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Self-regulated learning: the effect on student's mathematics achievement

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Abstract. Self-Regulated Learning (SRL) is a very important ability for students in learning process. Students who have Self-Regulated Learning will be able to plan goals, plan strategies, manage behaviors, and evaluate self-improvement. The purpose of this article is to analyze the results of research on the effects of self-regulated learning on student's mathematics achievement. The role of self-regulated learning is important to the mathematics achievement because it is a factor that makes the learning process more effective. In this article, there are 11 research results related to it. Based on the results of these studies, it can be concluded that students who have high self-regulated learning tend to have high motivation and achievement and vice versa, students who have lower self-regulated learning tend to have low achievement. Self-regulated learning is a cyclical process that includes three phases. 1) forethought phase that includes task analysis (goal setting, strategic planning) and self-motivation beliefs (self-efficacy, goal orientation). 2) performance/volitional control that includes self-control (self-instruction, attention focusing, task strategies). 3) self-reflection that includes self-reflection (self-judgment, self-evaluation) and self-reaction (self-satisfaction).

1. Introduction

The role of education is very important to improve the quality of human resources. Through quality education will certainly produce quality human resources as well. Education should also get more attention from the government because of the education of children will be able to develop the potential, ability, and talents it possesses such as logical, systematic, and creative thinking. These abilities can be developed through mathematics learning. Children who are able to develop the potential, talent, and creativity that has tends to have high academic achievement. Academic achievement is one aspect that becomes the benchmark of one's success in education [1].

The most influential and influential aspects of child achievement include anxiety, self-esteem, and optimism [2]. Then Lens, Lacante, Vansteenkiste, & Herrera [3] add an aspect that has an important effect on achievement is motivation. Students with high academic achievement tend to have strong competitiveness motivation compared with low achieving students. To get a better achievement in education today is certainly not enough just to study in school, because the current curriculum requires students to learn more by themselves. Therefore, a child's learning strategy is needed to develop students' cognitive abilities. Learning strategies used are not just active learning, but must also bring

students to the achievement of predetermined indicators and bring students to deep understanding of the material [4].

One of the students' ability which is supposed to be able to improve mathematics learning achievement is Self-Regulated Learning (SRL). Independent students tend to be able to optimize their potential without any guidance from others. [5]explains that students who learn independently will be able to find appropriate learning strategies, manage their own learning activities, improve learning activities by providing feedback during learning, and train themselves to improve their own academic performance. Therefore, students can become better if they are aware of what they are learning and acting on their own consciousness. [6]said that students who have a good self-regulated learning will be able to find the concept and how to learn it self so as to understand and be able to solve the problem. This means that independent students will not easily give up when not able to solve a problem so that students will try to find a solution by looking for other references.

Self-regulated learning (SRL) is an important approach in the learning process at both the basic and advanced levels. SRL is a cognitive learning approach strategy [7]. The use of SRL in learning has a significant positive correlation with academic achievement [8]. SRL is a combination of academic learning skills and self-control that makes learning easier, so students are more motivated to learn [9]. Murphy and Alexander [10] says that students who have SRL are those who have the skills, and the willingness to learn. [11]mentioned that students who have self-regulated learning are much more likely to succeed than students who do not have self-regulated learning.

Zimmerman [12] says that students who have self-regulated learning metacognitively, motivate, and conduct themselves provide initiative and direction for their own efforts to gain knowledge and skills independent of teachers, parents or others. [13]mentions the self-regulated learning also affects the involvement of parents so that his achievement increases. Parents support, teach, encourage, facilitate, use good strategies, and other processes to support their child's self-regulated learning [14]. SRL is also proven to increase students' motivation so that with such motivation their academic achievement increases [15]. [16]said that self-regulated learning is an important aspect of learning and becoming a student self-regulator, and will affect student academics. [17] states that the development of self-regulated learning plays an important role for students to develop themselves as good or bad in school learning, which impacts on performance and generate feedback from teachers, parents, and friends, as well as high achievement or low achievement.

Zimmerman said that SRL is an action and process that directs information and skills that involve the perception of agency, purpose, and equipment by the learner. Zimmerman then states that SRL is a concept of how a student becomes a regulator for his own learning. Zimmerman defines SRL a process whereby a student activates and encourages his cognition, behavior, and feelings systematically and is oriented towards the attainment of learning goals [18].

Self-regulated learning (SRL) can help students get used to learning better and strengthen their learning abilities, implement learning strategies to improve academic performance, monitor their performance, and evaluate their own academic skills [19]. Zimerman describes SRL as a cyclical process consisting of (1) planning, (2) implementation and monitoring, and (3) self-evaluation [20]. Zimmerman says that this cyclical process is used for making a decision by repeating the attempts that have been made. Such repetition attempts are necessary because people, the environment, and the behavior are constantly changing during the observed empire [21].

Zumbrunn, Tadlock and Danielle discussions about the SRL include three phases, namely forethought and planning phase, performance monitoring phase, and reflection on performance phase. In the forethought there are two things: task analysis (including goals setting, strategic planning) and self-motivated beliefs (self-efficacy and goal orientation). performance/volitional control include self-control (self-instruction, attention focusing, task strategies). And self-reflection phase consists of self-consideration (self-evaluation and attribution) as well as self-reactions (self-satisfaction and adaptability). The three phases are interrelated and mutually influencing to form a cycle. The cycle is described as follows.

Table 1. Phase Structure and Subprocesses of Self-Regulation (Zimmerman).

Cyclical self-regulatory phases		
Forethought	Performance/volitional control	Self-reflection
Task analysis • Goal setting • Strategic planning	Self-control • Self-instruction • Imagery • Attention focusing • Task strategies	Self-judgment • Self-evaluation • Causal attribution
Self-motivation beliefs • Self-efficacy • Outcome expectations • Intrinsic interest/value • Goal orientation	Self-observation • Self-recording • Self-experimentatiom	Self-reaction • Self-satisfaction/affect • Adaptive-defensive

Self-regulated learning (SRL) involves the ability to more effectively manage experiences in various areas of cognitive, emotional, physiological, and behavioral [22]. Furthermore, Berger [23]self-regulated learning is the ability to monitor cognition, emotion, and behavior to achieve a goal and to adapt to the cognitive and social situations. Another opinion about learning independence is the ability to behave naturally and automatically to achieve goals and follow the norms and rules [24].

Students with self-regulated learning will be aware of the skills and abilities they possess and do not possess so that students with SRL will actively seek out the necessary information and seek to understand it [25]. English and Kitsantas[26] say that students who have learning independence can set goals, plan actions, choose appropriate strategies, monitor themselves, and evaluate their own pursuits. In line with what Zimmerman pronounced that students who have self-regulated learning will do their tasks with self-help, diligent, full of ideas, aware of the abilities they have and which they do not have, so they are proactive in finding the information needed to understand a problem.

Woolfolk said self-regulated learning is certainly a more effective approach to learning. The self-regulated learning is influenced by many factors, namely knowledge, motivation, self-discipline, and self-will. This means that the knowledge in question is knowledge of himself, or knows himself, knowledge of the task, materials, goals, and strategies used to learn. Those who have self-regulated learning will know the easy learning style for themselves, what talents and interests, and how they cover their shortcomings and maintain their strengths.

A person who has self-regulated learning will take responsibility for their learning activities. They organize themselves, formulate goals and anticipate problems that may be faced in achieving the objectives that have been prepared, evaluating themselves in a better way to achieve its goals. [27]says that there are three terms that need to be distinguished in relation to learning objectives namely goals, objectives, and learning outcomes. Goals related to common goals identified as priorities for education such as learning to read, write, and count. An objective with regard to instructional results that describe the level of learning and learning outcomes is the result of instructional expressed in the form of student-specific behavior such as answering the problem of mathematics with good and right. McCombs and Morzano[28] say that students who are able to carry out learning independently will also be able to shape and manage a change that is in itself.

Students with self-regulated learning have an awareness of their performance. They can plan their level of performance based on planned performance. Eva Latipah summarizes some of the processes in self-management in learning that need to be done related to the performance dimensions of self-monitoring, self-judgment, and action control. [29] uses the term 'resourcefulness' which refers to the ability to control the surrounding physical environment in terms of restricting distractions that interfere with learning activities and to successfully locate and use the references and skills necessary to master what is learned. Resourcefulness is characterized by the liveliness of students in finding information, organizing the environment, and minimizing distractor.

Zimmerman suggests several factors of self-regulated learning that is related to one another, internal and external factors. Internal factors that come from within the individual that includes beliefs about self-ability and intrinsic values, individual knowledge includes the academic goals to be achieved, the condition of affection, and behavioral changes. Then external factors include social experience and the structure of the learning environment.

The realization of learning achievement can be either verbal or written acts and skills that can be measured by standard tests. The learning process, a student will gain a good learning achievement if he is aware, responsible, and knows how to learn efficiently. Such students are characteristic of students who have self-regulated learning.Students with the ability to learn independently will be responsible for their own learning activities. they will formulate the goals and problems they are likely to face in achieving their goals. They have strategies for achieving goals and some strategies for correcting their faults and redirecting them when the plans are not working properly. They will know the shortcomings and the advantages it has.

From the description above, the strategy of self-regulated learning proved very efficient to improve learning achievement. Even students who have learning difficulties will also be very effective if using a self-regulated learning strategy. Therefore, it can be said that students who have higher self-regulated learning then the achievement will also be high.

2. Method

The data collection in this article is done by browsing the journal on the internet using the MENDELEY program. The keywords used for journal search are self-regulated learning and mathematics achievement. Keyword use is used to narrow down the topic of research to facilitate literature search. Based on the search results using the above keywords, then obtained 11 articles that have been selected to examine the influence of self-regulated learning with learning achievement. Of the 11 articles in the analysis to draw a conclusion that there is the influence of self-regulated learning with academic achievement. The articles can be seen in Table 2 below.

Table 2. Research on self-regulated learning.

No	Year	Name of the researcher	Number of samples	Sample
1.	1996	Nola Purdie and John Hattie	493	Senior high school
2.	2002	Faye Marsha G. Kamahalan	60	Elementary school students
3.	2003	Lilia M. Ruban, D. Betsy McCoah, Joan M.McGuire, and Sally M. Reis	470	University students
4.	2003	YohananEshel&RevitalKohavi	302	Sixth grade student
5.	2005	Ivar Bra ten and Helge I. Stromso	286	College students
6.	2008	Yin-kum Law, Carol K. K. Chan and John Sachs	837	Elementary school children
7.	2009	Jill C. Chalk, Shanna Hagan Burke, and Mack D. Buck	15	High school students
8.	2011	Eric C. K. Cheng	6.524	Secondary school
9.	2012	Ana-Maria Cazan	117	Universitu students
10.	2014	Marini, J. A.S., and Boruchovitch, E.	107	University students
11.	2016	Jan Kalenda and SonaVavrova	49	University

students

3. Result and Discussion

Based on the analysis of 11 articles, there is a positive relationship between self-regulated learning on student achievement. The results of the analysis are used as the basis and provide specific guidance for research on the next self-regulated learning. Referring to the result of analysis of study data about self-regulated learning to achievement indicate that allegation which states the existence of the relation between self-regulated learning with the academic achievement show positive thing.

Self-regulated learning is very necessary today for elementary school students to college level. Self-regulated learning affects the failure of students in achieving learning achievement, students who are frustrated with their coursework demands new self-directed learning. Self-regulated learning is a combination of academic learning and self-control skills that make learning easier, so students are more motivated.

In the field of education, self-regulated learning has a very significant effect, especially for junior and senior high school students [30]. [31]have studied how the influence of self-regulated learning on students' academic emotions can ultimately affect the improvement of academic achievement. In addition, parents are also a factor supporting self-regulated learning through modeling, encouragement, facilities, the use of good strategies and other processes. Self-regulated learning is also proven to increase student motivation so that with such motivation students' academic achievement can be increased. Mahmodi, Kalantari, and Ghaslani[32] suggest that there is a significant relationship found between motivation and SRL. Motivation required students to implement strategies that will affect the learning process. Students will tend to more efficiently manage their time and be effective in learning if student motivation is high. With self-regulated learning, students become adept at regulating their own learning and can improve their learning outcomes.

Self-regulated learning evolved from the theory of Bandura which states that humans are the result of the causal structure of the personal aspects (person), behavior, and environment. These three aspects are the determinants of self-regulated learning. These three aspects are interrelated causation in which the person attempts to self-regulate, the result will be performance or behavior, and this behavior affects environmental change, and so on.

Furthermore, from the analysis of 11 articles, the sample used in the study varied or heterogeneous. The sample involved research subjects ranging from elementary school students, junior high school students, high school students, and college students. Of all the characteristics of different subjects, there is a diversity in the way of thinking about these subjects based on cognitive development at different stages of age. Such diversity can impact on different self-regulated learning strategies. But Woolfolk says that in children aged third grade and below, the use of self-regulated learning is not recommended. This means that at that age the child still needs guidance from the surrounding environment. In some of the articles in this study, the subjects were elementary students, but no class of students was included.

4. Conclusion

From the above results can be concluded that self-regulated learning is a strategy that is very influential on student achievement. Although at different levels from elementary to university levels the role of self-regulated learning has a positive influence on student achievement. Students with high self-regulated learning certainly have high achievement, and vice versa students with low self-regulated have low achievement.

In addition to learning achievement, self-regulated learning is also proven to increase students' motivation and confidence so that with increased motivation and confident students will be more active learning to obtain good learning outcomes. These results can support previous studies on the role of self-regulated learning strategies on academic achievement. Therefore, for the achievement of

high learning achievement, the use of self-regulated learning strategy should be highly considered. From these results and conclusions, it may be advisable to use more articles to review in order to get better results. Then for the next researcher to consider and focus the same sample characteristic, for example, the only sample at junior high school, high school, or college level.

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