

Implementation of E-learning in Mathematics to Improve Students' Self-Regulated Learning

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Abstract. The purpose of this study is to know the improvement of students' self-regulated learning (SRL) and describing of students' SRL after learning mathematics using e-learning. The method of research is a mix- method with embedded design. The subjects are forty students of the second semester of Mathematics Education in Pasundan University. The instruments are questionnaire, interview, and observation sheet. The result of this research is an increase of students' SRL which is still low after studying mathematics using e-learning. The aspects of SRL that improve are: (1) having initiative in learning mathematics; (2) determining learning objectives; (3) utilizing and finding relevant sorces in learning mathematics.

INTRODUCTION

Self-Regulated Learning (SRL) is an important component in mathematics learning should be improved. Long [11] looked at learning as a cognitive process influenced by several factors such as the individual circumstances, previous knowledge, attitudes, individual views, content, and manner of presentation. One important sub-factor of the individual circumstances that affect learning is self-regulated learning. Wang et al. [1] show that involved the high achievement of students' SRL activities, such as goal setting, planning, monitoring, and readjustment of the strategy used, evaluation and reflection.

There are three characteristic of SRL: (1) Individual designs their own learning in accordance with the purposes or objectives of the individual; (2) Individual chooses a strategy and implement the design study: then (3) Individual monitors their own learning progress, evaluates the results of his study and compares with certain standards [11]. These characteristics describe the state of the high individual personalities and load the metacognitive process in which individuals consciously designing, implementing, and evaluating his/her learning carefully. Habit learning activities such as above, cumulatively foster learning disposition, or strong desire, in the individual's learning. In further developments, the ownership of the disposition of a high learning on the individual, he/she will form a tough, tenacious, and responsible, has a high achievement motivation, and helps individuals achieve the best results.

SRL also determines the success of students in learning. Darr and Pintrich [5] found that SRL strongly correlates with one's success and positively affects the learning and achievement of learning outcomes. In addition, Hargis [3] states that individuals who have a high SRL, tend to learn better, able to monitor, evaluate, and organize effective learning; save time in completing its tasks; regulate learning and time efficiently, and get high score in science. Another study reported that students who have a degree of high self-efficacy showed a high degree of SRL also [12].

In higher education, SRL is more needed in completing tasks on open project or problem-solving, thesis and dissertation. When individual faces the task as above, he was faced with abundant resources that may be relevant or irrelevant to the needs and goals of the individual concerned. In

such conditions individuals must have their own initiatives and intrinsic motivation, analyzing needs and formulating goals, selecting and applying problem-solving strategies, selecting the relevant sources, and evaluating him/her against the appearance.

Based on expert opinion, Sumarmo [11] summarizes some indicators of SRL: a) having initiative and intrinsic learning motivation; b) diagnosing learning needs; c) setting goals/targets for learning; d) monitoring, regulating, and controlling the learning; e) looking adversity as a challenge; f) utilizing and locating relevant sources; g) selecting, implementing learning strategies; h) evaluating the learning process and results; i) having self-efficacy/self-concept. Based on observations, students' SRL at Mathematics Education of Pasundan University is still low, seen from some of the SRL indicators that are not owned by students: 1) the students do not have their own learning initiatives, they are waiting for instructions or giving the task of lecturers in the study; 2) has not been used to diagnose learning needs, students learn the material provided by the lecturer, not that they need; 3) goals/targets of student learning is still limited to receiving a satisfactory value, not the ability that should they develop; 4) some students are still not able to monitor, manage, and control the study, they just learn as necessary; 5) there are students who give up when faced with difficulties, even some who avoided; and the most common mistake done by the students is 6) they rarely evaluate the process and outcomes of learning.

For these problems, there must be efforts to increase students' SRL; one way that can be cultivated is the application of learning models which gives an open opportunity for students to learn independently. This learning model must be able to optimize students' learning motivation; create trained students learn independently; streamline the learning process of students; and able to cope with the fast growing knowledge and technology.

One solution that is deemed appropriate to achieve these objectives is the implementation of e-learning as a learning model, which gives students the opportunity to learn independently. E-learning has a comparative advantage, as in e-learning computer program can be used in teaching some concepts that may be very difficult if learned manually, demanding level of accuracy is very high, requiring a lot of repetitions, and require the exercise exploration concept for students.

Sloman [10] said "e-learning is the delivery of learning or training using electronically-based approaches, mainly through the internet, an intranet, extranet or Web (the e is short for electronic, originally popularized for e-mail, the transmission of messages digitally through a communications network). Through e-learning, students can access teaching materials or structured tasks independently without being limited by time and distance. E-learning also provides easy access (internet) for students. Among these are access to distance learning, latest information, sites of the necessary education, group discussions in newsgroups, e-mail, and file transfer. According Shimojo [8], the use of internet communication in the field of education and research are (1) analyze the structure of knowledge to create a good learning; (2) evaluate the performance of students through concept maps, knowledge structure analysis and concept-map the diagnosis of learning; (3) implement computer-supported collaborative learning, distance education; and (4) create courseware on the web for school students is concerned.

E-learning characteristics are productive, which implies the emergence of a lot of creative ideas generated; innovative, in the sense that the development of new breakthroughs in the field of learning that complements conventional learning model; efficient, in the sense that the more efficient is seen from the aspect of funds, personnel, or time; flexible, which means that the learning models varied, diverse, flexible and rich with the method/approach; interactive in the sense that it contains based activities stimulus-response, so that intensive interaction takes place between teachers and students, and between one students and other students [8].

Koohang and Harman [7] states that e-learning is an educational delivery (all activities relevant to the learning, teaching, and learning) through various electronic media. Koohang [6] states that the proper instructional design principles and theory which included learning is critical to the success of e-learning

The function of e-learning in the learning can be classified into three forms [14],[9]: supplement (extra), complement (complement), or enrichment (enrichment). In the implementation of web-based e-learning, 3 models are often used, i.e. Web-Course, Web-Centric Course, or Web-enhanced Course. In the web of course, the Internet is used for educational purposes in the form of distance learning without face-to-face activities. Unlike the web-course, web-centric learning activities integrate the activities to-face and distance learning. In a web-enhanced course, the Internet is used to provide enrichment (enrichment) on the students, as well as a communication tool between teachers and students, between students and students, or between students and resources.

Today, some mathematics education courses at universities across Indonesia has implement e-learning (web-based) in learning, such as mathematics education courses at the University of Pasundan, which a web-centric course, that involves classroom learning (face-to-face) and online learning. This model is quite effective to increase the efficiency of classroom learning and discussion or add/seek information outside the classroom. This is as presented by Yaniawati [13] that this blended learning provides better impact than full e-learning and conventional.

Based on the background of the problems mentioned above, s study was conducted to determine the impact of the implementation of e-learning (web-centric course) in a particular lecture. Based on the background of the problems that have been described previously, the formulation of the problem is:

- a. How students' SRL increased after learning mathematics using e-learning?
- b. What is the description of students' SRL after learning mathematics using e-learning?

METHOD

This study is a mix method between qualitative and quantitative, the embedded design. Quantitative data obtained from the SRL questionnaire scale, converted into an interval scale, while the qualitative data obtained from observations and interviews.

The population in this study was students of Mathematics Education of Pasundan University, whom has e-learning facility that can be utilized in this study.

Furthermore, the sample was 40 students of the second semester on Mathematics Education of Pasundan University.

The instruments used in this study are scale of self-regulated learning, observation sheets and interview.

RESULTS AND DISCUSSION

Results obtained from the questionnaire scale self-regulated learning is the average scale of students learning independence, prior to learning is 15.50 and after learning is 19.90, means that the average students learning independence has increased after e-learning. To view the increase is significant or not, parametric statistical analysis is implemented, i.e. t test using SPSS 21. The results concluded, with $\alpha = 0.05$, that there is an increase self-regulated learning student after getting learning by using e-learning. Based on the average value of the normalized gain, the increase is at low category, by category Hake [2].

In line with the results of the questionnaire, the results of the interview (with 10 students) is 70% of the students stated that by e-learning, their self-regulated learning them are better than ever before, they feel interested and increased motivation to learn mathematics, they can also take advantage of and search for learning resources on the Internet, they have also become accustomed to determine learning targets, manage, and control the learning and evaluation.

In contrast to the results of questionnaires and interviews, the observation shows the independence of learning students do not undergo any changes, both increases and decreases and independence of learning in middle category. Conclusion of the questionnaire scale, there is a distinction of self-regulated learning and the observation, possibly the self-regulated learning is so low in the learning process, and this increase might not be detected by the observer.

Learning independence [11] is a self-monitoring process of designing and careful review of the cognitive and affective processes in completing academic tasks; self-regulated learning is also an awareness of the individual to think, to use strategy and sustain motivation, and to evaluate learning outcomes. From this understanding, self-regulated learning is a process that can be improved, but requires habituation, with a strong will that based on internal factors of each individual.

At the time of observation the researchers also found that students tend to have higher attention to the practice of using a computer to learn compared to e-learning, as the use of computers in mathematics learning may a new learning experience for them. This is evident from their habit

during learning, they are more frequently asking about technical matters relating to the use of computers or e-learning, compared to the content of e-learning material.

Researchers also learn that e-learning in this study is to help some students who are busy with extracurricular activities or students who have activities outside, such as work or family activities that they cannot leave, they would be able to follow the learning process experienced by friends or a place and a different time. Similarly, the lecturers who have problems with time and distance learning process can continue, so that the distance is not a barrier anymore time for the implementation of the learning process.

CONCLUSION

Based on the analysis, the results of research, and discussions that have been disclosed earlier, obtained the following conclusion: "There is an increase in student self-sufficiency is still low after getting learning by using e-learning". The aspects of increased mathematics learning independence are (1) having initiative in learning mathematics; (2) determining the learning targets; (3) utilizing and finding relevant sources in learning mathematics.

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