

EDUCATIONAL TECHNOLOGY: APPLYING MICROSOFT MATHEMATICS TO ENRICH STUDENTS' MATHEMATICS LEARNING AND INCREASE MOTIVATION

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ABSTRACT

Microsoft Mathematics is one of free software for teachers made by Microsoft Corporation that can be applied as an integrating technology in mathematics learning. Using Microsoft Mathematics can help students both in visualizing and understanding the mathematics concepts and problems. This study presents the findings of investigating the use of Microsoft Mathematics, focusing on students' attitudes and opinions. Survey, experiment, and interview were conducted to collect the data. The subject of this study is the students from the first to third-years student in department of Computer System, Universitas Serang Raya. This study found that applying Microsoft Mathematics has the positive influence of educational technology in enriching students' mathematics learning and increasing students' motivation to get more involved in classroom learning activities.

Keywords: educational technology; information technology application; mathematics education; microsoft mathematics; students' motivation

1. INTRODUCTION

Over the last few decades, technology has become a very important tool in everyday life. Computers have become a common tool for communication, text processing, and many other activities, including various types of media, audio, graphics, video, and virtual reality. The use of computers and technology are not only for entertainment and communication, but also education. Application of technology in education is in the use utilization of processes and product of information technology to solve the problems in teaching and learning, known as educational technology [1].

Educational technology is the efficient organization of any learning system adapting or adopting methods, processes, and products to serve identified educational goals [2]. Educational technology can be used by all educators who want to integrate technology in their teaching. Technology have important role and give powerful influence on teaching and learning mathematics [3]. Microsoft Mathematics is one of free software made by Microsoft Corporation that utilized both teachers teach several mathematics content and students learn solve the problem such as Calculus, Statistics, Trigonometry and Linear Algebra.

2. RESEARCH BACKGROUND

Today's students –K through college- represent the first generations to grow up with this new technology [4]. Students persistently report that they prefer moderate use of Information and Communication Technologies in their courses [5]. Today's generation as Youth (Y) generation need integration of technology in their learning process to assist and challenge their understanding [6].

Integrating technology into classroom activities allows students to become more engaged in the lecture [7]. In addition, involving educational technology in the classroom possibly will be strategy to improve teaching and learning [8]. It has become a strategy since educational technology perceived as a tool for improving the presentation of material for making teaching and learning more fun for the learners, supporting innovative teaching, and encouraging active learning [9].

Technology and teacher motivation have positive effects on students motivation. It helps students actively participate in the learning instead of passively watching [10]. Implementing technology in learning indicated that the students were very attentive and engaged in learning that improves students motivation through this activity [11].

3. METODHOLOGY

This research paper aims to explore the current situation concerning the use and adoption of Microsoft Mathematics by the students in department of Computer System, Universitas Serang Raya. To accomplish this purpose both survey and experiment were conducted. A random of 240 students from the first to third-years student in department of Computer System was selected for the survey.

An experiment was conducted by 22 students from the first-year student in department of Computer System to investigate the use of Microsoft Mathematics in mathematics teaching and learning, focusing on students' mathematical understanding, their attitudes and opinions in relation to such experience. The students were divided randomly in two groups: control and experimental group. Both the control and experimental group were asked to attend six lectures. Teaching and learning in the control group were conducted using the traditional technique, while in the experimental group were conducted using Microsoft Mathematics. At the end of the lecture, both groups completed two questionnaires indicating their attitudes toward and self-confidence in mathematics and computers. In addition, the experimental group was asked to complete a questionnaire about their attitudes toward using Microsoft Mathematics.

The survey used a questionnaire that was adopted by Abrami, Wozney, Venkatesh (2006) [12], and the questionnaires were used in experiment study was taken from an article written by Fogarty, Cretchley, Harman, Ellerton, Konki (2001) [13]. In the article explained that the questionnaire is validated and used to measure confidence in mathematics, belief in the computer program and attitudes toward using technology in learning mathematics, in this focus study is Calculus.

4. FINDING AND DISCUSSION

4.1 Classification of Participant

The classification characteristics of the participants are showed in Table 1 and Table 2. The results in Table 1 illustrate that the majority of participants were male in age group 17-22 (71.67%; 81.67%). Moreover, the results demonstrate that the most of the participant were from the first year students (42.67%).

TABLE 1 Selected Characteristic of the Participants

Classification Information		%
Gender	Male	28.33
	Female	71.67
Age	17-22	81.67
	23-28	18.33
Students' Year	1 st (First)	41.67
	2 nd (Second)	30.83
	3 rd (Third)	27.5

The results in Table 2 illustrated the classification characteristics of the experiment participants. The table shows that the majority both of group (experimental and control) were male in age group 17-19 (experimental group: 63.64%, 81.82%; control group: 72.73%, 90.91%).

TABLE 2 Selected Characteristic of the 22 Participants Both Experimental and Control Group

Classification Information		%	
Experimental Group	Gender	Male	63.64
		Female	36.36
	Age	17-19	81.82
		20-22	18.18
Control Group	Gender	Male	72.73
		Female	27.27
	Age	17-19	90.91
		20-22	9.09

4.2 Descriptive Analysis

a. The Proficiency Levels of Students Related to Educational Technology

Table 3 described the proficiency levels of students as a user has in relation to educational technology. The results show that almost most of students are in the average to use computer related to educational technology (29.17%). The detail of students' proficiency levels can be noticed in the following table.

TABLE 3 The Proficiency Levels of Students to Use Educational Technology

Students' Proficiency	%
Unfamiliar I have no experience with computer technologies	0
Newcomer I have attempted to use computer technologies, but I still require help on a regular basis	9.58
Beginner I am able to perform basic functions in a limited number of computer applications	16.67
Average I demonstrate a general competency in a number of computer technologies	29.17
Advanced I have acquired the ability to completely use a broad spectrum of computer technologies	20
Expert I am extremely proficient in using a wide variety of computer technologies	24.58

b. The six Stage that Best Describes Related to Teaching Activities of Integrating Education Technology

TABLE 4 The Six Stage of Students Related to Teaching Activities of Integrating Educational Technology

Students' Stage	%
Awareness I am aware that technology exists, but have not used it – perhaps I'm even avoiding it. I am anxious about the prospect of using computers	7.5
Learning I am currently trying to learn the basics. I am sometimes frustrated using computers and I lack confidence when using them	25.83
Understanding I am beginning to understand the process of using technology and can think of specific tasks in which it might be useful	16.67
Familiarity I am gaining a sense of self -confidence in using the computer for specific tasks. I am starting to feel comfortable using the computer	13.75

Adaptation I think about the computer as an instructional tool to help me and I am no longer concerned about it as technology. I can use many different computer applications	15.42
Creative Application I can apply what I know about technology in the classroom. I am able to use it as an instructional aid and have integrated computers into the curriculum	20.83

c. The Attitudes Toward and Self-Confidence in Mathematics and Computer

Both control and experimental group have given the questionnaire 1 and 2. The questionnaire 1 is about mathematics confidence attitudes and the questionnaire 2 is about computer confidence attitudes. Here below are the following details of the results.

TABLE 5 Scores of Students in the Control Group in the Questionnaire 1 and 2

Students' Code	Mathematics Confidence	Computer Confidence
S12	37	35
S13	46	49
S14	26	60
S15	42	45
S16	40	57
S17	42	47
S18	48	54
S19	46	45
S20	50	47
S21	46	60
S22	47	51
Mean	42.73	45.83

TABLE 6 Scores of Students in the Experimental Group in the Questionnaire 1 and 2

Students' Code	Mathematics Confidence	Computer Confidence
S1	52	59
S2	48	56
S3	41	50
S4	31	42
S5	35	44
S6	32	38
S7	29	52
S8	39	46
S9	48	53
S10	42	54
S11	49	54
Mean	40.55	49.82

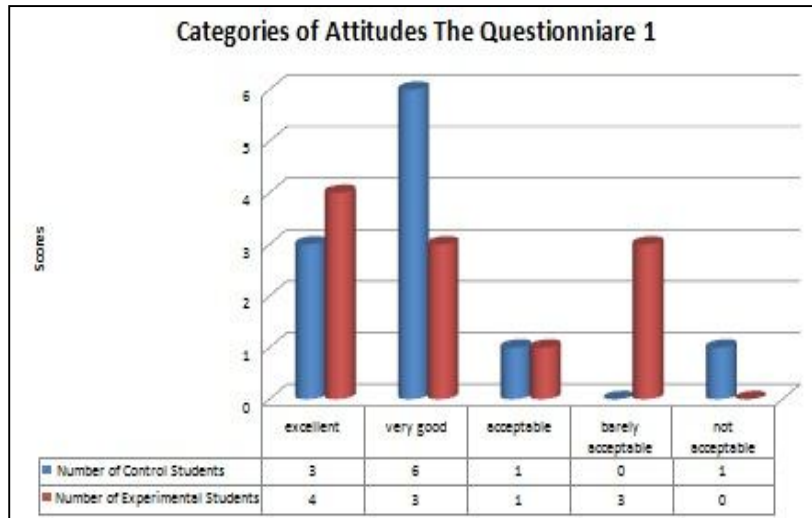


Figure 1. Categories of Attitudes Both Control and Experimental Group Based on the Responses from the Questionnaire 1

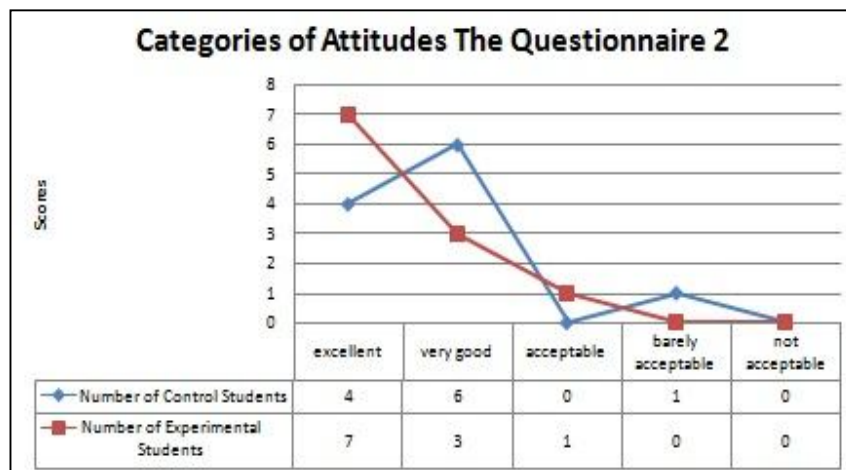


Figure 2. Categories of Attitudes Both Control and Experimental Group Based on the Responses from the Questionnaire 2

According to the Figure 1, mostly students in the control group had “very good” attitudes related to mathematics confident and generally students in the experimental group had “excellent” attitudes. Associating with computer confident, from the Figure 2 can be noticed that commonly students in the control group had “very good” attitudes and in the main students of the experimental group had “excellent” attitudes.

d. The Experimental Group

As already informed in the methodology chapter, one of the instruments given to the experimental group was a questionnaire 3 about the attitudes toward using Microsoft

Mathematics during the mathematics learning in the classroom. In the Table 7 shows the scores for each student in the experimental group answered 11 questions in the questionnaire 3. The mean of scores gathered is 42.36 from a maximum score, and most students responded positively and had positive attitudes (Figure 1).

TABLE 7 Scores for Each Experimental Student in Answering the Questionnaire 3

Students' Code	Scores	Students' Code	Scores
S1	48	S7	40
S2	43	S8	47
S3	49	S9	31
S4	41	S10	42
S5	37	S11	43
S6	45	Mean	42.36

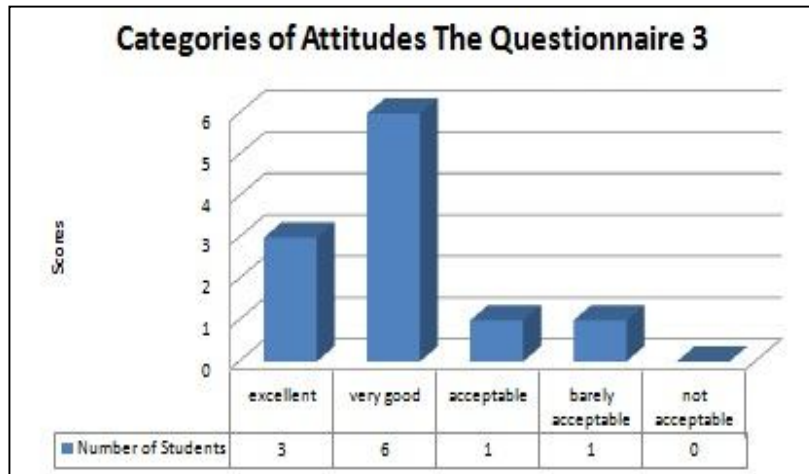


Figure 3. Categories of Attitudes Based on the Responses from the Questionnaire 3

From the Figure 3 above can be observed that mostly students had “very good” attitudes associated with the use Microsoft Mathematics in learning mathematics. Comparing to the others, student 9 had lower scores, and is in the category “barely acceptable” attitude. By the direct interview to the student 9, he absolutely agreed that students lose a lot of time because he believed when students using the program during the learning in the classroom will demand too much time to spend on technical problems. A different pessimistic reaction from the student was that mathematics with the computer technology will successful only if the students has access to a computer at home and requires extra time to understand mathematics which it is complex, tricky, and difficult enough with no

adding the computer. That comment expressed by student 5 who had complexities not only in mathematics but also in using the computer.

Most of students recognize the important of educational technology (Table 3 and Table 4), for that reason the opinion of students in relation to the effect of adopting educational technology, in this case Microsoft Mathematics, was inspected, as shown in Table 8.

TABLE 8 The Effect of Adopting Microsoft Mathematics

Effect	%		
	Agree	Not Sure	Disagree
Increase students' academic achievements (e.g., grades)	45.45	36.36	18.18
Promotes students' collaboration	45.45	36.36	18.18
Promotes the students' development of communication skills	45.45	36.36	18.18
Enrich students' mathematics learning (e.g., learning in the different method)	54.55	36.36	9.09
Motivates the student to get more involved in classroom learning activities	54.55	36.36	9.09
Improves student learning of critical concepts and ideas	72.73	18.18	9.09

Interview process was added to complete the data. The material point of interview is about the effect of adopting Microsoft Mathematics in learning mathematics, particularly in teaching and learning Calculus. Corresponding to the students' answer, these are three positive gains of using Microsoft Mathematics (Table 9).

TABEL 9 Three Positive Gains of Using Microsoft Mathematics Based on Students' Interview

Scope of Interview	Students' Answer	Respondent
Useful to learn Calculus	"It was interesting to answer the math problem with Microsoft Mathematics, so I can imagine the process and drawing visually"	Student 8
	"My understanding was helped by this program and I can see the problem solving process step by step"	Student 3
	"Microsoft Mathematics is very fun program and enriching my knowledge in solving math problem in different way"	Student 1
Easy to use	"The math computer program is easy to use especially in drawing graphs"	Student 10
	"Commands in this program is not hard to understand and I can operate it easily"	Student 4
Helping students in making a concrete of the material that explained by teacher	"Microsoft Mathematics facilitates my understanding of the material concepts more realistic that taught by lecturer on the whiteboard"	Student 2
	"This program makes the Calculus material of the lecturer clearer"	Student 6

4.3 Microsoft Mathematics Enriching Students' Learning

Calculus is one of the basic subjects that studied in the first year of student of Universitas Serang Raya. Learning Calculus deals with the complexity and difficulty. According to the author's experience in the lecture on the first year students in department of Computer System, Universitas Serang Raya, known that the weaknesses most of students in understand of Calculus abstract material and only able to perform simple calculations. Learning that facilitated by technology can be used to help students gained their understanding in Calculus.

Microsoft Mathematics is one of educational technology software made by Microsoft Corporation that can help students visualize problems. According to Microsoft Corporation (2010) there are three advantages using Microsoft Mathematics in learning mathematics, those are freeware with structured menu, some of the menu provide solution and helpful visualization [14]. Using Microsoft Mathematics expected to assist students in understanding the Calculus concepts and enrich students' mathematics learning.

From the data collection regarding to the effect of adopting Microsoft Mathematics obtained 54.55% students agree that Microsoft Mathematics can enrich students' mathematics learning. It supported the Chin (2004) statement that utilizing technology not only builds students' confidence with using technology, but also enhances learning and keeps students engaged [15].

4.4 Microsoft Mathematics Increasing Students' Motivation

According to the data that shown in Table 8 obtained 54.55% students agree that Microsoft Mathematics can motivate the student to get more involved in classroom learning activities. The students' helped by Microsoft Mathematics because it provides use students convenience in doing computational mathematics. Writing, calculating, and manipulating of mathematical expressions and both graphical visualization 2D and 3D, and animation can be instructed easily and shown the process of problem solving step by step. Microsoft Corporation (2010) stated that this software helps students by stepping through problems so that can improve students' understanding of formulas and concepts as students' do their homework [14].

5. CONCLUSION

The findings of the study reports in general the positive influence of educational technology, in this case applying Microsoft Mathematics, in enriching students' mathematics learning and increasing students' motivation to get more involved in classroom learning activities. Interactivity and visualization are two important components offered by Microsoft Mathematics. They help students to understand better the mathematical content related to Calculus. As described by students' reaction through filling the questionnaire and answering the interview associated with Microsoft Mathematics, they showed interest in using Microsoft Mathematics to support their learning exploration of mathematics. Overall the positive impact of teaching and learning processes using educational technology has already been proved by many studies (Rutz et al., 2003, Hennessy et al., 2010, Brown J., 2011) [16] [17] [18]. To have a complete understanding of the effect of Microsoft Mathematics, advance research should expand the result measures in both cognitive and affective domains.

Acknowledgment

The authors would like to thank the Indonesian Directorate General of Higher Education, Ministry of Education, who has funded for the opportunity to perform this research, and particularly to Yani Supriani as a research's partner. We would like to extend our gratitude to the students in department of Computer System, Universitas Serang Raya, who have participated in this research.

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