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INCREASING STUDENTS SELF-REGULATED LEARNING THROUGH A REALISTIC MATHEMATICAL EDUCATION

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Abstract

This research is motivated by the importance of students' self-regulated learning. However, based on the reality situation, not all students have good self-regulated learning. Therefore, a realistic mathematics approach can be used by teachers as a strategy to improve students' self-regulated learning abilities. Aims to determine the increase in self-regulated learning of students with a realistic mathematical education in learning mathematics and to know student responses. This type of research is descriptive research through questionnaire analysis. As for the number of participants in this study were 32 grade VII junior high school students. The instruments used were a self-regulated learning questionnaire and a questionnaire to see student responses. In this study, the data obtained were analyzed using a Likert attitude scale. This scale in self-regulated learning contains five components, namely: assessing students for (1) learning initiatives, (2) diagnosing learning needs, (3) setting learning goals, (4) monitoring, organizing and controlling learning, and (5) seeing difficulties as a challenge. The conclusions obtained in this study are related to self-regulated learning in mathematics can be seen as a whole by using realistic mathematics education. This shows that there are 95.68% of students who give a positive response.

Keywords: Realistic mathematic education, self-regulated learning, students

Abstrak

Penelitian ini dilatarbelakangi oleh pentingnya self-regulated learning siswa. Namun, berdasarkan situasi realitas, tidak semua siswa memiliki self-regulated learning yang baik. Oleh sebab itu, pendekatan matematika realistik, dapat digunakan oleh guru sebagai salah satu strategi untuk meningkatkan kemampuan self-regulated learning siswa. Bertujuan untuk mengetahui peningkatan self-regulated learning siswa dengan pendekatan matematika realistik dalam pembelajaran matematika serta mengetahui respon siswa. Jenis penelitian ini adalah penelitian deskriptif melalui analisis kuesioner. Adapun jumlah peserta dalam penelitian ini adalah sebanyak 32 siswa SMP kelas VII. Instrumen yang digunakan adalah angket self-regulated learning dan angket untuk melihat respon siswa. Pada penelitian ini diperoleh data yang dianalisis menggunakan skala sikap Likert. Skala dalam self-regulated learning ini memuat lima komponen, yaitu: penilaian siswa terhadap (1) inisiatif belajar, (2) mendiagnosa kebutuhan belajar, (3) menetapkan tujuan belajar, (4) memonitor, mengatur dan mengontrol belajar, dan (5) memandang kesulitan sebagai tantangan. Kesimpulan yang diperoleh dalam penelitian ini terkait self-regulated learning dalam matematika adalah dapat dilihat secara keseluruhan dengan menggunakan pendidikan matematika realistik. Hal ini menunjukkan bahwa terdapat 95,68% siswa yang memberikan respon positif.

***Kata kunci**: Pendekatan matematika realistic, self-regulated learning, siswa*

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INTRODUCTION

Students need to have certain soft skills in order to learn in schools, such as self-regulated learning. The capacity of pupils to control their own learning, also known as student learning independence, is referred to as self-regulated learning (DiFrancesca et al., 2016; Panadero, 2017; Siregar et al., 2022d, 2022a). The improvement of the quality and quantity of one's own learning is influenced by one's capacity for self-regulation while learning mathematics (Winne, 2017). Self-regulated learning emphasizes the value of one's capacity for self-control and regulation, particularly when confronted with tasks (Broadbent, 2017). This is in line assertion that achieving learning independence entails carefully planning and monitoring one's own cognitive and affective processes while completing academic tasks (Daniel et al., 2016). Students typically learn more well if they have a high level of self-regulation (Beaumont et al., 2014). The results of the study, which showed that people with high levels of self-regulated learning typically learn better, are able to monitor, analyze, and control their learning effectively, save time while completing tasks, and performed well in science, especially mathematics (McCardle et al., 2016; Panadero et al., 2017; Zheng et al., 2016).

Self-regulated learning, also known as independence in learning, is the process of carefully planning and self-monitoring cognitive and affective processes in order to complete an academic task (Rovers et al., 2019; Yamada et al., 2016, 2017). Hargis argues that self-regulated learning is a process of self-direction in turning mental abilities into specific academic skills rather than a mental capacity or certain academic skills (Li et al., 2020). Self-regulated learning is an effort to manipulate and deepen associative networks in a certain topic while also keeping track of and optimizing the relevant deepening process (Schuitema et al., 2016). In this instance, self-regulated learning is a process of self-direction in translating mental abilities into specific academic skills rather than a mental capacity or certain academic skills like reading fluency (Callan & Cleary, 2018; Siadaty et al., 2016).

Self-regulated learning is a learning process that is influenced by one's own thoughts, feelings, techniques, and behaviors that are geared toward reaching goals (Hooshyar et al., 2020). According to Bandura, independent learning has the following characteristics: self-observation and self-monitoring, comparison of one's position to predetermined criteria, and self-response (positive or negative response) (Broadbent & Fuller-Tyszkiewicz, 2018; Cerezo et al., 2019; Winne, 2019). However, based on the reality, not all kids are capable of learning mathematics in a self-contained manner (Adam et al., 2017; Kizilcec et al., 2017; Viberg et al., 2020).

Teachers can use a variety of strategies to increase their pupils' interest in arithmetic. Through the many available learning methods, including: realistic mathematical instruction (Cho et al., 2017; Jansen et al., 2020; Johnson et al., 2020; Musso et al., 2019; Roick & Ringeisen, 2018). Students' ability to pay attention, follow instructions carefully, produce work that is appropriate for expectations, or effectively use language to accomplish other learning objectives are all important components of learning. It is thought to be intriguing and useful if employed (Ferreira et al., 2022; Laelasari, 2018; Sa'id et al., 2021). One

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of the objectives of realistic education is to get students to switch from abstract to more realistic materials so that teachers can use various examples and props of the environment to help students understand encourage (Royhana et al., 2021). Additionally, actual mathematics education is so closely related to situations in daily life that pupils are more engaged in math than the notion of mathematics, which is seen as repetitive and abstract. Because of this, having realistic lessons makes studying math more concrete (realistic) and aids most students in comprehending instructional materials that are fun for teachers to present and don't seem as abstract (Lady et al., 2018). The realistic approach shares the same principles as Reality Mathematics Education (RME), from which it was adapted, but it also has some key differences. Differences result from context, culture, social systems, and natural phenomena (Maslihah et al., 2021). Most teachers still implement teacher-centered learning in accordance with the traditional methods of instruction used in schools today. Before offering assignments, the teacher starts the course by explaining the content or giving examples of it without placing it in a context (real life setting). Rarely do students and teachers interact with one another (Siregar, Mujib, et al., 2020).

Some students' preliminary research did not significantly contribute to the knowledge they already possessed; instead, they tended to accept just the information presented in accordance with the teacher (Siregar, Karnasih, et al., 2020). Because the difficulties provided to students in learning are still missing, this fact may be a catalyst for their low self-efficacy (Siregar et al., 2021). As a result, students' motivation in mathematics may also decline. This assessment is for instructors to continuously improve the learning environment so that the goals of studying mathematics can be met (Siregar & Prabawanto, 2021).

Additionally, some students continue to see mathematics classes as being challenging, esoteric, and disagreeable. This is in line with the belief held by some pupils that mathematics requires them to memorize several formulas (Wijayanto et al., 2022). Additionally, teachers still rule the classroom and explain math concepts in a monotonous manner, which leads pupils to believe that math is the most boring subject (Haka et al., 2022). Arithmetic materials are challenging for pupils to understand because of the lack of learning diversity, and teachers also frequently explain abstract math concepts using book methods.

In this study what is meant by independence in learning is a process of careful planning and self-development of cognitive and affective processes in completing an academic task. The indicators observed include learning independence used in this study is a mathematical disposition consisting of: learning initiatives, diagnosing learning needs, setting learning goals, monitoring, managing and controlling learning, and viewing difficulties as challenges. However, research related to learning independence in a realistic approach still needs to be studied more deeply and has not yet focused on seventh grade students of junior high school. Therefore, this study tries to examine more deeply related to student learning independence in a realistic approach based on phenomena that occur in class VII SMP.

Based on this description, the question in this study is how is the

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learning independence of junior high school students in a realistic approach to mathematics? So the purpose of this research is to describe the learning independence of junior high school students in a realistic mathematics approach in class VII. It is hoped that this research can contribute to learning mathematics and provide a variety of existing tests, especially those related to the angle of learning independence in a realistic mathematics approach and the level of student learning independence.

METHOD

Purposive sampling was the method utilized in this study's sampling (Naderifar et al., 2017). because the believes that the sample used knows the most about the issue that the would be examining. Purposive sampling is being used in this study to assess students' self-regulated learning in mathematics after employing a realistic mathematical approach to learning. 32 students from Al-Ulum Junior High School in Medan who were in grade VII participated in this study. As for the material examined in this study is social arithmetic topic.

This kind of study uses questionnaire analysis to do descriptive research. By describing and understanding natural objects as they are through observation, using qualitative research methodologies, descriptive research is research that aims to investigate certain circum-stances, conditions, situations, events, activities, etc. The purpose of this study is to characterize how students feel about themselves as mathematicians after receiving a genuine mathematical education.

Furthermore, there are three stages in this study, namely (1) the description stage or the orientation stage. At this stage, the describes what he saw, heard and felt, then the makes a cursory list of the information he has obtained. (2) The reduction stage. At this stage, the reduces all the information obtained in the first stage to focus on a particular problem. (3) Selection stage. At this stage, the outlines the focus that has been set into more detail then conducts an in-depth analysis of the focus of the problem. The result is a theme that is constructed based on the data obtained into a new knowledge, hypothesis, or theory related to increasing students' self-regulated learning through a realistic mathematical education. Then, this research was conducted within a period of approximately 3 (three) months, namely 6 meetings with realistic mathematics learning, with this time limit the felt it was sufficient to explore and collect data and facts in the form of information from students related to self-regulated learning through a realistic mathematical education.

Both observation and the use of a questionnaire are employed as the data gathering methods. The level of self-regulated learning of pupils in mathematics is assessed using data gathered by setting the self-regulated learning scale of students. The measure used in this study has five parts: (1) students' learning initiatives in mathematics, (2) diagnosing their learning needs in mathematics, (3) establishing their learning goals in mathematics, (4) monitoring, organize and control their learning in mathematics, and (5) view difficulties as their challenge in mathematics. With the appropriate modifications, this scale was created based on the one created by (Siregar et al., 2022c), which had four response options: strongly agree (SS), agree (S), disagree (TS), and severely disagree (STS). These four options help students avoid making uncertain

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decisions on the offered claims, and the steers clear of any statements that would cause students to hesitate before responding. The remarks provided about the opinions of the pupils are closed statements and include both positive and negative statements.

The Likert scale model will be applied as the scale model. There are four categories for categorizing the level of agreement with a statement: strongly agree (SS), agree (S), disagree (TS), and strongly disagree (STS). After applying learning with a RME, the results of the attitude scale analysis in this study describe students' self-regulated learning in mathematics.

The data analysis method makes use of descriptive analysis, which tries to characterize the state or status of a phenomena or data collection that is divided into two sets of data and described in words or sentences, separated by certain categories (Creswell, 2015; Drew et al., 2017). These are the processes that were taken in this study's data analysis: (1) Data Reduction (2) Data Display (3) Conclusion drawing or verification (conclusion drawing/ verification) (Creswell, 2015; Drew et al., 2017). A description of students' math self-regulated learning is thus obtained after applying learning with a RME and following completion of the phases in data analysis.

RESULT AND DISCUSSION

The results in this study will describe students' self-regulated learning in mathematics after using learning with realistic mathematics education. Qualitative data in this study were obtained from students' self-regulated learning scale. The scale of students' self-regulated learning attitudes is given to classes with realistic mathematics education at the end of learning. This attitude scale is used to describe students' self-regulated learning towards learning mathematics with realistic mathematics education. The attitude scale consists of 16 statements (7 positive and 9 negative) which contain five characteristics of self-regulated learning, namely: assessment of student learning initiatives in mathematics; student assessment of diagnosing learning needs in mathematics; student assessment of setting learning goals in mathematics; student assessment of monitoring, managing and controlling learning in mathematics; student assessments of viewing difficulty as a challenge in mathematics. Each character is developed into several indicators. Next, we will describe students' self-regulated learning per item based on their characteristics in learning mathematics.

Student Learning Initiatives

There are several indicators that can be developed in compiling statements according to the characteristics of self-regulated learning: an assessment of student learning initiatives in mathematics. The statements used in this study consist of three statements (two positive and one negative). A summary of the results of students' self-regulated learning calculations for these characteristics is shown in Table 1.

Table 1. Distribution of self-regulated learning scale on indicator 1 (learning initiative)

Statement		Statement	SS	S	TS	STS
No	Sign					
1	-	I studied social arithmetic material at home when I was going to have a test.	0 0%	0 0%	25 78.1%	7 21.9%

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Statement No	Statement Sign	Statement	SS	S	TS	STS
2	+	I asked friends or teachers in class, if they faced difficulties in social arithmetic material.	11 34.3%	20 62.5%	1 3.2%	0 0%
3	+	I always give comments when discussing social arithmetic material.	14 43.7%	16 50%	2 6.3%	0 0%

From Table 1 it can be seen that for statement number 1 (I studied social arithmetic material at home when I was going to repeat only) as many as 100% of students stated that they disagreed with this statement, these results are in accordance with the results of the observation guidelines on student activities that students are able to solve problems given by the teacher even though they were not notified beforehand they would be given a test.

For statement number 2 (I asked friends or teachers in class, if they faced difficulties in social arithmetic material) as many as 96.8% of students agreed with this statement, the answers to the questionnaire were in accordance with the results of observations of student activities, when there was material they did not understand ask teachers or friends, but for 3.2% of students who disagree, they do look passive when learning.

For statement number 3 (I always comment when discussing social arithmetic material) as many as 93.7% of students agree with this statement, the answers to the questionnaire are in accordance with the results of observations of student activities that most students are active when discussing both when discussing groups and when discussing class. But there are still students who have not actively discussed. This is in accordance with the results of the questionnaire that as many as 6.3% of students disagreed with this statement.

Diagnosing Students' Learning Needs

There are several indicators that can be developed in compiling statements according to the characteristics of self-regulated learning: an assessment of diagnosing students' learning needs in mathematics. The statements used in this study consist of four statements (one positive and three negative). A summary of the results of students' self-regulated learning calculations for these characteristics is shown in Table 2.

Table 2. Distribution of self-regulated learning scale on indicator 2 (diagnosing learning needs)

Statement No	Statement Sign	Statement	SS	S	TS	STS
4	-	I still have difficulty in using social arithmetic formulas.	0 0%	0 0%	26 81.2%	6 18.8%
5	-	I am confused when facing questions in the form of story questions.	0 0%	1 3.1%	20 62.5%	11 34.4 %
6	+	I try to understand social arithmetic material without the help of the teacher.	13 40.6%	18 56.3%	1 3.1%	0 0%
7	-	When studying mathematics in class/home, I need the help of friends.	0 0%	2 6.2%	14 43.8%	16 50%

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From Table 2 it can be seen that for statement number 4 (I still have difficulty in using social arithmetic formulas) as many as 100% of students disagree with this, this is in accordance with the results of interviews with students that all students have been able to use social arithmetic to solve mathematical problems . Then, for statement number 5 (I am confused when facing questions in the form of story questions) as many as 96.9% of students disagree with this statement, and 3.1% who agree with this statement intersect with students who answer agree with statement number 5 .

For statement number 6 (I try to understand social arithmetic material without being assisted by the teacher) as many as 96.9% of students agree with this statement and 3.1% of students disagree with this statement. This is in accordance with the results of interviews conducted with students that almost all students try to understand the material without the help of the teacher. Furthermore, for statement number 7 (When studying mathematics in class/home, I need help from friends) as many as 93.8% of students agree and 6.2% of students disagree with this statement.

Establishing Student Learning Goals

There are several indicators that can be developed in compiling statements that are in accordance with the characteristics of self-regulated learning: an assessment of setting student learning goals in mathematics. The statements used in this study consist of two statements (two negative). A summary of the results of students' self-regulated learning calculations for these characteristics is shown in Table 3.

Table 3. Distribution of self-regulated learning scale on indicator 3 (establishing learning goals)

Statement No	Statement Sign	Statement	SS	S	TS	STS
8	-	I study mathematics only to fulfill assignments.	0 0%	3 9.4%	15 46.9%	14 43.7%
9	-	I don't have a target to achieve in mathematics.	0 0%	4 12.5%	20 62.5%	8 25%

From Table 3 it can be seen that for statement number 8 (learning mathematics only to fulfill assignments) as many as 90.6% of students disagree, number 9 (I do not have a target to achieve in mathematics) as many as 87.5% of students do not agree, and as much as 12.5% of students agree with the statement.

Monitor, Organize and Control

There are several indicators that can be developed in compiling statements that are in accordance with the characteristics of self-regulated learning: assessments about monitoring, regulating and controlling student learning in mathematics. The statements used in this study consist of three statements (two positive and one negative). A summary of the results of students' self-regulated learning calculations for these characteristics is shown in Table 4.

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Table 4. Distribution of self-regulated learning scale on indicator 4 (monitor, organize and control learning)

Statement No	Statement Sign	Statement	SS	S	TS	STS
10	+	I always plan learning activities to be successful.	10 31.3%	21 65.6%	1 3.1%	0 0%
11	+	after finishing studying social arithmetic material it is always discussed again with friends.	14 43.8%	16 50%	2 6.2%	0 0%
12	-	Even though there is still social arithmetic material that I don't understand, I don't have time at home to review it.	0 0%	1 3.1%	14 43.8%	17 53.1%

From Table 4 it can be seen that for statement number 10 (I always plan learning activities to be successful) as many as 96.9% of students agree with this statement, this means that almost all students have learning activity plans. Then for statement number 11 (after finishing studying social arithmetic material it is always discussed again with friends) as many as 93.8% of students agree with this statement, this result is in accordance with the results of interviews that students have study groups and after school they always gather to discuss the material that has been studied. But for 6.2% of students who disagree they are students who rarely take part in group study. Furthermore, for statement number 12 (although there is still social arithmetic material that is not understood, I do not have time at home to review the material) as much as 96.9% % of students disagree with this statement, this is in accordance with statement number 10 that students have a plan of learning activities, so students have time to repeat the material that has been studied when at home.

View Difficulties as Challenges

There are several indicators that can be developed in compiling statements according to the characteristics of self-regulated learning: an assessment of viewing difficulties as students' challenges in mathematics. The statements used in this study consist of four statements (two positive and two negative). A summary of the results of students' self-regulated learning calculations for these characteristics is shown in Table 5.

Table 5. Distribution of self-regulated learning scale on indicator 5 (view difficulties as challenges)

Statement No	Statement Sign	Statement	SS	S	TS	STS
13	-	I feel that I have not been able to overcome difficulties in solving problems regarding social arithmetic material.	0 0%	2 6.2%	17 53.2%	13 40.6%
14	-	I always avoid difficult social arithmetic problems.	0 0%	1 3.1%	25 78.1%	6 18.8%

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Statement No	Statement Sign	Statement	SS	S	TS	STS
15	+	obstacles experienced in learning mathematics is a very valuable experience for learning.	14 43.8%	17 53.1%	1 3.1%	0 0%
16	+	the difficulties I faced in social arithmetic material encouraged me to study harder.	8 25%	24 75%	0 0%	0 0%

From Table 5 it can be seen that for statement number 13 (I feel that I have not been able to overcome difficulties in solving problems regarding social arithmetic material) as many as 93.8% of students disagree with this statement and for statement number 14 (I always avoid social arithmetic questions that difficult) as many as 96.9% of students disagree, students feel able to overcome difficulties in solving mathematical problems, so they don't avoid difficult questions, it can be seen from the results of the post-test they are working on, they are trying to do the problem as much as possible.

For statement number 15 (obstacles experienced in learning mathematics is a very valuable experience for learning) as many as 96.9% of students agree with this statement and statement number 16 (the difficulties I face in social arithmetic material encourage me to study harder) 100% of students agree with this statement, here students are aware that the obstacles experienced in learning are very valuable experiences for learning and encourage them to study harder.

Next, an overview of students' self-regulated learning will be described as a whole towards learning mathematics with realistic mathematics education. Data analysis by making a frequency distribution of alternative answers chosen by students. For positive statements, the choices are SS=4, S=3, TS=2, STS=1, but for negative statements it will be reversed to STS=4, TS=3, S=2, SS=1. The results of the overall recapitulation of students' self-regulated learning items in learning mathematics with a realistic mathematics approach are presented in Table 6.

Table 6. Distribution of the total scale of self-regulated learning

No Item	Alternative answer 1	2	3	4
Learning initiative				
1	0	0	25	7
2	0	1	20	11
3	0	2	16	14
Diagnosing learning needs				
4	0	0	26	6
5	0	1	20	11
6	0	1	18	13
7	0	2	14	16
Establishing study goals				
8	0	3	15	14
9	0	4	20	8
Monitor, organize and control learning				
10	0	1	21	10
11	0	2	16	12
12	0	1	14	17
View difficulties as challenges				
13	0	2	17	13
14	0	1	25	6
15	0	1	17	14
16	0	0	24	8
Total	**0**	**22**	**308**	**180**
%	**0%**	**4.32%**	**60.39%**	**35.29%**
(SMI = 510)				
	4.32%		**95.68%**	

From Table 6 it can be seen that the percentage of students who have high self-regulated learning as much as 95.68% of the percentage strongly agree and agree. For students who have low

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self-regulated learning as much as 4.32%. Based on the results of data analysis it is known that the student's response to the realistic mathematics approach is positive. In line with the results of this study, learning based on a realistic approach based on the premise of problematic situations adapted to the context of real life or everyday life will arouse students' interest and curiosity in solving problems because they are related to real life. In other words, learning using a realistic approach can arouse students' interest in learning so that learning activities become effective.

Learning is a process of change, namely a process of effort made by a person to obtain a completely new change in behavior as a result of interaction with his environment (Pahrudin et al., 2020; Van den Heuvel-Panhuizen & Drijvers, 2020). This is because the learning process is a complex matter, where students determine whether they will learn or not (Siregar et al., 2022b). Thus, the action/response to a stimulus in the form of teaching as an activity can be categorized into two things, namely a positive learning response (listening, reading, writing, discussing/asking) or a negative response (other irrelevant actions) (Siregar et al., 2022c). A positive response indicates that students are willing to participate in the learning process.

In addition, the positive response given by the students was because the teacher had provided a stimulus in the form of feedback and reinforcement according to the characteristics of the students after studying the class situation. In other words, the teacher is a very decisive component in the implementation of a learning strategy. A teacher must prepare a mature and appropriate learning planning process because with learning planning the teacher will be able to estimate how much success will be achieved.

Based on the results of data analysis, it shows that learning with realistic mathematics education towards learning mathematics encourages students to have confidence in their ability to produce high performance such as completing assignments optimally. Learning mathematics with realistic mathematics education takes place actively and interactively, students do their own LAS given in their group and explain and give reasons for the answers they make then other groups respond. Such activities generate self-confidence in one's own abilities and have a strong commitment, view difficulties as challenges and think of strategies in experiencing difficulties, like new situations, set goals that challenge oneself, persevere and try their best, try to face failure, focus with tasks, and not easily give up on failure.

Overall self-regulated learning of students who get learning with realistic mathematics education is very good and positive. Students' self-regulated learning abilities can be developed with realistic mathematics education because of the principles and characteristics of realistic mathematics education that are applied in learning.

Based on the explanation above, the learning approach factor is one of the most influential factors in increasing student learning independence. Applying the right approach such as realistic mathematics education in the learning process will make students more interested in mathematics and will be more responsible in solving mathematical problems. This is in accordance with the observations of when the learning process takes place

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with realistic mathematics education, most students look brave, enthusiastic, active, and enthusiastic when designing answers from the LAS given even though there are some students who are less enthusiastic such as resignedly waiting for friends to answer the LAS given. This is caused by several factors, including physiological conditions, emotional, social and experience.

Independent learning is an active and constructive process in which individuals set goals for their learning process and attempt to monitor, regulate, and control their cognition, motivation, and behavior which is limited by their goals and contextual features in the environment (Hasibuan et al., 2019). Thus it can be concluded that self-regulated learning is an activity in which individuals who learn actively as regulators of their own learning process, starting from planning, monitoring, controlling and evaluating themselves systematically to achieve goals in learning, using various strategies, both cognitive, motivation and behavior. So that the Realistic Mathematical Approach can increase student learning independence, this is because the mathematical approach is more real and in accordance with the environment and everyday life.

In general, students who get learning with realistic mathematics education have a positive tendency towards self-regulated learning. For example, having self-confidence or belief in their abilities in carrying out and completing the tasks at hand so that they are able to overcome obstacles and achieve the expected goals, it can be concluded that students who have high efficacy abilities will have an impact. on their learning achievement and can improve students' mathematical abilities.

Based on the results of observations made, it shows that students' attitudes respond positively to learning with realistic mathematics education. Student enthusiasm is seen when faced with concrete/real-world problems, because perhaps so far learning has always been faced with problems in mathematical and abstract concepts. With the application of learning with realistic mathematics education, it can be seen that students respond positively, are brave, active, enthusiastic, and enthusiastic. So it can be concluded that students' attitudes toward learning with positive realistic mathematics education and self-regulated learning of students using learning with realistic mathematics education increased.

CONCLUSION AND SUGGESTION

According to the analysis of research findings on self-regulated learning in mathematics, 95.68% of students responded positively overall when using realistic mathematics education, indicating that almost all students experienced positive self-regulated learning when using mathematics education-based learning. realistic. In order to pique students' attention, encourage their learning, and improve their ability to manage their own learning in all subject areas, schools and teachers can develop new and innovative curricula that incorporate actual mathematical instruction. Hopefully, it will be possible. Additionally, to assist students in self-regulating their learning, we advise you to employ a variety of learning models. The advises that future perform comparable research that is more in-depth, broader, and complementary to other mathematical skills by using actual mathematics education.

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REFERENCES

Adam, N. L., Alzahri, F. B., Cik Soh, S., Abu Bakar, N., & Mohamad Kamal, N. A. (2017). Self-Regulated learning and online learning: A systematic review. *Lecture Notes in Computer Science (Including Subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)*, *10645 LNCS*, 143–154. https://doi.org/10.1007/978-3-319-70010-6_14/COVER

Beaumont, C., Moscrop, C., & Canning, S. (2014). Easing the transition from school to HE: scaffolding the development of self-regulated learning through a dialogic approach to feedback. *Journal of Further and Higher Education*, *40*(3), 331–350. https://doi.org/10.1080/0309877X.2014.953460

Broadbent, J. (2017). Comparing online and blended learner's self-regulated learning strategies and academic performance. *The Internet and Higher Education*, *33*, 24–32. https://doi.org/10.1016/J.IHEDUC.2017.01.004

Broadbent, J., & Fuller-Tyszkiewicz, M. (2018). Profiles in self-regulated learning and their correlates for online and blended learning students. *Educational Technology Research and Development*, *66*(6), 1435–1455. https://doi.org/10.1007/S11423-018-9595-9/TABLES/6

Callan, G. L., & Cleary, T. J. (2018). Multidimensional assessment of self-regulated learning with middle school math students. *School Psychology Quarterly*, *33*(1), 103–111. https://doi.org/10.1037/SPQ0000198

Cerezo, R., Bogarín, A., Esteban, M., & Romero, C. (2019). Process mining for self-regulated learning assessment in e-learning. *Journal of Computing in Higher Education*, *32*(1), 74–88. https://doi.org/10.1007/S12528-019-09225-Y

Cho, M. H., Kim, Y., & Choi, D. H. (2017). The effect of self-regulated learning on college students' perceptions of community of inquiry and affective outcomes in online learning. *The Internet and Higher Education*, *34*, 10–17. https://doi.org/10.1016/J.IHEDUC.2017.04.001

Daniel, G. R., Wang, C., & Berthelsen, D. (2016). Early school-based parent involvement, children's self-regulated learning and academic achievement: An Australian longitudinal study. *Early Childhood Research Quarterly*, *36*, 168–177. https://doi.org/10.1016/J.ECRESQ.2015.12.016

DiFrancesca, D., Nietfeld, J. L., & Cao, L. (2016). A comparison of high and low achieving students on self-regulated learning variables. *Learning and Individual Differences*, *45*, 228–236. https://doi.org/10.1016/J.LINDIF.2015.11.010

Ferreira, P. D. C., Ferreira, A. I., Veiga Simão, A. M. V. Da, Prada, R., Paulino, A. P., & Rodrigues, R. (2022). Self-regulated learning and working memory determine problem-solving accuracy in math. *The Spanish Journal of Psychology*, *25*(6), e23. https://doi.org/10.1017/SJP.2022.

ISSN 2089-8703 (Print)
ISSN 2442-5419 (Online)

DOI: https://doi.org/10.24127/ajpm.v12i1.6748

19

Haka, N. B., Rohmah, R. N., Hamid, A., & Masya, H. (2022). Cognitive Conflict-Based Conceptual Change Model on Concept Mastery & Student Self-regulation. *Jurnal Pendidikan MIPA*, *23*(1), 100–110. https://doi.org/10.23960/JPMIPA/V23I1.PP100-110

Hasibuan, A. M., Saragih, S., & Amry, Z. (2019). Development of Learning Materials Based on Realistic Mathematics Education to Improve Problem Solving Ability and Student Learning Independence. *International Electronic Journal of Mathematics Education*, *14*(1), 243–252. https://doi.org/10.29333/iejme/4000

Hooshyar, D., Pedaste, M., Saks, K., Leijen, Ä., Bardone, E., & Wang, M. (2020). Open learner models in supporting self-regulated learning in higher education: A systematic literature review. *Computers & Education*, *154*, 103878. https://doi.org/10.1016/J.COMPEDU.2020.103878

Jansen, R. S., van Leeuwen, A., Janssen, J., Conijn, R., & Kester, L. (2020). Supporting learners' self-regulated learning in massive open online courses. *Computers & Education*, *146*, 103771. https://doi.org/10.1016/J.COMPEDU.2019.103771

Johnson, E. S., Clohessy, A. B., & Chakravarthy, P. (2020). A self-regulated learner framework for students with learning disabilities and math anxiety. *Intervention in School and Clinic*, *56*(3), 163–171. https://doi.org/10.1177/1053451220942203

Kizilcec, R. F., Pérez-Sanagustín, M., & Maldonado, J. J. (2017). Self-regulated learning strategies predict learner behavior and goal attainment in massive open online courses. *Computers & Education*, *104*, 18–33. https://doi.org/10.1016/J.COMPEDU.2016.10.001

Lady, A., Utomo, B. T., & Lovi, C. (2018). Improving mathematical ability and student learning outcomes through realistic mathematic education (RME) approach. *International Journal of Engineering & Technology*, *7*(2.10), 55–57. https://doi.org/10.14419/IJET.V7I2.10.10954

Laelasari. (2018). Self regulated learning trough project base learning on the prospective math teacher. *Journal of Physics: Conference Series*, *983*(1), 012156. https://doi.org/10.1088/1742-6596/983/1/012156

Li, S., Chen, G., Xing, W., Zheng, J., & Xie, C. (2020). Longitudinal clustering of students' self-regulated learning behaviors in engineering design. *Computers & Education*, *153*, 103899. https://doi.org/10.1016/J.COMPEDU.2020.103899

Maslihah, S., Waluya, S. B., Rochmad, Kartono, Karomah, N., & Iqbal, K. (2021). Increasing mathematical literacy ability and learning independence through problem-based learning model with realistic mathematic education approach. *Journal of Physics: Conference Series*, *1918*(4), 042123.

ISSN 2089-8703 (Print)
ISSN 2442-5419 (Online)

DOI: https://doi.org/10.24127/ajpm.v12i1.6748

https://doi.org/10.1088/1742-6596/1918/4/042123

McCardle, L., Webster, E. A., Haffey, A., & Hadwin, A. F. (2016). Examining students' self-set goals for self-regulated learning: Goal properties and patterns. *Studies in Higher Education*, *42*(11), 2153–2169. https://doi.org/10.1080/03075079.2015.1135117

Musso, M. F., Boekaerts, M., Segers, M., & Cascallar, E. C. (2019). Individual differences in basic cognitive processes and self-regulated learning: Their interaction effects on math performance. *Learning and Individual Differences*, *71*, 58–70. https://doi.org/10.1016/J.LINDIF.2019.03.003

Naderifar, M., Goli, H., & Ghaljaie, F. (2017). Snowball Sampling: A Purposeful Method of Sampling in Qualitative Research. *Strides in Development of Medical Education*, *14*(3), 67670. https://doi.org/10.5812/SDME.67670

Pahrudin, A., Ahid, N., Huda, S., Ardianti, N., Putra, F. G., Anggoro, B. S., & Joemsittiprasert, W. (2020). The effects of the ECIRR learning model on mathematical reasoning ability in the curriculum perspective 2013: Integration on student learning motivation. *European Journal of Educational Research*, *9*(2), 675–685. https://doi.org/10.12973/EU-JER.9.2.675

Panadero, E. (2017). A review of self-regulated learning: Six models and four directions for research. *Frontiers in Psychology*, *8*(APR), 422. https://doi.org/10.3389/FPSYG.2017.00422/BIBTEX

Panadero, E., Jonsson, A., & Botella, J. (2017). Effects of self-assessment on self-regulated learning and self-efficacy: Four meta-analyses. *Educational Research Review*, *22*, 74–98. https://doi.org/10.1016/J.EDUREV.2017.08.004

Roick, J., & Ringeisen, T. (2018). Students' math performance in higher education: Examining the role of self-regulated learning and self-efficacy. *Learning and Individual Differences*, *65*, 148–158. https://doi.org/10.1016/J.LINDIF.2018.05.018

Rovers, S. F. E., Clarebout, G., Savelberg, H. H. C. M., de Bruin, A. B. H., & van Merriënboer, J. J. G. (2019). Granularity matters: comparing different ways of measuring self-regulated learning. *Metacognition and Learning*, *14*(1), 1–19. https://doi.org/10.1007/S11409-019-09188-6/TABLES/3

Royhana, U., Widiatsih, A., Atmaja, I. W. W., & Septory, B. J. (2021). Development of teaching materials based on realistic mathematic education and its implementation in improving students' creative thinking skills on comparative material. *Journal of Physics: Conference Series*, *1836*(1), 012049. https://doi.org/10.1088/1742-6596/1836/1/012049

Sa'id, I. A., Pambudi, D. S., Hobri, Safik, M., & Insani, K. (2021). Development of mathematics learning tools with realistic mathematics education-jumping task (RME-JT) and its effect on

ISSN 2089-8703 (Print)
ISSN 2442-5419 (Online)

DOI: https://doi.org/10.24127/ajpm.v12i1.6748

the mathematic communication skills. *Journal of Physics: Conference Series*, *1839*(1), 012018. https://doi.org/10.1088/1742-6596/1839/1/012018

Schuitema, J., Peetsma, T., & van der Veen, I. (2016). Longitudinal relations between perceived autonomy and social support from teachers and students' self-regulated learning and achievement. *Learning and Individual Differences*, *49*, 32–45. https://doi.org/10.1016/J.LINDIF.2016.05.006

Siadaty, M., Gašević, D., & Hatala, M. (2016). Measuring the impact of technological scaffolding interventions on micro-level processes of self-regulated workplace learning. *Computers in Human Behavior*, *59*, 469–482. https://doi.org/10.1016/J.CHB.2016.02.025

Siregar, R. N., Karnasih, I., & Hasratuddin, H. (2020). Pengembangan perangkat pembelajaran berbasis pendekatan realistik untuk meningkatkan kemampuan berfikir kreatif dan self-efficacy siswa SMP (Development of learning tools based on a realistic approach to improve creative thinking skills and self-efficacy). *Jurnal Pendidikan Glasser*, *4*(1), 45–63. https://doi.org/10.32529/GLASSER.V4I1.441

Siregar, R. N., Mujib, A., Karnasih, I., & Hasratuddin, H. (2020). Peningkatan kemampuan berpikir kreatif siswa melalui pendekatan matematika realistik (Improving students' creative thinking skills through a realistic mathematical approach). *Edumaspul: Jurnal Pendidikan*, *4*(1), 56–62. https://doi.org/10.33487/EDUMASPUL.V4I1.338

Siregar, R. N., & Prabawanto, S. (2021). Increasing students ' self-efficacy through a realistic mathematical education. *(JIML) Journal of Innovative Mathematics Learning*, *4*(2), 63–74.

Siregar, R. N., Prabawanto, S., & Suryadi, D. (2021). Self-Efficacy Of Junior High School Students In Mathematic Problem Solving. *SIGMA DIDAKTIKA: Jurnal Pendidikan Matematika*, *9*(1), 23–37. https://ejournal.upi.edu/index.php/SIGMADIDAKTIKA/article/view/48350

Siregar, R. N., Suryadi, D., Prabawanto, S., & Mujib, A. (2022a). Cognitive Flexibility of Students in Solving Mathematical Problems: A Phenomenology Study. *Kreano: Jurnal Matematika Kreatif-Inovatif*, *13*(2), 355–369. https://doi.org/10.15294/KREANO.V13I2.40220

Siregar, R. N., Suryadi, D., Prabawanto, S., & Mujib, A. (2022b). Improving Student Learning: Mathematical Reasoning Ability Through A Realistic Mathematic Education. *AKSIOMA: Jurnal Program Studi Pendidikan Matematika*, *11*(4), 2698–2713. https://doi.org/10.24127/AJPM.V11I4.6250

Siregar, R. N., Suryadi, D., Prabawanto, S., & Mujib, A. (2022c). Students' Self-Regulated in Learning Mathematics using Realistic Mathematical Education Model. *(JIML) Journal of Innovative Mathematics Learning*,

ISSN 2089-8703 (Print)
ISSN 2442-5419 (Online)

DOI: https://doi.org/10.24127/ajpm.v12i1.6748

5(4), 183–195. https://doi.org/10.22460/JIML.V5I4.15059

Siregar, R. N., Suryadi, D., Prabawanto, S. P., & Mujib, A. (2022d). Improving students' self-esteem in learning mathematics through a realistic mathematic education. *Jurnal Pendidikan MIPA*, *23*(3), 1262–1277. https://doi.org/http://dx.doi.org/10.23960/jpmipa/v23i3.pp1262-1277

Van den Heuvel-Panhuizen, M., & Drijvers, P. (2020). Realistic Mathematics Education. *Encyclopedia of Mathematics Education*, 713–717. https://doi.org/10.1007/978-3-030-15789-0_170

Viberg, O., Khalil, M., & Baars, M. (2020). Self-regulated learning and learning analytics in online learning environments: A review of empirical research. *ACM International Conference Proceeding Series*, 524–533. https://doi.org/10.1145/3375462.3375483

Wijayanto, Z., Mutiara, H., & Pardimin, P. (2022). Implementation of the Flipped Classroom Learning Model to Improve Students' Self-Regulated Learning. *Jurnal Pendidikan MIPA*, *23*(3), 1123–1134. https://doi.org/10.23960/JPMIPA/V23I3.PP1123-1134

Winne, P. H. (2017). Cognition and Metacognition within Self-Regulated Learning. *Handbook of Self-Regulation of Learning and Performance*, 36–48. https://doi.org/10.4324/9781315697048-3

Winne, P. H. (2019). Paradigmatic Dimensions of Instrumentation and Analytic Methods in Research on Self-Regulated Learning. *Computers in Human Behavior*, *96*, 285–289. https://doi.org/10.1016/J.CHB.2019.03.026

Yamada, M., Goda, Y., Matsuda, T., Saito, Y., Kato, H., & Miyagawa, H. (2016). How does self-regulated learning relate to active procrastination and other learning behaviors? *Journal of Computing in Higher Education*, *28*(3), 326–343. https://doi.org/10.1007/S12528-016-9118-9

Yamada, M., Shimada, A., Okubo, F., Oi, M., Kojima, K., & Ogata, H. (2017). Learning analytics of the relationships among self-regulated learning, learning behaviors, and learning performance. *Research and Practice in Technology Enhanced Learning*, *12*(1), 1–17. https://doi.org/10.1186/S41039-017-0053-9/TABLES/7

Zheng, L., Li, X., & Chen, F. (2016). Effects of a mobile self-regulated learning approach on students' learning achievements and self-regulated learning skills. *Innovations in Education and Teaching International*, *55*(6), 616–624. https://doi.org/10.1080/14703297.2016.1259080