EFFECTS OF EDUCATIONAL GAMES AS INSTRUCTIONAL TOOLS IN TEACHING COLLEGE ALGEBRA

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ABSTRACT Time and again, curriculum planners, policy makers and researchers have been exploring the extent thru which numeracy among students develops and improves via Mathematics instruction. The quality of Mathematics education in the country is alarming. Some measures have been exhausted to address this discipline's status which is attributed to multi-faceted reasons, and causes. Commonly, students in college experience the most difficult phase in learning Mathematics. No matter how difficult a subject is, a competent instructor could make it easy. Believing that everything exists with its own hidden value, educational games do have its greatest value in the field of Mathematics especially in College Algebra. Thus, to help the Math instructors and other stakeholders solve the difficulties that students encounter in College Algebra, the researchers aimed to determine the effectiveness of educational games as instructional tools in teaching College Algebra among bona fide freshman students of Guimaras State College- Mosqueda and Salvador Campuses for the first semester of academic year 2015-2016. This study utilized the thirty (30) – item pretest and posttest multiple- choice questionnaire that undergone validation and reliability (Cronbach's alpha = 0.803). Communications to proper authorities were secured. This study used pretest posttest design between two groups: experimental in Mosqueda Campus, and controlled in Salvador Campus. Each group had thirty (30) subjects taught and facilitated by the same researcher instructor. The experimental group had an intervention of educational games while the controlled group had lecture method. Both groups had been taught for one term with the same time frame and topics. Mean scores were used to determine the performances of two groups while paired samples t-tests were used to determine the differences of their test results. Results were collected, organized, presented, analyzed, and interpreted using the Statistical Package for Social Sciences (SPSS) software program. The level of significance was set at 0.05. Results revealed that subjects in the experimental group had higher performance than controlled group based on their pretest and posttest mean scores. Likewise, there were significant differences on their pretest and posttest results. Hence, the null hypotheses were rejected. These results implied that educational games as instructional tools were better than pure lecture method in the teaching-learning process of the 21st century learners. Thus, educational games shall be used in other disciplines or areas, not only in College Algebra, and these shall serve as bases for extension programs for those learners who encounter difficulties in learning Mathematics.

Keywords: Mathematics, educational games, College Algebra

INTRODUCTION

Background of the Study

Time and again, curriculum planners, policy makers and researchers have been exploring the extent thru which numeracy among students develops and improves via Mathematics instruction. The quality of Mathematics education in the country is alarming. Some measures have been exhausted to address this discipline's status which is attributed to multi-faceted reasons, and causes.

Commonly, students in college experience the most difficult phase in learning Mathematics. College Algebra is a subject that deals with symbols that are easy to visualize. This course will enable the students to think critically by solving and graphing equalities and inequalities, applying algebraic expressions and linear equations in practical contexts, solving problems on combinatorial progression, and solving problems about exponential and logarithmic functions. This can also serve as a foundation for higher Mathematics that will help them consider that this subject can be of help on their daily existence. It takes an almost mystic character as students in all parts of the world to either struggle with it and find it quite difficult or find it a great deal of enjoyment and satisfaction(The Modern Teacher. (1999) Vol. 48. No. 3. Pp. 91-94).

Instructors are no longer demonstrating basic Arithmetic at this level, but are asked to introduce difficult concepts. Although College Algebra may seem less visual, and hands on fractions, for instance, is actually very tangible. If taught correctly, College Algebra is accessible and provides the basics in critical thinking and logic skills that have impacts outside the realm.

No matter how difficult a subject is, a competent instructor could make it easy. Believing that everything exists with its own hidden value; educational games do have its greatest value in the field of Mathematics especially in College Algebra.

Thus, to help the Math instructors and other stakeholders solve the difficulties that students encounter in College Algebra; the researchers came up with the study entitled: "Effects of Educational Games as Instructional Tools in Teaching College Algebra."

Statement of the Problem

Generally, this study aimed to determine if educational games were effective instructional tools in teaching College Algebra among bona fide freshman students of Guimaras State College- Salvador and Mosqueda Campuses for the first semester of academic year 2015-2016. Specifically, it sought answers to the following questions:

1. What is the pre-test performance of the subjects between experimental and controlled groups?
2. What is the post-test performance of the subjects between experimental and controlled groups?
3. Is there a significant difference between pre-test results of the experimental and controlled groups?
4. Is there a significant difference between post-test results of the experimental and controlled groups?
5. Is there a significant difference between post-test and pre-test results of the controlled group?
6. Is there a significant difference between post-test and pre-test results of the experimental group?

METHODOLOGY

Research Design

The experimental method of research was used in this study. This study used the pre-test posttest design.

Experimental Group ➔ Pretest ➔ Educational Games ➔ Posttest
Controlled Group ➔ Pretest (same test) ➔ Posttest (same test)

Subjects of the Study

The subjects of this study were the bona fide freshman students of Guimaras State College - Salvador and Mosqueda Campuses who took College Algebra as their subject in the first semester of academic year 2015-2016.
Thirty students at Mosqueda Campus were subjected to educational games, and thirty students were not subjected to educational games at Salvador Campus.

Research Instruments

This study utilized the pretest and posttest questionnaires. The pretest and posttest were multiple-choice types of tests. These were thirty (30) - item tests that were duly validated by three experts at Guimaras State College. These instruments also underwent reliability testing with Cronbach's alpha = 0.803.

Data Gathering Procedure

This study was conducted in the first semester of the academic year 2015-2016 at Guimaras State College particularly the bona fide freshman students who took College Algebra as their subject. In the administration of this study, permission from the authorities was secured. Communication was prepared, and submitted to the proper authorities. Letter for the respondents was also facilitated.

This study used pretest- posttest design between two groups: experimental in Mosqueda Campus, and controlled in Salvador Campus. Each group had thirty (30) subjects taught and facilitated by the same researcher/ instructor. The experimental group had an intervention of educational games while the controlled group had lecture method. Both groups had been taught for one term with the same time frame and topics. Mean scores were used to determine the performances of two groups while paired samplesv t-tests were used to determine the differences of their test results. Results were collected, organized, presented, analyzed, and interpreted using the Statistical Package for Social Sciences (SPSS) software program. The level of significance was set at 0.05.

Statistical Tools

The Descriptive Statistics used were the mean and standard deviation to describe the performance of freshman students after the use of educational games as instructional tools in teaching College Algebra. For the inferential analyses, paired samples t-tests for mean differences of two variables between two groups (controlled and experimental) were used. Significance level was set at 0.05 for two-tailed test.

RESULTS AND DISCUSSION

Pre-test Performance of the Subjects between Experimental and Controlled Groups

Table 1 shows the pre-test performance of the subjects between experimental and controlled groups. Results revealed that pretest performance in the experimental group M (4.9333), SD (2.69013) while the pre-test performance in the controlled group was M (3.5667), SD 1.71572). This implies that the subjects before the intervention of educational mathematical games as instructional tools in the experimental group performed better than controlled group based on their pre-test results in College Algebra.

Table 1. Pre-test Performance of the Subjects between Experimental and Controlled Groups

	N	Mean	Std. Deviation	Variance
Pre-test (Experimental Group)	30	4.9333	2.69013	7.237
Pre-test (Controlled Group)	30	3.5667	1.71572	2.944

Post-test Performance of the Subjects between Experimental and Controlled Groups

Table 2 shows the post-test performance of the subjects between experimental and controlled groups. Results revealed that the post-test performance in the experimental group was M(27.6667),SD (2.42591) while the post-test performance in the controlled group was M(21.3333),SD (2.56412). This implies that the subjects after the intervention of educational games as instructional tools in the experimental group performed better than those subjects in the controlled group where there was no intervention of educational games in College Algebra.

Table 2. Post-test Performance of the Subjects between Experimental and Controlled Groups

	N	Mean	Std. Deviation	Variance
Post-test (Experimental Group)	30	27.6667	2.42591	5.885
Post-test (Controlled Group)	30	21.3333	2.56412	6.575

Difference between Pre-test Results/Performance of the Experimental and Controlled Groups

Table 3 shows the difference between pre-test results of the subjects in the experimental and controlled groups. Results revealed that there was a significant difference t(2.177), sig. 2-tailed(0.038) between the groups. This implies that the subjects performed differently even before the intervention of educational games in the experimental group.

Table 3. Difference between Pre-test Results/Performance of the Experimental and Controlled Groups (Paired Samples Test)

	Paired Differences					t	df	Sig. (2-tailed)	Interpretation
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper				
Pre-test (Experimental Group) - Pre-test (Controlled Group)	1.36667	3.43896	.62787	.08254	2.65079	2.177	29	.038	Significant

* $\propto < 0.05$ *level of significance*

Difference between Post-test Results/Performance of the Experimental and Controlled Groups

Table 4 shows the difference between post-test results of the subjects in the experimental and controlled groups. Results revealed that there was a significant difference t(10.033), sig. 2-tailed (0.000) between the two groups. This implies that the subjects in the experimental group after the intervention of educational games as tools have higher performance than the controlled group with no intervention of educational games in College Algebra.

Table 4. Difference between Post-test Results/Performance of the Experimental and Controlled Groups (Paired Samples Test)

	Paired Differences					t	df	Sig.(2-tailed)	Interpretation
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper				
Post-test (Experimental Group) - Post-test (Controlled Group)	6.33333	3.45746	.63124	5.04230	7.62437	10.033	29	.000	Significant

* $\propto < 0.05$ *level of significance*

Difference between Post-test and Pre-test Results/Performance of the Controlled Group

Table 5 shows the difference between post-test and pre-test performance of the controlled group with no intervention of educational games. Results revealed that there was a significant difference between pre-test and post-test results t(39.800), sig. 2-tailed(0.000). This implies that the subjects improved their performance even without the intervention of educational games in College Algebra.

Table 5. Difference between Post-test and Pre-test Results/Performance of the Controlled Group (Paired Samples Test)

	Paired Differences					t	df	Sig. (2-tailed)	Interpretation
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper				
Post-test (Controlled Group) - Pre-test (Controlled Group)	17.76667	2.44503	.44640	16.85368	18.67966	39.800	29	.000	Significant

* $\propto < 0.05$ *level of significance*

Difference between Post-test and Pre-test Results/Performance of the Experimental Group

Table 6 shows the difference between post-test and pre-test performance of the experimental group with the intervention of educational games. Results revealed that there was a significant difference between pre-test and post-test results t(49.451), sig. 2-tailed(0.000). This implies that the subjects really improved their performance with the intervention of educational games as tools in College Algebra.

Table 6. Difference between Post-test and Pre-test Results/Performance of the Experimental Group (Paired Samples Test)

	Paired Differences								
				95% Confidence Interval of the Difference					Interpretation
	Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	Sig. (2-tailed)	Significant
Post-test (Experimental Group) – Pre-test (Experimental Group)	22.73333	2.51798	.45972	21.79310	23.67356	49.451	29	.000	

* $\propto < 0.05$ *level of significance*

CONCLUSION

1. Based on the pre-test results, the subjects between experimental and controlled groups had different performance based on their mean scores. Experimental group performed better than controlled group.
2. Based on the post-test test results, the subjects between experimental and controlled groups had different performance based on their mean scores. Experimental group performed better than controlled group.
3. Based on the pre-test results, there was a significant difference before the intervention of educational games in the experimental group. Hence, H0 was rejected.
4. Based on the post-test results, educational games as tools in teaching College Algebra really had a significant difference. Hence, H0 was rejected.
5. Based on the pre-test and post-test results, there was a significant difference between pre-test and posttest results of the controlled group. Hence, H0 was rejected.
6. Based on the pre-test and post-test results, educational games as tools in teaching College Algebra really had a significant difference. Hence, H0 was rejected.

RECOMMENDATION

1. It is recommended that the college instructors must have to strengthen and utilize the use of educational mathematical games as tools in teaching Mathematics, not only College Algebra.
2. It is recommended that educational games must be part of every subject area in Mathematics since it has an important role to play in teaching and learning mathematical concepts.
3. It is recommended that instructors and professors must try educational games as tools in teaching Mathematics, especially concepts in College Algebra.
4. It is recommended that instructors and professors must include educational games in areas of Mathematics in order to strengthen their students' critical thinking skills while they have fun learning Mathematics.
5. It is recommended that instructors and professors must use these educational games as tools to improve students' performance and appreciation on the language and beauty of Mathematics.
6. It is recommended that educational games must also be used in other areas aside from teaching College Algebra. These can be used as an educational extension program to students who had difficulty to grasp in learning Mathematical concepts. These can help to unlock the wrong notion on Mathematics as the most difficult discipline.

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