

The Effectiveness of 3D Visual Media Based on the Realistic Mathematics Education Approach in Mathematics Learning in Elementary Schools

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Abstract. 3D visual media is media whose appearance can be observed from any point of view and has dimensions of length, width, and height/thickness. There are still many teachers who teach using conventional methods even though there are many contextual media that can be used to deliver learning materials so that students better understand the material being taught. This study aims to determine the effectiveness of a 3D visual media based on the Realistic Mathematics Education approach in grade 5. The method used in this research is experimental research. Data collection is done by determining the population and samples are carried out before the research is carried out. This research was conducted in Class 5C of SD Negeri Cipocok Jaya 1. From the results of the study it can be concluded that the use of 3D visual media can improve student learning outcomes in Class 5C of SD Negeri Cipocok Jaya 1.

Keywords: 3D visual media, realistic mathematics education approach, mathematics.

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INTRODUCTION

Education is a conscious effort made by a person or individual to be better. Education is also one of the factors to change the destiny of individuals or groups and even education can influence the progress of a nation and state. If in a country the education system is bad, it will be possible for the country's progress to be bad because the human resources will also be bad. Unlike the case with a country where the education system is already good, it is likely that the country will be more advanced because in that country there are also good human resources.

In Indonesia, National Education has the goal of educating the life of the nation as stated in the Preamble to the 1945 Constitution, paragraph IV. In order to educate the life of the nation, the government and society are required/obliged to provide education. Education according to Thompson (1957) in Mikarsa (2007:1.3) is an individual who is influenced by the environment in order to give birth to a permanent transformation in thinking, behavior, habits and attitudes.

The goals of primary education must be linked to national goals and basic education goals. In elementary school education it is also necessary to look at the stages of development and characteristics of students and their adaptation to the surrounding environment. Basic education also needs to pay close attention to developments in technology, science and human life throughout the world. According to Mikarsa (2007: 1.3), the goals of education in elementary school include the formation of the basic personality of students as whole human beings according to their level of development, promotion of basic understanding, and learning guidance as a basis for learning, as well as the ins and outs of science and technology as a basis for learning at an educational level that higher and in social life.

Regulation of the Minister of National Education of the Republic of Indonesia No. 22 of 2006 concerning Content Standards for SKS stipulates that the SD curriculum must include eight subjects, mulok (local content) and self-development (Permendiknas, 2006:9). And one of them is mathematics that must be taught to elementary school students.

Mathematics is the science related to numbers and all things related to them and includes the operational procedures used in solving a problem related to numbers. Mathematics at the lowest level is only concerned with arithmetic, measurement and algebra. Nonetheless, these three forms the basis of mathematics which in turn is also applied to other disciplines such as

Physics, Sociology, Biology, Geography, Chemistry, Economics, Computers, Engineering, Medicine and so on. Almost all disciplines in the world have mathematics in them.

Similar to what has been described above, so that students are able to solve problems in life in their environment, in learning mathematics teachers are required to be able to direct students to master mathematical concepts in learning mathematics itself. In learning students do not only know and memorize Mathematical concepts, but teachers must also make students understand and understand the meaning of these concepts which link the interrelationships between a concept and other concepts through investigation, research, experimentation and exploration as a means of a problem solving pattern with critical thinking.

Based on the results of observations and interviews that researchers conducted at SDN Cipocok Jaya 1 in grade 5 mathematics learning there was a basic competence that they had to master in determining the nets of cubical and rectangular geometric shapes. However, after the researchers conducted observations and interviews, there were several problems, such as children who were less skilled at drawing nets, because usually students only accepted without knowing the process for obtaining beam and holy nets. In the sense that the teaching teacher is still traditional and pays little attention to the strategies applied when teaching in class.

Therefore, appropriate learning media and learning models are needed to improve students' ability to determine nets of cubes and blocks in grade 5 students at SDN Cipocok Jaya 1.

It is hoped that by applying the right strategy when learning in class and media that can be applied in learning activities, especially learning about nets and cubes, it can help students better understand and understand the material in their daily activities. In addition, it can also increase the motivation of students when learning because it is hoped that the learning process will be more interactive and not monotonous.

According to Briggs (1977) in Rudi and Cepi (2018: 6) reveals that learning media are physical means for conveying content/learning materials such as books, videos, slides, films, and so on. Munadi (2018: 7) states that learning media can channel and convey messages from sources in a structured manner to create a supportive learning environment where recipients/students can carry out the learning process effectively and efficiently, which is defined as an object.

Based on several opinions from several experts described above regarding the definition of learning media, it can be concluded that learning media is a visual aid to support the process of learning activities so that the material delivered by the teacher can be more easily understood by students.

One of the learning media is in the form of three-dimensional learning media, namely media whose shape can be observed from all directions and has dimensions of length, width, and height/thickness. Three-dimensional media can also be interpreted as a group of media without projections that convey three dimensions in plain view. This type of media can be in the form of real objects, both living and inanimate objects, and can be in the form of imitation objects that represent the original objects.

When real objects are used as learning media, they can be brought directly to class, or students can be deployed directly to the environment where the original object is located. If it is difficult or impossible to bring the original difference into the class, then the learning media that is brought to class can be in the form of an imitation object so that the object can represent the original object and can be more effective and efficient.

Three-dimensional media that can be made easily, its use and utilization is relatively simple, because without having to require special skills, it can be made by the teacher himself, the material is easy to obtain in the surrounding environment. The appropriate learning media to assist educators in teaching the material is 3-dimensional media. 3-dimensional learning media is known to be able to improve student learning outcomes (Astuti, 2017).

The media used in this study is called the "sisi berpasang" media. This media is a visual media that is delivered accompanied by an explanation of the cube nets from the teacher.

RME is an approach that emphasizes conceptual teaching and has a tendency for active students (Afriansyah, 2016). The Realistic Mathematics Education (RME) approach emphasizes how students reinvent concepts or procedures in mathematics through realistic problems for students. This approach refers to Freudenthal's opinion which says that mathematics must be

related to reality and mathematics is a human activity. Mathematics as a human activity, meaning that students must be given the widest possible opportunity to reinvent ideas or mathematical concepts themselves.

Indonesian Mathematics Realistic Education is a theory about learning mathematics in which one of the learning approaches uses a "real world" context (Fatthurrohman 2015: 185). The realistic approach or RME can also be interpreted as a way of teaching by providing opportunities for students to investigate and understand mathematical concepts through a problem in a real situation. In this lesson students are invited to form their own knowledge based on the experience they have gained or experienced before. So in the RME model students will play a greater role in learning where it will relate to what is in the real world according to the learning material so that students will easily understand the purpose of the learning.

METHOD

Places and Samples of Research Data Sources

Experimental studies require populations and samples as data sources. The population and sample were determined before the research was conducted. The population can be interpreted as the large group being studied, while the sample is a relatively smaller group or a small part of the population but can represent a larger group (population).

The population in this study were all fifth grade students at SDN Cipocok Jaya 1, which consisted of 3 class groups. After going through the previous observation process, in this study, class VC was chosen by the researcher as a sample class to represent all class V in Cipocok Jaya 1 Public Elementary School as a population.

Data collection technique

One important step in a scientific research is data collection which is a process of collecting data needed in a research. Therefore, in a research it is necessary to process data collection. In this study, the data collection techniques used by the researchers were literature studies, interviews, observations, pre-tests and post-tests.

Table 1. Assessment Criteria

Letter	Number 0 - 4	Number 0 - 100	Predicate
A	4	85 - 100	Very nice
B	3	70 - 84	Nice
C	2	55 - 69	Enough
D	1	40 - 54	Less
E	0	0 - 39	Very less

Data analysis technique

Analysis activity is an activity that aims to understand the facts contained in the environment. The analysis is carried out by examining the phenomena and events as a whole and their constituent parts and related relationships. (Iskandar, 2012). Bogdan and Taylor (1975) describe data analysis as a process that requires formal efforts to find topics and form ideas suggested by the data, and efforts to provide guidance on these topics and ideas (Nana Syaodih Sukmadinata, 2015).

Data analysis activities were obtained by comparing the pretest results (initial test) with the posttest results (final value) given to students. The pretest is given to students before students receive learning treatment, while the posttest is given after students have finished learning. The following is a table of comparison instruments for students' pretest scores with posttest scores.

In order to be able to see the effect of using 3-dimensional cube net media based on the Cooperative Learning Model on direct learning in class, the learning outcomes/test scores obtained by students are needed by researchers as data. To find out the completeness of student learning, student learning outcomes are analyzed using evaluation analysis techniques by analyzing test results data with learning completeness criteria, then KKM (Minimum Completeness Criteria) which has been determined previously becomes a comparison of the learning outcomes obtained by students. If the learning outcomes obtained by students reach a score of 75% or more, students can be categorized as having achieved mastery in learning, to find out about this, it can be done how to calculate the scores obtained by students with the maximum total score then multiplied by 100% or use the Percentages Correction formula as following:

$$S = \frac{R}{N} \times 100\%$$

Information:

S: The value sought/expected

R: total score of items/questions answered correctly

N: ideal maximum score of the test.

In order to find out how far the development of learning outcomes before and after the implementation of learning media of 3-dimensional cube nets based on the cooperative learning model, data analysis techniques were carried out by comparing the percentage of learning completeness/results of the pre-test and post-test. Meanwhile, the way to calculate student learning completeness is by comparing the number of students who are categorized as learning complete with the entire number of students who are sampled in the study (maximum students) then multiplied by 100%.

$$P = \frac{\text{Completeness percentage: the number of students who are in complete learning}}{\text{the total number of students}} \times 100\%$$

RESULTS

Pre-Test and Post-Test Results

Comparison of Students' Pre-Test and Post-Test Results

The following is a comparison of the results of the pre-test and post-test of class V C students at SDN Cipocok Jaya 1

Table 2. Pre-test results

No	Student's name	Pre-test	Information
1	S 1	50	Not Completed
2	S 2	50	Not Completed
3	S 3	50	Not Completed
4	S 4	15	Not Completed
5	S 5	35	Not Completed
6	S 6	60	Not Completed
7	S 7	30	Not Completed
8	S 8	50	Not Completed
9	S 9	45	Not Completed

No	Student's name	Pre-test	Information
10	S 10	60	Not Completed
11	S 11	75	Completed
12	S 12	20	Not Completed
13	S 13	10	Not Completed
14	S 14	15	Not Completed
15	S 15	45	Not Completed
16	S 16	50	Not Completed
17	S 17	60	Not Completed
18	S 18	35	Not Completed
19	S 19	50	Not Completed
20	S 20	50	Not Completed
21	S 21	70	Not Completed
22	S 22	25	Not Completed
23	S 23	65	Not Completed
24	S 24	55	Not Completed
25	S 25	65	Not Completed
26	S 26	60	Not Completed
27	S 27	35	Not Completed
28	S 28	45	Not Completed
28	S 29	75	Completed
30	S 30	50	Not Completed
31	S 31	40	Not Completed
32	S 32	70	Not Completed
33	S 33	35	Not Completed
34	S 44	40	Not Completed
35	S 35	65	Not Completed
36	S 36	35	Not Completed
Amount		1685	
Average		46,8	
Completeness percentage		5,55%	

Table 3. Hasil Post-test

No	Student's name	Post-test	Information
1	S 1	70	Not Completed
2	S 2	75	Completed
3	S 3	85	Completed
4	S 4	75	Completed
5	S 5	75	Completed
6	S 6	85	Completed
7	S 7	70	Not Completed
8	S 8	80	Completed
9	S 9	80	Completed
10	S 10	85	Completed
11	S 11	90	Completed
12	S 12	75	Completed
13	S 13	65	Not Completed
14	S 14	70	Not Completed
15	S 15	85	Completed

No	Student's name	Post-test	Information
16	S 16	70	Not Completed
17	S 17	80	Completed
18	S 18	80	Completed
19	S 19	85	Completed
20	S 20	75	Completed
21	S 21	90	Completed
22	S 22	80	Completed
23	S 23	80	Completed
24	S 24	85	Completed
25	S 25	75	Completed
26	S 26	80	Completed
27	S 27	65	Not Completed
28	S 28	80	Completed
28	S 29	85	Completed
30	S 30	85	Completed
31	S 31	80	Completed
32	S 32	80	Completed
33	S 33	70	Not Completed
34	S 44	80	Completed
35	S 35	85	Completed
36	S 36	85	Completed
Amount		2840	
Average		78,8	
Completeness percentage		80,5%	

The activity begins with the researcher entering the class by greeting, then greeting the students. Then, the researcher asked one of the students to lead the prayer before studying, the researcher took attendance to check student attendance by asking students in class who were not present at the meeting that day. After that, the researcher conducted an apperception regarding the subject matter to be carried out. The researcher links the material that has been taught with the new knowledge that will be taught. After that, the researcher conveyed the objectives of the teaching and learning activities to be carried out to students. Delivering clear goals from learning activities makes students able to understand which way they will learn.

To increase learning motivation, students must first understand the learning objectives that will be conveyed by the teacher so that this will increase student learning interest. The clearer the learning objectives to be learned, the stronger it will ask students to learn (Sanjaya, 2009:29). Therefore, the teacher is required to convey the learning objectives to be achieved to students firstlu.

In the main activity, before starting the learning activities the researcher distributes pre-test questions to students in order to find out the extent of students' knowledge regarding the learning material that will be discussed today, and also as a measure of the success of teaching conducted by researchers. When students work on pre-test questions, many students are confused because the material has not been taught. They also have not learned it at home.

After the students worked on the pretest questions, the researcher began to enter the learning material about nets. The researcher opened the lesson by giving open-ended questions to students, namely what their mothers often buy when they go to the market. Then students answer together according to their experiences. The answers produced must have been different, in the

end the researcher asked one of the students to answer and the other students were in charge of listening. Based on this, the researcher concluded that there were some students who already knew various objects and there were some who could count well. According to Ornstein (1990:275), good learning is characterized by the use of good questions, especially learning for large groups of children. Asking good questions can stimulate children's curiosity, stimulate children's imagination, and motivate children to acquire new knowledge, helping children clarify concepts and problems related to lessons.

Then, the researcher asked students to form groups of 5-8 people. The class atmosphere at that time was very lively and looked very rowdy. When the researcher assisted the students in determining the group the students felt a little helped and calmer. When the class feels conducive, the researcher explains the rules of the game, after the students understand, the researcher gives assignments to the students. The explanation of the material carried out by the researcher is assisted by writing examples on the blackboard.

Next, students sat down based on their respective groups that had been divided before, after that the researcher explained the material concerned with geometric shapes such as blocks, cubes, and tubes. After explaining briefly about the room structure, the researcher gave the students to ask if there was anything they did not understand. Soemantri and Johar argue that the question and answer method is a method of presenting lessons in the teaching and learning process through reciprocal interactions, or reciprocal traffic from teacher to student or student to teacher, and material through answers. way to get certainty. teacher or student. The question and answer method is a method of presenting lessons, especially in the form of questions that need to be answered from teacher to student and student to teacher. The question and answer method is the oldest method and is widely used in the educational process both at home, in the community and at school. Furthermore, the researcher continued with a specific and in-depth study of the material for cube nets in accordance with the initial research objectives.

Learning begins with the researcher showing the learning media that the researcher has prepared beforehand. Students are very enthusiastic and curious about the media that the researcher shows. After the researcher explained how to use the learning media the researcher asked one person from each group to come forward and try the cube net media. After the group representative understood how to use the media, he then explained it to his other friends. Alternately each group uses the media. The purpose of the discussion is to 1) develop questioning, communication, interpretation, and reasoning skills among students, 2) develop a positive attitude towards the school, teachers, and the subject being studied. 3) troubleshooting. from a positive self-concept, 4) the success rate of forming students' opinions increases. 5) development of attitudes towards controversial issues (Moedjiono, 1991).

Each student representative was able to explain the results of the discussion well and confidently. This means that the purpose of the discussion has been achieved because students have been able to develop problem-solving skills. After that, the researcher confirmed the students' explanation.

After all the students used the media that the researcher brought, the researcher tested them with several questions. When it is felt that students have begun to understand the material of cube nets, the researcher then gives the questions again. In working on these questions students are not too confused anymore.

Students pay attention to each presentation of the material provided by the researcher. When it is felt that all the material has been delivered, the researcher gives the opportunity for students to ask questions. After nothing was questioned, and all the material had been delivered, the researcher distributed post-test questions which were useful as the final evaluation of that day's learning activities.

After the learning material has been delivered, the researcher distributes post-test questions which are useful as the final evaluation of that day's learning activities. At the time of filling out the post test, some students did it smoothly, different from when they were doing the pre-test. All students took the post test questions seriously because the material on the test had already been explained before. The researcher only paid attention to the students answering the questions, because during implementation all the students in the class worked quietly and individually.

After the students filled out the post-test sheet given by the researcher, the students and the researcher together concluded the learning activities carried out today. After that, the researcher motivated the students to be more active in learning. Researchers remind students not to forget to study the learning material for tomorrow. After that, students were asked to pray before going home.

The results showed that the results of learning to evaluate the initial conditions of Class VC students at SD Negeri Cipocok Jaya 1 for the Material of Cube Nets not using 3D Visual Media Based on Realistic Mathematics Education Approach obtained an average initial condition value of 46.8 with the highest score being 75, there were 2 people and the lowest score is 10 there is 1 person with a learning requirement of 5.55% and 94.45% incomplete.

The results showed that the learning outcomes of Class VC students at SD Negeri Cipocok Jaya 1 for the Material of Cube Nets with 3D Visual Media Based on Realistic Mathematics Education Approach obtained an average score of 78.8 with the highest score being 90 there was 1 person and the lowest score was 65 there are 2 people with 80.5% study requirement and 19.5% incomplete.

Based on the data on pre-test and post-test learning outcomes, it showed that there was an increase in student learning outcomes in Class VC, Cipocok Jaya State Elementary School, which showed an increase in student learning outcomes on the same material, namely cube nets. This is because the pre-test and post-test showed an increase in student learning outcomes on the same material, namely cube nets.

CONCLUSION

Based on data analysis and testing of the research hypothesis, it can be concluded that the application of 3-dimensional cube net media in Realistic Mathematics Education Approach can be said to be successful and well used to improve students' abilities to cube nets in basic competencies 3.6. Explain and find simple geometric nets (cubes and blocks). With the existence of research on the use of contextual learning media in cooperative models to improve students' abilities in determining cube nets in basic competencies 3.6 in Mathematics class 5 SDN Cipocok Jaya 1, the researchers suggest to educators, teachers, and students as prospective teachers, in order to be able to add knowledge and abilities in improving student learning achievement so that it becomes even better, and create situations and conditions in classroom learning to be fun, effective, and memorable for students as much as possible.

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