Implementation of self-directed learning model to improve students’ self-regulated learning and self-confidence

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Abstract. This research aimed to investigate and to describe the improvement of self-regulated learning and self-confidence between two classes of students who implemented different learning model: one using self-directed learning and the other using conventional learning. This research was conducted at Mathematics Education Program of Universitas Galuh involving first-year students or 2nd-semester student of 2017/2018 academic year. We specifically observed students’ performance at Introduction of Mathematic Fundamental course. The data were collected using an instrument of scale to measure students’ self-regulated learning and self-confidence. Data analysis was performed towards the normalized gain of both sample groups using normalized gain difference test. The result showed that the learning method using self-directed learning affected the improvement self-regulated learning and self-confidence on students.

1. Introduction
Mathematics is an essential discipline which plays a key role in our education and also daily life. No wonder, it becomes a must-learned discipline for everyone, particularly formal school students, through their elementary school (ES) up to higher education (HE). According to Content Standard (CS) of Curriculum 2006, the purpose of mathematics education at school is to ensure that students are capable of understanding mathematics concepts, using sound reasoning, solving problems, communicating ideas, and appreciating the use of mathematics in life [1].

The different educational background becomes one factor which affects the performance of the students of the Mathematics Education Program of Universitas Galuh within a class. Students who had a difficult experience with mathematics during their earlier education (elementary school to high school) tend to perform poorly on the same subject later in their higher education. Such condition leaves the students with negative impression towards mathematics, specifically towards the introduction of Mathematics Fundamental, an introductory course for first-year students of Mathematics Education Program in Universitas Galuh. This course is of essential since it provides the students with basic mathematics knowledge and skill.

The content of Introduction of Mathematics Fundamental course is practically quite similar if not the same with what has been taught in earlier education. Thus, students are expected to score well on this course. Unfortunately, the result of the test doesn’t quite as expected. Most students did well on basic concept questions but failed more advance questions. It showed that students’ mathematical understanding was still lacking. This lack eventually has its toll on students soft skill namely self-regulated learning and self-confidence. To overcome this problem, something about current teaching-learning process must be changed. The use of Self-Directed Learning (SDL) model is that change.
SDL model or independent learning is a learning process which is done by oneself on their initiative. SDL defines as a process in which individuals take the initiative with or without the help of others in diagnosing their learning needs, formulating learning goals, identifying human and material resources for learning, choosing and implementing appropriate learning strategies and evaluating learning outcomes [2].

The thing about SDL is the implementation of the independent learning system. This system helps students to be more active and free in determining what they want to achieve. Learning process which accounts for a unique style of each student, and gives them autonomy to plan and arrange learning activity, to monitor and evaluate the result of their learning process is SDL model [3]. Generally speaking, SDL can be divided into three phases namely planning, monitoring, and evaluation [4]. This phase is initiated by planning several things such as learning activities, learning components, and learning target or achievement, followed by observation and evaluation of their learning. Implementation of SDL is expected to develop self-regulated learning and self-confidence in students.

Self-regulated learning is the ability to control oneself to learn. The ability to control oneself to learn mathematics will improve the quality and quantity of learning. Behavioural theories in self-regulated learning (SRL) in education have a backdrop of not considering the learners’ internal states (e.g. emotions, motivations, thoughts, and beliefs), instead concentrating heavily on learners’ self-control mechanisms (e.g. self-mentoring, self-reinforcement, self-evaluation, self-correction, and self-instruction) [5]. The term SRL for self-regulated in learning. Principally, SRL emphasizes the importance of regulating and controlling oneself, especially upon solving the problem. High SRL students tend to learn better [6]. It is supported by Hargis discovery that individual with high SRL tends to learn better. Moreover, they are capable of monitoring, evaluating, and controlling their learning process effectively. Thus they could save more time on completing the assignment, control time and learning process efficiently, and score well on science [7]. Similar result on their study that students with self-regulated learning ability showed better control in the learning process [8].

Regulatory processes are grouped into four phases including planning, monitoring, control and evaluation. In each phase of self-regulated activity comprised of four areas namely cognitive, motivational/affective, behavioural, and contextual [9]. It is found that SRL models have four shared assumptions. These assumptions are (1) Learners have active roles in determining their learning goals and strategies; (2) Learners have the ability to regulate the SRL components such as monitoring, behaviour, environment, self-efficacy, self-evaluative judgments, motivation and control of cognition; (3) Learners evaluate their learning progress against preset goals, criteria and standards; (4) SRL is not just determined by individual qualities or attributes and the environment but also students’ cognition, motivation and behaviour [10]. Based on the explanation above, self-regulated learning which is applied in this study are (1) learning initiative, (2) diagnosing learning needs, (3) determining learning purpose, (4) monitoring, controlling, and learning control, (5) view difficulties as challenges, (6) utilize and find relevant source, (7) choose and determine right learning strategy, (8) evaluating the learning process and result, (9) self-concept.

Self-confidence is positive behaviour of an individual who believes in their competency or ability to develop a positive impression both on their self and their environment. Self-confidence is related to two fundamental things in our life. First, self-confidence is related to how someone struggles for their goal (achievement or performance). Second, self-confidence is related to the ability to confront the obstacle which arises along the struggle to achieve their goal. It means that students with strong self-confidence will struggle to be better in a class by learning harder to beat the problem or in this case difficult subject.

The mathematics achievement depends on psychological factors, and the most important factor is self-confidence [11]. Bad self-confidence will disturb the mathematics achievement on mathematical learning. Oxford Dictionaries define self-confidence as a belief to self-ability, quality, and judgment [12]. The conclusion about self-confidence based on tree definition is someone who has good self-confidence will have the good belief in his/her ability. Self-confidence is a belief [13]. Self-confidence is an attitude or feeling of confident of one’s own abilities so that he has no worry about his action, feel free to do things and being responsible for his action, interacting with other friendly and politely,
could accept and appreciate others, having the motivation to achieve high, and understand his strength and weakness [14].

Self-confidence is the inner feeling of certainty, it is a feeling of certainty about who you are and who you have to offer the world and also offer the feeling that you are worthwhile and valuable [15]. While [16] define self-confidence as a conviction to do something to oneself as a personal character in which lies one’s ability, optimistic, objective, responsible, rational, and realistic. According to Lauster [16], self-confidence is comprised of these aspects: (1) believing in one’s ability; (2) optimistic; (3) objective; (4) responsible; (5) rational and realistic. Based on the previous explanation, the definition of self-confidence for this study are: (1) believing in one’s ability; (2) making decision independently; (3) feeling positive about one’s self; (4) dare to express an opinion.

Based on the observations of researchers during teaching students of mathematics education at FKIP Universitas Galuh and based on interviews with several students, they felt lack of confidence, or in other words, self-confidence was lacking and still could not regulate themselves in learning, especially when facing assignments. Based on the background of the problem, the formulation of the problem in this study are:

(1) Is there any difference in the improvement of self-regulated learning between the students treated with self-directed learning and students treated with conventional learning?
(2) Is there a difference in the improvement of self-confidence between students treated with self-directed learning and students treated with conventional learning?

2. Method

This experimental study was using non-equivalent control group design, a Quasi-Experiment which does not arrange the subject randomly but accepting the subject as it is [17]. In this study, we used two classes. First class was treated with Self-Directed Learning model while the other class was treated with conventional learning method. This study was conducted at the Mathematics Education Program of Universitas Galuh involving 2nd-semester students of 2017/2018 academic year on Introduction to Mathematics Fundamental course. Instruments of this study were non-test including two questionnaires about self-regulated learning and self-confidence.

3. Results and Discussion

3.1 Results

This study aimed to investigate the improvement of self-regulated learning and self-confidence on students who were treated with Self-Directed Learning model and students who were treated with conventional learning method. The data were processed in SPSS. The result was presented as follow:

3.1.1 Self-Regulated Learning. To find out the difference in the average score of an initial questionnaire about self-regulated learning, Mann-Whitney test was performed with the following hypothesis.

\( H_0 \) : There was no difference in the average score of an initial questionnaire about self-regulated learning on students who were treated with self-directed learning and students treated with the conventional learning method

\( H_1 \) : There was a difference in average score of an initial questionnaire about self-regulated learning on a student who was treated with self-directed learning and students treated with conventional learning method.

| Table 1. Initial Questionnaire Similarity Test for Self-Regulated Learning |
|-----------------------------|------------------|
| Value                                      |
| Mann-Whitney U                | 122.000         |
| Wilcoxon W                    | 275.000         |
| Z                             | -0.505          |
| Asymp. Sig. (2-tailed)        | 0.614           |
Based on Table 1, the value of Asymp. sig. (2.tailed) > $\alpha = 0.05$. It means that $H_0$ was accepted, thus there is no difference in average score of initial questionnaire about self-regulated learning in a class treated with Self-Directed Learning and class treated with conventional learning method. In other word, self-regulated learning of the students at both class are the same.

In order to examine self-regulated learning achieved by the students using normalized data Gain and to find out whether there is a difference of self-regulated learning improvement of the student in Self-Directed Learning class and conventional learning class was tested using Mann-Whitney test. The hypothesis were as follow:

$H_0$ : There is no difference in self-regulated learning improvement of students treated with self-directed learning and students treated with the conventional learning method

$H_1$ : There is a difference in self-regulated learning improvement of students treated with self-directed learning and students treated with the conventional learning method

| Table 2. N-Gain Difference Test |
|---------------------------------|
| *Self-Regulated learning*       |
| Value                           |
| Mann-Whitney U                  | 11.000 |
| Wilcoxon W                      | 147.000|
| Z                               | -4.506 |
| Asymp. Sig. (2-tailed)          | .000   |

Based on Table 2 the value of Asymp. Sig. (2-tailed) was significant (less than 0.05) thus $H_0$ was rejected, and $H_1$ was accepted. It means that there was a difference in self-regulated learning improvement of students treated with self-directed learning and students treated with conventional learning method.

3.1.2 Self-Confidence. To find out the difference in the average score of an initial questionnaire about self-confidence, Mann-Whitney test was performed with the following hypothesis:

$H_0$ : There is no difference in the average score of an initial questionnaire about self-confidence at a class treated with self-directed learning model and a class treated with the conventional learning method

$H_1$ : There is no difference in the average score of an initial questionnaire about self-confidence of students at a class treated with self-directed learning method and a class treated with the conventional learning method

| Table 3. Similarity Test of pre-test |
|--------------------------------------|
| Score self-confidence                |
| Value                                |
| Mann-Whitney U                       | 89.000 |
| Wilcoxon W                           | 225.000|
| Z                                     | -1.705 |
| Asymp. Sig. (2-tailed)               | .088   |

Based on Table 3 the value of Asymp. Sig. (2.tailed) > $\alpha = 0.05$, thus $H_0$ was accepted. It means that there was no difference in the average score of an initial questionnaire about self-confidence at a class treated with self-directed learning and a class treated with conventional learning method. Simply said that self-confidence of both classes was the same.

To find out self-confidence improvement achieved by students, the normalized data Gain was used and to find out the difference in self-confidence improvement of the students treated with Self-Directed Learning and students treated with conventional learning, Mann-Whitney test was performed with the following hypothesis:


H₀ : There is no difference in self-confidence improvement of the students treated with self-directed learning and students treated with conventional learning
H₁ : There is the difference in self-confidence improvement of the students treated with self-directed learning model and students treated with conventional learning

| Table 4. N-gain difference test self-confidence |
|-----------------------------------------------|
| Value                                         |
| Mann-Whitney U                                | 75.500 |
| Wilcoxon W                                    | 211.500 |
| Z                                             | -2.182 |
| Asymp. Sig. (2-tailed)                        | 0.029  |

Based on Table 4, the value of Asymp. Sig. (2-tailed) was significant (less than α = 0.05). Thus H₀ was rejected, and H₁ was accepted. It meant that there was a difference in self-confidence improvement of the students treated with self-directed learning and students treated with conventional learning.

3.2 Discussion
The result of normalized N-Gain data showed that there was a difference in the improvement of self-regulated learning and self-confidence among students who implemented self-directed learning method and students who implemented conventional learning method. The improvement of self-regulated learning in both classes was categorized as moderate. To be precise, there were five students (29.41%) whose improvement was high and 12 students (70.59%) whose improvement was moderate in self-directed learning class. While conventional learning class resulted in 11 students (68.75%) achieved moderate improvement and five students (31.25%) achieved low improvement.

The improvement of self-confidence in both classes was also categorized as moderate. Self-directed learning class resulted in 4 students (23.53%) whose improvement was high and 12 students (76.47%) whose improvement was moderate. On the other hand, conventional learning class resulted in 14 students (87.50%) whose improvement was moderate and two students (12.50%) whose improvement was low. These results were consistent with similar research by which found out that self-directed learning method promotes several benefits including the improvement of self-confidence, autonomy, motivation, and learning preparation [18].

4. Conclusion
Based on the result and discussion of this study. It can be concluded that: 1) There was the difference in self-regulated learning improvement of the students treated with self-directed learning and students treated with conventional learning; 2) There was the difference in self-confidence improvement of the students treated with self-directed learning and students treated with conventional learning.

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