEARCH QUESTION 1

What are teacher views of Art Integrated Learning in the mathematics classroom?

This part of the data presentation and analysis highlights and analyses the findings from the teacher about his views of Art Integrated Learning as he uses it in the AIL classroom. In this section, data are presented, analysed, and discussed under the ambit of Art Integrated Learning in teaching mathematics. Data to answer Research Question 1 was gathered through a semi-structured interview.

4.1.2 Art Integrated Learning in teaching mathematics

The teacher provided his views of Art Integrated Learning. The account from the teacher was necessary because it helped the study to gather his perception of the subject.

To me, Art Integrated Learning is when the learners have equal opportunities to work on problems and exercises and then learn from each other on how mathematics problems are solved.

He added:

I think Art Integrated Learning is a way to make learners participate in the AIL classroom. It helps when they talk to each other about what the teacher teaching them and how they understand it.

The teacher also spoke about the dynamics of art integrated learning in his AIL classroom:

Art Integrated Learning for me describes the activities that my learners do in groups. It describes the activities that I give them to work out with each other and present to each other, me, and the rest of the AIL classroom.

The teacher said that they believed that learners learned best from each other and using group work. The teacher also described further their applications of Art Integrated Learning in the AIL classroom:

I often give those ten minutes to work out the mathematics problems and, afterward, each of them is supposed to explain.

The teacher's view of Art Integrated Learning involved giving equal opportunities to work on problems and exercises. The teacher believed that these opportunities helped the learners learn from each other to solve mathematics problems.

The teacher seemed to believe that Art Integrated Learning would be more successful in closely managed groups in less overcrowded AIL classrooms. Overcrowded groups were viewed as inconvenient for focusing on struggling learners. However, these findings were not very divergent from the running theme in this study because indeed the literature revealed findings consistent with this critique of Art Integrated Learning (Good, Reys, Grouws, & Mulryan, 1989-90; King, 1993; Mulryan, 1992, 1995).

We, teachers, use different methods of teaching, but as I said earlier, I believe in mixing these teaching methods to enhance the understanding of learners in mathematics in general. I use all the methods of teaching in my AIL classroom but Art Integrated Learning is better than the traditional textbook method since it is learner-centered. It makes learners independent of their learning.

4.1.3 Summary to research question 1

The analysis of research question 1 is that the teacher agreed with the literature with regards to the view of Art Integrated Learning. The teacher believed that Art Integrated Learning provided equal opportunity to work on problems and exercises, and the opportunity helped the learners to learn from one another how mathematics problems were solved. Therefore, for the teacher, Art Integrated Learning has the potential to produce better learning outcomes for learners. Through observations, the researcher checked whether the teacher implemented his view of Art Integrated Learning in the AIL classroom setting. The study found that the teacher viewed Art Integrated Learning and applied it in the AIL classroom to a larger extent.

4.2 RESEARCH QUESTION 2

What is the Effect of Art Integrated Learning on Academic Achievement in Mathematics of 10th Grade Students?

This part focuses on discussing the data analysis and the data findings. Systematically the following headings were arrived at; organising and summarising data; findings and discussion. The findings are summarised after the chapter.

4.2.1 ORGANISING AND SUMMARISING DATA

Descriptive and inferential statistics were used to organise, infer and summarise the learners' marks, obtained in the pre-test and post-test. These tests were conducted for control and experimental groups.

The findings from the pre-test and post-test marks for control and experimental groups are discussed.

4.2.2 Control group histograms

The pre- and post- tests histograms for the control group are shown in Figures 4.1 and 4.2, respectively.

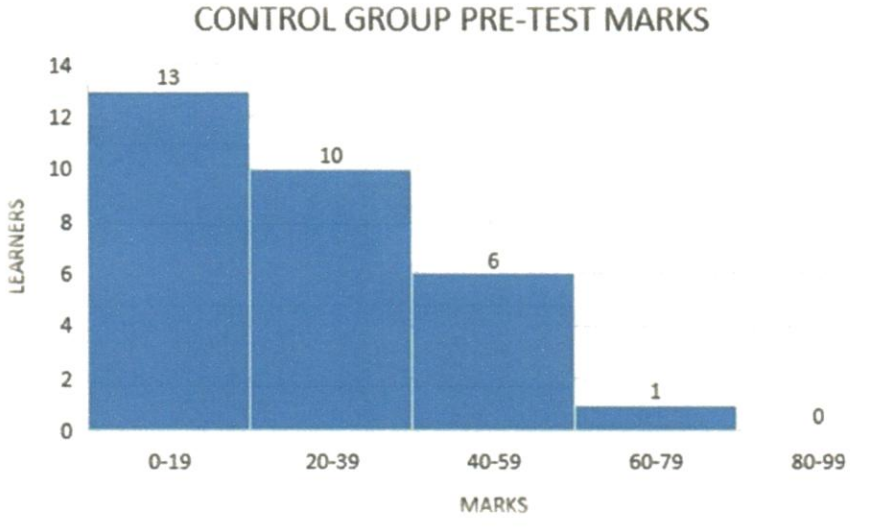

Figure 4: The control group's pre-test marks (n = 30)

Figure 4.1 indicates that 23 learners in the control group obtained scores of 39% and below for the pre-test. Only six learners obtained scores of 40-59%, whilst one learner obtained a score of 60% or more. The data were positively skewed or skewed to the right (Phillips, 2014). Most marks that the learners in the control group got in the pre-test, were to the left side of data distribution, with no remarkably high marks on the right. Table 4.1 indicates the mean at about 28% and the median at 23%. The mean was greater than the median. This also implies that most learners in the control group got low marks in the pre-test. The modal class in Table 4.2 was 0-19, supporting the observation regarding the deficient performance of the control group learners in the pre-test.

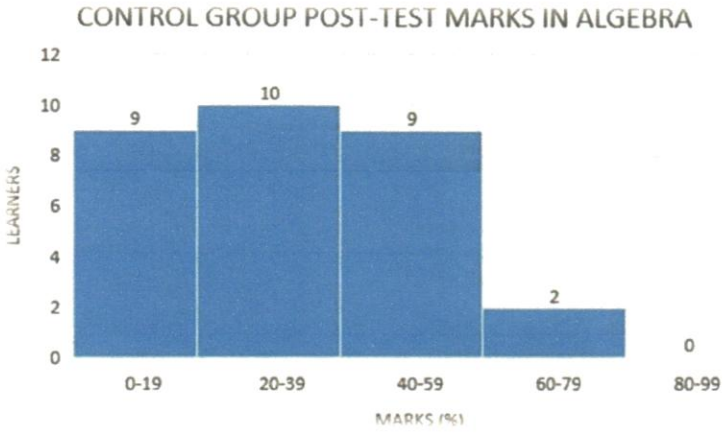

Figure 5: Control group's post-test marks (n= 30)

Figure 4.2 indicates that the number of learners in the control group for the posttest who received 39% and below, decreased from 23 learners to 19 learners, compared to the pre-test (Figure 4.1). The data was still positively skewed. Table 4.3 signifies that the mean was still greater than the median. The mean of data improved from 28% in the pre-test to 30% in the post-test.

The median increased from 23% in the pre-test to 26% in the post-test. The modal class in Table 5.4 was 20-39. There was a slight improvement in the control learners' performance in the post-test, compared to the pre-test, although most learners under-performed. The reason for the slight performance improvement could be due to the maturity of certain learners. In addition, the post-test was also written at the end of the first term when the learners were revising for the Mathematics term-end test.

4.2.3 Experimental group histograms

Figures 4.3 and 4.4 indicate the pre-test and post-test histograms for the experimental group, respectively.

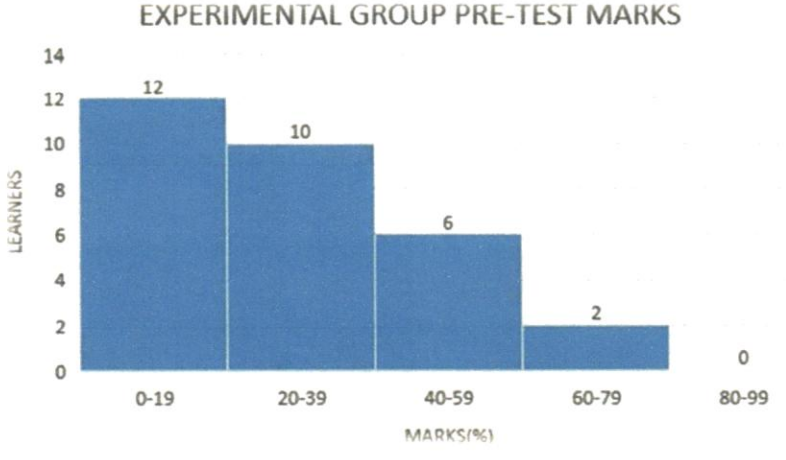

Figure 6: The experimental group's pre-test marks (n= 30)

Figure 4.3: The experimental group's pre-test marks (n= 30)

In the Mathematics pre-test, 22 learners from the experimental group got 39% and below and eight learners got 40% and above. Figure 5.3 signifies this information. Most learners got low marks. Data distribution for the experimental group was the same as data distribution for the control group in the pre-test. It was also positively skewed or skewed to the right. The mean was 30% and the median was 26%. Table 5.6 indicates that the mean was greater than the median. This also supports the skewness of data distribution to the right. The modal class from Table 5.7 was 019. Most learners in the experimental group received low marks in the pre-test. They were at the same low-performance level as the control group.

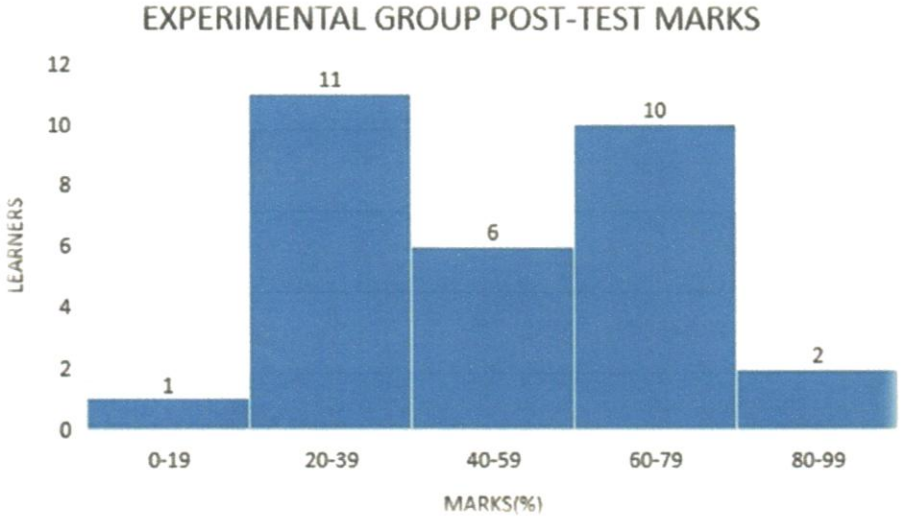

Figure 7: Experimental group's post-test marks (n=30)

After the intervention programme was administered to the experimental group, there was an improvement in the performance of certain learners in the post-test. Figure 5.4 indicates that 18 learners obtained 40% and above and 12 learners got 39% and below in the post-test; in the pre-test, eight learners received 40% and above and 22 learners received 39% and below. The distribution of data was neither skewed to the right nor skewed to the left. It was also not normally distributed. The mean was slightly less than the median indicated.

4.3 HYPOTHESIS-BY-HYPOTHESIS ANALYSIS OF DATA AND INTERPRETATION OF RESULTS

4.3.1 A paired samples dependent t-test

A paired samples dependent t-test was also used to determine whether there was no significant mean difference between the post-test and the pre-test marks of

the groups. In this research study, the same learners' marks were recorded before and after the intervention was administered to the experimental group.

Ho1: There was no significant mean difference between the pretest and posttest marks of the controlled group.

Ho2: There was no significant mean difference between the pretest and posttest marks of the experimental group.

Table 3: t-Test for Controlled Group

t-Test: Paired Two Sample for Means		
	Posttest	*Pretest*
Mean	30.1	27.533
Variance	296.3	269.154
Observations	30	30
Pearson Correlation	0.8092	
Hypothesized Mean Difference	0	
Df	29	
t Stat	1.350304	
P(T<=t) one-tail	0.09368	
t Critical one-tail	1.69913	
P(T<=t) two-tail	0.18736	
t Critical two-tail	2.04523	

$t_{critical}$= 2.045 at alpha equal to 0. 05.

$tcalculated < tcritical$

We fail to reject the null hypothesis. This implies that there was no significant improvement in the control group's achievement in mathematics.

Table 4: t-Test for Experimental Group

t-Test: Paired Two Sample for Means		
	Pretest	*Posttest*
Mean	28.76666667	48.93333333
Variance	296.5298851	462.5471264
Observations	30	30
Pearson Correlation	0.709537153	
Hypothesized Mean Difference	0	
Df	29	
t Stat	7.22819612	
P(T<=t) one-tail	0.00000003	
t Critical one-tail	1.69912703	
P(T<=t) two-tail	0.00000006	
t Critical two-tail	2.04522964	

$t_{critical}$= 2.045 at alpha equal to 0. 05.

$tcalculated > tcritical.$

We reject the null hypothesis. This means, there was a significant difference between the pre-test and post-test marks. Therefore, the art integration in the teaching and learning of mathematics had a positive impact on the experimental group's achievements.

4.3.2 one way ANOVA Test

The One-Way ANOVA for repeated measures was used to determine whether the pre-test to post-test mean scores in the achievement test of learners between the experimental group and controlled group was statistically significantly different or not.

Ho3: There is no significant difference between the achievement of the controlled and experimental groups.

Table 5: ANOVA for Controlled and Experimental Group

ANOVA: Single Factor						
SUMMARY						
Groups	*Count*	*Sum*	*Average*	*Variance*		
Controlled	30	212	7.0666667	95.92644		
Experimental	30	439	14.633333	134.3782		
ANOVA						
Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	858.8167	1	858.81667	7.458094	0.008352	4.00687289
Within Groups	6678.833	58	115.1523			
Total	7537.65	59				

It was found that $F_{calculated} > F_{critical}$

Therefore, we reject the null hypothesis. This means, there was a significant difference between the controlled and treatment groups. Hence, the art

integration in the teaching and learning of mathematics had a positive impact on the experimental group's achievements.

4.4 SUMMARY TO RESEARCH QUESTION 2

In this section, we have found that there was a significant difference between the pre-test and post-test marks of controlled and experiment groups. Therefore, the art integration learning in the teaching and learning of mathematics had a positive impact on the experimental group's achievements.

4.5 CONCLUSION

This chapter discussed the themes that recurred from the data collected. The themes that emerged were the understanding of group work in an AIL classroom; the difficulties in learning and understanding mathematics; the methods that are perceived to be effective in learning mathematics for understanding; and the benefits of using Art Integrated Learning in a mathematical classroom. The impact of Art Integrated Learning in enhancing learners' conceptual understanding of mathematics. The next chapter presents the conclusion and recommendations of this study.