



Visualization Of Learning Calculus Using Autograph5 At Budi Darma University

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Abstract

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In learning calculus at Budi Darma University, so far, they still use paper and presentations on the blackboard, making ineffectiveness due to one direction, making students less independent in learning. By learning calculus visualization using autographs, there is a very significant 90% change in student behavior and can be applied in everyday life. study of quadratic equations and geometric transformations. The research was conducted directly on students in the computer laboratory at Budi Darma University in the third.

Keywords:

Learning, Caculus, Autograph

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1. Introduction

The low understanding of students in calculus courses is still found. The main reason students lack understanding ability is that students' learning methods are still like learning the traditional way, which refers to the skills to solve problems oriented to procedural questions that only involve standard formulas and direct discussion of questions. While the learning process carried out is still a transfer process [1].

The use of autographs has been widely used in research on mathematics learning [1]–[6]. It can be seen that autographs help in visual mathematical explanations and proofs of existing theories. Autograph visualization is divided into 1, 2, 3 dimensions [7]. The success of learning calculus is supported by the activeness of the 2 elements for teachers and students. Teachers must update teaching methods in the form of using visual and audio.

Mathematics is a subject that to explain and understand face-to-face, especially with learning online. Need special skills to be able to outsmart teaching this subject. So that students feel satisfied and get the maximum lesson [8].

This study discusses the use of autographs in calculus, quadratic equations, geometric transformations other cases. To improve the quality of calculus learning at Budi Darma University, students' independence in solving problems can be applied to everyday life. The data generated from observations were analyzed to see how active students were during the learning process and how students' abilities and how the process was learning when using the autograph application.

2. Literature Review

2.1 Autograph

Autograph is an application to study statistics, geometric transformations, equations, coordinates, differentials, graphs, and algebra [4]. Contribute to increasing motivation to learn mathematics [3] and learning effectiveness using autographs compared to conventional [9] and to understand, understandable to draw geometric graphs [1].



Users also observe functions, equations, and calculations [10]. Dynamic display features to analyze, express models, lead to model search, (4) process data, (5) share and communicate [11].

2.2 Quadratic Equation

Equation form:

$$ax^2 + bx + c = 0 \quad \dots (1)$$

Where a, b, c are constants and $a \neq 0$

The solution to the quadratic equation is solved by:

a. Factorization

$$a(x - x_1)(x - x_2) \quad \dots (2)$$

b. Perfect square

$$(x + b)^2 = c$$

c. Formula ABC

$$x_{1,2} = -b \pm \frac{\sqrt{b^2 - 4ac}}{2a} \quad \dots (4)$$

2.3 Geometry Transformation

It can be said as a change in a geometric field which includes its own position, magnitude and shape. These geometric shapes can be various, can be triangles, circles, squares, pyramids, and others. Transformation can also be done on a set of points that form a certain shape.

$$A(x, y) \rightarrow A^1(x^1, y^1) \quad \dots (5)$$

3. Research methodology

3.1 Research sites

This research is located at University Budi darma, North Sumatera, Medan, Academic Year 2020/2021.

3.2 Research Subjects and Objects

The subjects in this study were students of Budi darma University in learning calculus

3.3 Types of research

This type of research is descriptive, namely knowing the results of calculus learning and student activity in the use of autograph applications in the form of visualizations.

3.4 Observation

Direct observation by solving calculus learning cases on quadratic equations and geometric transformations using the autograph application.

4. Research Results and Discussion

4.1 Test Trial Results

Before starting, students are first given an explanation of how to find the Autograph application on Google, how to install it, use features, input data and analyze the display results.

4.2 Experiment on the case of quadratic equation material display

To create a line of quadratic equation we write the exponent with the sign “^”.

equation form :

$$y = ax^2 \rightarrow y = 4x^2; y = 6x^2; y = 8x^2;$$

can be seen in the following image:

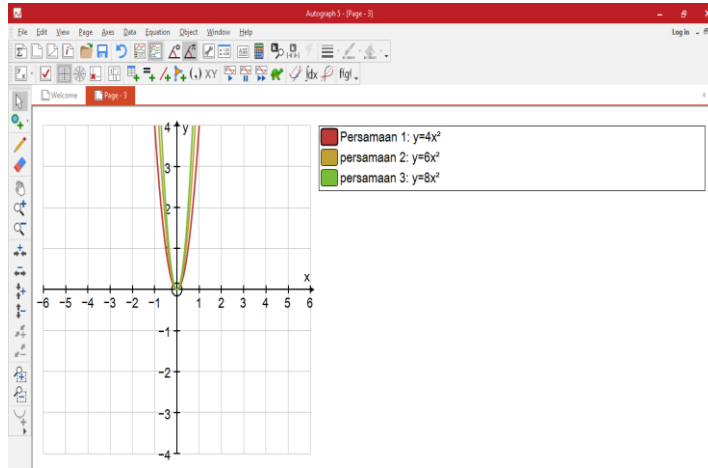


Fig 1. Quadratic equation display

If using input on x and y data, on perfect squares, we can see the formation of the graph of the equation as follows.

Table 1. Quadratic equation data input

x	y
2	4
3	6
4	8

The results of the input in the x and y tables, the graph form is:

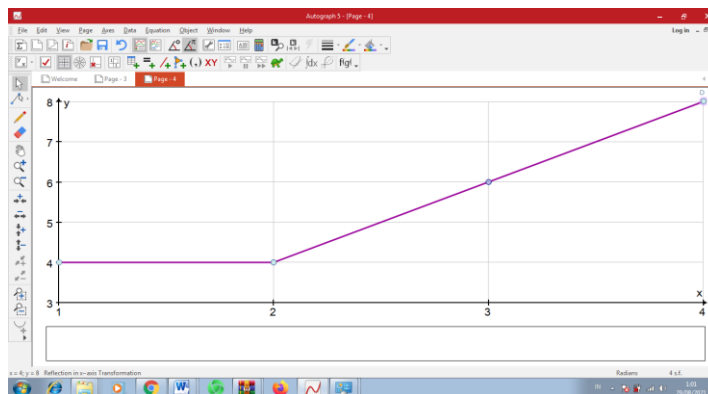


Fig 2. the result of the equation table input

The use of autograph5 starts from the stage of determining the theoretical formulation by using the "Enter Question" on the 2-Dimensional display, for example in Equation:

$$2x + 5y \leq 10 ;$$

$$4x + 6y \leq 24 ;$$

$$x \leq 0; y \leq 0$$



To display the graph of $2x + 5y \leq 10$ the equation is as follows:

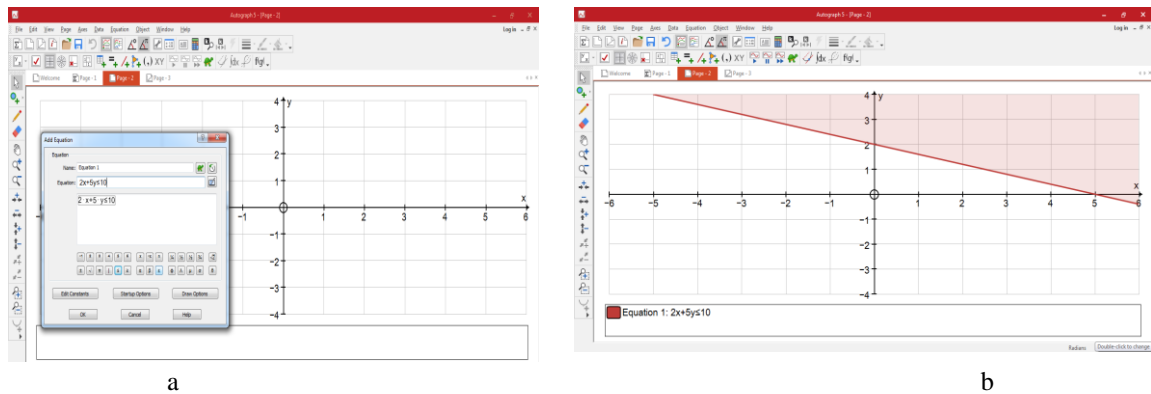


Fig 3. a. Equation Input, b. Graphic Result Display $2x + 5y \leq 10$

On the transformation material can be seen in the reflection with the equation $x = -2$, the laying of lines and coordinates on the x and y axes is reflected according to the existing formula

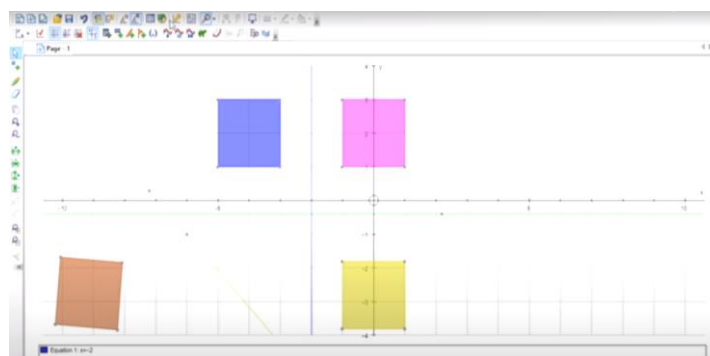


Fig 4. Reflection geometry transformation display equation $x = -2$

4. Conclusion

In learning calculus using Autograph5 at Budi Darma University, several conclusions were obtained including, There is a suitability of the theory of the formulation of calculus material which is translated into a visualization form using the autograph application, Students can easily follow calculus learning, this is seen by students being able and active by solving some of the cases given. The formation of effectiveness in learning calculus with the use of autographs in the translation of calculation formulas, graphs in the form of visualization

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