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STUDENTS' SELF-REGULATED IN LEARNING MATHEMATICS USING REALISTIC MATHEMATICAL EDUCATION MODEL

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ABSTRACT

To study at school, students must have soft skills such as self-regulated learning, namely the ability of students to manage their own learning. The significance of students' self-regulated learning is what inspired this study. This study sought to ascertain the rise in students' self-regulated learning when learning mathematics using a realistic mathematics education model, as well as the students' reactions to learning mathematics using a realistic mathematics education model. This kind of study uses questionnaire analysis to do descriptive research. A self- regulated learning questionnaire and a questionnaire for students' responses made up the tool used to assess the self-regulated learning abilities that had been put to the test. Data were collected for this study to examine the rise in realistic mathematics education students' ability to learn mathematics independently, as well as the students' attitudes toward learning mathematics through mathematics education, which were assessed using a Likert attitude scale. The self-regulated learning scale is made up of four parts: the students' evaluations of how well they (1) use and locate pertinent learning resources in mathematics, (2) select and determine their learning strategies in mathematics, (3) assess and evaluate their learning outcomes in mathematics, and (4) have a positive view of themselves as mathematicians. By utilizing realistic mathematics education, the findings of this study about self-regulated learning in mathematics can be viewed as a whole. Based on the results of data analysis it is known that students' responses to realistic mathematics education models are positive which are adapted to real-life contexts or everyday life which will arouse students' self-regulated learning in solving problems because they are related to real life. This demonstrates that 98.18% of students respond positively.

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INTRODUCTION

To study in schools, students must possess soft skills like self-regulated learning. Self-regulated learning, also known as student learning independence, is the ability of students to manage their own learning (DiFrancesca et al., 2016; Panadero, 2017; Siregar et al., 2022c, 2022a). The ability to self-regulate while learning mathematics has an impact on the quality and quantity of one's own learning (Winne, 2017). Theoretically, self-regulated learning highlights the importance of a person's ability to exercise self-control and regulation, especially when faced with challenges (Broadbent, 2017). This supports the claim that attaining learning independence necessitates carefully organizing and keeping track of one's own cognitive and affective processes when completing academic assignments (Daniel et al., 2016). If students are very self-regulated, they often learn more effectively (Beaumont et al., 2014). This is supported by the study's findings, which demonstrated that individuals with high levels of self-regulated learning often learn more efficiently, can effectively monitor, analyze, and control their learning, can complete tasks faster, and perform well in science, particularly mathematics (McCardle et al., 2016; Panadero et al., 2017; Zheng et al., 2016).

The process of carefully planning and self-monitoring cognitive and affective processes in order to finish an academic work is known as self-regulated learning, also known as independence in learning (Rovers et al., 2019; Yamada et al., 2016, 2017). Hargis contends that rather than a mental capacity or specific academic skills, self-regulated learning is a process of self-direction in translating mental capacities into specific academic skills (Li et al., 2020). Self-regulated learning, according to Kerlin (1992), is an effort to control and deepen associative networks in a particular topic while also monitoring and optimizing the relevant deepening process (Schuitema et al., 2016). This concept states that conscious self-design and supervision of cognitive and affective processes throughout the completion of an academic task constitutes self-regulated learning. In this case, rather than a mental capacity or specific academic skills like reading fluency, self-regulated learning is a process of self-direction in transforming mental ability into specific academic skills (Callan & Cleary, 2018; Siadaty et al., 2016).

Learning that is self-regulated is learning that is impacted by an individual's own ideas, emotions, strategies, and actions that are focused on achieving objectives (Hooshyar et al., 2020). Self-observation and self-monitoring, comparing one's status to specified criteria, and self-response are all traits of independent learning, according to Bandura (positive or negative response) (Broadbent & Fuller-Tyszkiewicz, 2018; Cerezo et al., 2019; Winne, 2019).

We must change the arithmetic learning strategy if we want to achieve our learning goals. It's crucial to develop mathematical ideas from the viewpoint of the pupil. Teachers can highlight a variety of techniques for encouraging students to think, ask questions, solve problems, present ideas, discuss ideas, and possibly learn something new in order to increase their enthusiasm for learning (Mardiah et al., 2021). Van de Walle also argues that teachers should adopt a student-centered approach rather than a teacher-centered one. In this case, education must encourage student creativity, excite their interest, and challenge the value of truth (Siregar et al., 2022b). Identifying and solving issues, making assumptions, and avoiding the pressure of mechanically generating solutions are all part of the process of learning mathematics (Santoso & Syarifuddin, 2020). Additionally, it connects the concepts of mathematics with its applications rather than viewing it as a collection of isolated notions and methods.

The majority of teachers continue to use the conventional teaching strategies still in use in schools today when implementing teacher-centered learning. The instructor begins the course by outlining the material or providing samples of it without putting it in a context before

assigning any homework (real life setting). Students and teachers hardly ever speak to one another (Siregar, Mujib, et al., 2020). Additionally, students have fewer opportunity to develop their abilities because the teacher actually controls the teaching and learning process and does not promote student participation (Dwi Kurino & Cahyaningsih, 2020). This problem illustrates how little teachers comprehend the notion that education should be student-centered.

Preliminary investigation by some students did not considerably add to their prior knowledge; instead, they tended to accept just the material offered in line with the teacher (Siregar, Karnasih, et al., 2020). The fact that learning challenges are still lacking for pupils may be a contributing factor in their poor self-efficacy. Students' interest in arithmetic may also wane as a result. This evaluation is for teachers to continuously enhance the learning environment in order to achieve the objectives of studying mathematics (Siregar & Prabawanto, 2021).

Additionally, some students still view mathematics classes as difficult, obscure, and unpleasant. This is consistent with some students' beliefs that arithmetic requires them to memorize a number of formulas (Wijayanto et al., 2022). Additionally, teachers continue to dominate the classroom and use a monotonous approach to explain math concepts, which influences students to view math as the most boring subject (Haka et al., 2022). Due to a lack of learning diversity and the frequent use of textbook approaches by teachers, arithmetic materials might be difficult for students to comprehend.

It is the responsibility of the teacher to make sure that the pupils understand the mathematical concepts taught in textbooks. Naturally, if the teacher in question uses the book's language to explain an existing concept without employing his or her presentational skills, the student will not be helped in learning the subject, but the student will understand the book. suitable for reading (Prestiani et al., 2021). Because of this, some students reported that math was a difficult topic and that they were still confused by it. Teachers, on the other hand, need to put in a lot of effort to ignite students' interests, support their skill development, and help them reach their full potential. One is to employ a variety of tactics, such providing useful math training.

Using a realistic education model encourages students to understand the material in a more tangible, realistic, or non-abstract way. The item is surrounded by a range of illustrations, materials, and artifacts that help pupils comprehend mathematical ideas (Dwi Kurino & Cahyaningsih, 2020). Since it is so close to the difficulties encountered in daily life, realistic math education can improve students' interest in learning math concepts that seem dull and abstract. As a result, math appears less impersonal and more real. The majority of children benefit from realistic math programs because they promote self-regulated learning and motivate them to learn math in a fun way. This study aims to determine whether more realistic arithmetic instruction enhances students' capacity to direct their own learning.

METHOD

The sample strategy used in this study was purposeful sampling (Sugiyono, 2012). Because the researcher thinks the sample has the highest knowledge about the subject under investigation. This study uses purposeful sampling to evaluate students' self-regulated mathematics learning after using a realistic mathematical education model to learning. 32 seventh-grade pupils from Medan's Al-Ulum Junior High School took part in this investigation.

Questionnaire analysis is used in this type of study to conduct descriptive research. Descriptive research is research that tries to investigate specific circumstances, conditions,

situations, events, activities, etc. through observation, description, and understanding of natural objects as they are. This study aims to describe how students perceive themselves as mathematicians following a rigorous mathematical education.

As a way of acquiring information, a questionnaire as well as observation are both used. Data acquired by setting the student self-regulated learning scale are used to determine the amount of self-regulated learning of students in mathematics. The four components of the measure utilized in this study are: (1) using and locating pertinent learning materials in mathematics; (2) selecting and deciding on learning techniques in mathematics; (3) assessing learning outcomes in mathematics; and (4) self-concept in mathematics.

The scale model used will be the Likert scale model. The degree of agreement with a statement can be divided into four categories: strongly agree (SS), agree (S), disagree (TS), and strongly disagree (STS). The findings of the attitude scale analysis in this study describe students' self-regulated learning in mathematics after applying learning with a realistic mathematics education. The data analysis technique then applies descriptive analysis, which aims to characterize the state or status of a phenomenon or data collection that is split into two sets of data and stated in words or sentences, separated by specific categories (Creswell, 2015; Drew et al., 2017; Sugiyono, 2012, 2013). The following procedures were used to analyze the study's data: Data reduction, data display, and drawing or verification of conclusions are the first three steps. (Sugiyono, 2012; Drew et al., 2017; Creswell, 2015) Thus, after applying learning with a realistic mathematical education and following completion of the steps in data analysis, a description of students' arithmetic self-regulated learning is obtained.

RESULTS AND DISCUSSION

Result

The findings of this study will be used to demonstrate how children learned mathematics on their own after receiving a realistic mathematics education. The self-regulated learning scale that students completed served as the source of the study's qualitative data. At the conclusion of learning, courses using realistic mathematics instruction are given a scale of the students' self-regulated learning attitudes. Students' self-regulated learning toward learning mathematics with genuine mathematics education is described by this attitude scale. The attitude scale consists of 12 statements, five of which are positive and seven of which are negative. They cover four aspects of self-regulated learning: student assessments of using and locating relevant learning resources in mathematics; student assessments of choosing and determining learning strategies in mathematics; student assessments of evaluating the process and learning outcomes in mathematics; and student assessments of self-concept in mathematics. Multiple indications are established for each character. Based on the features of the kids' math learning, we will now describe the self-regulated learning of each item for each student.

Analysis of Students' Self-Regulated Learning Data on Assessment Characteristics About Utilizing and Searching for Relevant Learning Resources for Students in Mathematics

There are several indicators that can be developed in compiling statements that are in accordance with the characteristics of self-regulated learning: assessments about utilizing and finding relevant learning resources for students 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 (Utilizing and Searching for Relevant Learning Resources)

Statement No	Sign	Statement	SS	S	TS	STS
17	+	When I don't have the math books I need, I borrow them from friends, seniors or the library.	13 40.6%	18 56.3%	1 3.1%	0 0%
18	+	Apart from source books, I look for social arithmetic materials from other sources, such as the internet.	7 21.9%	24 75%	1 3.1%	0 0%
19	-	Even though I have a math book, I never read it.	0 0%	0 0%	25 78.1%	7 21.9%

From Table 1 it can be seen that for statement number 17 (when I didn't have the math books needed, I borrowed them from friends, seniors or the library) as much as 100% of students agreed, students who didn't have books, borrowed from seniors or the library, This can be seen from the number of books owned by students. Then for statement number 18 (apart from source books, I look for social arithmetic material from other sources, for example the internet) as many as 96.66% of students agree with this statement, but as much as 3.33% of students disagree. This shows that most students have used and searched for relevant learning resources. Furthermore, for statement number 19 (even though I have a math book, I have never read it) as many as 100% of students disagree with this statement, students can answer the teacher's questions about the material to be studied. This shows that students read in advance the material that will be studied in class.

Analysis of Students' Self-Regulated Learning Data on Assessment Characteristics About Selecting and Establishing Student Learning Strategies in Mathematics

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 selecting and determining student learning strategies 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 2.

Table 2. Distribution of Self-Regulated Learning Scale on Indicator 2 (Selecting and Establishing Learning Strategies)

Statement No	Sign	Statement	SS	S	TS	STS
20	-	I find it difficult to understand social arithmetic material when studying by discussing.	0 0%	0 0%	26 81.2%	6 18.8%
21	-	If there is homework/mathematics assignment, I always see the answer from friends.	0 0%	1 3.1%	24 75%	7 21.9%
22	+	I study math at home before the	2	30	0	0

Statement No	Statement Sign	Statement	SS	S	TS	STS
		teacher explains it in class.	6.2%	93.8%	0%	0%
23	+	After reading math books, I always make a summary so it's easy to remember and understand.	4 12.5%	28 87.5%	0 0%	0 0%

From Table 2 it can be seen that for statement number 20 (I find it difficult to understand social arithmetic material when studying by discussing) as many as 100% of students disagree with this statement, students look happy when learning by discussing and when the teacher gives questions when finished learning by discussing, they can work on the problem.

For statement number 21 (if there is homework/mathematics assignment, I always see the answers from friends) as many as 96.9% of students disagree and 3.1% agree. After tracing, it turned out that students who answered in agreement were students who often did not focus when participating in learning. Their grades were not so good when compared to the students in general in the class.

For statement number 22 (I study mathematics at home before the teacher explains it in class) and statement number 23 (after reading math books, I always make a summary so that it is easy to remember and understand) as much as 100% of students agreed with the statement. Answers to student questionnaires are in accordance with the results of interviews with students to study the material presented by the teacher in advance. After reading the math book, students make a summary.

Analysis of Students' Self-Regulated Learning Data on Assessment Characteristics About Evaluating Processes and Student Learning Outcomes in Mathematics

There are several indicators that can be developed in compiling statements that are in accordance with the characteristics of self-regulated learning: assessments about evaluating students' learning processes and outcomes in mathematics. The statements used in this study consist of three statements (one positive and 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 (Evaluating Learning Processes and Outcomes)

Statement No	Statement Sign	Statement	SS	S	TS	STS
24	+	I always try to do math problems to see the mastery of the material that has been studied.	4 12.5%	27 84.4%	1 3.1%	0 0%
25	-	I learn to use props to make me not understand the material being studied.	0 0%	0 0%	24 75%	8 25%
26	-	Even though the math scores were mediocre, I was quite satisfied.	0 0%	1 3.1%	22 68.8%	9 28.1%

From Table 3 it can be seen that for statement number 24 (I always try to do math problems to see my mastery of the material that has been studied) as many as 96.9% of students agree with

this statement, but as much as 3.1% of students disagree. After being traced, it turns out that students who do not agree are students who are not focused when participating in learning.

For statement number 25 (learning to use visual aids makes me not understand the material being studied) as much as 100% disagree with this statement. When learning using visual aids, students understand the material being studied more quickly.

For statement number 26 (even though the math score is mediocre, I feel quite satisfied) as many as 96.9% of students disagree with this statement, students realize that they can get even better grades and for 3.1% of students who agree with these statements often do not go to school, they tend not to have the motivation to get better grades.

Analysis of Students' Self-Regulated Learning Data on Characteristics of Assessment of Students' Self-Concept in Mathematics

There are several indicators that can be developed in compiling statements that are in accordance with the characteristics of self-regulated learning: assessment of students' self-concept 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 4.

Table 4. Distribution of Self-Regulated Learning Scale on Indicator 4 (Self-concept)

Statement No	Statement Sign	Statement	SS	S	TS	STS
27	-	Math lessons make me uneasy and confused.	0	2	20	10
			0%	6.2%	62.5%	31.3%
28	-	When asked to do questions on the blackboard, I feel less confident.	0	1	19	12
			0%	3.1%	59.4%	37.5%

From Table 4 it can be seen that for statement number 27 (mathematics lessons make me uneasy and confused) as many as 93.8% of students disagree and 6.2% even agree. After tracing, it turned out that students who answered in agreement were students who often did not attend school and were not focused when participating in learning. Their grades were not so good when compared to other students in the class.

For statement number 28 (when I was asked/asked to do questions on the blackboard, I felt less confident) as many as 96.9% of students disagreed. When the teacher gives opportunities to students to work on questions on the blackboard, students generally come forward and work on these questions confidently.

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 education model are presented in Table 5.

Table 5. Distribution of the Total Scale of Self-Regulated Learning

No Item	Alternative answer			
	1	**2**	**3**	**4**
Utilizing and Searching for Relevant Learning Resources				
17	0	1	18	13
18	0	1	24	7
19	0	0	25	7
Selecting and Establishing Learning Strategies				
20	0	0	26	6
21	0	1	24	7
22	0	0	30	2
23	0	0	28	4
Evaluating Learning Processes and Outcomes				
24	0	0	27	5
25	0	0	24	8
26	0	1	22	9
Self-concept				
27	0	2	20	10
28	0	1	19	12
Total	0	7	287	90
Percentage (SMI = 384)	0%	1.82%	74.74%	23.44%
	1.82%		98.18%	

From Table 5 it can be seen that the percentage of students who have high self-regulated learning as much as 98.18% of the percentage strongly agree and agree. For students who have low self-regulated learning as much as 1.82%.

Discussion

Based on the results of data analysis it is known that the student's response to the realistic mathematics education model is positive. In line with the results of this study, learning based on a realistic education model 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 education model can arouse students' interest in learning so that learning activities become effective.

A person's effort to achieve a completely new shift in behavior as a result of interaction with his environment is known as the learning process (Pahrudin et al., 2020; Prahani et al., 2020; Van den Heuvel-Panhuizen & Drijvers, 2020; Yang & Wu, 2010). This is due to the complexity of the learning process, which is how kids decide whether or not they will learn. Therefore, an educational activity's action or response can be divided into two categories: a

positive learning response (listening, reading, writing, discussing/asking) or a negative response (other irrelevant actions). A favorable answer shows that the pupils are eager to take part in the learning process.

The teacher had also supplied a stimulus in the form of feedback and reinforcement tailored to the qualities of the students after analyzing the scenario in class, which contributed to the students' favorable response. In other words, a key element in the application of a learning technique is the teacher. Because learning planning will allow the instructor to predict how much success will be attained, a teacher must create a mature and suitable learning planning procedure.

According to the data analysis's findings, learning mathematics with a realistic education model inspires students to have faith in their capacity to deliver excellent performance, such as successfully completing tasks. With actual mathematics education, students actively participate in their learning by completing their own LAS assignments, explaining and justifying their decisions, and receiving feedback from other groups. Such endeavors foster self-assurance in one's own abilities and a strong commitment, view challenges as opportunities to learn and come up with strategies for overcoming obstacles, such as novel situations, set challenging goals, persevere and do their best, try to face failure, concentrate on tasks, and not easily give up on failure. Overall, pupils' self-regulated learning is excellent and beneficial when they receive a realistic mathematics education. Because of the concepts and traits of realistic mathematical education that are employed in learning, students' self-regulated learning capacities can be developed with this model.

According to the previous explanation, one of the most important variables in boosting student learning independence is the learning strategy component. Students will become more interested in mathematics and more responsible in their model to problem-solving if the proper strategy, such as realistic mathematics education, is used during the learning process. Researchers have found that when learning occurs through realistic mathematics instruction, most students appear brave, enthusiastic, engaged, and enthusiastic when coming up with solutions to the LAS given, despite the fact that some students display less enthusiasm by resignedly waiting for friends to respond to the LAS given. Physical, emotional, social, and experiential variables, among others, all contribute to this.

Setting goals for one's learning process and attempting to monitor, regulate, and manage one's cognition, motivation, and behavior while being constrained by those goals and environmental contexts constitute independent learning, which is an active and constructive process (Hasibuan et al., 2019). Thus, it can be said that self-regulated learning is a process in which people actively regulate their own learning, starting with systematic planning, monitoring, control, and evaluation. This is done by using a variety of cognitive, motivational, and behavioral strategies to achieve learning goals. This is because the mathematical method is more realistic and in line with the environment and everyday life, which helps promote student learning independence.

Students who learn mathematics through realistic instruction typically have a favorable propensity for self-regulated learning. It can be concluded that students with high efficacy abilities will have an impact on their learning achievement and can improve students' mathematical abilities by, for instance, having self-confidence or belief in their abilities to carry out and complete the tasks at hand so that they are able to overcome challenges and achieve the expected goals.

Based on the findings of the observations, it is evident that students' attitudes are favourably affected by learning mathematics in a realistic setting. Since learning has likely always been challenged by issues with mathematics and abstract notions, it may be that student excitement

is evident when confronted with concrete/real-world situations. Students respond positively, are daring, energetic, passionate, and enthusiastic when learning with genuine mathematical education, as can be observed. Therefore, it can be stated that students' attitudes toward learning with a positive realistic mathematical education and students' ability to self-regulate their learning have both enhanced.

CONCLUSION

Almost all students experienced positive self-regulated learning while utilizing mathematical education-based learning, according to an examination of study data on the subject. 91.18% of students responded positively overall when using realistic mathematics education. Schools and teachers can create brand-new, cutting-edge curriculum that include genuine mathematics education in order to grab students' attention, promote their learning, and enhance their capacity to manage their own learning in all subject areas. I'm hoping it'll be achievable. We also suggest that you use a range of learning strategies to help kids learn to self-regulate. The researcher suggests that by employing actual mathematics education, future researchers undertake analogous study that is more in-depth, broader, and complementary to other mathematical abilities.

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