The Use of Microsoft Mathematics Program toward Students' Learning Achievement

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N Mayasari[1], C Hasanudin[2*], A Fitrianingsih[3], R Jayanti[4], N Setyorini[5], P Y Kurniawan[6], L Nurpratiwiningsih[7]

[1]Mathematics Education Department, IKIP PGRI Bojonegoro, Bojonegoro, Indonesia
[2]Indonesian Language and Literature Education Department, IKIP PGRI Bojonegoro, Bojonegoro, Indonesia
[3]English Education Department, IKIP PGRI Bojonegoro, Bojonegoro, Indonesia
[4]Indonesian Language and Literature Education Department, Majapahit Islamic University, Mojokerto, Indonesia
[5]Indonesian Language and Literature Education Department, University of Muhammadiyah Purworejo, Purworejo, Indonesia
[6]Indonesian Language and Literature Education Department, Muhadi Setiabudi University, Brebes, Indonesia
[7]Primary Teacher Education, Muhadi Setiabudi University, Brebes, Indonesia

[*]cahyo.hasanudin@ikippgribojonegoro.ac.id

Abstract. The aim of this study was to investigate the students' learning achievement by using Microsoft Mathematics media in the course of *Matematika Sekolah II*. The research design was quasi experimental with posttest only control design. The population in this study were all of first year students in the Mathematics Department of IKIP PGRI Bojonegoro. The sampling techniques was saturated sampling. The data was collected by using test. The technique in analysing data was using t-test with a significance level of 5%. The results of this study revealed that $t_{count} > t_{table}$ was $3.156 > 1.71$ so that H_0 was rejected. It showed that the first year students' learning achievements that was taught using Microsoft Mathematics media in the course of *Matematika Sekolah II* were higher than those who taught without it.

1. Introduction

The globalization era and large market have caused serious problems in every context of life [1] so it must behave in an environmentally conscious manner towards the environment with an attitude based on responsibility [2]. One of which is the responsibility for rapid development of computers. According to [3] in Blissmer, computer is referred to an electronic device that is able to do the tasks by receiving input, working on the input in accordance with the instructions, storing the results of its processing, and producing the instructed output. [4] Software is a set of electronic data that is stored and managed in a computer. There are various types of paid and unpaid softwares. One of unpaid softwares is Cyberlink power director apps [5] and the software in schoology apps designed by Jeremy Friedman, Ryan Hwan, and the Trinidad team [6].

In Mathematics learning, many kinds of software can be used such as: a) SPSS, it is a software that is used to analyze statistics including median, mode, mean, standard deviation, hypothesis testing, etc, b) Geogebra, it is a software that is used for geometry, algebra, and calculus in geometry, c)

Microsoft Mathematics, it is a software that is used for arithmetic problems, matrices, statistics, linear algebra, trigonometry, and some problems involving physics and chemical formulas. Geogebra and Microsoft Mathematics are softwares that can be free downloaded.

According to [7], Microsoft Mathematics is an application created to help students in learning mathematics. Features included in Microsoft Mathematics are science calculators, 2D and 3D graphics visualization, algebraic and symbolic computations for elementary mathematical functions and operations. The advantage of Microsoft Mathematics according to [8] is that it can be used to solve maths and science problems more quickly and easily in teaching important basic concepts. The features of Microsoft Mathematics are able to solve complex problems in algebra, trigonometry, calculus, physics, and chemistry. [9] The other advantages of Microsoft Mathematics are 1) calculations in mathematics problems become faster, 2) the accuracy of the results obtained from the calculation, 3) it can be used as an evaluation, 4) it can visualize graphs to facilitate teacher in calculating and preparing questions for students. It is in line with a research by [10] shows that the results of training and mentoring activities in using Geogebra and Microsoft Mathematics are: 1) the participants have succeeded in operating it, 2) they are able to use it in solving mathematics problems, 3) they are able to draw 2D, 3D, and animation graphics, 4) the Mathematics teachers in senior high school Sedaratan Flores have successfully used it in Mathematics learning. A study by [11] reveals that the media in form of Mathematics materials by using Microsoft Mathematics apps are feasible to be used as learning media to increase students' learning motivation. Another research by [12] concludes that the use of Microsoft Mathematics program can improve students' accuracy in solving the multiplication problems of two matrices.

Nowadays, Mathematics learning uses computer technologies that has a goal as stated by [13], the use of ICT has a purpose to make students have the ability in 1) critical engagement while learning Mathematics, 2) communicating, using appropriate and varied multimedia tools (emails, websites etc) while learning Mathematics, 3) using ICT efficiently in research and problem solving, and 4) using ICT efficiently for professional development in the teaching of Mathematics. As stated by [14] Mathematics is really needed in the study of science, humanities, and technology. [15] states that mathematics is the study of quantity, the geometry structure, two-dimentional figures, and changes in numbering. The trigonometric materials are sine, cosine, tangent, secan, cosecan, and cotangen functions. Most of these materials have not been mastered by students, so the appropriate teaching media and method are needed. Many mathematics students consider it as a difficult material. Based on the result of previous assessment on the trigonometry material for the first year of mathematics students, there are 50% of them who pass the minimum standard, with an average score of 6,7.

It is also supported by a survey that the students' learning achievement are still low, especially in Mathematics. It is based on the opinion of [16] in PISA that the Indonesian students' mathematics learning achievement are in the rank of 61 from 65 participant countries with the average score of 371, in which the international average score is 500. It means that the Indonesian learning achievement in mathematics is still low. One of the factors that influences it is the lack use of computer program in learning.

Learning achievement in [17] is the level of actual abilitiy that can be measured, in form of knowledge mastery, attitudes, and skills achieved by students as a result of what they have learned. This achievement can be enhanced by the use of computer programs, which are able to build creativity and independence. Hidayat in [18] states that students are able to increase their knowledge and thinking abilities. [19] One of the ways in improving students' learning achievements in the course of *Matematika Sekolah 2* on trigonometric subject is the use of Microsoft Mathematics program. It is supposed to make their achievements be better than before. In the trigonometry materials, the students are expected to memorize the spesial angles and formulas of sine, cosine, and tangent. By using Microsoft Mathematics program, the students are able to solve the questions given correctly and save their times.

The figure 1 and figure 2 show the implementation of Microsoft Mathematics program on trigonometric materials.
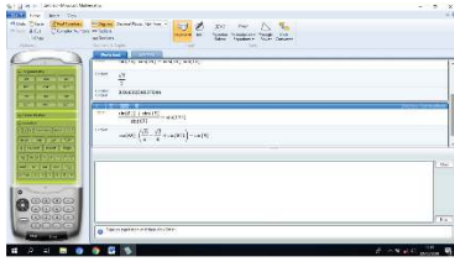
Figure 1 The examples of answering the questions in Microsoft Mathematics
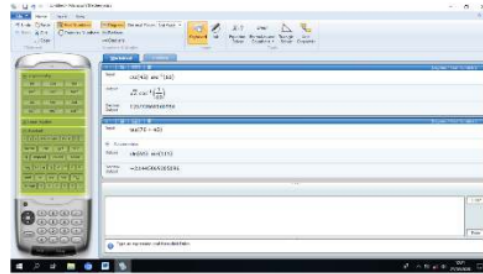
Figure 2 The examples of answering the questions in Microsoft Mathematics

The results of a study [20] reveals that there is a significant difference on the learning achievement between the students who taught by using Microsoft Mathematics and those who taught by using conventional learning on the materials of linear equation system. [21] This study finds that students' achievement who taught by using Microsoft Mathematics is higher than who taught by traditional teaching methodologies. Based on the previous studies, this study aims to investigate the students' learning achievement by using Microsoft Mathematics media in the course of *Matematika Sekolah II*.

2. Methods

The research design was quasi experimental with posttest only control design. The technique in analysing data was using t-test with a significance level of 5% with a consideration that the variance is not homogeneous ($\sigma_1{}^2 \neq \sigma_2{}^2$). The population in this study were all of first year students in the Mathematics Department of IKIP PGRI Bojonegoro. The instruments were students' test sheets. It contained 10 questions that would be given to the students in form of essays. It had to be validated by 3 validators who were the mathematics lecturers. The reliability was tested by using the formula of KR-20 (the questions were said to be reliable if the reliability index was $r_{11} > 0{,}70$). The difficulty level used the formula $I = \frac{B}{N}$ (the criteria of it were $0.31 - 0.70$) with a medium category level. Discriminating power used the formula $D = \frac{B_A}{J_A} - \frac{B_B}{J_B} = P_A - P_B$ (the discrimination index had to be $D > 0{,}40$).

This research design took two classes that consisted of class A as an experimental class and class B as a control class. The class A was taught by using Microsoft Mathematics program and class B was taught without using it. Both classes were given the tests of normality, homogeneity, and balance. The normality test used Liliefors test with a significance level of 5%. The result was both classes had normal distributions. It could be viewed in the table 1.

Table 1. The normality test result of the pre-test data

Group	L_{obs}	L_{tabel}	Test Decision
Experimental	0,11	0,18	Ho was accepted
Control	0,15	0,18	Ho was accepted

In the table 1, it showed that $L_{obs} < L_{tabel}$. It meant that each sample came from a normally distributed population. Then, the homogeneity test was done by using the formula of F test with dk of the denominator = 24; dk of the numerator = 24; and the significance level $\alpha = 5\%$. The results were $F_{table} = 1{,}96$; and $F_{count} = 0{,}819$. $F_{count} < F_{table}$ ($0{,}819 < 1{,}96$) it meant that Ho is accepted. Those results could be concluded that the variances of both classes were homogeneous. In addition, the balance test used t-test with a significance level of 5%. The result were $t_{table} = 2{,}064$; $t_{count} = 1{,}42$; and DK $= \{t \mid t < -t_{0,025} \text{ atau } t > t_{0,025}\}$. It showed that $t_{hitung} < t_{tabel}$ ($1{,}42 < 2{,}064$) that meant Ho was accepted. Those results could be concluded that both sample classes had the same initial abilities.

3. Results

The post-test results of both classes could be seen in the table 2.

Table 2. The results of post-test

Group	Number of students	Average score	Variance
Experimental	25	83	64,58
Control	25	76	58,33

In table 2, there was an improvement in the average score of students' post-test results. It could be stated that the learning process in the experimantal class was better than in the control class. The normality test was done by using Lilliefors test. Moreover, the homogeneity test used F test and hypothesis testing used t-test.

a) *The normality test of post-test data*

Table 3. The post-test result

Group	L_{obs}	L_{tabel}	Test Decision
Experimental	0,16	0,18	Ho was accepted
Control	0,11	0,18	Ho was accepted

In table 3, the normality test was done by using Lilliefors formula $\alpha = 5$ %. The critical area or DK = {L | L > 0,18} so Ho was accepted. It could be concuded that each sample came from the normally distributed population.

b) *The homogeneity test of post-test data*

The results of homogeneity test with $\alpha = 5\%$; dk of denominator = 24; and dk of numerator = 24 . $F_{table} = 1,96$; and $F_{count} = 0,90$. $F_{hitung} < F_{tabel}$ (0,90 < 1,96), so Ho was accepted. Based on the results, it could be concluded that the variances of both classes were homogeneous.

c) *Hypothesis testing*

It was done by using t-test with $\alpha = 5$ % and dk = 24. The value of $t_{table} = 1,71$ and $t_{count} = 3,15$ in which $t_{count} > t_{table}$. Ho was rejected and H_1 was accepted. Based on the results of analysis, the first year students' learning achievements in the Mathematics department of IKIP PGRI Bojonegoro who taught using Microsoft Mathematics program were higher than those who taught without it.

It was in line with some previous studies, a) [21] this study found that students' achievement who taught by using Microsoft Mathematics is higher than who taught by traditional teaching methodologies, b) [22] students who taught by using Microsoft Mathematics had better achievement and got possitive advantages in improving their confidence in learning Calculus, c) [23] this study revealed that the graphical calculator had proven to be a useful technological tool to enhance teaching and learning and as a result, improved students mathematical understanding particularly linear function, d) [24] this study concluded that the use of Microsoft Math 3.0 in mathematics learning could improve students' creativity because they are able to manipulate the graphics or solve the questions given.

4. **Conclusion**

Based on the results of hypothesis testing with a total participant of 25 students for each class, with $\alpha = 5$ % and dk = 24. It was acquired that the value of $t_{table} = 1,71$ and $t_{count} = 3,15$. The value of $t_{count} > t_{table}$, so Ho was rejected and H_1 was accepted. It could be concluded that the students' learning achievements who taught by using Microsoft Mathematics program in the course of *Matematika Sekolah 2* were higher than those who taught without it.

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