Comparisons of Mathematics Achievement, Attitude towards Mathematics and Analytical Thinking between Using the Geometer's Sketchpad Program as Media and Conventional Learning Activities

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ABSTRACT

This study aimed to compare mathematics learning achievement entitled Parabola, attitude towards mathematics, and analytical thinking abilities of Mathayomsuksa 3 (grade 9) students between organization of activities using the Geometer's Sketchpad Program as media and organization of activities using conventional method. They were assigned into an experimental group of 38 students who learned using organization of learning activities by the use of the Geometer's Sketchpad Program, and a control group of 39 students who learned using the conventional organization of learning activities. The research instruments used in the study included 12 lesson plans for organization of activities using the Geometer's Sketchpad Program and 12 lesson plans for conventional organization of activities., a 30-item of multiple-choice mathematics achievement test, a 30-item analytical thinking ability test, and a 30-item scale on attitude towards mathematics. Mean, standard deviation, Pearson correlation (r_{xy}), t-test (independent samples), and Hotelling's T^2 were employed for testing hypotheses.

The findings revealed that students who learned using organization of activities by the use of the Geometer's Sketchpad Program as media had higher attitude towards mathematics learning than those organization of activities Using conventional method at the .05 level of statistical significance. In addition, students who learned using organization of activities by the use of the Geometer's Sketchpad Program as media had higher mathematics achievement entitled, Parabola and more analytical thinking abilities than those who learned using the organization of activities using conventional method at the .05 level of significance

Keywords: Mathematics Achievement, Attitude toward mathematics, Analytical thinking, GSP Geometer's Sketch Program

INTRODUCTION

Computer plays an important role in the educational contexts. The use of computer technology makes it easier to create learning environments that enhance learning competences (Bransford et.al., 1999). The new technologies can help our students to draw difficult understanding and help to create an active problem-solving environment. Technology is promoted and effective tool to teach and learn geometry. When technology is used appropriately, it can provide a rich environment in which students' geometric understanding. Computers with appropriate software transform the mathematics classroom into a laboratory much like the environment in many classes.

One of the important vehicles of technological chance in geometry classroom is the use of Geometers' Sketchpad (Jackiw, 1991). It can enhance students understanding or will enhance the pedagogical process (Habre & Grunmeier, 2007), allows mathematics to be taught visually to the class as a whole, to small groups, or to individuals, also to serve interaction between teacher, student, and computer (Lester, 1996; Yousif, 1997; Baharvand, 2001, Gaeddert, 2001; Baharvand, 2001; Myles, 2006; Thompson, 2006). The software enables students and teachers to investigate and construct unlimited geometric shapes. The shapes are first created and then they are explored, manipulated and transformed to ideal concept (Venkataraman, 2007).

This study tries to study way of learning mathematics through computer and technology. Two instructional methods are to affect learning outcomes. Organization of activities using the Geometer's Sketchpad Program as media and organization of activities using conventional method were raised and measured learning outcomes in terms of mathematics learning achievement, attitude towards mathematics, and analytical thinking abilities. The results of study will be discussed and future classroom applications will be considered.

METHODOLOGY

Participant

Seventy seven students of Huaymek school, Kalasin Province were sampled by cluster random sampling. They were assigned into an experimental group of 38 students who learned using organization of learning activities by the use of the Geometer's Sketchpad Program, and a control group of 39 students who learned using the conventional organization of learning activities.

Research Instruments

The research instruments used in the study included 12 lesson plans for organization of activities using the Geometer's Sketchpad Program and 12 lesson plans for conventional organization of activities., a 30-item of multiple-choice mathematics achievement test with discriminating powers (B) ranging .21-.63 and a reliability of .97, a 30-item analytical thinking ability test with difficulties (p) ranging .32-.80, discriminating powers (r) ranging .24-.80 and a reliability of .88 ;

and a 30-item scale on attitude towards mathematics with discriminating powers (r_{xy}) ranging .31-.73 and a reliability (α) of .93. Mean, standard deviation, Pearson correlation (r_{xy}), t-test (independent samples), and Hotelling's T^2 were employed for testing hypotheses.

Procedure

The study employed two group pretest-post test design, is widely used to compare different kind of instructional method. Firstly, correlation between independent variables; mathematics learning achievement, attitude towards mathematics, and analytical thinking ability were analyzed by Pearson Product Correlation Coefficient. Secondly, comparison of attitude towards mathematics between control and experimental groups by t-test (independent samples), Finally, comparison of mathematics learning achievement and analytical thinking ability between control and experimental group by Hotelling's T^2.

RESULTS

Correlation between mathematics learning achievement, attitude towards mathematics, and analytical thinking ability

Mathematics learning achievement and analytical thinking ability were correlated by means of .01 statistics different significantly, but attitude towards mathematics was not difference as be shown in Table 1.

Table 1 Correlation between mathematics learning achievement, attitude towards mathematics, and analytical thinking ability.

	Mathematics Learning Achievement	Analytical Thinking Ability	Attitude towards Mathematics
Mathematics learning achievement	-	.544	.206
Sig		.000	.072
Analytical thinking ability	-	-	.126
Sig			.274

Comparison of attitude towards mathematics between control and experimental groups

Attitude towards mathematics score of control group had lower than those experimental group at .05 statistical differences as be shown in Table 2.

Table 2 Comparison of attitude towards mathematics between control and experimental groups

Group	N	$\overline{X}$	S.D.	t	p
Control	39	97.538	11.758	2.320	.012
Experiment	38	105.000	16.070		

Comparison of mathematics learning achievement and analytical thinking ability between control and experimental groups

Average and standard deviation of mathematics learning achievement and analytical thinking ability between control and experimental groups can be shown in Table 3. In addition analysis of multiple of variance by comparing mathematics learning achievement and analytical thinking ability between control and experimental groups as be shown in Table 4.

Table 3 Comparison of mathematics learning achievement and analytical thinking ability between control and experimental groups by using Hotelling's T^2

Variables	Experimental group		Control group	
	$\overline{X}$	S.D.	$\overline{X}$	S.D.
Learning achievement	17.71	5.65	13.10	6.01
Analytical thinking	19.76	4.25	19.13	4.48

Table 4 Analysis of multiple of variance by comparing mathematics learning achievement and analytical thinking ability between control and experimental groups

Variables	criteria	Value	Hypothesis df	Error df	F	p
Learning activity	Pillai's Trace	.161	2.0	74	7.125	.001
	Wilks's Lambda	.839	2.0	74	7.125	.001
	Hotelling's T^2	.193	2.0	74	7.125	.001
	Roy's Largest Root	.193	2.0	74	7.125	.001
Variables	Contrast	SS	df	MS	F	p
Learning achievement	Contrast	408.672	1	408.672	12.004	.001
	Error	2553.406	75	34.045		
Analytical thinking ability	Contrast	7.760	1	7.760	.407	.526
	Error	1431.227	75	19.083		

Mathematics learning achievement, analytical thinking ability between organization of activities using the Geometer's Sketchpad Program as media and organization of activities using conventional method were statistical significantly differences at .05

CONCLUSIONS

Attitude towards mathematics learning is not correlate to mathematics learning achievement and analytical thinking ability. Students who learned using organization of activities by the use of the Geometer's Sketchpad Program as media had higher attitude towards mathematics learning than those organization of activities using conventional method at the .05 level of statistical significance. The result indicate that students who learned by Geometer's Sketchpad need more time to implement (Yousif, 1997; Baharvand, 2001; Myles, 2006; Thompson, 2006). The Geometer's Sketchpad, is easy to use, fun to learn, based on hands-on activities that stimulates students inquiring mind. Students who learned using organization of activities by the use of the Geometer's Sketchpad Program as media had higher mathematics achievement entitled Parabola and more analytical thinking abilities than those who learned using the organization of activities using conventional method at the .05 level of significance. Lester (1996) Baharvand (2001) and Gaeddert (2001) also found that students to learn mathematics through direct action learning. Students can be made their visual in terms of Parabola, and interact with learning environment. It can be concluded that the organization of activities using the Geometer's Sketchpad Program as media could engage students reached mathematics in efficiently. Therefore, mathematics teachers should be promoted to apply this approach to pedagogical implication in the future.

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