COMPUTER-AIDED MODULAR INSTRUCTIONS IN PROBLEM SOLVING

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Abstract

This study is an experimental pre-test and post-test design which essentially needed to compare the effectiveness of Computer Aided Modular Instruction with the Traditional Method of teaching word problem involving fractions to the grade six (6) pupils of Gadgaran Integrated School, Calbayog City, Samar during the school year 2019-2020.Computer aided modular instruction is a teaching technique that enable pupils interact with the lesson programmed to the computer given to the experimental group. The Traditional Method on the other hand, is a usual way of teaching composing with lecture-discussion given to the control group. A single class consisting of regular grade six (6) pupils was chosen as the subject of the study. Their average grade is approaching proficiency level in Mathematics subject during the first grading period both of experimental and control group. They were randomly assigned and chosen using odd or even technique. The instrument used in this study was researcher made test in Mathematics and was carefully validated. The content topics in the Computer Aided Modules were based on the DepEd Learning competencies set for the grade six level. These are further checked and validated by the Mathematics teachers of Calbayog IV District, Division of Calbayog City. The evaluation survey questionnaire on pupils' difficulties, reactions and attitudes towards Computer Aided Modular Instruction was adapted from the study of Saladaña on SIM-Based Instruction. The questionnaires were revised by the present researcher of this study. The control and experimental group have significant mean difference in the pre-test and post-test scores but have no significant mean difference in the mean percentage gain of scores. The Computer Aided Modular Instructions and the Conventional Method of Instruction resulted for the same level of achievement for the pupils with slight challenges on the part of pupils and facility in teaching of the teachers. Based on the result it was recommended on the implementation and adaptation of this strategy into the classroom utilizing Computer Aided Instruction in enhancing the better-learning output.

Key Words: *Computer-Aided, Module, Problem Solving, CAMI, Instruction, and Difficulties Encountered*

INTRODUCTION

Teachers believed that learner do not achieved at the same rate and are not ready to learn at the same time. In order to focus on individualized instruction especially on crowded classrooms and large classes a modular instruction maybe planned which serves a package intended for self-study. The researcher personally believed that the pupils solve the problem and learn using different techniques based on unique behavior repertoire. We live in the age of the computer, growing demands on the use of computers are everywhere by everyone, including teachers and pupils. From the use of chalkboard and with the advancement of technology, teachers aim at the use of computer technology as a tool which will aid in the teaching-learning process. With the advancement of technology and its need in any field of endeavor, technology becomes the necessity in the schools. Pupils now a day are very particular on the kind of learning process that involves the basic senses such as seeing, listening and touching in acquiring learning. Teachers always think positive that they would like to remain responsive and relevant by keeping their teaching interesting and challenging, thus, they have to learn and adopt the use of the recent technology in the classroom[1]

Teachers who are assigned to teach a multi-grade class are very much worried. They have the feeling that they will not be able to meet the demands of the educative process. Developing different programs for different grade levels is not an easy task. It would be impossible to cover all the competencies in mathematics set for particular grade level in this type of classroom. Besides teaching two or more grade levels of children in one classroom, the teacher is confronted, too, with Multi-age group.Notwithstanding this problem causing factor, the researcher has to find ways to learn how to cope with stressful situation. It is a fact that teacher plays different roles. Other than as a teacher and a facilitator, a teacher who assigned to teach multi-grade classroom must be a planner, a material designer and an action researcher. For these reasons mentioned above, the researcher thought of providing opportunity for a systematic, organize, individualized and optimum learning for the learners.The real quandary lies on whether or not all schools can afford to purchase the gadgets or computers necessary in teaching-learning process; where the government steps in. The government can do so by finding and providing cheaper alternatives that are still at par with the pricey ones performance and reliability wise. This, I believe, is a step towards narrowing the digital divide I mentioned earlier. Otherwise, it defeats the purpose of integrating technology in our educational system. It is also in this light of that researcher would like to make use of computer as aid in modular instruction to the grade six pupils in solving word problems involving fractions which are based on the real life situations. Furthermore, the researcher would like to find out if the use of computer will make easy and alleviate teachers handling multi-grade classroom on their daily instructions, whether it can provide much more interesting activities than the use of other instructional tools as has been used traditionally

[1] Brenda B. Corpuz, Ph. D., “Educational Technology” , Lorimar Publishing Inc. Manila, 2002, p. 35

without sacrificing the learner's competencies. The researcher would also want to prove that even with the use of computer as a tool in instruction, the efficiency, effectiveness and quality of the teaching-learning process is not impaired.

The researcher sought answers to the following specific questions:

1. What is the profile of the Grade VI pupils of in terms of the following variables comprising with control and experimental group:

1.1 Age

1.2 Mathematics performance?

2. What is the pre-test achievement level in Mathematics of the regular grade six pupils composing:
   2.1 Control group; and
   2.2 Experimental group?
3. What is the post-test achievement level in Mathematics of the regular grade six pupils composing the :
   3.1 Control group; and
   3.2 Experimental group?
4. What is the mean percentage gain (mpg) in scores of the pre-test and post-test scores of the control group and experimental group?
5. Is there a significant difference in proportion in terms of age, gender and mathematics achievement between the regular grade six pupils composing the experimental and control group during the first grading period?
6. Is there a significant mean difference between the pre-test scores of the control group and pre-test scores of the experimental group?
7. Is there a significant mean difference between the post-test scores of the control group and post-test scores of the experimental group?
8. Is there a significant mean difference between pre-test and post-test scores of the regular grade six pupils composing the control group during the first grading period?
9. Is there a significant mean difference between the pre-test and post-test scores of the grade six pupils composing experimental group?
10. Is there a significant difference in the mean percentage gain (mpg) scores between the pre-test and post-test scores of the control group and experimental group?
11. What difficulties did the students encounter when taught using the Computer-Aided Modular Instructions?
12. What intervention may the researcher propose to enhance the effectiveness of the Computer-Aided Modular Instructions?

The researcher is prompted to conduct this study with the intention that the findings may pave that there is a space on the improvement of the techniques in teaching Mathematics in elementary schools, especially on multi-grade classrooms because it helps the teacher handle pupils independently on their own.

RESEARCH METHOD

This study utilized the experimental method of research employing pre-test and post-test group design to be applied in determining the effects of using Computer-Aided Modular Instructions in teaching problem solving. Such study was conducted by dividing into two sets of respondents one for experimental group and the other for control group.

This study was conducted on the second grading period since the topic understudy fall on the said period as indicated on the budget lessons of the Elementary Learning Competencies (ELC). The study was done for four (4) weeks of instruction with the same concept for the lessons applied to both the experimental group and control group. The manner by which the latest topics were to be presented follows the competencies published and disseminated by the Department of Education.

Table 1

Activities to be employed in the Conduct of the Study

Computer-Aided Modular Instruction	**Traditional Instruction**
1. Pre-discussion	1. Pre-discussion
Lesson Proper (Computer-Aided Modular Instruction)	2. Lesson Proper
3. Post-Discussion	3. Post-Discussion

It must be noted that in the pre-discussion and post-discussion students perform with the supervision and guidance of the teacher. However, facts, concept and principles will be discovered by students themselves in the process of performing the learning whether by tradition or the use of Computer-Aided Modular Instructions.

RESEARCH ENVIRONMENT

This study was conducted at Gadgaran Integrated School, Calbayog City, Samar. Gadgaran is known for its credibility in performing high computerized advancement in teaching learning process. In fact, they are given computer facilities that cater the need of every pupil and are used as an instructional aid for learning. The school is growing into friendly, high participation rate and offering complete elementary and secondary year levels. In other word, Gadgaran Integrated School fits to the Aim of the Department of Education on the implementation ok K-12 program, hence, it offers complete program from kindergarten up to grade 12. The reason for a teacher to conduct study in that school is that he is a part of the District level where he is teaching and Gadgaran is the only Institution that caters computerized system on teaching learning process.

RESEARCH RESPONDENTS

The respondents of the study are grade six pupils who were enrolled by the school year 2014-2015 of the Division of Calbayog City.

Table 2

Respondents of the study

Section	**N**	**Experimental Group**		**Control Group**		**Total**
Grade VI		Frequency	%	Frequency	%	
Male	32	16	53.33%	16	53.33%	32
Female	28	14	46.67%	14	46.67%	28
Total	**60**	**30**	**100%**	**30**	**100%**	**60**

Table 2 shows that 100% of Grade VI was used as the respondents. The male respondents of the experimental and control group is 16 for the total of 32 while the female respondents of the experimental and control group is 14 for the total of 28. Both experimental and control group have equal distribution of frequencies of respondents for a total of 60.

RESEARCH INSTRUMENT

Based from the concepts of the chosen topics, the following instruments were formulated to determine the effectiveness of Computer-Aided Modular Instructions as well as to answer all the problems as aimed in this study.

Pre-test/Post-test. A 60-item multiple choice teacher-made tests prepared and validated which will be administered to both experimental and control group before and after the conduct of the study.

Computer-Aided Modular Instructions. Refers to a computer program equipped with computer device which is designed to facilitate learning interventions given to the experimental group.

The following are the different parts of the Computer-Aided Modular Instructions

1. **Computer Aided-Module.** This is the arranged instruction guiding the experimental group in the lesson provided with the interactive instructions to pupils.

2. **Computer Set and Projector.** Gives the information towards the pupils in the experimental group, this is also installed with the modular instructions and computer program using power point presentation.
3. **Survey Questionnaire.** A set of questionnaire to be administered to the pupils by answering related questions regarding reactions, attitudes and problems encountered as they experience the discussion using the Computer-Aided Modular Instruction.

Table 3

The Researcher's Lessons/Topics in Each Module

MODULES SEQUENCE No.	TOPICS	(REFERENCES) (BEC-PELC)/Textbook
Module 1	Solving Word Problems involving Addition of Dissimilar Fractions	BEC PELC IV .H.5(p.212)/Math for everyday use 6 page 83
Module 2	Solving Word Problems involving Subtraction Fractions	BEC PELC II.H.4(p.223)/Math for everyday use 6 page 98
Module 3	Solving Word Problems involving Multiplications of Fractions	BEC PELC III.D.3.1 Math for better life grade 6
Module 4	Solving 2-to 3 steps Problems Involving Addition, Subtraction and Multiplication of fractions	BEC PELC H 8-3.3.3 (p.258)/ Math for everyday use 6 page 101 and 115
Module 5	Solving Word Problems involving Division Fractions	BEC PELC II.J.4.4.1-4.3(p.282)/ Math for everyday use 6 page 123
Module 6	Solving 2-to 3-step Problems Involving All Operations on Fractions	BEC PELC I 5.4-5.6(p.286) /Math for everyday use 6 page 125

All the topics fall under Problem Solving involving Fractions which can be found in the Teachers Guide for Mathematics 6. For the control Group a teacher made activities following the traditional method of instruction having the same topic as the Computer-Aided Modular Instruction was employed. The skills of each module/lesson are based on the competencies set by the DepEd intended for Grade VI Mathematics.

SAMPLING PROCEDURE

The respondents were ranked based from the first grading scholastic performance in Mathematics and were selected on the basis of odd and even sampling technique; the even numbers constituted with the experimental while odd numbers composed the control group. The experimental group has been facilitated in the Computer Laboratory which is only adjacent to the Control Group which

is traditional way of teaching. The researcher stands as facilitator of experimental group and as well as the teacher of the control group at the same time. The researcher manage the time in every after the activities given. However, the researcher took time to check the pacing on the experimental group while having the activity in the control group. Pre-test was administered before the lesson and post-test after the lesson. The procedure was carefully administered in order to obtain exact data from both experimental group and the control group.

This experimental study involved the following activities:

Grouping the respondents into two. Respondents were carefully grouped into two; those are, experimental and control groups.

Test Construction and Instrument Validation. This is a construction of 80-item test to be validated covered from the selected topics out of 80 items formulated and subjected for validation. 60 items were chosen and revised to form question.

Conduct of the Pre-test/Post-test. This was given both to the experimental and control groups prior/after the actual experimentation phase using the validated 60-item multiple choice teacher made test.

Instruction. This was given before the activity in the Module, Pre-test and Post-test, Validation of Instruments, and during the conduct of the experimentation.

VALIDATION OF INSTRUMENT

Formulation and construction of test items for the pre-test and post-test are based on the educational objectives set from the content and competencies for the grade six level in mathematics. After formulating and constructing the pre-test and post-test, and after checking by the researcher's adviser, dry run was conducted for the purpose of validating the test items to determine the reliability of the instrument. The researcher validated his teacher-made test on Problem Solving involving Fractions at Calbayog Pilot Central School, Calbayog City, since this school is the only elementary school which provided enough material on the researcher's study. And, the Computer Aided Modules have been validated by the Mathematics teacher of Calbayog IV District and checked by the Educational Program Supervisor in Mathematics.

ITEM ANALYSIS

To determine items to be retained, rejected or improved, an item analysis is to be made on each of the test items. In this study, the U-L Index Method Advanced by John Stocklein (1975) was applied. This technique employed the following steps.[2]

1. Scores the test.
2. Arrange the papers highest to lowest scores.
3. Separate the top 27 percent and the bottom 27 percent of the class. In the study the sample size will be 60.
4. Prepare the tally sheet. Tally the number of cases from each group who will get the item right from each of all the items.
5. Convert the tallies to frequencies and then to proportions.
6. Compute the difficulty index of each item using this formula:
   $Df = (P_u - P_1) /2$

   Where:

   Df – Difficulty Index

   Pu – proportion of the upper 27 percent group who got the item right.

   P1 – Proportion of the lower 27 percent group who got the item right.

7. Compute the discrimination index of each item using this formula:

   $Ds = P_u – P_1$

   Where :

   Ds- Discrimination Index

   Pu – proportion of the upper 27 percent group who got the item right.

   P1 – Proportion of the lower 27 percent group who got the item right.

8. Deciding whether to retain or discard an item was based on two ranges. Items with difficulty indices within 0.4 to 0.8 were retained and discrimination indices within 0.28 to 0.39 were improved and 0.28 and below were to be rejected. The indices were interpreted Using Ebel's "rule of Thumb" (Stanley and Hopkins)

[2] Joy B. Saldana." SIM-Based Instruction in Electricity and Magnetism", (unpublished Thesis; Christ the King College, 2014. P. 49

Table 4

Ebel's "rule of thumb"

Index of Discrimination	Evaluation
0.40 and above	Very Good
0.34 to 0.39	Reasonably good but need to be improved
0.29 to 0.33	Marginal item usually need to be improved
0.28 and below	Poor item, to be rejected or revealed

Questionnaire on the reactions and attitudes as well as the questionnaire on the problems encountered of the pupils about the Computer-Aided Modular Instruction which was used in the present study was validated and was adopted from the study of Joy Saldana on SIM- Based Instruction on the development and Validation of a Survey Instrument for the Evaluation of the Instructional Aide. Simple Revision is to be done by the researcher to fit the present study.

RESEARCH PROCEDURES

The researcher asked permission to allow the conduct of the study from the principal of Gadgaran Integrated School to conduct the research. The scholastic performance of the respondents was gathered through the Report Card or (form 138-A) and the gender and age profile were gathered through DepEd form 1 (School Register) which was requested by the researcher from the class advisers of the respondents of the study. Selecting the respondents has done with the "Odd and Even Technique" in order to come up comparative data result from them.

Prepared and validated 60-item test was based from the learning competencies in problem solving involving fractions. The tests were administered to both experimental and control groups. Test was scored from both experimental and control groups and the test for significance was made to test the null hypotheses. After the prescribed time of the conduct of the study, the experimental group was given questionnaire to solicit their reactions, attitudes and problems encountered regarding Computer-Aided Modular Instructions. Answers of every respondent were treated sincerely.

Gathering of Data

The data gathering procedure was employed in the conduct of the study like tabulations of the test results administered to the experimental and control groups. The result of the pre-post test are categorized into its experimental and as well as the control group in every module.

PRESENTATION, ANALYSIS AND INTERPRETATION OF DATA

The profile in terms of age and gender of Grade 6 pupils of Gadgaran Integrated School (G.I.S). Below is the Frequency percentage distribution to describe the intermediate pupils in terms the following variables, namely: sex, average grades and the socio-economic status. Means and the standard deviation will be employed to determine the profiles of the grade six pupils in the experimental and control groups on the bases taken from the Pre-test result and its comparative result on the Post-test. It is shown using the given formula;

$$P = \frac{f}{n} x100\%$$

Where:

P = percentage

f = frequency of an observation

n = total number of observation

Table 4

Profile of Grade 6 Pupils in Terms of Age and Gender

Variables	**Frequency**	**Percentage (%)**
Age		
Control Group		
11 years old	13	43.3
12 years old	14	46.7
13 years old	3	10.0
Total	**30**	**100.0**
Average Age	**11.7 years old**	
Standard Deviation	**0.66**	
Experimental Group		
11 years old	10	33.3

12 years old	17	56.7
13 years old	3	10.0
Total	**30**	**100.0**
Average Age	**11.8**	
Standard Deviation	**0.63**	
Gender		
Control Group		
Female	14	46.7
Male	16	53.3
Total	**30**	**100.0**
Experimental Group		
Female	14	46.7
Male	16	53.3
Total	**30**	**100.0**

The frequency distribution of Grade 6 pupils in the control group in terms of age is as follows: 11 years old 13 or forty-three and 3 tenths percent (43.3%), 12 years old 14 or forty-six and 7 tenths percent (46.7%), and 13 years old 3, or ten percent (10.0%). The average age is 11.7 years old with standard deviation of 0.66.

Meanwhile, for the experimental group the frequency distribution of students is as follow: 11 years old 10 or thirty-three and three tenths percent (33.3%), 12 years old 17 or fifty-six and seven tenths percent (56.7%), and 13 years old 3 or ten percent (10.0%). The average age is 11.8 years old with standard deviation of 0.63.

As regards to gender group, both groups are composed of fourteen (14) female and sixteen (16) male pupils.

Table 5 shows the mathematics grade of the control group and experimental group. Grades were based from the average of the first grading periods. It is shown using the given formula;

$$P = \frac{f}{n} x100\%$$

Where:

P = percentage

f = frequency of an observation

n = total number of observation

Table 5

	Frequency	**Percentage (%)**
Control Group		
Advance (90% and above)	1	3.3
Proficient (85% - 89%)	5	16.7
Approaching Proficiency (80% - 84%)	19	63.3
Developing (75% - 79%)	5	**100.0**
Beginning (74% and below)	0	
Average Grade	**82.2**	
Standard Deviation	**3.01**	
Experimental Group		
Advance (90% and above)	4	13.3
Proficient (85% - 89%)	4	13.3
Approaching Proficiency (80% - 84%)	16	53.3
Developing (75% - 79%)	6	20.0
Beginning (74% and below)	0	**100.0**
Average Grade	**83.1**	
Standard Deviation	**4.38**	

Item can be gleaned from the table that out of thirty (30) Grade 6 pupils in the control group one (1) or three percent (3.3%) are in the Advanced achievement level, five (5) or sixteen and seven tenths percent (16.7%) were Proficient, nineteen (19) or sixty-three and three tenths percent (63.3%) Approaching Proficiency, and five (5) or sixteen and seven tenths percent (16.7%) Developing and none in the beginning mathematical achievement level during the first quarter and none in the beginning Mathematics Achievement level during the first two quarters. The average grade is 82.2 Approaching Proficiency with standard deviation of 3.01.

For the experimental group, four (4) or thirteen and three tenths percent (13.3%) are in the Advanced level, another four (4) in Proficient level, sixteen (16) or fifty-three and three tenths percent (53.3%) Approaching, and six (6) oe twenty percent (20%) are in Developing level and also none in the beginning mathematical achievement level during the first quarter and none in the beginning Mathematics Achievement level during the first two quarters. The average grade of the group is 83.1 Approaching Proficiency with standard deviation of 4.38.

Table 6 reveals the pre-test achievement level in mathematics of the control group in the six (6) modules. It is shown using the given formula;

$$P = \frac{f}{n} x100\%$$

Where:

P = percentage

f = frequency of an observation

n = total number of observation

Table 6

Pre-Test Achievement in Mathematics of the Control Group

Achievement level	**Frequency**	**Percentage**
Module 1-Solving problem involving addition of dissimilar fraction.		
Advanced (9-10)	2	6.7
Proficient (7-8)	19	63.3
Approaching Proficiency (5-6)	9	30.0
Mean Score	**7.17**	
Standard Deviation	**1.26**	

Module 2- Solving problem involving subtraction of fraction. Advanced (9-10) Proficient (7-8) Approaching Proficiency (5-6) **Mean Score** **Standard Deviation**	 7 21 2 **7.83** **1.09**	 23.3 70.0 6.7
Module 3- Solving problem involving multiplication of fraction. Advanced (9-10) Proficient (7-8) Approaching Proficiency (5-6) **Mean Score** **Standard Deviation**	 14 14 2 **8.40** **0.62**	 46.7 46.7 6.7
Module 4- Solving 2-3 step problem involving addition, subtraction multiplication of dissimilar fraction. Advanced (9-10) Proficient (7-8) Approaching Proficiency (5-6) **Mean Score** **Standard Deviation**	 17 11 2 **8.43** **0.90**	 56.7 36.7 6.7
Module 5- Solving problem involving division of fraction. Proficient (7-8) Approaching Proficiency (5-6) **Mean Score** **Standard Deviation**	 27 3 **7.20** **0.61**	 90.0 10.0

Module 6- Solving 2-3 step problem involving all operations of fraction. Proficient (7-8) Approaching Proficiency (5-6) **Mean Score** **Standard Deviation**	 18 12 **6.70** **0.99**	 60.0 40.0

The mathematics achievement of the control group in each module are as follow: Module 1, six and seven tenths percent (6.7%) of the pupils are Advanced, sixty-three and three tenths percent (63.3%) Proficient, and Approaching Proficiency thirty percent (30.0%). The mean score is 7.17 with standard deviation of 1.26.

In Module 2, twenty-three and three tenths percent (23.3%) of the pupils are Advanced, seventy percent (70.0%) Proficient, and six and seven tenths percent (6.7%) Approaching Proficiency. The mean score is 7.83 with standard deviation of 3.01.

In Module 3, forty-six and seven tenths percent (46.7%) of the pupils are in Advanced, another forty-six and seven tenths percent (46.7%) are Proficient, and 6.7% Approaching Proficiency. The average score is 8.40 with standard deviation of 0.62.

In Module 4, 56.7% of the pupils are in Advanced level, 36.7% Proficient, and six and seven tenths percent (6.7%) Approaching Proficiency. The average score is 8.43 with standard deviation of 0.90.

In Module 5, ninety percent (90.0%) of the pupils are in Proficient level, ten percent (10%) are Approaching Proficiency. The mean score is 7.20 with standard deviation of 0.61.

In Module 6, sixty percent (60.0%) of the pupils are Proficient, and forty percent (40.0%) are Approaching Proficiency. The average score is 6.70 with standard deviation of 0.99.

Table 7 reveals the pre-test achievement level in mathematics of the experimental group in the six (6) modules.

Table 7

Pre-Test Achievement in Mathematics of the Experimental Group

Achievement level	**Frequency**	**Percentage**
Module 1-Solving problem involving addition of dissimilar fraction.		
Advanced (9-10)	6	20.0
Proficient (7-8)	13	43.3
Approaching Proficiency (5-6)	11	36.7
Mean Score	**7.17**	
Standard Deviation	**1.26**	
Module 2- Solving problem involving subtraction of fraction.		
Advanced (9-10)	6	20.0
Proficient (7-8)	22	73.3
Approaching Proficiency (5-6)	2	6.7
Mean Score	**7.77**	
Standard Deviation	**0.94**	
Module 3- Solving problem involving multiplication of fraction.		
Advanced (9-10)		
Proficient (7-8)	13	43.3
Approaching Proficiency (5-6)	17	56.7
Mean Score	**8.53**	
Standard Deviation	**0.68**	
Module 4- Solving 2-3 step problem involving addition, subtraction multiplication of dissimilar fraction.		
Advanced (9-10)		
Proficient (7-8)	14	46.7
Mean Score		

Standard Deviation	16 **8.50** **0.86**	53.3
Module 5- Solving problem involving division of fraction. Advanced (9-10) Proficient (7-8) Approaching Proficiency (5-6) **Mean Score** **Standard Deviation**	 1 22 7 **7.13** **0.82**	 3.3 73.3 23.3
Module 6- Solving 2-3 step problem involving all operations of fraction. Proficient (7-8) Approaching Proficiency (5-6) **Mean Score** **Standard Deviation**	 17 13 **6.57** **0.90**	 56.7 43.3

The mathematics achievement of the experimental group in each module are as follow: Module 1, twenty percent (20.0%) of the pupils are Advanced, forty-three and three tenths percent (43.3%) Proficient, and Approaching Proficiency thirty-six and seven tenths percent (36.7%). The mean score is 7.17 with standard deviation of 1.60.

In Module 2, twenty percent (20.0%) of the pupils are Advanced, to seventy-three and three tenths percent (73.3%) Proficient, and six and seven tenths percent (6.7%) Approaching Proficiency. The mean score is 7.77 with standard deviation of 0.94.

In Module 3, forty-three and three tenths percent (43.3%) of the pupils are in Advanced level while fifty-six and seven tenths percent (56.7%) are in Proficient level. The mean score is 8.40 with standard deviation of 0.62.

In Module 4, forty-six and seven tenths percent (46.7%) of the pupils are in Advanced level while fifty-three and three tenths percent (53.3%) are in Proficient level. The mean score is 8.50 with standard deviation of 0.86.

In Module 5, three and three tenths percent (3.3%) of the pupils are Advanced, to seventy-three and three tenths percent (73.3%) Proficient, and twenty-three and three tenths percent (23.3%) Approaching Proficiency. The mean score is 7.13 with standard deviation of 0.82.

In Module 6, fifty-six and seven tenths percent (56.7%) of the pupils are Proficient, and forty-three and three tenths percent (43.3%) are Approaching Proficiency. The average score is 6.53 with standard deviation of 0.90.

Table 8 reveals the post-test achievement level in mathematics of the control group in the six (6) modules.

Table 8

Post-Test Achievement in Mathematics of the Control Group

Achievement level	**Frequency**	**Percentage**
Module 1-Solving problem involving addition of dissimilar fraction.		
Advanced (9-10)	10	33.3
Proficient (7-8)	20	66.7
Mean Score	**8.37**	
Standard Deviation	**0.85**	
Module 2- Solving problem involving subtraction of fraction.		
Advanced (9-10)	24	80.0
Proficient (7-8)	6	20.0
Mean Score	**9.03**	
Standard Deviation	**0.67**	
Module 3- Solving problem involving multiplication of fraction.		
Advanced (9-10)	27	90.0
Proficient (7-8)	3	10.0
Mean Score	**9.20**	
Standard Deviation	**0.61**	

Module 4- Solving 2-3 step problem involving addition, subtraction multiplication of dissimilar fraction. Advanced (9-10) **Mean Score** **Standard Deviation**	30 **9.47** **0.51**	100.0
Module 5- Solving problem involving division of fraction. Advanced (9-10) Proficient (7-8) **Mean Score** **Standard Deviation**	3 27 **8.07** **0.52**	10.0 90.0
Module 6- Solving 2-3 step problem involving all operations of fraction. Proficient (7-8) **Mean Score** **Standard Deviation**	30 **7.80** **0.41**	100.0

In Module 1, thirty-three and three tenths percent (33.3%) of the Grade 6 students are in Advanced level while sisty-six and seven tenths percent (66.7%) are in Proficient level. The mean score is 8.37 with standard deviation of 0.85.

In Module 2, eighty percent (80.0%) of the Grade 6 pupils are in Advanced level while twenty percent (20.0%) are in Proficient level. The mean score is 9.03 with standard deviation of 0.67.

In Module 3, ninety percent (90.0%) of the Grade 6 pupils are in Advanced level while ten percent (10.0%) are in Proficient level. The mean score is 9.20 with standard deviation of 0.61.

In Module 4, all thirty (30) pupils got a rating of Advanced. Their mean score is 9.47 with standard deviation of 0.51.

In module 5, thirty percent (10.0%) of the Grade 6 pupils are in Advanced level while ninety percent (90.0%) are in Proficient level. The mean score is 8.07 with standard deviation of 0.52.

In Module 6, all thirty (30) pupils got a rating of Proficient. Their mean score is 7.80 with standard deviation of 0.41.

Table 9 reveals the post-test achievement level in mathematics of the experimental group in the six (6) modules.

Table 9

Post-Test Achievement in Mathematics of the Experimental Group

Achievement level	**Frequency**	**Percentage**
Module 1-Solving problem involving addition of dissimilar fraction.		
Advanced (9-10)	19	63.3
Proficient (7-8)	11	36.7
Mean Score	**8.87**	
Standard Deviation	**1.01**	
Module 2- Solving problem involving subtraction of fraction.		
Advanced (9-10)	23	76.7
Proficient (7-8)	7	23.3
Mean Score	**9.10**	
Standard Deviation	**0.76**	
Module 3- Solving problem involving multiplication of fraction.		
Advanced (9-10)	28	93.3
Proficient (7-8)	2	6.7
Mean Score	**9.40**	
Standard Deviation	**0.62**	
Module 4- Solving 2-3 step problem involving addition, subtraction multiplication of dissimilar fraction.		
Advanced (9-10)	28	93.3
Proficient (7-8)	2	6.7
Mean Score	**9.50**	
Standard Deviation		

	0.63	
Module 5- Solving problem involving division of fraction. Advanced (9-10) Proficient (7-8) **Mean Score** **Standard Deviation**	 6 24 **8.03** **0.61**	 20.0 80.0
Module 6- Solving 2-3 step problem involving all operations of fraction. Advanced (9-10) Proficient (7-8) **Mean Score** **Standard Deviation**	 2 28 **7.71** **0.93**	 6.7 93.3

In Module 1, sixty-three and three tenths percent (63.3%) of the Grade 6 pupils are in Advanced level while thirty-six and seven tenths percent (36.7%) are in Proficient level. The mean score is 8.87 with standard deviation of 1.01.

In Module 2, seventy-six and seven tenths percent (76.7%) of the Grade 6 pupils are in Advanced level while twenty-three and three tenths percent (23.3%) are in Proficient level. The mean score is 9.10 with standard deviation of 0.76.

In module 3, ninety-three and three tenths percent (93.3%) of the Grade 6 pupils are in Advanced level while six and seven tenths percent (6.7%) are in Proficient level. The mean score is 9.40 with standard deviation of 0.62.

In module 4, ninety-three and three tenths percent (93.3%) of the Grade 6 pupils are in Advanced level while six and seven tenths percent (6.7%) are in Proficient level. The mean score is 9.50 with standard deviation of 0.63.

In module 5, twenty percent (20.0%) of the Grade 6 pupils are in Advanced level while eighty percent (80.0%) are in Proficient level. The mean score is 8.03 with standard deviation of 0.61.

In module 6, six and seven tenths percent (6.7%) of the Grade 6 pupils are in Advanced level while ninety-three and three tenths percent (93.3%) are in Proficient level. The mean score is 7.71 with standard deviation of 0.90.

Table 10 shows the mean percentage gain (mpg) between the pre-test scores and post-test scores of the control group and experimental group. The Mean Percentage Gain (MPG) was used to determine the Pre-test Scores and the Post-test Scores.

$$MPG = \frac{(Mean_{post\text{-}test}) - (Mean_{pre\text{-}test})}{Mean_{pre\text{-}test}} \times 100\%$$

Table 10

Mean Percentage Gain (MPG) Between The Pre-Test Scores and Post-Test Scores of The Control Group and Experimental Group

Module	Control Group			Experimental Group		
	Pre-test	**Post-test**	**MPG**	**Pre-test**	**Post-test**	**MPG**
1	7.17	8.37	16.74	7.17	8.87	23.71
2	7.83	9.03	15.33	7.77	9.10	17.12
3	8.40	9.20	9.52	8.53	9.40	11.90
4	8.43	9.47	12.34	8.50	9.50	11.76
5	7.20	8.07	12.08	7.13	8.03	12.62
6	6.70	7.80	16.42	6.57	7.71	17.35
Across Modules			**13.74%**			**15.74%**
s.d.	**2.87**			**5.06**		

critical value (cv) = 2.230 at 0.05 level of significance

S = significant; ns = not significant

The mean percentage gain of the control group in Module 1, 2, 3, 4, 5, and are 16.73, 15.33, 9.52, 12.33, 12.08, and 16.42, respectively. The mean of the six (6) mpgs is 13.74 with standard deviation of 2.87.

The mean percentage gain of the experimental group in Modules 1, 2, 3, 4, 5, and 6 are 23.71, 17.12, 10.20, 11.76, 12.62, and 18.26, respectively. The mean of the six (6) mps is 15.61 with standard deviation of 5.06.

Table 11 shows the mean difference in age of students of the control and experimental group. t-test for un-correlated means was utilized to determine the significant difference between the pre-test results of the experimental and control groups, as well as the post-test results of the experimental and control group. This is based on the formula given below;

$$t = \frac{x_1 - x_2}{\sqrt{\frac{(n_1 - 1)(sd_1)^2 + (n_2 - 1)(sd_2)^2}{n_1 + n_2 - 2}\sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}}$$

Where:

t = t- value

x_1 = mean of the first sample

x_2 = mean of the second sample

n_1 = number of respondents of the first sample

n_2 = number of respondents of the second sample

sd_1 = standard deviation of the first sample

sd_2 = standard deviation of the second sample

Table 11

Mean Difference in Age Between Students of the Control and Experimental Group

Group	Mean Age	Standard Deviation	Difference	t-value
Control	11.7	0.66		
Experimental	11.8	0.63	0.10	**0.600^{ns}**

critical value (cv) = 1.960 at 0.05 level of significance

s = significant; ns = not significant;

The difference between the mean age of pupils in the control group and the mean age of the pupils in the experimental group is 0.10. The computed t-value for this difference is 0.600; this value is less than the critical value of 1.960 at 0.05 level of significance ($t_{0.600} < cv_{1.960}$), hence the null hypothesis that there is no significant difference between the ages of the pupils in the control group and experimental group is accepted. Therefore, there is no significant difference in age of pupils composing the control group and experimental group.

The ages of the pupils in both groups are in the same bracket.

Table 12 presents the mean difference in the mathematics achievement between the control group and experimental group. Below is the formula used;

$$t = \frac{x_1 - x_2}{\sqrt{\frac{(n_1 - 1)(sd_1)^2 + (n_2 - 1)(sd_2)^2}{n_1 + n_2 - 2}\sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}}$$

Where:

t = t- value

x_1 = mean of the first sample

x_2 = mean of the second sample

n_1 = number of respondents of the first sample

n_2 = number of respondents of the second sample

sd_1 = standard deviation of the first sample

sd_2 = standard deviation of the second sample

Table 12

Mean Difference in the Mathematics Achievement Between the Control and Experimental Group

Group	Mean	Standard Deviation	Difference	t-value
Control	82.2	3.01		
Experimental	83.1	4.28	0.90	**0.942^{ns}**

critical value (cv) = 1.960 at 0.05 level of significance

s = significant; ns = not significant;

The difference between the mathematics achievement of pupils in the control group and the mathematics achievement of the pupils in the experimental group is 0.90. The computed t-value for this difference is 0.942; this value is less than the critical value of 1.960 at 0.05 level of significance ($t_{0.942} < cv_{1.960}$), hence the null hypothesis that there is no significant difference between the mathematics achievement of the pupils in the control group and experimental group is accepted. Therefore, there is no significant difference in mathematics achievement of pupils composing the control group and experimental group.

This means that the two groups of pupils used in the study are of the same academic achievement in mathematics.

Table 13 shows the mean differences in the pre-test scores between the control and experimental group using the t-test formula.

$$t = \frac{x_1 - x_2}{\sqrt{\frac{(n_1 - 1)(sd_1)^2 + (n_2 - 1)(sd_2)^2}{n_1 + n_2 - 2}} \sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}$$

Where:

t = t- value

x_1 = mean of the first sample

x_2 = mean of the second sample

n_1 = number of respondents of the first sample

n_2 = number of respondents of the second sample

sd_1 = standard deviation of the first sample

sd_2 = standard deviation of the second sample

Table 13

Mean Differences in the Pre-Test Scores Between the Control and Experimental Group

Group		Mean Score	Standard Deviation	Difference	t-value
Mod 1	Control Group	7.17	1.26		
	Experimental Group	7.17	1.26	0.34	0.000^{ns}
Mod 2	Control Group	7.83	1.09		
	Experimental Group	7.77	0.94	0.06	0.228^{ns}
Mod 3	Control Group	8.40	0.62		
	Experimental Group	8.53	0.68	0.13	0.774^{ns}
Mod 4	Control Group	8.43	0.90		
	Experimental Group	8.50	0.86	0.07	0.308^{ns}
Mod 5	Control Group	7.20	0.61		
	Experimental Group	7.13	0.82	0.07	0.375^{ns}
Mod 6	Control Group	6.70	0.99		
	Experimental Group	6.57	0.90	0.13	0.532^{ns}

critical value (cv) = 1.960 at 0.05 level of significance

s = significant; ns = not significant;

In module 1, the mean difference between the pre-test scores of the control group and the experimental group is 0.00. The computed t-value for this difference is 0.000; a value that is less than the critical value (cv) of 1.960 at 0.05 level of significance ($t_{0.000} < cv_{1.960}$). Hence, the null hypothesis stated that there is no significant difference between the pre-test scores of the pupils in the control and experimental group is accepted. Thus, there is no significant difference between the pre-test scores of pupils in the control and experimental group.

In module 2, the mean difference between the pre-test scores of the control group and the experimental group is 0.06. The computed t-value for this difference is 0.228; a value that is less than the critical value (cv) of 1.960 at 0.05 level of significance ($t_{0.228} < cv_{1.960}$). Hence, the null hypothesis stated that there is no significant difference between the pre-test scores of the pupils in

the control and experimental group is accepted. Thus, there is no significant difference between the pre-test scores of pupils in the control and experimental group.

In module 3, the mean difference between the pre-test scores of the control group and the experimental group is 0.13. The computed t-value for this difference is 0.774; a value that is less than the critical value (cv) of 1.960 at 0.05 level of significance ($t_{0.774} < cv_{1.960}$). Hence, the null hypothesis stated that there is no significant difference between the pre-test scores of the pupils in the control and experimental group is accepted. Thus, there is no significant difference between the pre-test scores of pupils in the control and experimental group.

In module 4, the mean difference between the pre-test scores of the control group and the experimental group is 0.07. The computed t-value for this difference is 0.308; a value that is less than the critical value (cv) of 1.960 at 0.05 level of significance ($t_{0.308} < cv_{1.960}$). Hence, the null hypothesis stated that there is no significant difference between the pre-test scores of the pupils in the control and experimental group is accepted. Thus, there is no significant difference between the pre-test scores of pupils in the control and experimental group.

In module 5, the mean difference between the pre-test scores of the control group and the experimental group is 0.07. The computed t-value for this difference is 0.375; a value that is less than the critical value (cv) of 1.960 at 0.05 level of significance ($t_{0.375} < cv_{1.960}$). Hence, the null hypothesis stated that there is no significant difference between the pre-test scores of the pupils in the control and experimental group is accepted. Thus, there is no significant difference between the pre-test scores of pupils in the control and experimental group.

In module 6, the mean difference between the pre-test scores of the control group and the experimental group is 0.13. The computed t-value for this difference is 0.532; a value that is less than the critical value (cv) of 1.960 at 0.05 level of significance ($t_{0.532} < cv_{1.960}$). Hence, the null hypothesis stated that there is no significant difference between the pre-test scores of the pupils in the control and experimental group is accepted. Thus, there is no significant difference between the pre-test scores of pupils in the control and experimental group.

The researcher concludes that students of the control group and the experimental group obtained the same level of performance in the pre-test in each of the six (6) modules.

Table 14 shows the mean differences in the post-test scores between the control and experimental group.

Table 14

Mean Differences in the Post-Test Scores Between the Control and Experimental Group

Group		Mean Score	Standard Deviation	Difference	t-value
Mod 1	Control Group	8.37	0.85		
	Experimental Group	8.87	1.01	0.50	2.075^{s}
Mod 2	Control Group	9.03	0.67		
	Experimental Group	9.10	0.76	0.09	0.378^{ns}
Mod 3	Control Group	9.20	0.61		
	Experimental Group	9.40	0.62	0.20	1.260^{ns}
Mod 4	Control Group	9.47	0.51		
	Experimental Group	9.50	0.63	0.03	0.203^{ns}
Mod 5	Control Group	8.07	0.52		
	Experimental Group	8.03	0.61	0.04	0.273^{ns}
Mod 6	Control Group	7.80	0.41		
	Experimental Group	7.71	0.90	0.49	0.498^{ns}

critical value (cv) = 1.960 at 0.05 level of significance

s = significant; ns = not significant;

In module 1, the mean difference between the post-test scores of the control group and the experimental group is 0.50. The computed t-value for this difference is 2.075; a value that is greater than the critical value (cv) of 1.960 at 0.05 level of significance ($t_{2.075} > cv_{1.960}$). Hence, the null hypothesis stated that there is no significant difference between the pre-test scores of the pupils in the control and experimental group is not accepted. Thus, there is significant difference between the pre-test scores of pupils in the control and experimental group.

In module 2, the mean difference between the post-test scores of the control group and the experimental group is 0.07. The computed t-value for this difference is 0.374; a value that is less than the critical value (cv) of 1.960 at 0.05 level of significance ($t_{0.374} < cv_{1.960}$). Hence, the null hypothesis stated that there is no significant difference between the pre-test scores of the pupils in

the control and experimental group is accepted. Thus, there is no significant difference between the pre-test scores of pupils in the control and experimental group.

In module 3, the mean difference between the post-test scores of the control group and the experimental group is 0.20. The computed t-value for this difference is 1.260; a value that is less than the critical value (cv) of 1.960 at 0.05 level of significance ($t_{1.260} < cv_{1.960}$). Hence, the null hypothesis stated that there is no significant difference between the pre-test scores of the pupils in the control and experimental group is accepted. Thus, there is no significant difference between the pre-test scores of pupils in the control and experimental group.

In module 4, the mean difference between the post-test scores of the control group and the experimental group is 0.03. The computed t-value for this difference is 0.203; a value that is less than the critical value (cv) of 1.960 at 0.05 level of significance ($t_{0.203} < cv_{1.960}$). Hence, the null hypothesis stated that there is no significant difference between the pre-test scores of the pupils in the control and experimental group is accepted. Thus, there is no significant difference between the pre-test scores of pupils in the control and experimental group.

In module 5, the mean difference between the post-test scores of the control group and the experimental group is 0.04. The computed t-value for this difference is 0.273; a value that is less than the critical value (cv) of 1.960 at 0.05 level of significance ($t_{0.273} < cv_{1.960}$). Hence, the null hypothesis stated that there is no significant difference between the pre-test scores of the pupils in the control and experimental group is accepted. Thus, there is no significant difference between the pre-test scores of pupils in the control and experimental group.

In module 6, the mean difference between the post-test scores of the control group and the experimental group is 0.09. The computed t-value for this difference is 0.234; a value that is less than the critical value (cv) of 1.960 at 0.05 level of significance ($t_{0.234} < cv_{1.960}$). Hence, the null hypothesis stated that there is no significant difference between the pre-test scores of the pupils in the control and experimental group is accepted. Thus, there is no significant difference between the pre-test scores of pupils in the control and experimental group.

This means that in module 1 the pupils in the experimental group performed better than pupils in the control group; however, the two groups of pupils obtained the same level of achievement in the rest of the five (5) modules.

Table 15 shows the mean score difference between pre-test and post-test scores of the control group.

Table 15

Mean Differences Between the Pre-Test and Post-Test Scores of the Control Group

Test		Mean Score	Standard Deviation	Difference	t-value
Mod 1	Pre-Test	7.17	1.26		
	Post-Test	8.37	0.85	1.20	4.324[s]
Mod 2	Pre-Test	7.83	1.09		
	Post-Test	9.03	0.69	1.20	3.602[s]
Mod 3	Pre-Test	8.40	0.62		
	Post-Test	9.20	0.61	0.80	5.038[s]
Mod 4	Pre-Test	8.43	0.90		
	Post-Test	9.47	0.51	1.04	5.507[s]
Mod 5	Pre-Test	7.20	0.61		
	Post-Test	8.07	0.52	0.87	5.945[s]
Mod 6	Pre-Test	6.70	0.99		
	Post-Test	7.80	0.41	1.10	5.623[s]

critical value (cv) = 1.960 at 0.05 level of significance

s = significant; ns = not significant;

In Module 1, the mean difference between the pre-test scores and post-test scores of the control group is 1.20. The computed t-value for this difference is 4.324, a value that is greater than the critical value (cv) of 1.960 at 0.05 level of significance ($t_{4.324} < cv_{1.960}$). Hence, the null hypothesis that there is no significant difference between the pre-test and post-test scores of the control group is not accepted. Therefore, there is a significant difference between the pre-test and post-test score of the control group.

In Module 2, the mean difference between the pre-test scores and post-test scores of the control group is 1.20. The computed t-value for this difference is 3.602, a value that is greater than the critical value (cv) of 1.960 at 0.05 level of significance ($t_{3.602} > cv_{1.960}$). Hence, the null hypothesis that there is no significant difference between the pre-test and post-test scores of the control group

is not accepted. Therefore, there is a significant difference between the pre-test and post-test score of the control group.

In Module 3, the mean difference between the pre-test scores and post-test scores of the control group is 0.80. The computed t-value for this difference is 5.038, a value that is greater than the critical value (cv) of 1.960 at 0.05 level of significance ($t_{5.038} > cv_{1.960}$). Hence, the null hypothesis that there is no significant difference between the pre-test and post-test scores of the control group is not accepted. Therefore, there is a significant difference between the pre-test and post-test score of the control group.

In Module 4, the mean difference between the pre-test scores and post-test scores of the control group is 1.04. The computed t-value for this difference is 5.507, a value that is greater than the critical value (cv) of 1.960 at 0.05 level of significance ($t_{5.507} > cv_{1.960}$). Hence, the null hypothesis that there is no significant difference between the pre-test and post-test scores of the control group is not accepted. Therefore, there is a significant difference between the pre-test and post-test score of the control group.

In Module 5, the mean difference between the pre-test scores and post-test scores of the control group is 0.87. The computed t-value for this difference is 5.945, a value that is greater than the critical value (cv) of 1.960 at 0.05 level of significance ($t_{5.945} > cv_{1.960}$). Hence, the null hypothesis that there is no significant difference between the pre-test and post-test scores of the control group is not accepted. Therefore, there is a significant difference between the pre-test and post-test score of the control group.

In Module 6, the mean difference between the pre-test scores and post-test scores of the control group is 1.10. The computed t-value for this difference is 5.623, a value that is greater than the critical value (cv) of 1.960 at 0.05 level of significance ($t_{5.623} > cv_{1.960}$). Hence, the null hypothesis that there is no significant difference between the pre-test and post-test scores of the control group is not accepted. Therefore, there is a significant difference between the pre-test and post-test score of the control group.

The researcher concludes that the pupils in the control group performed better in the post-tests in all six (6) modules than in their pre-tests.

Table 15 shows the mean between pre-test and post-test scores of the experimental group.

Table 15

Mean Differences Between the Pre-Test and Post-Test Scores of the Experimental Group

Test		Mean Score	Standard Deviation	Difference	t-value
Mod 1	Pre-Test	7.17	1.60		
	Post-Test	8.87	1.01	1.70	4.921[s]
Mod 2	Pre-Test	7.77	0.94		
	Post-Test	9.10	0.76	1.33	6.026[s]
Mod 3	Pre-Test	8.53	0.68		
	Post-Test	9.40	0.62	0.04	5.178[s]
Mod 4	Pre-Test	8.50	0.86		
	Post-Test	9.50	0.63	1.00	5.138[s]
Mod 5	Pre-Test	7.13	0.82		
	Post-Test	8.03	0.61	0.90	4.823[s]
Mod 6	Pre-Test	6.57	0.90		
	Post-Test	7.71	0.93	0.03	4.824[s]

critical value (cv) = 1.960 at 0.05 level of significance

s = significant; ns = not significant;

In Module 1, the mean difference between the pre-test scores and post-test scores of the experimental group is 1.70. The computed t-value for this difference is 4.921, a value that is greater than the critical value (cv) of 1.960 at 0.05 level of significance ($t_{4.921} > cv_{1.960}$). Hence, the null hypothesis that there is no significant difference between the pre-test and post-test scores of the experimental group is not accepted. Therefore, there is a significant difference between the pre-test and post-test score of the experimental group.

In Module 2, the mean difference between the pre-test scores and post-test scores of the experimental group is 1.33. The computed t-value for this difference is 6.026, a value that is greater than the critical value (cv) of 1.960 at 0.05 level of significance ($t_{6.026} > cv_{1.960}$). Hence, the null hypothesis that there is no significant difference between the pre-test and post-test scores

of the experimental group is not accepted. Therefore, there is a significant difference between the pre-test and post-test score of the experimental group.

In Module 3, the mean difference between the pre-test scores and post-test scores of the experimental group is 1.80. The computed t-value for this difference is 5.178, a value that is greater than the critical value (cv) of 1.960 at 0.05 level of significance ($t_{5.178} > cv_{1.960}$). Hence, the null hypothesis that there is no significant difference between the pre-test and post-test scores of the experimental group is not accepted. Therefore, there is a significant difference between the pre-test and post-test score of the experimental group.

In Module 4, the mean difference between the pre-test scores and post-test scores of the experimental group is 1.00. The computed t-value for this difference is 5.138, a value that is greater than the critical value (cv) of 1.960 at 0.05 level of significance ($t_{5.138} > cv_{1.960}$). Hence, the null hypothesis that there is no significant difference between the pre-test and post-test scores of the experimental group is not accepted. Therefore, there is a significant difference between the pre-test and post-test score of the experimental group.

In Module 5, the mean difference between the pre-test scores and post-test scores of the experimental group is 0.90. The computed t-value for this difference is 4.823, a value that is greater than the critical value (cv) of 1.960 at 0.05 level of significance ($t_{4.823} > cv_{1.960}$). Hence, the null hypothesis that there is no significant difference between the pre-test and post-test scores of the experimental group is not accepted. Therefore, there is a significant difference between the pre-test and post-test score of the experimental group.

In Module 6, the mean difference between the pre-test scores and post-test scores of the experimental group is 1.10. The computed t-value for this difference is 6.170, a value that is greater than the critical value (cv) of 1.960 at 0.05 level of significance ($t_{6.170} > cv_{1.960}$). Hence, the null hypothesis that there is no significant difference between the pre-test and post-test scores of the experimental is not accepted. Therefore, there is a significant difference between the pre-test and post-test score of the experimental group.

The researcher concludes that the pupils in the experimental group performed better in the post-tests in all six (6) modules than in their pre-tests.

Table 16 shows the difference in the mean percentage gain (mpg) scores between the control and experimental group.

Table 16

Difference in the Mean Percentage Gain (MPG) Scores Between the Control and Experimental Group

Group	Mean Age	Mean Percentage Gain (MPG)	Standard Deviation	Difference	t-value
Control	30	13.74	2.87		
Experimental	30	15.61	5.06	**1.87**	**0.787^{ns}**

critical value (cv) = 2.230 at 0.05 level of significance

s = significant; ns = not significant;

The mean percentage gain (mpg) difference across the six (6) modules between the control group and the experimental group is 1.87. The computed t-value for this difference is 0.787. This value is less than the critical value (cv) of 2.230 at 0.05 level of significance. Hence, the null hypothesis that there is no significant difference between the mean percentage gains of the control group and the experimental group is accepted. Thus, there is no significant difference between the mean percentage gain (mpg) of the control group and the experimental group.

Table 17 reveals the difficulties of pupils encountered when taught using computer-aided modular instruction using the simple descriptive statistics below where the weighted mean is the point of reference.

Table 17

Difficulties Encountered by Pupils When Taught Using Computer-Aided Modular Instruction

Problems Encountered	**Weighted Mean**	**Description**
Ability to formulate hypothesis	1.93	Slightly serious problem
Knowledge of Mathematics Content	1.90	Slightly serious problem
Training in the Mathematical Process	1.87	Slightly serious problem
Time Allotment for Mathematics is too short	1.80	Slightly serious problem
Skills in the computation of some mathematical problems.	1.73	Slightly serious problem

Over-sized class	1.70	Slightly serious problem
Time to perform the mathematics activities	1.67	Slightly serious problem
Ability to comprehend and communicate in English	1.60	Not a serious problem
Teachers' knowledge of mathematical content	1.57	Not a serious problem
. Working alone	1.33	Not a serious problem

Weighted Mean Description

0.00 – 0.80.....Absence of the problem

0.81 – 1.60.....Not a serious problem

1.61 – 2.40.....Slightly serious problem

2.41 – 3.20.....Serious problem

3.21 – 4.00.....Very serious problem

The students encountered a slightly serious problem in the 1) ability to formulate hypothesis, 2) knowledge of Mathematics Content, 3) training in the Mathematical Process, 4) time Allotment for Mathematics is too short, 5) skills in the manifestation of some mathematical problems, 6) over-sized class, 7) time to perform the mathematics activities and considered, and not serious problem in 8) ability to comprehend and communicate in English; 9) teachers' knowledge of mathematical content and 10) working alone as not a serious problem.

This means that students will really benefit in learning mathematical concepts and skills using computer aided instruction because this particular method of instruction pose no problem to them.

CONCLUSIONS

The researcher finds the hereunder conclusions reasonable on the basis of the summary of findings.

1. The age, and academic performance of the control group and experimental group cannot be accounted as the source of any differences in performance in the pre-test and post-test taken by the two groups.
2. The achievement levels in the pre-tests and post-tests of the control group and experimental group are approximately the same.
3. The control group performed better in their post-tests than in the pre-tests.
4. The experimental group performed better in their post-tests than in their pre-tests.

5. Computer-aided modular instruction and the conventional method of instruction resulted for the same level of achievement for the pupils.

RECOMMENDATIONS ON THE APPLICATION OF THE CAMI FOR TEACHING AND LEARNING

From the findings of the study, the researcher offers the following recommendations.

1. The computer-aided modular instruction as well as the conventional instruction with slight challenges on the part of the students and facility of instruction of the teachers. Hence, the researcher recommends that schools make effort to utilize computer-aided instruction in teaching mathematics concepts and skills.
2. In the light of the findings, the researcher recommends, but schools utilized the proposed archetype instructional material on Multi-Grade Instructions and Recommended, Reinforcement and Enrichment program (RRE) in teaching mathematics with the integration of Computer Aided Modular Instruction.

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