Kreano 12 (1) (2021) : 14-25
KREANO
Jurnal Matematika Kreatif-Inovatif
http://journal.unnes.ac.id/nju/index.php/kreano

Implementation of Situation-Based Learning Model To Improve The Junior High School Students' Critical Thinking And Self-Regulated Learning Skills

Siti Mulia[1], M. Ikhsan[1], and M. Duskri[3]

[1]Master of Mathematics Education Study Program Universitas Syiah Kuala Banda Aceh
[3] Mathematics Education Study Program Universitas Islam Negeri Ar-Raniry Banda Aceh
Corresponding Author: m.duskri@ar-raniry.ac.id

History Article
Received: December, 2020 *Accepted: March, 2021* *Published: June, 2021*

Abstrak

The aim of the research was determining the effect of the Situation-Based Learning (SBL) learning model in improving students' mathematical critical thinking skills and self-regulated learning in mathematics. This research is quantitative research using a quasi-experimental research design, the research sample are the eighth grade of junior high school students, the experimental class (eighth-1) applied the SBL model and the control class (eighth-2) applied conventional learning. The statistical analysis of the Mann-Whitney test for critical thinking skills obtained r_k = 0.835 and a sig value <0.0001, for self-regulated learning r_k = 0.611 and a sig value <0.0001 and the effect size of critical thinking skills is d = 1.87, and self-regulated learning is d = 1.43. This shows that their difference in the increase in critical thinking skills and self-regulated learning between the experimental class and the control class is very significant.

Abstract

Penelitian ini bertujuan untuk mengetahui pengaruh model pembelajaran *Situation-Based Learning* (SBL) dalam meningkatkan keterampilan berpikir kritis matematis dan kemandirian belajar matematika siswa. Penelitian ini merupakan penelitian kuantitatif menggunakan desain penelitian kuasi eksperimen, dengan sampel penelitian siswa kelas VIII SMPN 1 Samudera, kelas eksperimen (VIII-1) diterapkan model SBL dan kelas kontrol (VIII-2) diterapkan pembelajaran konvensional. Analisis statistik uji *mann-whitney* untuk ketrampilan berpikir kritis diperoleh r_k=0,835 dan nilai sig <0,0001, untuk kemandirian belajar diperoleh r_k=0,611 dan nilai sig <0,0001. Hal ini menunjukkan bahwa terdapat perbedaan yang signifikan peningkatan keterampilan berpikir kritis dan kemandirian belajar siswa kelas eksperimen bila dibandingkan dengan kelas kontrol. Besaran nilai efek keterampilan berpikir kritis sebesar d = 1.87, dan kemandirian belajar sebesar d = 1.43, hal ini menunjukkan bahwa perbedaan peningkatan kelas eksperimen dan kelas kontrol sangat signifikan.

***Keywords**: Situation-Based Learning; Critical Thinking Skill; Self-Regulated Learning.*

BACKGROUND

Mathematics learning at the junior high education level aims to prepare students to be able to face all changes in life, including practice to behave based on logical, rational, critical, careful, affective, and efficient thinking, and to prepare

p-ISSN: 2086-2334; e-ISSN: 2442-4218

students to be able to use mathematics and mathematical thinking patterns in everyday life (Permendikbud, 2016). Mathematics subject in school is useful for equipping students to have the ability to work together and the ability to think logically, analytically, systematically, critically, and creatively (Putri and Santosa, 2015). In this changing world, those who can and will understand mathematics will significantly increase the opportunities and options for forming their future. Proficiency in mathematics can bridge a productive future (NCTM, 2000). Learning mathematics's primacy is to improve skills in solving a problem and efforts to find various solutions to problems that can train perseverance and persistence, and mathematics is important in everyday life. Many career fields require a strong foundation of mathematical knowledge (TIMSS, 2015).

However, the reality shows that mathematics achievement performance according to International standards for Indonesian students is ranked 48 out of 56 participating countries. The percentage of Indonesian students' mathematics performance at a low standard (students already have basic mathematical knowledge) is 50%, at an intermediate standard (students can apply basic mathematical knowledge to simple situations) is 20%, at a high standard (students can apply their knowledge and understanding to solve problems) is only 3%, and at a higher standard (students can apply their knowledge and understanding to solve problems in various situations that are relatively complicated and able to provide reasons) is 0% (TIMSS, 2015).

The average percentage of national examination results for mathematics subject at the SMP/MTs level is 43.50% at the national level, for Aceh Province is 35.17%, and North Aceh Regency is 37.39%, and at the level of Education Units, especially SMPN 1 Samudera, is 5.43%. Therefore, the average percentage acquisition in mathematics subjects is still low compared to the absorption capacity that should have been achieved, which is 55.00% (Puspendik, 2018). The national examination results in 2017/2018 also show that based on the characteristics of the questions according to the cognitive level, there are still many question absorption capacities that are lower than what they should have achieved. One of them is at level 2 (applying) for the question indicator "solving story questions related to the linear equations in two variables" the average national acquisition is 35.21%, while in Aceh Province, it is 27.96% (Puspendik, 2018).

The national examination results in 2018/2019 also show that the question absorption capacity is still low from 55.00%, as in the question indicator "analyzing problems about the creation of new arithmetic series". The national average is 27.23%, while in Aceh Province is 22.10%, for the question indicator "analyzes the problem of the linear equations in two variables" national average is 36.90%, while in Aceh Province is 26.19% (Puspendik, 2019).

The achievement of learning outcomes of mathematics subject obtained by Indonesian students is still low because students are only required to solve problems rather than being trained to present/formulate existing problems (Larawati, Isrok'aton, & Gusrayani, 2016). Students also still have difficulty in understanding and interpreting the meaning of story/non-routine problems, and they still have difficulty in presenting daily life problems into a mathematical model and determining the right strategy to solve them (Darmawan, Kharismawati, Hendriana, & Purwasih, 2018). When learning mathematics in schools, teachers play a more active role, while stu-

dents only pay attention and are rarely trained with non-routine questions. As a result, students' critical thinking skills are low (Yunita, Rosyana, & Hendrian, 2018).

Based on preliminary observations that the researchers done, it was found that students were less able to provide further explanations and make decisions (make reasons) and were less able to determine appropriate concepts and strategies to solve a problem. Thus, the problem was found that critical thinking skills are still low even though critical thinking skills are very important and must be mastered by students. The skills that must be possessed by students at the SMP/MTs/SMPLB levels contained in Permendiknas Number 20 (2016) are students must have skills in thinking and behaving, including: creative, productive, critical, self-regulated, collaborative, and communicative. Critical thinking skills are very important and need to be mastered by students in order to understand and solve a problem both in the sphere of education and real-life and be able to present well-constructed arguments (Judge, Jones, & McCreery, 2009). Critical thinking is an aspect of thinking activities. In the learning process, critical thinking is useful as a tool to generate new knowledge by processing existing knowledge and ideas through analysis, understanding, and synthesis. (Moon, 2008).

The 2013 curriculum not only requires students to master critical thinking skills but also must have a self-regulation character in learning. Self-regulated learning is a very important aspect because self-regulation can develop students' academic skills in 5 aspects, namely: planning and using study time more effectively, understanding and drawing conclusions from learning matter better, improving note-taking techniques, anticipating and prepare things for the test better, write more effectively (Zimmerman, Bonner, & Kovach, 1996).

A self-regulation character is the main character that every individual must have to optimally empower all the potential, abilities, skills, creativity, and innovation that exists in each individual later; therefore, they can achieve the goals they want to achieve (Rianawati, 2014). Students need to be trained to be self-regulated in learning because self-regulated learning also determines students' learning success and needs to increase self-regulation in learning in order that students can be more responsible for their success of learning (Fajriyah, Yoga, Padillah, & Marten, 2019). Students who are self-regulated in learning will be able to withstand challenging and difficult situations, remain positive and assertive in the face of failure and adjust or change their behavior when they are not successful (Clearly, 2018).

Based on Sofyan & Ratumanan's research, it was stated that the effect of learning activities on students' mathematics learning outcomes directly or indirectly through self-regulated learning is 34.1% in the large category (Sofyan & Ratumanan, 2018). On the other hand, it was found that 66% of students really liked learning mathematics, but it was not supported by the resources available in schools where 61% of the conditions and resources of Indonesian schools had problems ranging from moderate to severe categories. It was also found that self-confidence in Mathematics is only 23% of students who are very confident, 53% are confident, and 24% are not confident (TIMSS, 2015). Most of the students only copy answers from capable friends without understanding the answers they have got (Sofyan & Ratumanan, 2018).

Based on preliminary observations by interviewing several students, it was

found that the lack of effort and desire of students to follow lessons well and seriously, students tend to be down and out, not paying enough attention when the teacher explains the lesson. The interactions that occur in the classroom are still dominated by students who have more abilities, and many of them tend to wait for the results of their friends' work to be copied. Therefore, another problem was found that the students' self-regulated learning was still low. Self-regulation in learning is an active learning activity that is motivated by the intention and motive to master competency in order to solve a problem (Wicaksono & Roza, 2016). Students who are self-regulated in learning will be actively involved and can control their behavior, motivation, and cognition when completing academic tasks (Schwart, 2005).

One alternative learning model that is expected to help students improve critical thinking skills and self-regulation learning is the Situation-Based-Learning model. In this SBL learning model, the teacher's task is only to guide students as facilitators, help and guide students if they find any difficulties (Isrok'atun & Tiurlina, 2016).

The model consists of 4 stages/phases, namely (a) Creating Mathematical Situation, in this first stage, the teacher creates mathematical situations that can help students to raise various questions. (b) posing mathematical problem, in this second stage, students are expected to be able to interpret and analyze the situation that has been presented by the teacher in order to make questions that are in accordance with the context being studied and have a solution to solve.

Practicing critical thinking skills is to get used to asking yourself and others because these questions will later encourage the brain or mind to come up with ideas to answer or find better solutions (Alvonco, 2013). (c) solving mathematical problem, in this third stage, students are expected to be able to analyze and evaluate in choosing questions that need to be resolved and not out of the context that is being studied. (d) applying mathematics, at this last stage, students are expected to be able to interpret, analyze and evaluate in applying the concepts obtained to solve applied practice questions. The expectation after passing each stage of SBL learning, students are accustomed to solving a problem critically and self-regulated in empowering or managing the best possible time in working on each problem that occurs at each stage/phase of SBL learning.

Several studies conducted prove that the Situation-Based-Learning (SBL) model has a positive impact on learning, namely an improvement in the Creative Problem-Solving Ability (CPS) of mathematics students taught using SBL learning compared to students taught using conventional learning (Ardagh & Borges, 2016). The application of the SBL learning model can improve mathematical problem-solving skills (Lestari, Andinny, & Mailizar, 2019). The SBL learning model has an influence on quantitative literacy (Latifah, Cahya & Suhendra, 2017). Competencies that are directly related to quantitative literacy are critical thinking, problem-solving, decision making, communication, information literacy, and media literacy (NCTM, 2012). The previous research conducted by Latifah, Cahya & Suhendra (2017) focuses on the effect of using the SBL model on critical thinking skills. However, the research has not been carried out related to increasing critical thinking skills accompanied by self-regulated learning.

Therefore, there are two problem formulations to be analyzed: the improvement of mathematical critical

thinking skills and the self-regulated learning in mathematics of students who are taught using the SBL learning model better than students who are taught conventionally.

METHODS

This research used a quantitative approach with the experimental research type. The population in this research was grade VIII SMPN 1 Samudera. The population selection is based on the reason that the National Examination (UN) results of students in mathematics at this school are still low. It can be seen from the results of the 2017/2018 academic year in SMP/MTsN. The research design used was the nonequivalent control group design; therefore, there were two classes be the samples, namely class VIII-1 with 30 students as the experimental class, which was taught using the SBL model and class VIII-2 with 22 students as the control class taught conventionally. The two classes were randomly selected by using a simple random sampling technique. The independent variable in this research is the situation-based learning (SBL) model, while critical thinking skills and self-regulated learning are the dependent variables. The learning process lasts for 5 meetings. The data were collected from the results of the pretest and the post-test students' critical thinking skills and self-regulated learning.

The test of critical thinking skills with regard to relations and functions matter in mathematics subject in SMP/MTsN grade VIII 2013 curriculum consists of four questions in the form of descriptions. The arrangement is adjusted to the indicators of critical thinking skills. In this research, indicators of critical thinking skills were adapted from Ismaimuza (2010) and Facione & Facione (2011). The indicators of critical thinking skills are (a) interpretation (categorizing problems, making meanings, clarifying meanings), (b) analysis (determining important information, connecting important information with other matter or knowledge, choosing the appropriate strategy), (c) evaluation (considering information, considering arguments, giving reasons). However, to get good test questions, it is necessary to do a test questions try out to determine the validity, reliability, discrimination power, and level of difficulty of each question. The correlation coefficient (r_{xy}) of the validity of the questions obtained was 0.38 to 0.45, the reliability coefficient of the questions was 0.89, the discrimination power of each question was 0.49 to 0.70, and the level of difficulty of the questions obtained was from 0.30 to 0.62.

Self-regulated learning data were collected from the answers of the self-regulated learning in mathematics questionnaire. The self-regulated learning questionnaire in this research was adapted from Jansen, Leeuwen, Janssen, Kester, & Kalz (2017), with 5 indicators, namely (a) metacognitive skills, (b) structuring learning time, (c) time management, (d) help seeking, and (e) persistence. The self-regulated learning questionnaire has been tested and analyzed using exploratory factor analysis and confirmatory factor analysis. The reliability scale of the exploratory factor analysis (EFA) results was obtained ranging from $\alpha = 0.68$ to $\alpha = 0.91$ and for confirmatory factor analysis (CFA) ranging from $\alpha = 0.705$ to $\alpha = 0.902$. The scale used in this instrument is in the form of a closed questionnaire scale with a 7-point Likert scale, ranging from "absolutely not true/not in accordance with me" (= 1) to "very true/in accordance with me" (= 7).

The data analysis technique used is descriptive and inferential statistics. The descriptive statistical analysis step of the

Table 3. Relative Frequency Distribution of Mathematical Critical Thinking Skills

Indicator of Mathematical Critical Thinking Skills	Control				Experiment			
	Pretes		Postes		Pretes		Postes	
	Less Good	Good	Less Good	Good	Less Good	Good	Less Good	Good
Interpretation	72.5%	27.5%	50%	50%	63.5%	36.5%	11.5%	88.5%
Analysis	91%	9%	64%	36%	81%	19%	37%	63%
Evaluation	95%	5%	80%	20%	92%	8%	53%	47%

pretest and post-test data started with the relative frequency distribution, then continued with the table of descriptive statistics. The relative frequency distribution of the critical thinking skills data used to see the extent of the percentage of improvement by looking for the difference between the post-test and pretest score percentages, the self-regulated learning data used to see the tendency of self-regulated learning in mathematics. The analysis of the inferential statistics step of the pretest data started from the normality test, homogeneity, and the mean similarity test. The next inferential statistical analysis to see the improvement using the N-gain data starts from the analysis of the N-gain difference test, the effect size test, and the N-gain value criterion test.

The analysis of the N-gain effect size test is useful for seeing how significant the difference experiencing improvement of critical thinking skills and self-regulated learning between the two classes; the following is the formula for the effect size and the criteria for the effect size test:

$$d = \frac{< g >_{SBL} - < g >_T}{< SD >}$$

Information: d (effect size), $< g >_{SBL}$ is the mean N-gain of the experimental class, and $< g >_T$ is the mean N-gain of the control class, and $< SD >$ is the mean of standard deviation.

Table 1. Criteria for the effect size test

Effect Size	Size	Interpretation
d~0,80	Large	Meaningful/Important
d~0,50	Medium	Less Meaningful/Less Important
d~0,20	Small	Not Meaningful/Not Important

Note. $d =$ effect size value, adapted from "Statistics Plain and Simple" by Sherri L. Jackson, 2014.

The analysis of the N-gain value criterion is carried out to determine how effective the learning model used in improving critical thinking skills and self-regulated learning, the following is the formula for finding the N-gain value and the criteria for the N-gain value:

$$N - gain = \frac{posttest\ score - pretest\ score}{ideal\ score - pretest\ score}$$

Table 2. Criteria for the N-gain value

N-gain Score	Size	Interpretation
$g \geq 0{,}7$	High	Very Effective
$0{,}3 \leq g < 0{,}7$	Moderate	Effective
$g < 0{,}3$	Low	Less Effective

Note: g = normalized gain value, adapted from "Analyzing Change/Gain Score" by Richard R. Hake, 1997.

Although the researcher has tried to condition one experimental class and one control class, and the pretest mean scores for the two groups are relatively the same, it still has its weaknesses. It is impossible for the researcher to form a class with random samples from all parallel classes because it will interfere with learning in the classroom. Researchers

are also not possible to control the situation of students outside of learning; for example, students are not allowed to take part in mathematics learning other than predetermined lesson hours such as interactions with other teachers, mathematics group learning outside of learning hours, private lessons, and others where it exists the possibility of influencing the learning outcomes they achieved. From the analysis side, because the quantitative method is analyzed in inferential statistics, namely analyzing the average or as a whole, then it is difficult to observe more in-depth condition or signs, researchers have attempted to explain an actual situation through descriptive statistics, but even that has not been able to describe a situation as a whole or individually.

RESULTS AND DISCUSSION

Research Results

Mathematical Critical Thinking Skills

Table 3 below shows the percentage acquisition of data for each indicator and each class. In the control class the interpretation indicator increased by 22.5%, the analysis indicator increased by 27%, and the evaluation indicator increased by 15%. In the experimental class, the interpretation indicator increased by 52%, the analysis indicator increased by 44%, and the evaluation indicator increased by 39%. It can be seen that the percentage of critical thinking skills improvement of the experimental class that was taught using the SBL model is greater than the control class. As shown in Figure 1 below, students' mathematical critical thinking skills who are taught with the Situation-Based-Learning (SBL) model are better than students who are taught conventionally.

The data of the pretest score of mathematical critical thinking skills, which were analyzed in descriptive statistics, showed that the two classes had almost the same or not much different mean and variance, while in the post-test data, the experimental class, after being taught using the SBL model experienced an increase in mean of critical thinking skills better than the control class. The results are shown in table 4.

Table 4. Descriptive Statistical Analysis

Pretest					
	N	Min	Max	Mean	SD
Control	22	3.00	14.50	7.52	3.19
Experimental	30	3.00	13.88	7.54	3.31
Posttest					
	N	Min	Max	Mean	SD
Control	22	3.00	14.39	7.43	3.36
Experimental	30	7.32	17.72	13.35	2.99

The improvement of mathematical critical thinking skills obtained based on descriptive statistics in the above discussion needs to be further analyzed by conducting statistical tests to determine the significant difference in the increase. The pretest data normality test was carried out using the *Shapiro-Wilk* statistical test, obtained the statistical value of control class is 0.936 with a significance value = 0.16 > 0.05, and the statistical value of the experimental class is 0.941 with a significance value = 0.095 > 0.05, that H_0 is accepted. Thus, it can be concluded that the pretest data were normally distributed. The statistical test used for the pretest data homogeneity test is the *Bartlett* test, the significance value of the *Bartlett* test with *Chi-Square* statistics obtained by χ^2_{count} with the amount of 0.229 and χ^2_{table} for dk = 2-1 is 3.841; this means the value of $\chi^2_{count} < \chi^2_{table}$ then both variances of the data are homogeneous.

The mean similarity test was analyzed using the *t-test* statistical test, and it was obtained that the *sig (2-tailed) value* = 0.988 for the variance, which was

Tabel 5. Relative Frequency Distribution of Mathematics Self-Learning

Self-Learning Indicator	Control						Experiment					
	Pretes			Postes			Pretes			Postes		
	KM	N	M	KM	N	M	KM	N	M	KM	N	M
Metacognitive Skill	71%	1%	28%	47%	3%	51%	74%	1%	24%	13%	5%	82%
Time Manajemen	79%	6%	15%	45%	5%	50%	68%	7%	26%	13%	10%	77%
Learning Environment Arrangement	51%	10%	39%	26%	10%	64%	79%	4%	17%	15%	0%	85%
Looking for Help	79%	5%	15%	54%	6%	40%	71%	1%	28%	32%	9%	59%
Persistence	77%	7%	15%	51%	5%	44%	62%	20%	18%	6%	4%	90%

assumed to be the same, the significance value was 0.988 > 0.05, so H_o is accepted and also obtained the t_{count} = 0.014, from the t-distribution list with the probability 0.975, and dk = 50 obtained $t_{0.975}$ = 2.008, therefore, that t_{count} = 0.014 is in the acceptance region H_0, that is, there were no significant differences in mathematical critical thinking skills between experimental class students and control class students before treatment.

The post-test data analyzed were N-gain (normalized gain) data of the mathematical critical thinking skills, using non-parametric tests with the *Mann-Whitney* statistical test, the value of U = 54.500, so (r_k) = 0.835, thus the effectiveness of the implementation of the learning model using SBL and conventional can explain with the amount of $(0.835)^2$ or 69.72% mathematical critical thinking skills. The significance (2-tailed) value obtained is 0.0001, so that the significance (1-tailed) = 0.0001/2 = 0.000005 < 0.05 so reject H_o, shows that there were significant differences in the improvement of the mathematical critical thinking skills of students who are taught using the SBL model better than students who are taught conventionally. The results of the analysis of the effect size of the pretest and post-test scores for the control class were d = 0.30, the experimental class was d = 1.80, and the differences between the two classes were d = 1.87. The results of the analysis of the N-gain value criterion of the control class is g = 0.19, and the experimental class is g = 0.63.

Self-Regulated Learning in Mathematics

Table 5 shows that in the data of post-test, the tendency of self-regulated learning in mathematics of the control class is no better than the experimental class that was taught using the SBL model. In graph 2 shows that the difference in the percentage of the pretest and post-test frequency of self-regulated learning in mathematics in the control class is smaller than the experimental class, and the percentage acquisition of the post-test frequency of self-regulated learning in mathematics after being applied to the two classes is different. This shows that the tendency of self-regulated learning in mathematics in experimental class students who are taught with the Situation-Based-Learning (SBL) model is better compared to students who are taught conventionally.

The pretest data of the descriptive analysis result of the self-regulated learning in mathematics questionnaire of the two classes has almost the same or not much different mean and variance, while in the post-test data, the mean score of students' self-regulated learning in math-

ematics in the two classes is different, as shown in Table 6.

Table 6. Descriptive Statistical Analysis

	N	Min	Max	Med
Control	22	82.00	168.00	126.00
Experimental	30	82.00	216.00	125.00
	N	Min	Max	Med
Control	22	122.00	226.00	154.00
Experimental	30	138.00	228.00	215.00

Furthermore, inferential statistics data analysis is carried out, the pretest data for self-regulated learning in mathematics will be analyzed in non-parametric statistics because the data is in the form of ordinal scale starting from the mean similarity pretest data using the *Mann-Whitney* statistical test, obtained a significance (2-tailed) value with the amount of 0.795. Significance (1-tailed) value = 0.795/2 = 0.3975 > 0.05 so, H_0 is accepted. It shows that there were no differences in self-regulated learning in mathematics between students in the experimental class and the control class before given the treatment.

The post-test data analyzed were N-gain (normalized gain) data for self-regulated learning in mathematics, using a non-parametric test with the *Mann-Whitney* statistical test, obtained a value of U = 128.500, so (r_k) = 0.611 thus the effectiveness of the implementation of the learning model using SBL and conventional can explain with the amount of $(0.611)^2$ or 37.3% self-regulated learning in mathematics. The sig (2-tailed) value obtained is 0.001. The sig value (1-tailed) = 0.0001/2 = 0.00005 < 0.05 so reject Ho. It shows that there was a significant difference in the improvement of self-regulated learning in mathematics of students who are taught using the SBL model better than students who are taught conventionally. The results of the analysis of the effect size of the pretest and post-test scores for the control class was d = 1.65, the experimental class was d = 3.00, and the difference between the two classes was d = 1.43. The results of the analysis of the N-gain value criterion of the control class was g = 0.32, and the experimental class was g = 0.61.

Discussion

Based on the results of research that have been analyzed statistically, it shows that there was an increase in students' mathematical critical thinking skills and self-regulated learning in mathematics who are taught using the SBL model, both variables have a large effect size, and the effectiveness of the SBL model is categorized as moderate on each variable.

In the critical thinking skills variable, there were significant differences in the increase in students who are taught using the SBL model are better than students who are taught conventionally, have a meaningful/important difference and increase in experiencing improvement of critical thinking skills between the experimental and control classes, and the SBL model is more effective in improving critical thinking skills than conventional learning model. Likewise, in the self-regulated learning variable, that there were significant differences in the increase in the self-regulated learning of students who are taught with SBL better than those taught conventionally, obtained a meaningful/important difference improvement between the two classes is obtained, the SBL model is more effective in increasing self-regulated learning compared to the conventional learning model.

The Situation – Based – Learning (SBL) model can be used to improve critical thinking skills and self-regulated learning because at each stage in the SBL

model it requires students to be able to think and analyze something properly, thoroughly and precisely, especially at posing mathematical problem stage (presenting mathematical questions) aims to make students ask a variety of questions ranging from simple questions to more complex questions.

Critical thinking skills can be trained by getting used to asking questions starting from simple questions to deep questions, such as what, why, and how (Surya, 2013). Not only that, self-regulated learning also needs to be trained. As Fajriyah, Yoga, Padillah, & Marten (2019) stated, students need to be trained to be self-regulated in learning because self-regulated learning also determines students' learning success and needs to increase self-regulated in learning so that students can more responsible for their success of learning.

In the third stage, solving mathematical problems requires students to be able to sort out problems that are important and need to be resolved and analyze situations, existing problems, and forming possible solutions or forming and make strategies to solve such problems (Isrok'aton, & Tiurlina, 2014). The last stage is applying mathematic students work on several applied problems by applying the concepts they have obtained in the third stage, namely solving mathematical problems (Isrok'atun & Tiurlina, 2016).

Based on the results of the research on the implementation of the SBL model to improve critical thinking skills and self-regulated learning in mathematics, after a descriptive analysis, it was found that there was an increase in student's mathematical critical thinking skills and self-regulated learning in mathematics who were taught using the SBL learning model. However, there are indicators of mathematical critical thinking skills that are still low compared to other indicators, namely evaluation; after being investigated, it turns out that the most frequent evaluation indicators are on the level 2 rating scale, namely considering statements or considering arguments and giving wrong reasons, after being checked again, it turns out that there are still many students who are only able to consider statements, after being investigated this is because the students' activity sheets are not enough to practice considering arguments well.

In the self-regulated learning variable, there is one indicator that is still low compared to other indicators, namely the indicator of help seeking. After being investigated, it turns out that one of the indicators of help-seeking is that the 7th statement shows that the frequency of students who are used to asking for help from the teacher is still a lot. This is because some students ask for help from the teacher just to make sure of what they will or have done; this shows that they are still doubtful and unsure of what they think and what they have done.

The factor that causes one of the indicators of critical thinking skills and self-regulated learning to be low when viewed from the learning process that takes place is the Posing mathematical problem phase. Students often ask the teacher about the statements or questions they have made correct/appropriate or vice versa. This causes students not to believe in consideration of arguments and reasons that they have made themselves, as well as students have a dependency to ask the teacher.

CLOSING

Conclusions

Based on the research results and discussions, it can be concluded that there were

significant differences in the improvement of critical thinking skills and self-regulated learning of students who are taught using SBL better than students who are taught conventionally. This is supported by the results of the analysis of the N-gain effect size test obtained that the difference and increase of improvement in the pretest and post-test scores of the control class is no better than the experimental class, as well as the results of the analysis of the N-gain value criterion which indicate that the SBL model is more effective than the conventional learning model. Thus, the use of SBL model can improve students' mathematical critical thinking skills and self-regulated learning in mathematics better than the conventional learning model.

Suggestions

Based on the conclusions obtained in this research, the researcher recommends both readers and future researchers who are interested in conducting further research, further research is needed on the arrangement of a more focused students worksheet; in order to all indicators of critical thinking skills increase and meet the value of minimum completeness criteria, and it is necessary to do further research on the use of the SBL model to have a consistent effects or not on improving mathematical critical thinking skills and self-regulated learning in mathematics.

REFERENCES

Alvonco, J. (2013). The Way of Thinking, Tingkatkan Cara Berpikir Agar Lebih Kreatif, Rrasional, dan Kritis. Jakarta: PT Alex Media Komputindo.

Ardagh, M., & Borges, K. (2016). Situaton-Based-Learning in Elementary School : Enhancement of Students ' Mathematical Creative Problem Solving Ability. International Jurnal of Science Art and Commerce, 1(6), 60–70.

Cleary, T. J. (2018). The Self-Regulated Learning Guide: Teaching Students to Think in the Language of Strategies. New York: Routledge.

Darmawan, I., Kharismawati, A., Hendriana, H., & Purwasih, R. (2018). Analisis Kesalahan Siswa SMP Berdasarkan Newman dalam Menyelesaikan Soal Kemampuan Berpikir Kritis Matematis pada Materi Bangun Ruang Sisi datar. Journal for Research in Mathematics Learning, 1(1), 71–78.

Depdiknas. (2004). Kurikulum Berbasis Kompetensi Pelajaran Matematika Sekolah Pertama. Jakarta: Depdiknas.

Facione, P. A., Facione, N. C., & Beach, H. (2011). The Holistic Critical Thinking Scoring Rubric. Millbrae: The California Academic Press.

Fajriyah, L., Yoga, N., Padillah, A., & Marten, B. (2019). Pengaruh Kemandirian Belajar Siswa Smp Terhadap Kemampuan Penalaran Matematis. Journal of Medives : Journal of Mathematics Education IKIP Veteran Semarang, 1(2), 288–296.

Hake, R. R. (1997). Interactive-Engagement Versus Traditional Methods: A Six-Thousand-Student Survey of Mechanics Test Data for Introductory Physics Courses. American Association of Physics Teachers. 66(1), 64-74.

Ismaimuza, D. (2010). Kemampuan Berpikir Kritis dan Kreatif Matematis Siswa SMP Melalui Pembelajaran Berbasis Masalah dengan Strategi Konflik Kognitif.

Isrok'aton, & Tiurlina. (2014). Enhancing Students' Mathematical Creative Problem Solving Ability Through Situation-Based Learning. Mathematcal Thoery and Modeling, 4(11), 44–50.

Isrok'atun, & Tiurlia. (2016). Model Pembelajaran Matematika Situation-Based-Learning Di Sekolah Dasar. Sumedang: UPI Sumedang Press.

Jackson, S. L. (2014). Statistics Plain and Simple. Belmont: Wadsworth Cengage Learning.

Jansen, R. S., Leeuwen, van A., Janssen, J., Kester, L., & Kalz, M. (2017). Validation of the Revised Self-regulated Online Learning Questionnaire. Lecture Notes in Computer Science (Including Subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics), 29(1), 116–121.

Judge, B., Jones, P., & McCreery, E. (2009). Critical Thinking Skills for Education Students. Southernhay East: Learning Matters Ltd.

Larawati, I., Isrok'aton, & Gusrayani, D. (2016). Penerapan Model Situation-Based-Learning Pada Materi Sifat-Sifat dan Jaring-Jaring Bangun Ruang Sederhana di Kelas IV SDN Sumedang. Jurnal Pena Ilmiah, 1(1), 71–80.

Latifah, T., Cahya, E., & Suhendra. (2017). The Impact of Situation-Based Learning to Students' Quantitative Literacy. International Conference on Mathematics and Science Education.

Lestari, I., Andinny, Y., & Mailizar, M. (2019). Pengaruh Model Pembelajaran Situation Based Learning dan Kemandirian Belajar Terhadap Kemampuan Pemecahan Masalah Matematis. JNPM (Jurnal Nasional Pendidikan Matematika), 3(1), 95-108.

Moon, J. (2008). Critical Thinking: An Exploration of Theory and Practice. Nnew York: Routledge.

National Council of teachers of Mathematics (NCTM). (2000). Principles and Standart for School Mathematics. United Stated of America: The National Council of teachers of Mathematics.

National Council of teachers of Mathematics (NCTM). (2012). Education For Life and Work: Developing Transferable Knowledge and Skills in The 21st Century, Report Brief, July 2012. United Stated of America: The National Council of teachers of Mathematics.

Permendikbud. (2016). Permendikbud Nomor 20 Tahun 2016 tentang Pembelajaran Pada Pendidikan Dasar dan Pendidikan Menengah. Jakarta: Permendikbud

Programme for International student Assessment (PISA). (2015). "Indonesia", in PISA 2015 Results (volume I): Excellence and Equity in Education. Paris: OECD.

Pusat Penilaian Pendidikan (Puspendik). (2018). Laporan Hasil Ujian Nasional. Jakarta: Pusat Penilaian Pendidikan Kementerian Pendidikan dan Kebudayaan.

Pusat Penilaian Pendidikan (Puspendik). (2018). Penguasaan Materi Ujian Nasional. Jakarta: Pusat Penilaian Pendidikan Kementerian Pendidikan dan Kebudayaan

Pusat Penilaian Pendidikan (Puspendik). (2019). Penguasaan Materi Ujian Nasional. Jakarta: Pusat Penilaian Pendidikan Kementerian Pendidikan dan Kebudayaan

Putri, R. I., Santosa, R. H. (2015). Keefektifan Strategi React ditinjau dari Prestasi Belajar, Kemampuan Penyelesaian Masalah, Koneksi Matematika, Self-Efficacy. Jurnal Riset Pendidikan Matematika, 2(2), 262-272.

Rianawati. (2014). Implementasi Nilai- Nilai Karakteristik Pada Mata Pelajaran. Pontianak: IAIN Pontianak Press.

Schwart, M. H. (2005). Expert Learning For Low Students. North Coralina: Carolina Academic Press.

Sofyan, A., & Ratumanan, T. G. (2018). Pengaruh Aktivitas Belajar Dan Kemandirian Belajar Terhadap Hasil Belajar Matematika Siswa Smp Negeri 21 Ambon, 1(1), 15–22.

Surya, H. (2013). Cara Belajar Orang Jenius. Jakarta: PT. Alex Media Kmputindo.

Tim MKPBM. (2010). Comman Text Book: Strategi Pembelajaran Kontemporer. Bandung: Jica.

Trends in International Mathematics and science Study (TIMSS), 2011. (2015). Assesment Framework. Boston: TIMSS & PIRLS International Study Center, Lynch School of Education, Boston College.

Wicaksono, A., & Roza, A. S. (2016). Teori Pembelajaran Bahasa: Suatu Catatan Singkat. Yogyakarta: Penerbit Garudhawaca.

Yunita, N., Rosyana, T., & Hendrian, H. (2018). Analisis Kemampuan Berpikir Kritis Matematis Berdasarkan Motivasi Belajar Matematis Siswa. Jurnal Pembelajaran Matematika Inovatif, 1(3), 325–332.

Zimmerman, B. J., Bonner, S., & Kovach, R. (1996). Developing Self-Regulated Learners: Beyond Achievement to Self-Efficacy. Washington: American Psychological Association.