

Effectiveness of Computer Assisted Instruction in the Performance of Grade 3 Learners in Mathematics

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Abstract —Computer-Assisted Instruction (CAI) is the use of the computer to help in delivering the subject matter (Seo & Bryant, 2012). The computers and programs that go along with the instruction can provide use of many different types of hands-on opportunities with the touch of a mouse. Using computer assisted instructions, teaching made easier and pupils were motivated to participate in the teaching-learning process because they were given the chance to manipulate the computers. Technology based teaching has most used mostly by the teachers in the development of the lesson. Giving activities using the computers will surely improve the academic achievement of the pupils. With these, the researcher as computer advocate, is challenge to conduct this study in order to evaluate the effectiveness of computer assisted instruction in improving the performance of the Grade III learners in Mathematics in Canbantug Elementary, Merida District, Leyte Division. An intervention plan in Mathematics was formulated based on the result of the study. It was revealed on the table that the pre-test performance of Grade 3 learners in Math is moderate for the experimental and control group while the post-test performance is very high for the experimental group and high for the control group. Moreover, it was also revealed that there is significant difference between the scores in the pre-test and post-test performance of the Grade 3 learners in Math for both groups and there is also significant difference on the scores in the posttest performance among the two groups. This means that computer assisted instruction is an effective intervention in improving the performance of the Grade 3 learners Mathematics. It is recommended to implement the formulated Intervention Plan in Mathematics to improve or maintain the performance of the Grade 3 learners.

Keywords — *Effectiveness, Computer Assisted Instruction, Performance, Grade 3 Pupils, Mathematics*

I. Introduction

“Education has always been important but perhaps, never more so, in man’s history than today. In a science-based world, education and research are crucial to the development process of

a country, its welfare, progress and security” (Ramani, 2012). The 21st century world can be called a scientific world, advancing rapidly in information technology, medicine, engineering, space communication, astronomy, astrophysics, artificial intelligence, robotics and many other disciplines (Ramani, 2012). Our country requires technically skilled manpower. For all disciplines mathematics is the base.

Mathematics is an abstract subject. The reasoning in mathematics possesses a number of characteristics, namely, characteristics of accuracy, verification of results, certainty of results, similarity to reasoning in life, originality (Ramani, 2012). All these characteristics automatically become a part and parcel of a child when he learns mathematics. Mathematics has a special language in which symbol occupies an important position. Students find it difficult to understand mathematics because of symbols and abstractness. Patel (2006) in her study specifies that one of the reasons for the selection of commerce stream was that students felt science stream to be difficult, as it requires a lot of hard work to be put in.

Mathematical skills are an essential prerequisite for both school achievement and success in the workplace. These skills can be develop using traditional method and computer assisted instruction. Computer-Assisted Instruction (CAI) is the use of the computer to help in delivering the subject matter (Seo & Bryant, 2012). The computers and programs that go along with the instruction can provide use of many different types of hands-on opportunities with the touch of a mouse. Some programs will have tools that are not as user friendly or require a short tutorial on how to use them correctly. As with most exposure to something new, the more practice with the tool will allow the students to become more familiar with its concept and application of the tool in their work (Christensen, 2016).

As in the case in Canbantug Elementary School, learning Mathematics is very difficult where most of the learners were not able to get the 75% proficiency level during their 1st quarter examination. Teachers had a hard time in explaining the concept using the traditional method. The major reason for the failure is that the teachers quite often pay no attention to the basic concepts and generally adopt methods of solving questions with crammed up formulae.

In order to overcome the difficulties faced by the learners, teacher should adopt different methodology in teaching of mathematics like drill method, using different audio-visual aids, computer aided instruction, mathematical club etc. One of the methods is auto-instructional method. It is a method of individualized instruction. One of its forms is CAI (Computer Assisted/Aided Instruction) auto instructional teaching.

ICT (Information and Communication Technology) has great potential for teaching and learning process at all levels. The use of ICT has enriched the teaching learning process with the help of computer. It has brought a great change, innovativeness, and creativity in teachers in teaching learning process. Mathematics and computer are both important in today’s life as they open the gate of ample opportunities in this modern world. Mathematics is widely used in

computers both in hardware and software. Computer helps in improving the knowledge of mathematics. Computer helps in making classroom teaching lively.

The use of PowerPoint is a strategy to help students practice their math skills as an exercise by following the learning could affect the achievement of students in math classes. As Tienken and Maher (2008) researched their study in the use of PowerPoint yielded no positive significant growth in any of their categories in their Grade Eight Proficiency Assessment (GEPA). This finding, although somewhat defeating, had some limitations that factored into their results. While the use of PowerPoint should not stand alone, the students and teachers involved need to have a structure in which to share and review the concepts being learned. It is possible that the medium itself was not as conducive to the learning of skills and concepts. Also, worth noting is to narrow and clarify the topic which is being presented.

One CAI intervention Math Explorer uses four cognitive strategy steps. Seo and Bryant (2012) listed the steps as: Reading, Finding, Drawing, and Computing. They also continued to list the metacognitive steps as doing the activity, asking about the situation, and checking to make sure the students understand (Seo & Bryant, 2012). This program, unlike Merlin's Math Mill, works to improve the problem-solving nature of math equations.

Using computer assisted instructions, teaching made easier and pupils were motivated to participate in the teaching-learning process because they were given the chance to manipulate the computers. Technology based teaching has most used mostly by the teachers in the development of the lesson. Giving activities using the computers will surely improve the academic achievement of the pupils. Many research studies conducted on how computer assisted instruction effective and helps improve the performance of the learners most specifically in Mathematics lessons.

Among the studies which are similar to the present study, Pilli and Aksu (2013) employed a quasi-experimental research design to examine the impact of educational software for mathematics on 4th grade pupils' achievements in mathematics, the pupils' attitudes towards mathematics and computer-assisted teaching and learning as well as the retention of mathematical knowledge. They found that the educational software is an effective tool for teaching and learning mathematics in the sense that pupils who used the software in the classrooms achieved higher test scores and had more positive attitudes towards mathematics.

Roschelle et al. (2010) focus in an experimental design on a software tool that was developed with the purpose of enabling a large group of pupils to learn more advanced mathematical concepts and skills in Texas. They identified a positive significant impact of the use of the program on pupil's mathematics achievements. Roschelle et al. conclude that the CAI-tool is an effective tool to enhance pupil knowledge of more advanced mathematics.

These are some of the related studies undertaken by researchers which motivated the researcher to conduct. Hence, it was shown that computer can play vital role in learning process as it can work with the imagination of students. Any concept in mathematics can be explained with

the help of pictures and this visual image can help in understanding the concept at ease. In paper pencil method student can get bored easily and can find it difficult to practice the sum again and again. CAI works as a change and increases the curiosity of students and they can learn interestingly without any difficulty. Also, whatever is learnt through computer aided instructions, the contents can be retained for longer time as they use more senses of the students.

It is in this premise that the researcher decided to come up with this study in order to evaluates the effective of computer assisted instructions in improving the mathematics performance of the Grade 3 learners in Canbantug Elementary School. With the result of the study, the researcher was able to formulate intervention plan in Mathematics.

This study evaluates the effectiveness of computer assisted instruction in the performance of Grade 3 learners in Mathematics of Canbantug Elementary School, Merida District, Leyte Division. The findings of the study were bases for the proposed intervention plan.

Specifically, this study sought to answer the following questions:

1. What is the pre-test performance of Grade 3 learners in Math in the control and experimental group?
2. What is the post-test performances of Grade 3 learners in Math in the control and experimental group?
3. Is there a significant difference between the pre-test and post-test performances of Grade 3 learners in Math in the two groups?
4. Is there a significant difference between the post-test performances of Grade 3 learners in Math in the two groups?
5. What intervention plan can be proposed based on the findings of this study?

II. Methodology

Design. This study employed a quasi-experimental research design to evaluate the effectiveness of computer-assisted instruction in improving the performance of the Grade 3 learners in Mathematics. Canbantug Elementary School, Merida District, Leyte Division is the main locale of the study. The respondents of this study were the twenty (20) learners enrolled in Grade 3 under the advisory of the researcher. The research instrument used in this study was a researcher-made Mathematics Test which covered the 3rd Quarter List of Competencies stipulated in the Curriculum Guide for the grade. This was a 30-item multiple choice test. This was validated and submitted to the District Mathematics Coordinator and the School Head for critiquing and adjustment of test items or choices. This test was conducted before and after the integration of computer assisted instructions in teaching Mathematics. This research is focused in evaluating the effectiveness of computer assisted instruction in the performance of Grade 3 learners in

Mathematics and its relationship. A Proposed Intervention Plan based on the findings of the study is the output.

Sampling. There are twenty (20) Grade 3 learners involved in this study. The research was conducted personally by the researcher with consent from the parents of the pupils.

Research Procedure. The researcher prepared the research design and tools to be utilized in the study. Approval and recommendation from the Panel of Examiner of the Graduate Studies and permit from the Schools Division Superintendent of Leyte Division, District Supervisor of Merida District and school head of the said locale was sought. A letter request to conduct this study was forwarded to the Office of the Schools Division Superintendent. Upon approval, permission from the District Supervisor, District Math Coordinator and School Head was secured before the actual gathering of data. Validation of the instruments through the School Head, District Math Coordinator and District Supervisor was sought. Orientation of the participants and administration of the pre-test and post-test was done in the classroom by the researcher. Permission from the parents of the respondents was secured. The present study involved two groups, the experimental group which used computer assisted instruction in teaching Mathematics while the control group used traditional method of instruction. A pre-test and post-test were used to determine the significant difference on pupil's performances in Mathematics. The two classes were taught by the researcher during the period in which they were assigned. Hence, the present locale has only one section for the grade level, teaching using the mother tongue based and English instruction for Mathematics lessons were given on specific date. After given intervention, post-test was conducted. Results of the tests were collected. Data were tallied and submitted for statistical treatment. Analysis and Interpretation of Data. Making of Proposed Improvement Plan followed.

Ethical Issues. The right to conduct the study was strictly adhered through the approval of the Schools Division Superintendent of Leyte Division, District Supervisor, of Merida District and school head of Canbantug ES. Orientation of the respondents with their parents or guardians was done during the parent conference. In the orientation, issues and concerns were addressed and consent to be included in the study were signed.

Treatment of Data. The Simple Percentage and Weighted Mean was employed to determine and evaluate the pretest and posttest performance in Mathematics of the Grade 3 learners. t-Test of Mean Difference was used to determine the significant difference between the pretest and posttest pupil's performance in Mathematics before and after the utilization of computer assisted instruction in teaching Mathematics. This formula proved or disproved what was postulated in the hypothesis.

III. Results and Discussion

Table 1
Pre-Test Performance of Grade 3 Learners in Mathematics (N=20)

Data	Experimental Group	Interpretation	Control Group	Interpretation
No. of Pupils	20	Moderate	20	Moderate
No. of Items	30		30	
Total Score	329		329	
Mean	16.45		16.45	
MPS	54.83		54.83	

Table 1 presents the pre-test performance of the Grade 3 learners in Mathematics for the control and experimental groups. It was revealed on the table that the pre-test performance of Grade 3 learners in Math for the control and experimental group has a total score of 329 with an average mean of 16.45 and mean percentage score of 54.83 which is interpreted as moderate. This means that both groups performed moderately in Mathematics. This implies that these pupils need intervention in order to improve their performance in Mathematics. From observation, mathematics is considered one of the core subjects of curriculum universally. Hence, globally, mathematics is compulsory from kindergarten to college (Ding, Song, & Richardson, 2007). Brothen and Wambach (2000) stated that the complex nature of mathematics supports a constructivist theory of learning, which makes it suitable for computer-aided instruction. Fundamental to the understanding of constructivism is that pupils in mathematics classes should be active knowledge seekers and constructors. This pursuit of knowledge is fueled by natural innate curiosity.

Table 2
Post-Test Performance of Grade 3 Learners in Mathematics (N=20)

Data	Experimental Group	Interpretation	Control Group	Interpretation
No. of Pupils	20	Very High	20	High
No. of Items	30		30	
Total Score	526		438	
Mean	26.30		21.90	
MPS	87.67		73.00	

Table 2 presents the post-test performance of the Grade 3 learners in Mathematics for the control and experimental groups. It was revealed on the table that the post-test performance of Grade 3 learners in Math for the control group has a total score of 438 with an average mean of 21.90 and mean percentage score of 73.00 which is interpreted as high. This means that even without the intervention in teaching Math still this groups of learners were able to improve their performance. This implies that teachers had employed activities for the learners to work on and there were also learners who really were good in numbers.

Zhao, Valcke, Desoete, & Verhaeghe (2011) posited that an examination of Piaget's theory of learning is essential to the understanding of constructivism. His central idea is that knowledge proceeds neither solely from experience of objects or phenomenon nor from an innate programming performed in the subject but from successive constructions. From observation, in mathematics classes where traditional instructional strategies have been the dominant method of instruction, the pupils might not internalize the vast amount of knowledge or content that is presented by the teacher.

Moreover, this table also shows the post-test performance of the grade 3 learners in Math for the experimental group. It was revealed on the table that the post-test performance of the grade III learners in Math after the integration of computer-assisted instruction, the total score reached to 526 with average mean of 26.30 and mean percentage score of 87.67 which is interpreted as very high. This means that their performance had increased after the integration of computer-assisted instruction. This implies that computer-assisted instruction is an effective intervention in improving the performance of the learners in Mathematics.

Computer-Assisted Instruction (CAI) is the use of the computer to help in delivering the subject matter (Seo & Bryant, 2012). The computers and programs that go along with the instruction can provide use of many different types of hands-on opportunities with the touch of a

mouse. Some programs will have tools that are not as user friendly or require a short tutorial on how to use them correctly. As with most exposure to something new, the more practice with the tool will allow the students to become more familiar with its concept and application of the tool in their work (Christensen, 2016).

Table 3
Test of Difference Between the Scores in the Pre-Test and Post-Test Performances of Grade 3 Learners in Mathematics

Aspects	Test Scores		Computed T	Critical T	Decision	Interpretation
Experimental Group	Pre	54.83	0.03	0.05	Reject H_0	Significant
	Post	87.67				
Control Group	Pre	54.83	0.03	0.05	Reject H_0	Significant
	Post	73.00				

Table 3 presents the test of difference between the scores in the pre-test and posttest performance of the grade 3 learners for both groups. It was revealed on the table that for the experimental group, the pre-test was 54.83 and posttest of 87.67 with p value of 0.03 at .05 level of significance, so null hypothesis is rejected. This means that there is significant difference between the scores in the pre-test and posttest performance of the grade 3 learners in Mathematics. This implies that based on the data, computer assisted instruction is an effective intervention in improving the performance of the grade 3 learners in Mathematics.

Christmann and Badget (2000) examined the difference in achievement levels between pupils who were taught by the traditional instruction approach (control group) and pupils who had classes in which a CAI tool was used as a supplement to the traditional classes (the experimental group). In doing so, they compiled data from 26 studies. The overall results suggested a mean effect size of 0.127. Hence, pupils who were taught and who learned mathematics via an educational software as supplement to traditional teaching displayed higher achievement levels compared to the other pupils in the control group. Moreover, as denoted by Christmann and Badget (2000), the achievement level of the typical pupil in the experimental group increased from the 50th percentile to the 55th percentile.

Moreover, it was also revealed on the table that in the control group, the pre-test was 54.83 and posttest of 73.00 with p value of 0.03 at .05 level of significance, so null hypothesis is rejected. This means that there is significant difference between the scores in the pre-test and post-test performances of the grade 3 learners in Mathematics for the control group. This implies that based on the data, traditional method of teaching Math is also effective in improving the performance of the grade 3 learners in Mathematics but in minimal increased. Satsangi and Bouck (2015) stated, "When compared alongside concrete manipulatives increased skill attainment for each student using virtual manipulatives." The cognitive load theory presents that it is lacking a link to the

physical movements of concrete manipulatives and the ideas taught. Using manipulatives materials in teaching Math will also help in improving the performance of the pupils.

Table 4
Test of Difference Between the Scores in the Post-test Performance of Grade 3 Learners

Aspects	Test Scores		p value	Level of Sig	Decision	Interpretation
Post Test Scores	Control Experimental	73.00 87.67	0.04	0.05	Reject H _o	Significant

Table 4 presents the test of difference between the scores in the post-test performance of the grade 3 learners for both groups. It was revealed on the table that the posttest performance in the control group has mean percentage score of 73.00 and experimental group of 87.67 with p value of 0.04 at .05 level of significance, so null hypothesis is rejected. This means that there is significant difference between the scores in the post-test performance of the grade 3 learners in Mathematics for both groups. This implies that post-test results show that there is significant difference, for the post-test of the experimental group is higher with that of the control group. This implies further that integration of computer-assisted instruction is more effective than the traditional method of teaching the subject.

Pilli and Aksu (2013) employed a quasi-experimental research design to examine the impact of educational software for mathematics on 4th grade pupils' achievements in mathematics, the pupils' attitudes towards mathematics and computer-assisted teaching and learning as well as the retention of mathematical knowledge. They found that the educational software is an effective tool for teaching and learning mathematics in the sense that pupils who used the software in the classrooms achieved higher test scores and had more positive attitudes towards mathematics.

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IV. Conclusion

The data revealed that there is significant difference in the pre-test and post-test Mathematics performance of the Grade 3 learners for both groups and there is significant difference in the post-test scores in Math for the two groups. This means that computer-assisted instruction is an effective intervention in improving the performance of the grade 3 learners in Mathematics for it is child-friendly and easy to understand due to the pictures used in the activities and learners at the same enjoy answering the activities.

V. Recommendations

The researcher offered the following recommendations based on the result of the study:

1. The Math intervention plan formulated should be utilized;
2. School Heads should allocate funds for the procurement of IT equipment and software including maintenance on internet connectivity;
3. School Heads should provide technical assistance to the teachers in formulating different computer assisted instruction activities;
4. Teachers should enhance their teaching competencies in ICT through attending LAC sessions, trainings and seminars;
5. School Heads should encourage teachers for further learning on computer assisted instruction in teaching like joining the Microsoft Education and other IT related courses; and
6. Future researchers should replicate this study to include different locale, and include different variables aside from the mentioned in this study.

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