

The effectiveness of E-Book Based On Maple for Integral Calculus Course at Mathematics Education of PGRI Semarang University

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Abstract: The purpose of this research was to determine the effectiveness of e-book based on Maple for Integral Calculus at Mathematics Education of PGRI Semarang University. This type of research is Quasy Experiment. The research population was two-semester students of Mathematics Education of PGRI Semarang University which consists of seven classes. With random sampling techniques have two classes, 2B as an experimental class and class 2A as the control class. How to capture data through observation and learning achievement test? The data with the thoroughness were testing learning achievement test and comparative test t. The results showed that the implementation achieve effective learning characterized by: a) the average value of the individual test results of students exceeding the standard minimum = 75, b) the average experimental class learning achievement at 82.43 while the control group 70.37, the experimental class has an average of study results significantly better than average class control. Based on these results, it can be concluded that the e-book based on Maple for Integral Calculus at Mathematics Education of PGRI Semarang University effective.

Keywords: Effectiveness, E-Book, Maple, Integral Calculus

Education is a matter that absolutely must be addressed by the Indonesian people if wants to improve the quality of Human Resources. One of the government efforts to improve the quality of education is to improve the curriculum. In 2011, the Indonesian National Qualifications Framework (KKNI) came into effect in the education system in Indonesia. KKNI is leveling competence and qualifications framework to reconcile, equalize, and integrate the fields of education and job training and work experience in order to award the work in accordance with the recognition of the competence structure of employment in various sectors.

KKNI is the embodiment of quality and identity of the Indonesian people associated with national education and training system that is owned by Indonesia. The Description of qualifications on KKNI reflect one's learning outcomes obtained through lane 1) education, 2) training, 3) work experience, 4) independent learning. Appropriate description of qualifications in KKNI on independent learning, the development of e-book is one way to achieve that. Self-reliance is needed especially in developing student learning in order to establish the competence of learners by giving meaning and responded to prior knowledge, and establish a mutually beneficial relationship with the community and the environment. In this case, constructing and preparation of knowledge takes place and made of, by, and for the learners.

Mathematics participates in developing education. Mathematics is one of the basic sciences that are very important to provide students in the face of later life in society. Therefore mathematics should be able to be one of the means to increase the power of reason and the students can improve their ability to apply mathematics to face the challenges of life in solving problems.

Meanwhile, Maple is software developed by Waterloo Maple Inc. for solving mathematical problems. Maple runs on the Windows family of operating systems and is quite easy to use. Commands such as cut, copy and paste can be used as in the Windows hotkey. Maple is one of the few software is a computer application that can be used to solve various mathematical problems by using this program, a variety of mathematical problems can be solved.

Reality on the ground based on the experience of researchers for teaching Calculus courses, learning tools which there are less support faculty efforts to develop students 'potential optimally, especially the use of technology to develop students' critical thinking skills. Therefore, the design of the course is not enough, because of the need for a device that supports the use of learning on learning in college.

Based on these descriptions, the researchers formulate problems that are the focus of research is whether the use of the learning subjects such as calculus-based e-book on the subject Maple calculus in Mathematics Education courses University PGRI Semarang effective?.

LITERATURE

Relevant Research, many previous researchers who had been examined the benefits of multimedia in particular e-book and Maple in learning. Research conducted Dhimas Ardiansyah and Rakhmawati (2012) under the title "Development of Learning Media e-book Interactive On Training Courses Digital Electronics at the Department of Electrical Engineering UNESA" states that the use of e-book interactive positively influence is increasing student learning outcomes at the course digital electronics as well as a positive effect on the attitudes of students who thought he could not be so motivated to explore their own abilities through questioning and discussion.

While Ari Widodo, M. Ed (2011) conducted a study entitled "The Effect of Use electronic-book (e-book) in Science Education to Increase Mastery of Concepts and Technology Literacy RSBI junior high school students". The study was conducted in two RSBI schools located in West Java to compare the use of e-book issued by the Education Ministry and the e-book compiled by investigators. Differences between the e-book used in this research is, e-book issued by the Education Ministry has pdf format without fitted with other multimedia aspects such as audio, video and animation, while the e-book developed by researchers are equipped with the multimedia aspect. The results obtained from this research is an electronic book (e-book) that is equipped with the multimedia aspects of using flash program can improve their understanding of concepts and junior high school students' science literacy.

Prawoto and others in the research entitled "Development and Use of Maple to Improve Student Comprehension about Integral Function'. The research was conducted on students majoring in mathematics, State University of Surabaya (UNESA). Based on the research that has been done the conclusion that use of Maple to improve students' ability to calculate the area using the integral. Overall the study above is a separate research. The research team intends to conduct research that combines e-book with Maple.

E-Book

According to Wikipedia e-book known as digital books, e-text is in the form of digital media and sometimes protected by digital copyright. The shape can be shaped pdf files, word, html, txt and others. But the famous usually e-book form pdf file that can be read by programs

like acrobat reader which can be downloaded for free earlier. An e-book, as defined by the Oxford English Dictionary, is "an electronic version of a printed book that can be read on a personal computer or a handheld device designed specifically.

In technology, e-book is actually a collection of digital text. Michael Hart and his Project Gutenberg is a pioneer who sought the use of digital technology for textual materials. He began the project in 1971 to digitize the Declaration of Independence (proclamation of independence of the United States) uses a standard known as the American Standard Code for Information Interchange (ASCII). The technology is simple and without consideration of the beauty of the view as it now can be done with a variety of word-processing program. The aim is also simple: provide digital text as much as possible to the general public.

The types of e-book based on its content, is the most common type of digital books. This type of book is the most traditional, usually the number of pages and there are hundreds of them exactly with paper books. Type the e-book is sorted into chapters and several topics and contains more than one idea.

Software Maple

Maple is a computer program that was first developed in 1980 by the Symbolic Computation Group at the University of Waterloo Ontario, Canada for purposes of the fields of mathematics, statistics and computational algebra. Maple is a comprehensive tool for digging, teaching and applying mathematics. Maple contains thousands of mathematical procedures. But we can also make your own procedure with the programming language. Maple provides a "worksheet" that we can use to enter commands and see the output at once.

We can use Maple as a tool for understanding the Calculus through visualization, calculators include algebraic operations, drawing functions, seek limit function, continuity of functions, derivative, the application of derivatives, integrals and application it. Maple runs on the Windows family of operating systems and is quite easy to use. Before getting into commands that will be used to solve the problem, especially for the course Calculus, we must first understand Maple. When first run, Maple will immediately open a command window and on the left there is a sign, sign Maple is ready to receive commands.

The effectiveness of learning

In Sinambela (2008: 78), the learning is said to be effective if it achieves the desired objectives in terms of both learning goals and student achievement are maximized. Clark et al (2009) used three criteria to declare effective learning in her study that the achievement of mastery learning by students, influential in learning achievement and learning achievement results are better when compared with the results of classroom learning achievement with conventional learning. A class is said to be complete (mastery learning) to learn if there are 80% of students who achieve a minimum completeness criteria targeted at the class. Minimum mastery learning criteria used in this research followed the completeness criteria applicable. Score 80% coming from Clark, Guskey, & Benninga (1983).

RESEARCH METHODS

This study is quase experimental. The research population is two-semester students of mathematics education University PGRI Semarang which consists of seven classes. With a sample random sampling techniques have two classes, 2B as an experimental class and class 2A as the control class. How to capture data through observation and learning achievement test?

The data with the thoroughness of testing learning achievement test and comparative t test. Variable research on effectiveness studies E-Book Maple Based on Calculus Course in Mathematics Education University of PGRI Semarang is as follows.

- 1) The independent variables in this research are learning to use e-book calculus-based Maple.
- 2) The dependent variable in this research is result of learning.

RESULTS AND DISCUSSION

Test Mastery Learning Achievement Tests

This test is done to look for answers one indicator of the effectiveness of learning in the experimental class of achieving mastery learning achievement with a minimum completeness criteria is 75.

To answer these questions, hypothesis being tested is

H_0 : (average learning achievement test scores equal to 75)

H_1 : (average learning achievement test scores are not the same as 75)

Criteria deny H_0 if the significance value $< 5\%$.

In current research, the data obtained class learning achievement test scores from these data further experiments performed classical completeness test data analysis using SPSS and obtained the results as shown in Table 1.

Table 1 One-Sample Test						
	Test Value = 75					
	T	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Values experiment	5.204	34	.000	7.429	4.53	10.33

Because value of sig = 0,000 = 0% < 5%, so H_0 denied. This means that the average learning achievement test scores are not equal to 75. Furthermore, to know that average values of the thoroughness of the experimental class of more than 75 seen from Table 2 below.

Table 2 One-Sample Statistics				
	N	Mean	Std. Deviation	Std. Error Mean
Values experiment	35	82.43	8.445	1.427

Further investigation averaging empirical look at the output table One-Sample Statistics shows that the average value of learning achievement at 82.43. Value shows the average test scores of completeness criteria so that it can be concluded mastery learning achievement.

Comparative test of academic achievement of Student

Comparative tests herein are intended to compare the average of a variable between the experimental class and control class.

Data test scores for experiment class and control class previously performed first equality test variants. In this research comparative test data analysis using Independent Sample Test and the results are shown in Table 3.

Table 3 Independent Samples Test

		Levine's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Value	Equal variances assumed	4.044	.048	4.086	68	.000	12.057	2.951	6.169	17.945
	Equal variances not assumed			4.086	53.001	.000	12.057	2.951	6.139	17.975

Look at the table independent sig Samples Test for 0,048 = 4.8%. The sig value of less than 5% then H_0 is rejected, and then there is a difference of variance between the experimental class and control class. Furthermore, by seeing the value in column sig (2-tailed) column of Independent sample t-test of 0.000 < 0.05 indicates that H_0 is rejected, meaning that the learning outcomes experimental class and control class differed significantly. To determine which class who score higher on average used the analysis of Group Statistics are presented in Table 4.

Table 4 Group Statistics					
	Class	N	Mean	Std. Deviation	Std. Error Mean
Value	Experiment Class	35	82.43	8.445	1.427
	Control Class	35	70.37	15.278	2.582

By seeing the average learning achievement in the mean columns, tables Statistics Group acquired 82.43 to 70.37 for the experimental class and control class. The results showed that the experimental class learning outcomes better than the control class. Also the average value of the experimental class achieve mastery targeted is 75. In other words, the experimental class students achieve mastery in classical.

CONCLUSION

The results showed that the implementation achieve effective learning characterized by:
a) the average value of the individual test results of students exceeding the standard minimum = 75, b) the average experimental class learning achievement at 82.43 while the control group only 70.37, the experimental class has an average of research results significantly better than average grade control. Based on these results, it can be concluded that the e-book based on subjects Maple calculus in mathematics education courses University PGRI Semarang effective.

Suggestion

Based on these results, the advice to the researchers suggested, as follows. Learning to use e-book based on the Maple Calculus courses provide opportunities for students to be active both within and between groups, so that learning with this method is suitable for use in the classroom that have a low learning achievement.

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