THE EFFECTS OF MOBILE LEARNING TOOLS IN MATHEMATICS AMONG FILIPINO GRADE 7 STUDENTS

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Abstract

The study was conducted to ascertain the effectiveness of using mobile learning tools in teaching Mathematics proficiency of Grade 7 students of the Eastern Samar National Comprehensive High School. The use of MLT as the experimental treatment was compared against the use of CLM. Pretest-posttest experimental design was used in determining the mathematics proficiency of two groups of classes. Each group composed of 30 respondents chosen using matched comparison of their mathematics performance based on their grades obtained in the previous quarter. The gathered data were subjected to analysis using statistical tools such as mean, standard deviation, and t-test for independent samples. On testing the hypothesis, the level of significance was set at 0.05. The results revealed no significant difference between the pretest mean scores of MLT and CLM which indicated an almost equal level of prior knowledge of the content and skills considered prior to the experimental process. On the other hand, a significant difference was revealed between the pretest and posttest mean scores of each group, posttest mean scores of the two groups and the mean learning gains scores of the two groups. The result implied that learning was evident on both groups. However, students taught with the use of mobile learning tools performed better than those of conventional learning method as indicated by the significant result on the learning gain scores. The result further justified that the use of mobile learning tools in teaching Mathematics is significantly effective than the conventional method to promote long-term retention of knowledge and skills acquired during the learning experience. A Mobile learning Tool Guide for teachers on using some of the online mobile learning platforms and applications was developed to enhance students proficiency in Mathematics. It is recommended that with appropriate pedagogy, mobile technology in the classroom can facilitate efficient and effective teaching-learning and thus resulted to improved mathematics proficiency.

Keyword: Mobile learning Tool, Conventional Learning Method, Mathematics Proficiency.

1 INTODUCTION

There had been recent changes in the local, national, and international mathematics standards that make some high school students to hardly grasp lessons in basic mathematics. Mathematics and Science education has prompted them to emphasize in their national agenda since it has long been recognized as a major factor in development. A priority concern of policy makers and educators worldwide is on students' learning and measurement of their performance. The Trends in Mathematics and Science Study (TIMSS), which is being done since 1995 and every four years hence by the International Association for the Evaluation of Educational Achievement (IEA), is one study that measures performance of students in mathematics and science which is generating increasing attention. The Philippines participated in 1999 and 2003. The Low achievement scores in National Achievement Tests and TIMSS reflects the poor quality basic education and put the Philippines in the 64th rank out of 71 countries with a mean performance of 377.7 in math for grade 8 (world bank, 2003) .This has pushed the Philippines to embrace the k-12 curriculum which has been started in 2013 .

The Department of Education (D.O. 72, s.2011) said that there was a poor National Achievement Test (NAT) result among almost two-thirds of the high schools of the country in 2011. It has been shown that among 5,600 secondary schools, approximately 67.10 percent earned scores within the "lower average" range which is 26 and 50 percent correct and 0.34 percent of schools earned scores between 0 and 25 percent in NAT.

The NAT MPS of High School in mathematics has declined in 2004-2012 from 50.70 to 46.37 (Pacific Policy Research Center, 2010). Although the National Achievement Test for grade 10 S.Y. 2017-2018 result which started to cover the 21st century skills gave the Region 8 an overall MPS of 45.09 which ranked 4th among 17 regions, the Mathematics got low MPS in terms of the three categories of 21st century skills especially in Information Literacy. The ESNCHS got the NAT MPS in mathematics of 49.3 (S.Y. 2012-2013), 42.27 (SY. 2013-2014), and 29.68 (S.Y. 2014-

2015) (DepEd- National Education Testing Research Center, 2018) .It was found out by the researcher that the National Achievement Test results of the region in the past years and the MPS of the school is continuously declining.

The alarming result of the recent National Achievement Test (NAT) and the mathematics Mean Percentage Scores (MPS) of High School students made the researcher realized to think of an intervention that would help increase the students' performance in mathematics. Since most of the students are techno-savvy, the researcher realized that the use of mobile learning tools could be a big help on their mathematics proficiency thus resulting to an improved performance.

Recently, the adaption of mobile technology for the purpose of supporting activities for the advanced learning has matured sufficiently and spread globally. Mobile technology seemed natural for the students since they're being surrounded by these in their daily lives. The advanced wireless technology has proliferated and facilitated learning where vast educational content can be accessed by individuals regardless of location. There are vast opportunities that Mobile technology offers for timely and active acquisition of knowledge (Woodill, 2011; Jones, Scanlon, & Clough, 2013). It is expected that mobile technology would play a significant role in educational settings because of its wide range of benefits (Cheon, Lee, Crooks, & Song, 2012, Lapada & Lapada, 2017).There are lots of online learning platforms where the use of mobile learning tools can be maximized.

Some schools in the Philippines like the public schools in Makati City were able to improve their students' performance in the recent National Achievement Test (NAT) by up to 30 percent in 2016, an accomplishment being attributed to an online platform designed to make learning more fun (Yee, 2016). Maria Theresa Namoro, ASDS (DepEd-Makati), said the students were able to raise their English proficiency and competency in Math and Science with the help of Quipper School, a free online learning tool that allows teachers to "streamline teaching methods and class management," enabling students to "learning in a fun and effective way." Jelis Mercader, the company's head of the content of the online learning platform said that the gamified lessons and quizzes further motivate students to master new concepts or skills.

Students born in this generation of digital era are called Digital Natives. Surround by computers, smart phones and tablets, they spent their daily activities using these technological gadgets. Due to the demand and growth of mobile and wireless technologies in the past few years, there has been an expansion of mobile learning. A new paradigm shift in teaching and learning dimension is being offered by mobile learning that conventional classrooms may not be able to offer. Thus, there is a need for teachers to incorporate technological devices in teaching process adapting the digital natives era (Lapada, et. al., 2020). This study therefore examines the effect of using mobile learning tools on the proficiency in Mathematics of Grade 7 students of the Eastern Samar National Comprehensive High School.

Objectives of the Study

The study aims to determine the effectiveness of the use of Mobile Learning Tools (MLT) on the mathematics academic achievement of Grade 7 Students of Eastern Samar National Comprehensive High School. The use of this material as an experimental treatment will be compared against the use of conventional learning method (CLM).

Specifically, this study tried to attain the following objectives:

1. Determine the level of mathematics proficiency of the MLT and the CLM groups in terms of the pretest mean scores.
2. Determine if there is a difference between the pretest mean scores of the two groups.
3. Determine the level of mathematics proficiency of the MLT and the CLM groups in terms of the post-test mean scores.
4. Determine if there is a difference between the post-test mean scores of the two groups.
5. Determine if there is a difference between pretest and post-test mean scores of each group.
6. Determine if there is a difference between the mean learning gains of the two groups.
7. Develop a Mobile-Learning Tool Guide for teachers

2 METHODOLOGY

Initially, the researcher sought necessary requests and permits to the school where the study was conducted. The study was conducted in Eastern Samar National Comprehensive High School located at Barangay Alang-alang, Borongan City, Eastern Samar, and is approximately two kilometers from the City proper of Borongan. The school is one of the two Comprehensive High schools in Eastern Samar and is considered one of the large High Schools in the province with the population of more or less 4300 with 107 sections and 167 teaching staff including the Senior High School as of 2019.

The pretest-posttest design was used. It has adapted the matched comparison sampling since comparative technique was used in choosing the respondents. The study used two groups, the MLT group under which the treatment was applied and the CLM group with no treatment applied. Two sections of the grade seven classes were used as population and the sampled respondents were taken based on their grade category (Table 1) and were the low performing students in mathematics for grade seven from both groups. The respondents from the two groups under study were believed to have same characteristics (academic performance) measured in terms of third quarter grade in math of the current school year.

The researcher adopted a mathematics achievement test composed of 30 multiple- choice item questions. Items were standardized and are found at the end of each lesson on the grade 7 & 8 learners' module provided by Department of Education. Both groups were given a pretest before the experimentation to assess the prior knowledge/initial capability of the students about the topics to be delivered. The researcher conducted a month of teaching of the same learning content to both MLT group (where mobile devices, mobile learning applications applicable to math lessons, online activities and gamified assessments were used) and CLM group (where learner's modules, common instructional materials, graphic organizers, and other teacher-made resources were used) during 4th quarter period of the school year. After the experimental process, the groups have undergone a post-test with the same set of questions as the pretest to assess their learning gain.

The researcher used the mean as the measure of average for the pretest scores, post-test scores, and learning gain score of the MLT and CLM group. Standard deviation for the spread of the scores and T-test were used as the statistical tool in finding the difference between pretests means, post-tests means, pretest-posttest means, and mean learning gain scores of each group, thus determining whether the use of MLT in teaching mathematics enhances the Mathematics proficiency among grade 7 student-respondents.

3 RESULTS AND DISCUSSION

Mathematics Proficiency level in terms of pretest result

The Mathematics proficiency level of the students determined by the raw scores in the test converted into percentage grade was transmuted with base percentage of 60. Descriptions and the grading scale used in determining the mathematics proficiency level were adopted from the School Form 9 – Learner Progress Report Card issued by the DepEd and stipulated in the DepEd Order 8, s. 2015. No one from the respondents met the expected standard percentage grade from the result of the pretest (Table 3). This observation may be attributed to the fact that the competencies were not yet achieved and the lessons were not yet studied prior to the conduct of the study.

The difference of the pretest mean scores between the MLT group and CLM group

The pretest results of the two groups as were compared to assess the homogeneity of the respondents prior to the experimental process (Table 4).There was a mean difference of 0.26 in the pretest results among the two groups. The scores of the CLM group were more spread compare to the MLT group with a difference in mean standard deviation of 1.04. The t-test result of the pretest of the two groups revealed a value p= 0.663 higher than the set significance level of 0.05. The result accepted the hypothesis stating that no significant difference in the pretest mean score of the two groups. This result implied that the respondents almost likely have same knowledge level prior to the conduct of the study.

Mathematics Proficiency level in terms of posttest result

Mathematics proficiency level of the respondents in terms of posttest result was identified based on the scores converted to percentage grade. It can be observed that only half of the respondents from the CLM group and 26 from the MLT group were able to meet the expected standard percentage grade (Table 5). This observation may be attributed

to the motivation of the students towards learning, the approaches used in teaching and other factors affecting learning. However, If the raw scores were compared, both groups earned a positive mean learning Gain Scores (LGS). Generally, a positive LGS means an increase in mathematics proficiency though some students from each group earned negative LGS which means a decrease in performance or even zero for no gain at all.

The differences of the posttest mean scores between the MLT group and CLM group

The two groups were also compared as to the extent of the difference in terms of posttest results (Table 6). A mean difference of 3.4 in the post-test results among the two groups was observed in favor of the MLT group presented in the Table 6. The scores of the CLM group were more spread compare to the MLT group with a difference in mean standard deviation of 1.042.The t-test result of the pretest of the two groups revealed a value p= 0.001 which is less than the set level of significance 0.05.The result rejected the hypothesis which states that no significant difference in the post-test mean score of the two groups. This result implied a significant difference in the post-test mean score of the two groups and the MLT group got a considerably higher scores compared to the CLM group.

Test on the difference between the pretest mean scores and the posttest mean scores

Regardless of which of the two methods under the study, the success and effectiveness of teaching is indicated by the assessment results and learning gained by the students. Whether positive learning occurred or not would further be understood by comparing the pretest and posttest result of each group (Table 7a & 7b). It can be noted that there was a big difference in the pretest and posttest mean scores in pretest and post-test of CLM group. Though the post-test result exceeded 4.83 mean score, it has more spread distribution compared to the pretest result with a difference in standard deviation of 1.453. The t-test result of the pretest and post-test of the CLM group revealed a value p= 0.000 which is less than the set level of significance 0.05. This result rejected the hypothesis which states that no significant difference in the pretest and post-test results of the CLM group. The pretest and post-test results of the MLT group were compared as well. A big difference of 7.97 in the mean scores was observed. The post-test result got more spread distribution compared to the pretest result with a difference in standard deviation of 1.451. The t-test result of the pretest and post-test of the MLT group revealed a value p= 0.000 which is less than the set level of significance 0.05. This result rejected the hypothesis which states that no significant difference in the pretest and post-test results of the MLT group. Objectives of the lessons were met and a positive learning occurred from the students.

Test on the difference between the Learning gain scores

To further validate whether a significant difference in the tests results was evident, A comparison between the mean Learning gains of the groups was conducted.

T-test for independent samples using 0.05 level of significance was used to compare the mean LGS of the two groups taken from the pretest and post-test. The mean learning gained in the experimental group was higher compared to that of the control group with a difference of 3.14 (Table 8). However, a significant difference between the mean LGS of the two groups needs to be determined. In terms of variability, the scores in of the MLT group were more spread in relation to the mean with the difference in standard deviation of 0.67.

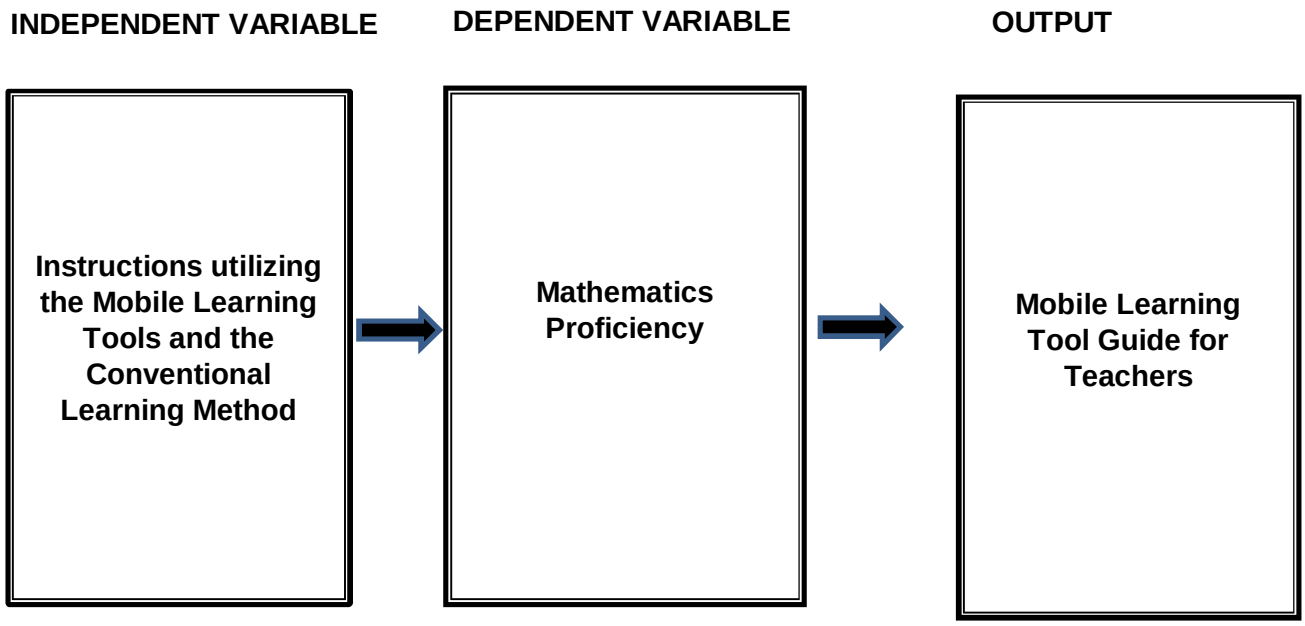

Figure 1. Figure illustrating the variables in the study and their relationships.

The results further indicate that more students from the MLT group gained a considerable difference in content knowledge from the other group. From the t-test result validated through SPSS, the computed p-value of 0.002 is less than the set level of significance (0.05). The result rejects the hypothesis that states no significant difference in mathematics proficiency of students from the two groups and therefore indicates a significant difference in academic performance of students from the two groups. The learning gain scores of LMT group was significantly higher than the CLM group.

Table 1. Number of respondents for each group per category

Grade in Math	CLM Group	MLT Group
84-86	4	4
81-83	6	6
78-80	12	12
75-77	8	8
Total	30	30

Table 2. Respondents and their corresponding Quarter 3 grade in Math

Student	Grade	
	CLM Group	MLT Group
1	75	75
2	75	76
3	76	76
4	76	77
5	76	77
6	77	77
7	77	77
8	77	77
9	78	78
10	78	79
11	79	79
12	79	79
13	79	79
14	79	80
15	80	80
16	80	80
17	80	80
18	80	80
19	80	80
20	80	80
21	82	81
22	82	83
23	82	83
24	83	83
25	83	83
26	83	83
27	85	84
28	86	85
29	86	86
30	86	86

Table 3. Mathematics Proficiency level of CLM and MLT groups in terms of pretest result

Description & Grading Scale	Frequency	
	CLM group	MLT group
Outstanding (90-100)	0	0
Very satisfactory (85-89)	0	0
Satisfactory (80-84)	0	0
Fairly satisfactory (75-79)	0	0
Did not meet Expectations (below 75)	30	30
Total	**30**	**30**

Table 4. The T-test result of the pretest scores of the MLT and the CLM group.

Groups	N	Mean	SD	Mean Difference	p-value	Interpretation
MLT	30	11.93	1.78	0.26	.663	not significant
CLM	30	11.67	2.82			

Difference is not significant at α= .05

Table 5. Mathematics proficiency of CLM and MLT groups in terms of posttest result

Description & Grading Scale	Frequency	
	CLM group	MLT group
Outstanding (90-100)	0	0
Very satisfactory (85-89)	0	5
Satisfactory (80-84)	5	11
Fairly satisfactory (75-79)	9	10
Did not meet Expectations (below 75)	16	4
Total	**30**	**30**

Table 6. T-test of the posttest results of the MLT and CLM group.

Groups	N	Mean	SD	Mean Difference	Interpretation
MLT	30	19.90	3.231	3.4	significant
CLM	30	16.50	4.273		

Difference is significant at α= .05

Table 7.a T-test of the pretest and posttest results of the CLM group.

CLM	N	Mean	SD	Mean Difference	p-value	Interpretation
PRETEST	30	11.67	2.820	4.83	.000	significant
POSTTEST	30	16.50	4.273			

Difference is significant α= .05

Table 7.b T-test of the pretest and posttest results of the MLT group.

MLT	N	Mean	SD	Mean Difference	p-value	Interpretation
PRETEST	30	11.93	1.780	7.97	.000	significant
POSTTEST	30	19.90	3.231			

Difference is significant α= .05

Table 8. T-test of the Learning Gains of the CLM and MLT group.

Groups	N	Mean	SD	Mean Difference	p-value	Interpretation
MLT	30	7.97	3.399	3.14	.002	significant
CLM	30	4.83	4.069			

Difference is significant α= .05

4 CONCLUSIONS

Based on the findings summarized, conclusions were drawn and include:

1. The MLT and the CLM groups got almost equal scores from the pretest conducted. The two groups got almost equal mathematics proficiency as determined by their pretest mean score.
2. No significant difference between the pretests mean scores of each group was observed. It can therefore be concluded that the respondents from each group were more likely homogeneous, performed almost equally and most likely to have same level of prior knowledge of the content and skills considered prior to the experimental process.
3. The MLT group generally scored higher than the CLM group from the post-test conducted. The former group got higher mathematics proficiency as determined by the difference in their post-test mean score.
4. A significant difference between the post-test mean scores of each group was evident. It can therefore be concluded that the MLT group generally had better mathematics proficiency than the CLM group in terms of the significant difference in their post-test mean scores.
5. Learning was generally evident in both groups as justified by the comparison of the pretest and post-test results within each group. Both groups earned a positive learning gain regardless of the scores earned in both tests. The MLT group generally earned higher learning gain as determined by the difference between the pretest and post-test mean scores of each group.
6. The students taught with the use of mobile learning tools performed better than those of conventional learning method. This result of the test on the difference of the mean LGS of the two groups further justified that the use of mobile learning tools in teaching in Mathematics is significantly more effective than the conventional method in skills acquisition and promoting long-term retention of knowledge during the learning experience.
7. A Mobile-Learning Tool Guide for teachers was developed.

It can therefore be concluded that use of Mobile Learning Tools (MLT) enhances the Mathematics proficiency of students.

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