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Improved Learning Outcomes of Simple Geometri through RME with Nuanced Cognitive Burden for 4th-grade Students of Jumerto Public Elementary School 1

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***Abstract**: This study aims to improve learning outcomes of simple geometri with RME-based learning tools that pay attention to cognitive load. This type of research is a classroom action research with the trial subjects of 4th-grade students of **Jumerto Public Elementary School 1** for the 2019/2020 academic year consisting of 15 male students and 11 female students. The results of this study are: (1) the application of RME with cognitive load nuances can improve learning outcomes on classical completeness from 30.77% in cycle I to 90.15% in cycle II, (2) the application of RME with cognitive load nuances can improve learning outcomes based on the average test results from 46.19 in the first cycle to 78.5 in the second cycle; (3) the application of RME with cognitive load nuances can increase the implementation of learning from 84.38% with a good category in the first cycle to 90.63% with a very good category in the second cycle.*

Keywords: RME, cognitive load, learning outcomes

1. INTRODUCTION

In elementary and secondary education, learning is a process between learners, between learners and educators or learning resources in a learning environment, Permendikbud 103 the year 2014. This requires educators to be able to carry out learning that connects learning material with learning resources that can be from the environment of students. According to Gravemeijer in Hadi, [2] the learning process of students must be given the opportunity to find (to reinvent) mathematics under adult guidance. This activity can be carried out if the mathematics material being studied starts from real-world situations or is in accordance with the context of the students' thoughts (realistic), this learning is known as Realistics Mathematics Education (RME).

The results of the observation of 4th-grade mathematics learning at Jumerto public elementary school 1 is students are less motivated to learn mathematics because they find it difficult to understand the concept, there are only 20% of students who can understand mathematical concepts and can apply mathematical material in their daily life. The completeness of student learning outcomes is still relatively low, it because students do not understand the mathematical concepts being learned, learning mathematics that involves real objects around students will be easier accepted by students according to the cognitive load of elementary school students.

Based on the problems faced at Jumerto public elementary school 1, it is necessary to improve learning in class, especially in mathematics. RME learning uses real objects to explain mathematical concepts. The advantages in RME, such as (1) Realistic mathematics learning can provide students with a clear and operational understanding of the relationship between mathematics and daily life and the general use of mathematics., (2) Realistic mathematics learning provides a clear and operational understanding to students that mathematics is a study constructed and developed by students, and (3) Realistic mathematics learning also provides a clear and operational understanding to students that the way of solving problems does not have to be single and does not have to be the same from one student to another

In Hadi [2], learning mathematics with the RME approach includes aspects, including (1) starting the lesson by asking real problems for students according to their experience and level of knowledge, so that students are immediately involved in the lesson meaningfully, (2) the problems given must be directed according to the objectives to be achieved in the lesson, (3) students develop or create symbolic models informally about the problems/problems posed, and (4) teaching takes place interactively: students explain and giving reasons for the answers he gave, understanding the answers of his friends (other students), agreeing with his friends' answers, expressing disagreement, looking for other alternative solutions, and reflecting on each step taken or on the results of the lesson. Waluyo, et al [1] discussed the development of the lesson plan and student worksheet based on Realistic Mathematics Education by taking into account the students' cognitive load. Cognitive load theory is introduced as a teaching theory based on the knowledge of our human cognitive architecture. The principle of cognitive load theory is the quality of learning will increase if attention is concentrate on the role and limitations of working memory.

Through the RME learning device with paying attention to the cognitive load, it is expected that the learning

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outcomes of 4th-grade Jumerto public elementary school 1 students will increase in the 2019/2020 academic year.

2. RESEARCH METHOD

2.1 Research subject

The subjects of this research were 4th-grade students of Jumerto public elementary I Jember in the 2019/2020 school year. 4th-grade students totaled 26 students consisting of 15 male students and 11 female students. Students' academic abilities are heterogeneous.

2.2 Research Procedures

This research is classroom action research and was conducted in 2 cycles with classroom action research steps consisting of planning, implementing, observing, and reflecting. Arikunto [4], classroom action research, each cycle consists of 4 stages, namely: (1) planning, (2) implementation, (3) observation, and (4) reflection.

The planning stage was carried out: design a Lesson Plan for simple geometry materials according to the RME with nuances of cognitive load, compiling an RME-based student worksheet with nuances of cognitive load, compiling evaluation questions and assessment rubrics and compiling research instruments in the form of learning implementation observation sheets.

At the implementation stage, the teacher applies RME with nuanced cognitive load according to the Lesson plan that has been compiled.

The observation stage is implemented during the learning activities. This observation uses an observation sheet to determine the implementation of learning during the learning process through RME with nuances of cognitive load

Reflection is implemented after the implementation of learning and aims to find out the research results that have been achieved. Reflection in cycle I serve as input and improvement of the implementation of learning cycle II.

Data analysis in the form of test learning outcomes and implementation of learning using a descriptive percentage. The data obtained in the form of a learning outcome test were analyzed using mastery techniques, namely (1) individual completeness if individually the student was declared complete learning with a value of ≥ 60 in the material of simple building blocks according to the specified KKM. Students who do not reach the KKM score are said to be incomplete learning; (2) classical completeness is calculated by the following formula [5]:

classical completeness =

$$\frac{\text{the number of students studying completely}}{\text{Jthe number of students}} \text{ x } 100\%$$

The percentage of learning implementation is calculated by the formula [6]:

Percentage of learning implementation =

$$\frac{\text{acquisition score}}{\text{maximum score}} \text{x } 100\%$$

The percentage results are categorized according to the following table [6].

Table 1. learning implementation category

percentage	category
$86 < P \leq 100$	Very good
$70 < P \leq 86$	good
$55 < P \leq 70$	Good enough
$P \leq 55$	Not good

3. RESULT AND DISCUSSION

Implementation of cycle I

The implementation of cycle I uses lesson plan and student worksheets based on RME by paying attention to the cognitive load for the material properties of simple spatial shapes. At the observation stage, observations were made using the implementation observation sheet. The evaluation was carried out at the second meeting attended by 26 4th-grade students the number of students studying completely.

Analysis of the evaluation value of the first cycle of the second meeting, there were 8 students completed with the classical completeness achieved was 30.77% and an average score of 46.19. The highest score was obtained 66 and the lowest score was 20. The observation results of the implementation of learning cycle I are presented in Table 2.

Table 2. The result of **Implementation of cycle I**

No	Rated aspect	Obs 1	Obs 2
1	Delivering learning objectives using cognitive maps about blocks and cubes.	4	4
2	Motivate students by giving flat plane questions.	4	3
3	Ask students to take out student worksheet 01 and the teacher to provide tangible objects in the form of blocks, cubes, balls and tubes.	4	4
4	Explain simple geometry by raising examples of problems with real objects that are around them.	4	3
5	Invite students to pay close attention to the forms of these real objects.	3	3
6	Guiding students to do an experiment measuring examples of real objects directly. Examples of objects used are blocks and cubes	3	4
7	Guide students to decide whether 2 examples of real objects whose folds are measured have the same shape or not.	3	4
8	Providing more varied real objects.	4	4
9	Going around and guiding groups that do not know or understand	3	3

	the problems in Student Worksheet 01		
10	Ask the group (representatives) to present the results of their group discussion about the problems in student worksheet 01	3	3
11	Guiding students to conclude the material that has been studied	3	3
12	Ask students to study the next material about block nets and cubes	3	3
	Total	41	40
	Percentage of implementation	85,42%	83,33%
	Implementation everage	84,38%	

Based on Table 2, the average percentage of implementation in cycle 1 is 84.38% in the good category. This is in contrast to the very low test results obtained. students have not been able to understand the material properties of simple shapes. Based on the indicators of the success of learning outcomes and classical completeness in cycle I this has not been achieved so it is necessary to do cycle II.

Implementation of cycle II

The implementation of cycle II uses RME-based lesson plans and student worksheets by paying attention to the cognitive load for cube and block nets material. Similar to the first cycle, the observation stage, the observation is made using the implementation observation sheet. The evaluation was carried out at the second meeting attended by 26 4th-grade students.

Analysis of the evaluation value of the second cycle of the second meeting, 25 students were completing the classical completeness achieved was 96.15% and an average value of 78.5. The highest score was obtained 93 and the lowest score was 44. The observation results of the implementation of learning cycle II are presented in Table 3.

Table 3. The result of **Implementation of cycle II**

No	Rated aspect	Obs 1	Obs 2
1	Delivering learning objectives using cognitive maps about blocks and cubes.	4	4
2	Motivate students by giving flat plane questions.	4	3
3	Ask students to take out student worksheet 01 and the teacher provides tangible objects in the form of blocks, cubes, balls and tubes.	4	4
4	Explain simple shapes by raising examples of problems with real objects that are around them.	4	3
5	Invite students to pay close attention to the forms of these real objects.	3	3
6	Guiding students to conduct an experiment measuring examples of real objects directly. Examples of objects used are blocks and cubes	3	4
7	Guide students to decide whether 2 examples of real objects whose folds are measured have the same shape or not.	3	4
8	Providing more varied real objects.	4	4
9	Going around and guiding groups that don't know or understand the problems in student worksheet 01	3	3
10	Ask the group (representative) to present the results of their group discussion about the problems in Student worksheet 01	4	4
11	Guiding students to conclude the material that has been studied	4	4
12	Ask students to study the next material about block nets and cubes	4	4
	Total	44	43
	Percentage of implementation	91,67%	89,58%
	Implementation everage	90,63%	

Based on Table 3, it is obtained that the average percentage of implementation in cycle 1 is 90.63% with the very good category. The reflection from cycle II is that students are used to learning activities based on RME by paying attention to cognitive load.

The comparison results of the cycle I and cycle II can be presented in Table 4.

Table 4. Comparison of Cycle I and Cycle II

No	Aspect	Implementation Result		Enhancement
		Cycle I	Cycle II	
1	Learning outcomes (classical completeness)	30,77%	96,15%	65,38%
2	learning outcomes everage	46,19	78,5	32,31
3	Learning inplementation	84,38%	90,63%	6,25%

There is a significant increase in student learning outcomes based on the average test results and classical completeness. This is because in cycle I, students are not familiar with RME-based learning.

This classroom action research was implemented in 2 cycles because the results achieved in the cycle I did not meet all the indicators of success so that it was necessary to

carry out the second cycle. Each cycle consists of four stages, namely planning, observing, implementing, and reflecting. At the implementation stage, RME-based learning is implemented which takes into account the cognitive load. The learning device used is an RME-based learning tool with cognitive load nuances. The RME steps that pay attention to cognitive load are (1) understanding contextual problems that reduce extraneous loads, (2) explaining contextual problems that increase Germany's burden, (3) solving contextual problems this manages intrinsic cognitive load, increases Germany's burden, reduces extraneous cognitive load, (4) comparing and discussing answers that increase Germany's cognitive load, and (5) concluding that managing intrinsic cognitive load. This learning implementation aims to pay attention to the cognitive load of students so that students will be more ready and easier to understand mathematical concepts specifically for simple building materials.

4. CONCLUTION

Based on data analysis and the results of discussion of activities, the following conclusions are drawn: (1) the application of RME with cognitive load nuances can improve learning outcomes in classical completeness from 30.77% in cycle I to 90.15% in cycle II, (2) application of RME nuanced cognitive load can improve learning outcomes based on the average test results from 46.19 in cycle I to 78.5 in cycle II; (3) the application of RME with cognitive load nuances can increase the implementation of learning from 84.38% with a good category in the first cycle to 90.63% with a very good category in the second cycle. Based on the conclusions of the results of this study, the following suggestions are made: (1) the learning tools used will be better if they pay attention to the cognitive load of students and the teacher can apply RME-based learning tools that pay attention to the cognitive load on other materials.

5. ACKNOWLEDGMENT

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6. REFERENCES

[1] Waluyo, E., Sa'dijah, C., Subanji (2016). Pengembangan RPP dan LKPD Berbasis RME dengan Memperhatikan Beban Kognitif Siswa Materi Bangun Ruang Sederhana Kelas IV SD, Jurnal Pendidikan Universitas Negeri Malang, vol. 1 No. 12, pp.2300-2306

[2] Hadi,S. (2005). Pendidikan Matematika Realistik dan Implementasinya. Banjarmasin: Tulip

[3] Kuan, Nigel Choon Hao. 2010. Integrating link maps into multimedia: An investigation. Sydney: University of Sydney

[4] Arikunto, Suharsimi. Suhardjono. Supardi. (2014). *Penelitian Tindakan Kelas*. Jakarta: Bumi Aksara.

[5] Trianto. (2013). *Mendesain Model Pembelajaran Inovatif-Progresif*. Jakarta: Prenada Media Group.

[6] Kementerian Pendidikan dan Kebudayaan. (2016). *Panduan Pembelajaran untuk Sekolah Menengah Pertama Kurikulum 2013*. Jakarta: Kementerian Pendidikan dan Kebudayaan