THE APPLICATION OF THE MAPLE PROGRAM TO SELF-REGULATED LEARNING ON THE MATHEMATICS' PROSPECTIVE TEACHERS STUDENTS

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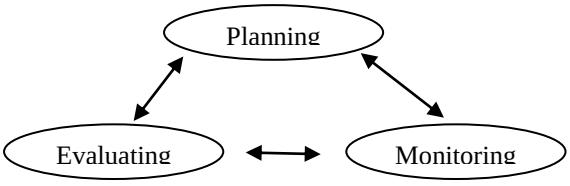
Abstract. Self-regulated learning can be achieved if in the process of learning mathematics provides an open opportunity for students to learn independently. This research is a mixed method type embedded design, which aims to conduct studies that focus on the use of maple program on self-regulated learning. The sample selection was done from the population by purposive sampling, then taken 2 classes that contracted the Calculus. The instrument used in this study is a questionnaire of learning self-regulated learning with a Likert scale, interviews, and observation sheet. Based on the data analysis, it can be concluded that (1) The self-regulated learning of superior student and low who received the maple program is better than of superior students and low students who received expository learning, (2) Student activity in following by maple program the average rises from fewer criteria to good, and students explain that the use of maple program is more interesting and better when compared with expository learning.

Keyword: maple program, self-regulated learning

I. INTRODUCTION

Self-Regulated Learning (SRL) or known as Self-reliance learning, includes person ability to choose a cognitive strategy, learn techniques of studying and learn at the whole of his lifetime so they can set themself when learning. Hargis (Sumarmo, 2011) defines "Self-reliance learning is a precise design process and self-monitoring of cognitive and affective in completing academic task". Findings from Darr and Fisher (2004), and Pintrich & Groot (1990) (Izzati, 2012: 13), shows that "Learning independence is strongly correlated with the learner's success".

Self-reliance learning is one of the factors that improve learner's academic achievement. Wang et al. (Abdullah and Iannone, 2010: 3) indicate that "Engaging in high achievement is an activity of learning independence, such as goal setting, planning, monitoring, readjusting of strategies used, evaluation and reflection".



Picture 1. Learning Independence Cycle

Knain & Turmo (Gumiarti, 2014: 25) defines, "Self-reliance learning as a dynamic process, that is, students build knowledge, skills, and attitudes when studying specific contexts. According to Schunk and Zimmerman (Supianti, 2013: 18), "There are three stages of Self-reliance learning cycle; learning plan, monitoring progress when implementing a plan, and evaluating outcomes".

We often encounter complexity and long computations in searching conventional mathematical solutions in calculus that bear upon no time to analyzing, discussing, or interpret the solutions obtained, therefore it is

appropriate that we need tools like computers. But in fact we also need to realized that in general we're mostly facing a problem with computer programming language. This Maple application program is able to perform mathematical computation easily and quickly without requiring mastering a certain computer programming language, hence people who do not master computer programming language still will be able to use this Maple program.

The Maple program helps someone searching mathematical solutions for researchers, mathematicians, faculty and learners easily and quickly without having to get stuck in the difficulty or complexity of mathematical computing. or even the difficulty and complexity of the computer. This suits Wangler's opinion (2012: 266), "Maple is a powerfull software program that can be used to help student learn math. .... In this article I will ilustrate the kind of things an instructor can do with maple to help the students learn math by seeing math ".

Some computer applications which one of it is Maple, having the ability to change the order of representation. Representations like tables, pictures, graphics and symbols allowing researchers to present a broader mathematical knowledge to their students. This dynamic relationship will help students to connect different aspects of mathematics, hence students can construct wider knowledge of mathematics.

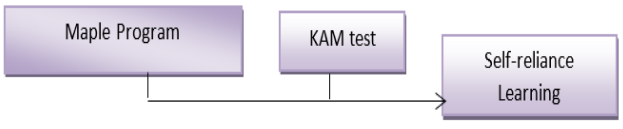
Maple is one of the offline e-learning computer programs which can overcome the technical problems of learning (learning media), as well as an effort to answer the substantial problem of learning (teaching resources). In the process of learning, it is possible for students to develop them self and be able to learn independently without any limitations of distance and time. It also can grow self-reliance after learning many times through maple program, both cognitive and affective competence and the growth of creativity of education stakeholders.

The results of the study by Shen, Lee, and Tsai (2007) are taken from a journal entitled "Applying Web-Enabled Problem-Based Learning and Self-Regulated Learning to Enhance Computing Skills of Taiwan's Vocational Students: a Quasi-Experimental Study of a Short- Term Module". In his research SRL is a learning that can contribute further to students through e-learning.

Other research results from Saputra (2015) revealed that the increase of mathematical problem solving ability of high-ranked students who obtained e-learning is better than the mathematical problem solving skills of high-ranked students who obtained expository learning. Therefore Maple pogram is a good computer program which can assist students self-reliance learning. Based on the background that have been described previously, the authors are interested to know the extended use of maple in the process of lectures, especially on developing students Self-reliance learning based on the ability of early mathematics ability (KAM).

Based on the background that has been described previously, the purpose of this study is to analyze the students self-reliance ability who obtained e-learning with the students self-reliance ability who obtained expository learning from the students KAM (high-ranked and low-ranked), and review the lecturers and students activities which uses Maple program.

Basically e-learning is assumed to have an impact on student self-reliance based on KAM. KAM has a role in controlling when learning process is given. The link between the learning components can be described as follows:

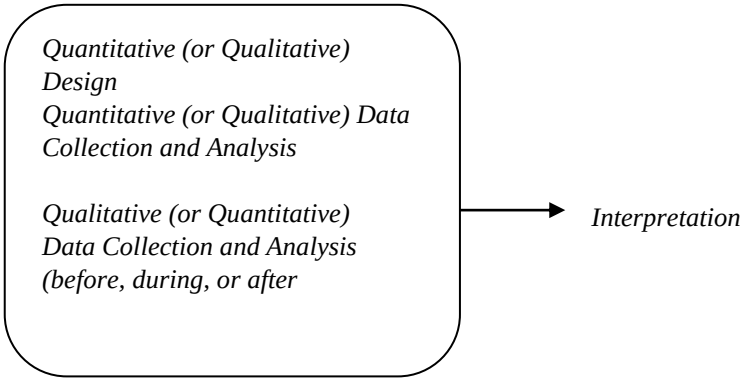


Picture 2. Research Flowchart

Annotation:
Independent Variable : Maple Program
Dependent Variable : Student's Self-reliance
Control Variable : Early Mathematical Ability (KAM).

II. METHODOLOGY

The research method that will be used in this research is Mixed Method Embedded type Design with Embedded type experimental model. Here is Embedded design design according to Creswell and Clark (2007):

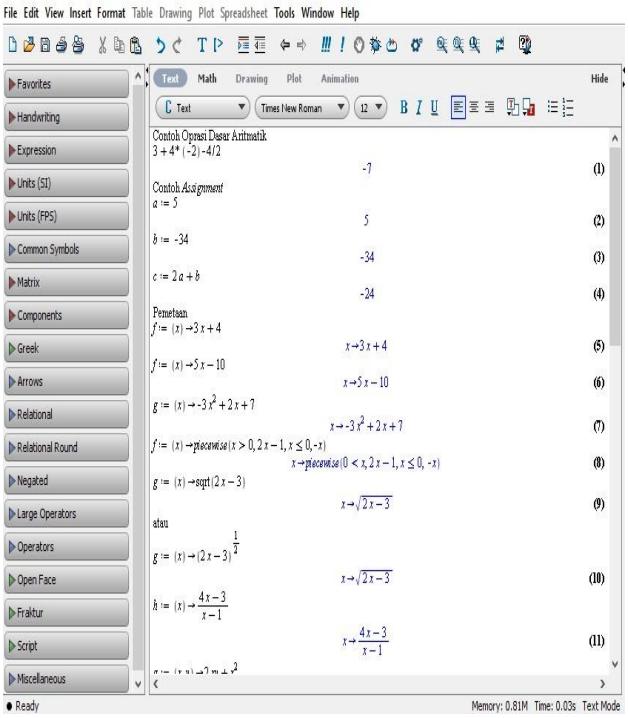


Picture 3. Research Procedure of Embedded Experimental Model

The sample selection is done from the population by purposive sampling. The sample of the research is students who take Calculus I courses. The students divided in 2 class, one as the experimental class (then called A class) inhabited by 29 people, consist of 14 high-ranked students and 15 low-ranked students. The other class as the control class (then called B class) inhabited 31 students, consist of 17 high-ranked students and 14 low-ranked students.

The data available in this study were collected from the instruments already given on the subject of the study. The instrument used is non test. Non-tests were conducted in the form of self-study enquette questionnaires, observations, and interviews. The goal is to observe directly the activity of learning process of mathematics with maple program, to know student response, and student learning independence.

Students self-reliance in mathematics contains 9 components; 1) Initiative and motivation of intrinsic learning, 2) The habit of diagnosing learning needs, 3) Establishing learning objectives or targets, 4) Monitoring, organizing, and controlling learning, 5) challenges, 6) Harnessing and searching for relevant sources, 7) Selecting, applying learning strategies, 8) Evaluating process and learning outcomes, 9) Self efficacy or self-concept or self-ability Sumarmo (2011: 110). Experimental class given maple teaching materials that they can do at any time. The following is one of the views of algebra by maple.



Picture 4. Maple Program Views

Statistical analysis used to compare mean is mann-whitney test because the data is not normal. The observations data analyzed is the activities of lecturers and students that can be developed during the learning process of mathematics. Activity data is qualitative which can be obtained by using observation sheet. From the observation sheets will be calculated average student activity in the classroom at each meeting. This series of research activities are divided into three stages: preparation stage, implementation stage, data processing phase, data analysis phase and report writing.

III. RESULTS

When the normality test is done, the questionnaire has normal distribution, hence next step is to compare mean between the two classes using parametric statistics with independent t test.

Table 1. Student self-reliance T-Test Results

Independent Samples Test

	Levene's Test for Equality of Variances		t-test for Equality of Means						
								95% Confidence Interval of the Difference	
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Equal variances assumed	.156	.694	2.567	58	.013	3.05784	1.19108	.67363	5.44206
Equal variances not assumed			2.570	57.903	.013	3.05784	1.19000	.67571	5.43998

From Table 1 it appears that the sig (2-tailed) value is 0.013, so the value of sign (2-tailed) 0.013 < 0.05/2, then Ho is rejected, and H_1 is accepted. This means that there is a mean difference between student self-reliance of the experimental class and the control class. So it can be concluded that at $\alpha = 0.05/2$. We can also analyze from mean value of students self-reliance that obtains maple program learning is better than students self-reliance who obtained expository learning.

To determine existence of mean difference between two groups of high-ranked and low-ranked students, calculated with two-way ANOVA. By using SPSS 17.0 namely General Linear Mode (GLM) -Univariate, results of the calculations presented in Table 2 as follows:

Table 2. Two-Way ANOOVA Results of Students Self-Reliance
due high-ranked low-ranked and Learning Model

Multiple Comparisons

SRL Tukey HSD

(I) KAM	(J) KAM	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
High-ranked eksperimen	Asor eksperimen	5.7238*	1.12701	.000	2.7396	8.7080
	High-ranked kontrol	2.4454	1.09453	.127	-.4528	5.3436
	Low-ranked kontrol	10.3571*	1.14627	.000	7.3219	13.3923
Low-ranked eksperimen	High-ranked eksperimen	-5.7238*	1.12701	.000	-8.7080	-2.7396
	High-ranked kontrol	-3.2784*	1.07434	.018	-6.1232	-.4337
	Low-ranked kontrol	4.6333*	1.12701	.001	1.6491	7.6175
High-ranked kontrol	High-ranked eksperimen	-2.4454	1.09453	.127	-5.3436	.4528
	Low-ranked eksperimen	3.2784*	1.07434	.018	.4337	6.1232
	Low-ranked kontrol	7.9118*	1.09453	.000	5.0136	10.8100
Low-ranked kontrol	High-ranked eksperimen	-10.3571*	1.14627	.000	-13.3923	-7.3219

Low-ranked eksperimen	-4.6333*	1.12701	.001	-7.6175	-1.6491
High-ranked kontrol	-7.9118*	1.09453	.000	-10.8100	-5.0136

First row (High-ranked Experiment Class – Low-ranked Experiment Class)

The value of sig = 0.000 is less than 0.05. Means Ho rejected and H1 accepted, then there is a significant difference between mean value of student self-reliance of high-ranked experiment class and low-ranked experiment class.

Second row (High-ranked Experiment Class – High-ranked Control Class)

The value of sig = 0.127 is more than 0.05. Means Ho accepted and H1 rejected, so there is no significant difference between mean value of student self-reliance of high-ranked experiment class and high-ranked control class.

Third row (High-ranked Experiment Class - Low-ranked Control Class)

The value of sig = 0.000 is less than 0.05. Hence Ho is rejected and H1 accepted, then there is a significant difference between mean value of student self-reliance of High-ranked Experiment Class and Low-ranked Control Class.

Fifth row ((Low-ranked Experiment Class - High-ranked Control Class)

The value of sig = 0.018 is less than 0.05. Hence Ho is rejected and H1 accepted, then there is a significant difference between mean value of student self-reliance of Low-ranked Experiment Class and High-ranked Control Class.

Sixth row (Low-ranked Experiment Class - Low-ranked Experiment Class)

The value of sig = 0.001 is less than 0.05. Hence Ho is rejected and H1 accepted, then there is a significant difference between the mean value of student self-reliance of Low-ranked Experiment Class and Low-ranked Experiment Class.

The ninth row (High-ranked Control Class - Low-ranked Control Class)

The value of sig = 0.000 is less than 0.05. Ho means rejected and H1 accepted, then there is a significant difference between mean value of student self-reliance of High-ranked Control Class - Low-ranked Control Class.

Based on the observation to the lecturers, it was found that at the first meeting the lecturer did not explain the subject requirement because the lecturer assumed that the student had known the subject requirement, unfortunately not all students knew about it. Lecturers also do not convey apperception, because the lecturer's solicitude about the time which may not enough to discuss the core of subject matters.

In the second meeting, the lecturers carry out every step of the learning activities, but the lecturer doesn't close the classroom activities with making conclusions about the material that has been taught and do not reflect or evaluate their learning result. This is due to the time that has running out, so the lecturer directly assigns a task. Basically at the first and second meetings the lecturer seems do not get used to maple program that intended to assist in the learning, so the lecturer was not consider the time to use very well.

At the third, fourth and fifth meetings, the lecturers are in accordance with every step of the learning. This is because the lecturer has been accustomed to using maple program.

Observations were made to the experimental class at each meeting for 5 meetings. Category of observation assessment consists of 1 = Very less, 2 = Less, 3 = Enough, 4 = Good, 5 = Very good.

At the 1 to 5 meeting in the learning activity it was found that the average of student activity was 2.33 (less), 2.78 (less), 3.56 (enough), 4.00 (good), and 4.44 (both). So the average student activity rose in every meeting.

Meanwhile, when viewed from the value of Z at the meeting 1 to 5 in the learning activities obtained that the average standard value of student activity is -1.16, -0.69, 0.14, 0.62, 1.09. From the above description, it can be concluded that student activity using maple program from the first meeting until the fifth meeting has changed towards a better attitude.

Interviews were conducted to explore problems encountered by students on good learning related to maple giving, and student self-reliance.

Table 3. Student's Answer Interpretation into Interview Results.

Questions	Student's Answers
What do you think about maple program?	Generally, learning with maple program is very helpful, and interesting because it feels encouraged to be more active in solving real and independent problems in learning, and the medium was very suitable because of the limited time and place.
How do you take advantage of the facilities on the maple program?	Generally we use maple facilities by studying maple's syntax, so they can evaluate the answers done manually besides using maple.
What facilities do you like and do not like about e-learning? Why?	We prefer graphics because some of us find it difficult to imagining graphic, now it can be helped by maple that can create 2 and 3 dimensional images, so we're feel helpful in understanding the transformation of the graph.
What are the advantages and disadvantages that you feel in learning by using a maple program?	Generally the advantages and kekurangnnya as follows. Advantages: ➢ This learning is not limited by space and time. ➢ The workmanship is very interesting. ➢ Indirectly developing IT skills. Disadvantages: ➢ Some laptops sometimes having errors in syntax writing.
What is your advice on learning by using maple program?	Generally our advice is: ➢ We hope this kind of lesson should be developed and applied in another courses/subjects.

IV. DISCUSSION

The results obtained from the questionnaire on the scale of self-reliance indicate that students self-reliance using maple program is better than the students' self-reliance who gain expository learning. According to Munir (2008: 205), the results of the study stated that "In learning e-learning (maple) learners do not depend entirely on the teacher, learners learn independently in digging science through internet or other information technology media".

Based on the analysis of the results of questionnaire self-reliance can be concluded that there is a difference of self-reliance's mean between students using maple program with students using expository learning. So it can be concluded that the students self-reliance who get a maple program is better than the students self-reliance who get expository learning.

When viewed from KAM, it is found that there is a significant difference between the mean value of students self-reliance of high-ranked class using maple program and low-ranked class that use expository learning. The self-reliance of high-ranked class students who use maple program is better than the low-ranked class students who use expository learning. There is a significant difference between the mean values of students' self-reliance in using

the maple program and the high-ranked class using expository learning. The self-reliance of high-ranked class students who use expository learning is better than the students of the low-ranked class who use the maple program. There is a significant difference between the mean values of students' self-reliance learning using the maple program and the low-ranked classes using expository learning. The self-reliance of the low-ranked class students using maple program is better than the low-ranked class students who got expository learning.

The self-reliance according to Sumarmo (2010) is "The process of careful self-design and monitoring of the cognitive and affective processes in completing academic tasks, self-reliance is also an individual's awareness to think, use sustainable strategies and motivation, and evaluate learning outcomes". Viewed from the definition of self-reliance is a process that requires habituation, a strong will because it is based on the internal factors of each individual, so it is not easy to be able to change it.

There have been findings where there are negative statements, but many students in both classes who derived the PBL model with the help of e-learning and who acquired an expository learning model that chose strongly agreed, agreed and neutral when the statement read, "My feelings are anxious when faced with a difficult mathematical task". So the number of scores for these statements is the smallest of the two classes, meaning that it still needs to be done follow-up action in the future to conduct research on students' anxiety about difficult math problems.

In this case maple program has an important role in facilitating students to be able to learn independently wherever and whenever using a laptop, so students will be more motivated because the maple has an interesting feature and easy to use.

V. CONCLUSION

Based on the results from data processing and findings obtained in this study some conclusions; the self-reliance learning of high-ranked and low-ranked students who obtain a maple program is better than the self-reliance learning of high-ranked and low-ranked students who gain expository learning; The mean of student activity in using maple program rose from criteria not good enough into good, and the students explain that the maple program is more interesting and better when compared with expository learning.

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