Development and Validation of a Computer Aided Instructional Material in Selected Topics in Elementary Algebra

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Abstract- The study developed and validated a computer-aided instructional material in Elementary Algebra. It made used of Quasi - Experimental Research method utilizing one group pretest-posttest design. It also utilized the 100 items validated pretest/posttest developed for the purpose of attaining the objective of the study. The subjects of the study were the 15 randomly selected students in Elementary Algebra at Peter Pan Learning Center, Baras, Rizal, Philippines. Findings revealed that the performance pretest and posttest of the subjects in both Algebraic expressions and first degree equation and inequalities are satisfactory and very satisfactory respectively. It emphasizes that the computed-aided instructional materials in Elementary Algebra brought significant gain in knowledge and skills of the students upon its exposures.

Index Terms- Computer-aided instructional material, development and validation, elementary algebra.

I. INTRODUCTION

Basic Education is an important tool for the preparation of prospective college students who are aiming to finish degree courses. It provides foundation to students in various subjects essential to advance studies. One of these subjects is Mathematics. Mathematics has so many branches or field of study and to cite one is Elementary Algebra. This subject is considered as an indispensable subject because of its wide range of application in school particularly in various disciplines such as education, architecture and engineering and in most cases essential in the real world of life. In other words, if the foundation of students in elementary algebra is poor, the students are hard up in coping up with application of concepts as they move to higher levels of learning. Thus, teaching the subject should produce good quality products. The 1987 Constitutions provides that "the state shall protect and promote the right of all citizens to quality education at all levels and shall take appropriate action to make education accessible to all."

The constitutional provision mandates that the school should devise means in order to make teaching elementary algebra interesting to the students. The value of this fact lies in the sense that the students encountered difficulties in learning concepts and practical applications of the subject. Such difficulties is attributed to the techniques and strategies used by the teacher.

In recent years, the Government took the necessary steps that would make the subjects in the high school, specifically Elementary Algebra responsive and realistic to the changing time. This idea is indicated in the revised Basic Education Curriculum through its features. One of the features is the new focus of Mathematics in the secondary level. The 2002 BEC Handbook stated that "In the secondary level, instead of the spiraling integrated approach in Mathematics, we will now offer Elementary Algebrain the First Year, Intermediate Algebra in Second Year and Geometry in Third Year."

This feature emphasizes the necessity of Elementary Algebra in the high school. The teaching and learning process should be functional and more realistic so that it will meet the demand of the changing time. In the final analysis, teaching the subject must be interesting through the provision of a learning material which will enhance the mastery of the students. In other words, instructional materials should be developed to attain the aims of quality education. The development of instructional materials is not new to the people in the academic community. Sec. 5 of PD. No. 6-A states that "one of the best educated objectives is to design, utilize, and improve instructional technology and develop or produce textbooks and other instructional materials leading to quality education.

One of these materials is a Computer Aided Instructional Material. The material is interesting and will help facilitate individualize instruction. It also reinforces learning. Bauzon (1994) supports this contention when he stated that the theory of self activity is the basis of all learning. He commented that "the pupils or students learn by doing, experiencing and experimenting". This comment implies that a computer aided instructional material is needed to strengthen learning of the students.

II. OBJECTIVES

The study aimed to develop and validate a Computer Aided Instructional Material of Selected Topics in Elementary Algebra for first year high school students during the School Year 2007-2008.

Specifically, it sought determine the following:

1. the mean performance of the students in pretest and posttest of the developed Computer Aided Instructional Material in Algebraic Expressions and first degree equation, and
2. find the significant difference between the mean performance of the students in pretest and posttest of the developed Computer Aided Instructional Material Elementary Algebra.

III. RESEARCH METHODOLOGY

The study made use of Quasi - Experimental Research method utilizing one group pretest-posttest design.

The study was conducted at Peter Pan Learning Center. Peter Pan Learning Center is a private school offering secondary and elementary level of education. The school believes on child's progress and advancement in his study, fulfilling the mission of Christ on earth through the development of man, thus providing a balance development of the child is ensured towards this end. Some of the important activities of the school is the development of the students through Mathematics Quiz Bee which is immensely contributed by the subject, Elementary Algebra.

The subjects of the study were the 15 first year high students enrolled during the school year 2007-2008. There were no equating factors considered in the considered in the selection of the subjects of the study, but it was made clear that no irregular first year students were included in the study.

The teacher made test which was used in determining the validity of the developed material consisting of 100-items. The test was divided into two sets and each set was administered before and after the grading period. The test was developed based on the learning competencies provided by the Department of Education and the table of specification. The test was content validated by experts in test preparations. Suggestions provided by experts was considered in the revision. It was tried out to 10 second year high students enrolled at Peter Pan Learning Center, Baras, Rizal, Philippines during the school year 2007-2008. The result of the try out was analyzed through indices of difficulties and discrimination in order to improve the poor items and the test was finalized.

The mean score of the students in every learning area was interpreted using the following scale:

Range	**Interpretation**
41 - 50	Outstanding
31 - 40	Very Satisfactory
21 - 30	Satisfactory
11 - 20	Fair
1 - 10	Poor

IV. RESULTS

Performance of the Students in Pretest and Posttest of the Developed Computer Aided Instructional Material in Elementary Algebra

Table I. Computed Mean and Standard Deviation on the Performance of Students in Pretest and Posttest of the Developed Computer Aided Instructional Material in Elementary Algebra

	Pretest			Posttest		
Learning Areas	Mean	SD	VI	Mean	SD	VI
1. Algebraic Expressions	25.2	3.28	S	33.07	4.98	VS
2. First Degree Equation & Inequalities	24.47	3.29	S	33.13	4.14	VS
Over-all	24.84	3.29	S	33.1	4.56	VS

Legend:
SD - Standard Deviation VI- Verbal Interpretation S- Satisfactory

Significant Difference Between the Level of Performance of the Students in Elementary Algebra as revealed by the Pretest and Posttest With Respect to the Learning Areas

Table II. Computed t-value on the Performance of the Students in Pretest and Posttest of the Different Learning Areas of the Computer Aided Instructional Material of Selected Topics in Elementary Algebra

Learning Areas	**Tc**	**Df**	**p-value**	**Ho**	**VI**
1. Algebraic Expression	6.499	14	.000	R	S
2. Linear Equation and Inequalities	9.225	14	.000	R	S

Legend:
df - degrees of freedom R - Rejected S - Significant
t_c - Computed t-value Ho - Null Hypothesis

V. DISCUSSIONS

As indicated in the table 1, the mean score of the students in pretest Algebraic Expressions is 25.2 with a standard deviation of 3.28 verbally interpreted as satisfactory and the mean score in posttest is 33.07 with a standard deviation of 4.98 verbally interpreted as very satisfactory. On the other hand, the mean score of the students in pretest in the First Degree Equation and Inequalities is 24.47 with standard deviation 3.29 verbally interpreted as satisfactory and the mean score of the students in

posttest is 33.13 with a standard deviation of 4.14 verbally interpreted as very satisfactory.

The overall mean score of students in pretest in the two learning areas is 24.84 with a standard deviation of 3.29 verbally interpreted as satisfactory and the over-all mean score in posttest is 33.1 with a standard deviation of 4.56 verbally interpreted as very satisfactory. These figures emphasize that there was an increase in the mean scores of students in posttest upon utilization of the computer aided instructional material. This statement is valid because the overall standard deviation of the mean scores in pretest and posttest are low. Pagoso et.al. (1978) stated that "if the standard deviation is small, there is a homogeneity in the intelligence of the students". It means that the performance of the students in pretest and posttest are reliable. Therefore, there is no doubt that the students acquire greater amount of knowledge and skills in different learning areas of the computer aided instruction.

This finding is strengthened by the study of Robles (2004) when she spelled out that the students acquired knowledge and skills after the students were exposed to the developed instructional modules. In addition Otto (2004) found out that there was a significant difference between the pretest-posttest of the students upon completing the developed programmed modules.

As shown in the Table 2, the p-value of computed t-test on the performance of the students in pretest and posttest in algebraic expressions is .000 which resulted to the rejection of the null hypothesis stating that "there is no significant difference between the performance of the students in posttest in algebraic expressions of the developed instructional materials". Similar is true in Linear Equation and Inequalities, the table revealed that the p-value of the computed t-test is .000 which has a decision to reject the null hypothesis paving the way to have the significant result.

The findings emphasize that there was a significant gain in terms of knowledge and skills of the students when exposed to the Computed Instructional Material in Elementary Algebra. In other words, the developed instructional material was valid as manifested in the performance of the validated teacher pretest and posttest.

Abarro (2004) revealed that "the over-all mean performance of the students in pretest in the different learning areas of the material was 5.45 and the performance of the students in posttest was 10. The result pave the way to conclude that the developed worktext in Principles and Methods of Teaching is valid as evidenced by a significant difference in pretest and posttest scores.

VI. CONCLUSION

The performance of the students tend to increase when exposed to the computer-aided instructional material in Elementary Algebra. This implies that the computer-aided instructional material help students acquire more knowledge and skills in Elementary Algebra.

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