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The Development of Mathematical Teaching Books-Based Realistic Approach to Increase Creative Thinking Ability in 5th Grade Elementary School

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***Abstract*— This type of research is development research that refers to the theory of Borg and Gall. The population of this study was all fifth grade students in SD Negeri Gugus I, Rajabasa Subdistrict and a sample of 51 students obtained by purpose sampling technique were students of class V B of SDN 1 Rajabasa as Experimental Classes and students of class V B SDN 3 Rajabasa as a control class. Data collection techniques use test results of learning and observation. The feasibility of the instrument is theoretically based on expert judgment with an average of 90.09 very good categories. While the feasibility of the instrument empirically based on the analysis 20 essay questions are worthy and quality from the results of the test of validity, reliability, different power, and level of difficulty. Mathematical textbooks based on realistic approaches are also effective. This can be seen from the average value of students in the experimental class using a realistic textbook based on mathematical approaches that is 74.29 higher than the average value of students in the control class who do not use mathematical textbooks based on realistic approaches, namely 59.47 with the normalized Gain value of 0.38 with the "medium" category.**

Keywords: mathematics textbooks, realistic approaches, creative thinking skills

I. INTRODUCTION

Improving the quality of learning starting from Elementary School is the most basic level of education in the State of Indonesia. At the Primary School level educators are expected to develop the potential that exists in students through increasing the ability to think critically, creatively and based on logic, especially those related to everyday life. In the real situation, students consider mathematics lessons that are very difficult to solve. This is indicated by a result of international research in the fields of mathematics and science through the 2016 Program for International Student Assessment (PISA) [1] Indonesia ranked 62 of 72 countries with results below the average of countries that followed the competencies of the Organization for Economic Cooperation and Development despite increasing results compared to 2012. The results of the needs analysis carried out on 9 educators in fifth grade in the Public Elementary School Gugus I Dahlia, Rajabasa, that is, educators considered that lack to give the students freedom to contract their knowledge so that their creativity is not used optimally and rarely associates with problems that occur in the daily lives of students; teaching materials that used are still limited and have not shown problems in everyday life; Mathematical textbook based on realistic approaches are textbook that are a guide to help students in learning by developing mathematical concepts starting from real situations, which are easily understood by students to solve problems based on mathematical concepts independently.

The results of the research that were used as the reference for this study were the research that conducted by [2] entitled "How Does Realistic Mathematics Education (RME) Improve Students Mathematics Cognitive Achievement?". The second study was [3] examines The Effect of Realistic Mathematics Education Approach on Students 'Achievement and Attitudes Towards Mathematics. The results of the third study by [4] examined The Effects of Realistic Mathematics Education on Students Achievements and Attitudes In Fifth Grades Mathematics Courses and the results of the study of [5] examines the Development of Learners' Creative Thinking Abilities in Mathematics Learning with the Indonesian Realistic Mathematics Education Approach". The conclusions of this study are: 1) Through Realistic Mathematics Education learning becomes more meaningful; 2) Use of the world real help improve students 'understanding of mathematical concepts; 3) Improve student learning outcomes 4) Through Realistic Mathematics Approach can improve students' creative thinking skills.

According to [6] there are three main principles in realistic mathematical approaches, that are (a) "guided discovery" and "advanced mathematics" (guided reinvention and progressive mathematics), (b) didactical phenomena (didactical phenomenology), and (c) an independent development model

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(emerging model). The first principle "Guided discovery" means students are allowed to discover their mathematical concepts by solving various contextual problems. Based on the questions, students build models of problem situations (in a formal or informal form), then construct mathematical models to solve them until students get formal knowledge of mathematics.

The second principle of realistic mathematics approach is the existence of learning phenomena that emphasizes the importance of contextual questions to introduce mathematical topics to students. This is by considering two aspects, that are the appropriateness of the application of context in teaching and the appropriateness of the impact in the process of rediscovering the form and mathematical model of the contextual problem. According to Goffree (1993), contextual questions in a realistic mathematical approach function to form concepts, models, applications, and exercises. The third principle of a realistic mathematical approach is the development of a self-developed model that functions to bridge the gap between informal and formal mathematical knowledge from students. In a realistic mathematical approach raised and developed independently by students. Beginning with solving contextual problems from real situations that students are familiar with, then finding "models of" (models of) these situations (informal forms), which are then followed by finding "models for" (models for) these forms (formal forms of mathematics) to get problem-solving in the form of standard mathematical knowledge. Based on the description that has been described, there is a problem that is quite interesting to study. So that researchers want to develop a math textbook for students based on a realistic approach so that the mathematical creative thinking abilities of fifth grade students in Public Elementary School Gugus I, Rajabasa, Bandar Lampung City can increase.

II. RESEARCH METHODOLOGY

Research carried out using development that is Research and Development (R and D) [8]. This research develops mathematics textbook products based on realistic approaches to improve the creative thinking skills of fifth grade in Elementary School students. This research was conducted in January - May at the Public Elementary School Gugus I Dahlia, Rajabasa. The product trial subjects were fifth grade B class students at Public Elementary School 1 Rajabasa as an experimental class, totaling 28 and fifth grade B class fifth grade B class students at Elementary School 3 Rajabasa as a control class, amounting to 23. The school was in Gugus I Dahlia, Rajabasa and had used the curriculum 2013 in the learning process. The Borg and Gall procedure (1983: 781) uses 10 steps, that are:

A. Research and data collection

At this stage the researcher conducted an observation to spread the questionnaire on the needs of fifth grade students in four Public Elementary Schools in Gugus I Dahlia, Rajabasa District.

B. Planning

The planning phase is carried out on the development of a mathematics textbook based on a realistic approach to the material of Build Flat-Side Space.

C. Initial product development

At this step researchers began to develop the initial product form.

D. Test the initial product

This stage is carried out on material expert lecturers, media experts, and educator validation tests using a validation sheet questionnaire. Feasibility analysis is obtained from the results of product validation calculated by the formula:

$$\text{Final Score} = \frac{\text{Score Obtained}}{\text{Maximum Score}} \times 100$$

The final score is converted to the assessment criteria shown in table 1

TABLE I. CONVERSION OF EXPERT VALIDITY VALUES

Final Score	Criteria
81 % - 100 %	Very valid, very complete, can be used
61 % - 80 %	Valid enough, quite effective, can be used with minor repairs
41 % - 60 %	Less valid, less effective, less complete, used not to be used
21 % - 40 %	Invalid, ineffective, incomplete, can't be used
00 % - 20 %	Very invalid, very ineffective, very not complete, cannot be used

E. Initial product revision

The initial product revision is based on input and suggestions from the instrument validation results from experts.

F. Main field test

This stage is done after the product has been refined. The main field test was conducted on 6 (six) teachers of fifth grade Public Elementary School in Gugus I of Rajabasa sub-district from 3 different elementary schools. Data collection about products is done using the educator validity questionnaire.

G. Revised the main product

This revision is done to refine the products that have been developed in accordance with the real conditions in the field.

H. The operational field test phase

This phase was carried out on the sample of the test were 28 students in the experimental class in fifth grade class B Public Elementary School 1 Rajabasa and 23 students in the control class in fifth grade class B Public Elementary School 3 who had low, medium, and high abilities. In the experimental class students carry out learning activities with mathematics textbooks based on a realistic approach. Whereas the control

class carries out conventional learning. Product tests were conducted to see significant differences in student learning outcomes before and after learning using a mathematics teaching book based on a realistic approach.

I. Revised the final product

This revision is based on the results of field tests and the acquisition of quantitative data, namely the learning outcomes of students to find out the creative thinking abilities of students. Data analysis is done using the formula (Sugiyono, 2012) :

$$\bar{x} = \frac{\sum x_i}{n} \times 100\%$$

Information:

$\bar{x}$ = the average percentage of indicators of students' creative thinking abilities

$\sum x_i$ = the number of values for each indicator of creative thinking ability

n = the maximum positive score for each indicator

Then add the scores of each section to obtain the final score. Thus knowing the categories of students' creative thinking abilities based on the following table 2:

TABLE II. CLASSIFICATION OF CRITERIA FOR CREATIVE THINKING ABILITY

Criteria	Category
81 % - 100 %	Very creative
61 % - 80 %	Creative
41 % - 60 %	Creative enough
21 % - 40 %	Less creative
0 % - 20 %	Not creative

Thus it can find out the percentage of the number of students from each category using the formula:

$$NP = \frac{R}{SM} x100\%$$

Information:

NP = the percentage value of the category of creative thinking ability

R = the number of students from each category

SM = the number of all students

In stage ten it should consist of dissemination and implementation, but researchers only carry out the implementation phase due to limited funds and time. The form of the experimental design used is the pretest-posttest control group design, in detail can be seen in table 3 below.

TABLE III. PRE-TEST POST-TEST CONTROL GROUP DESIGN.

	Group	Pre-test	Treatment	Post-test
R	Experiment	O_1	X	O_2
R	Control	O_3		O_4

III. RESULTS AND DISCUSSION

The initial step of this research is data collection with field studies and literature reviews to find out information about the implementation of learning using the curriculum 2013 in mathematics subjects. At the stage of the field survey, the activities were interviews and observations about obstacles and the availability of learning media in schools. The findings data are used as material to plan for designing mathematics textbook products based on realistic approaches. After the initial product is finished, it will be validated by media experts and educators. Advice from media experts is used to revise the product. Then, the researchers conducted a main field trial which was a continuation of the expert test. Where the researchers distributed the educator's validity questionnaire to 6 teachers of fifth grade which come from 3 different schools. The results of the questionnaire obtained the following data:

TABLE IV. THE RESULTS OF QUESTIONNAIRE FOR VALIDITY OF EDUCATORS

No	School name	Value
1.	Educator of fifth grade A class of Public Elementary School I Rajabasa	90,52
2	Educator of fifth grade B Class of Public Elementary School 1 Rajabasa	91,37
3.	Educator of fifth grade C Class of Public Elementary School 1 Rajabasa	92,24
4.	Educator of fifth grade A Class of Public Elementary School 2 Rajabasa	93,10
5.	Educator of fifth grade B Class of Public Elementary School 2 Rajabasa	94,83
6.	Educator of fifth grade A Class of Public Elementary School 3 Rajabasa	95,68

After revising the product to the results of the main field trial. Comments and suggestions on the previous trial were used as a benchmark for product improvement. Some of the improvements made are replacing images around the students' environment. Then the next step is to conduct an operational field trial at Public Elementary School I Rajabasa. Before the learning activities take place the students carry out the pretest first. After the pretest was carried out, students carried out learning activities with mathematical textbook, and at the end of the lesson the students carried out the posttest. This is intended to see whether or not there is a change in student learning outcomes before and after using a mathematics textbook based on a realistic approach to the material of building flat side spaces. Product testing is done to see the significant differences in student learning outcomes before and after learning using a mathematics textbook based on a realistic approach. The analysis carried out was comparing the learning outcomes before and after learning using paired t-test.

Before the t-test analysis is carried out, the analysis requirements test is carried out, that is the data normality test. The results of testing the validity of the pretest and posttest questions are as follows:

TABLE V. RECAPITULATION OF TEST VALIDITY OF TRIAL RESULTS

No	Validity test	Frequency	Percentage (%)
1	Valid Problem Amount Invalid	24	83,33
2	Number of Questions	6	16,67
total		30	100,00

Based on the results of the validity test, 20 questions were selected from 24 valid questions to test the hypothesis of the research conducted. The first hypothesis tested in this study was "The realization of a mathematics textbook based on a realistic approach that is feasible for fifth grade of elementary school students". Testing the first hypothesis by testing product validation developed by experts who are competent with textbook. The results of testing the first hypothesis are based on the results of the validation of teaching books by material experts and media experts in the following table.

TABLE VI. RESULTS OF TESTING THE FIRST HYPOTHESIS

No	Evaluation Aspect	Score
A.	***Material Validation***	
1.	Feasibility of the contents of the Math textbook	42
2.	Feasibility in presenting Mathematics textbook	31
3.	Language feasibility of Mathematics textbook	36
4.	Realistic Assessment	16
	Total	125
	Average	86,80
B.	***Validation of Media Experts***	
1.	The design of the Mathematics textbook cover	26
2.	Design the contents of the Mathematics textbook	50
	Total	76
	Average	95,00
	Average Score	90,90

Based on the data in the table above, it is known that the assessment of material experts and media experts on Mathematics textbook products developed through a realistic approach obtained an average score of 90.90 with very good qualitative criteria. Thus the hypothesis which states the realization of the form of development of mathematics textbook based on realistic approaches for fifth grade of elementary school students, is clearly tested by the existence of a realized product. The second hypothesis in this study is that there is the influence of the use of mathematical textbook based on a realistic approach towards improving the creative thinking skills of fifth grade of elementary school students obtained from student learning outcomes before using mathematics textbook based on realistic approaches in fifth grade of elementary school using flat building material (pretest) and after using a mathematics textbook based on a realistic approach in fifth grade of elementary school that using the material for constructing a flat side space (posttest) can be seen in the Table below.

TABLE VII. STUDENT LEARNING OUTCOMES IN FIELD TRIALS

Sample name	Average value		Enhancement (%)
	Pretest	*Posttest*	
Public Elementary School 1 Rajabasa Fifth grade B class (Experiment)	58,39	74,29	15,90
Public Elementary School 3 Rajabasa Fifth grade B class (Control)	49,78	59,47	9,69

The table above shows that in general there are differences and improvements in student learning outcomes after learning using mathematics textbook based on a realistic approach to the material of building a flat side space. In the experimental class the average student learning outcomes before being given learning by using a mathematics textbook based on a realistic approach to the material on the flat side building is 58.39 increasing to 74.29 after being given learning using a realistic approach to the material on the flat side space or an average increase of 15.90%. Whereas, the average learning outcomes of the pretest and posttest of the control class students were 49.78 increased to 59.47, an average increase of 9.69%. Furthermore, the results of the pretest and posttest of students in the experimental class and control class can be seen in the following figure.

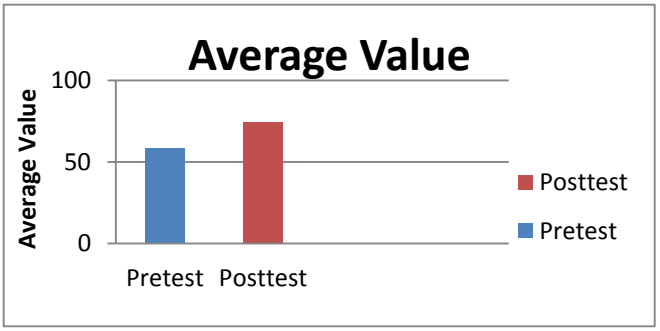

Fig. 1. Diagram of the Value of Learning Outcomes Pretest and Posttest of students of fifth grade B class of Public Elementary School 1 Rajabasa (experimental class)

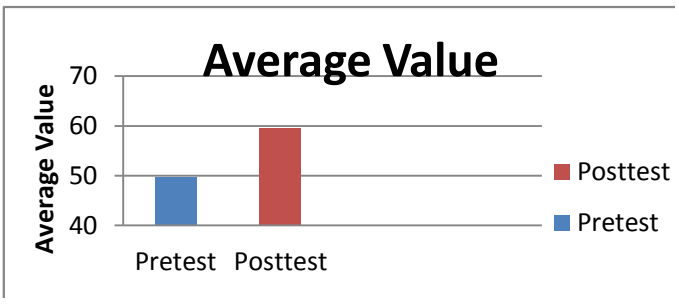

Fig. 2. Diagram of the Value of Learning Outcomes Pretest and Posttest of students of fifth grade B class of Public Elementary School 3 Rajabasa (control class)

Based on the analysis of the data values of the post-test experimental class and control class, the average percentage of each indicator of creative thinking ability was obtained. The results of the analysis of the average percentage of each indicator of students' creative thinking skills can be seen in the following figure:

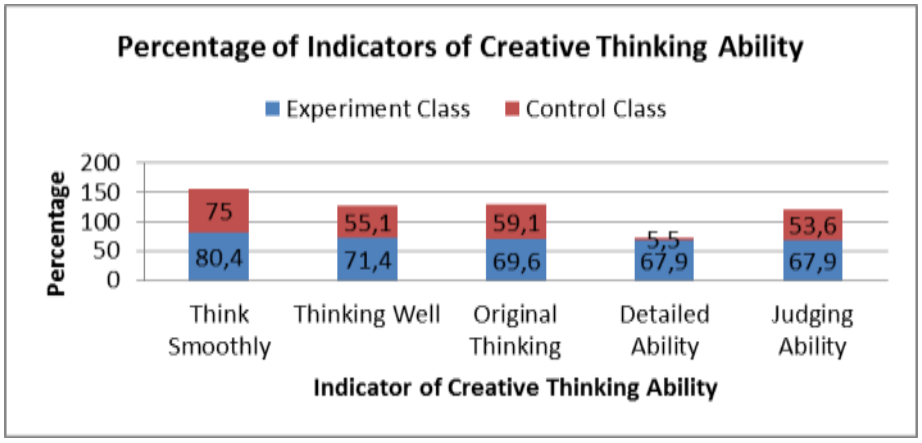

Fig. 3. Percentage Diagram of Indicators of Creative Thinking Learners Judging from the Posttest Results of Students

Then determine the percentage of students' creative thinking abilities as a whole so that the categories obtained from the average results of all indicators of creative thinking are based on the posttest results of fifth grade B class students of Public Elementary School 1 Rajabasa (experimental class). The average percentage of the categories of creative abilities of students in the experimental class is presented in the following picture:

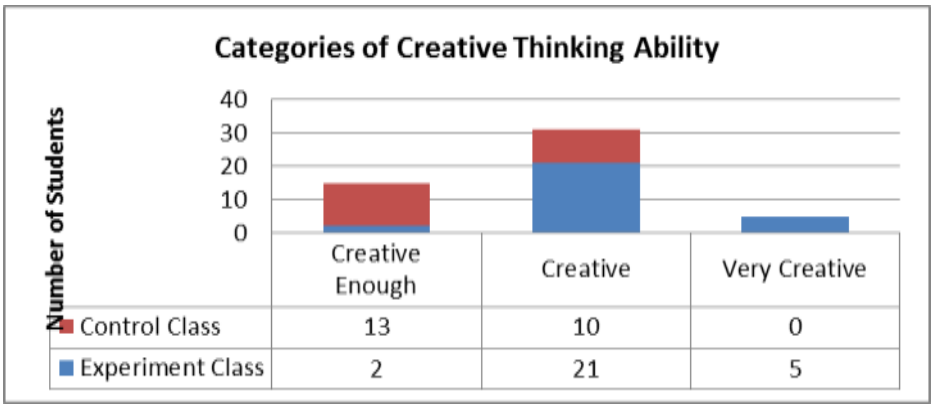

Fig. 4. Students' Creative Thinking Category Diagram Viewed from the Posttest Results of Students

The results of the analysis of differences in the test with the t-test formula of two free samples (independent) were obtained t value of 5.428 with t table 2.0075 in other words t count > t table. Then it can be concluded that there is a significant difference between learning outcomes in fifth grade B class in Public Elementary School 1 Rajabasa (experimental group) and fifth grade B class in Public Elementary School 3 Rajabasa (control group).

Next to test the effectiveness of the learning outcomes then using the N-Gain Test by obtaining the following results:

TABLE VIII. RESULTS OF N-GAIN PRETEST-POSTTEST AFTER COUNTING

No	Test Samples	Gain
1.	Fifth grade B class in Public Elementary School 1 Rajabasa (experimental group)	0.38
2.	fifth grade B class in Public Elementary School 1 Rajabasa (experimental group)	0.18

From the table above, the average gain results in the experimental class show the results of 0.38, which means that the normalized gain is in the middle classification, then the level of effectiveness is effective. This can happen because students use Mathematics textbooks that use realistic approach steps where students are required to follow each stage systematically.

The use of textbooks in mathematics learning is done in groups, and students learn according to the syntax developed by Kamdi (2008: 526), namely (1) motivating students, (2) communicating learning objectives, (3) proposing real problems, (4) collecting data, (5) developing or creating symbolic models, and (6) formulating conclusions and reflecting. Steps in learning mathematics with a realistic approach, according to the results of which reveals how important independence and confidence when dealing with mathematics in everyday life and active students as one of the key skills of the 21st century. Based on the results of research conducted and referring to relevant research, that learning is measured through learning outcomes of students showing an increase in the ability of creative thinking by looking at the high and low learning outcomes obtained after using a mathematics teaching book based on a realistic approach.

IV. CONCLUSION

Based on the results of the research and discussion, the researcher can conclude that the final product in this study is produced a mathematical textbook product based on a realistic approach that is feasible to use. The use of textbook products based on realistic approaches developed can improve the creative thinking skills of fifth grade elementary school students. This is supported by learning outcomes, a significant increase in the scores of the pre-test and post-test.

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