



## The Relationship of Learning Based on Three-Dimensional Visual Media (3D) with the Critical Thinking Skills of Students in Mathematics Learning in Public Elementary Schools

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**Abstract** The Relationship of Learning Based on Three-Dimensional Visual Media (3D) with the Critical Thinking Skills of Students in Mathematics Learning in public Elementary Schools. The problem of this research is the low critical thinking skills of students in learning mathematics. The purpose of this study was to see the critical thinking skills of students when learning using three-dimensional (3D) visual media and to find out the relationship between visual three-dimensional (3D) based learning and students' critical thinking skills in mathematics learning at SD Negeri 3 Perumnas Way Kandis.. This type of research is correlational research with a quantitative approach. The population numbered 195 and the study sample numbered 60 students. Data collection techniques used were questionnaire and documentation. The results of the study, it was found that there is a positive and significant relationship between learning based on three-dimensional visual media (3D) with students' critical thinking skills in mathematics learning with "strong enough" level.

**Keywords:** Management, Facilities and Infrastructure, Planning, Procurement, Inventionization

**Abstrak** Hubungan Pembelajaran Berbasis Media Visual Tiga Dimensi (3D) dengan Keterampilan Berpikir Kritis Siswa dalam Pembelajaran Matematika di Sekolah Dasar Negeri. Permasalahan dalam penelitian ini adalah rendahnya kemampuan berpikir kritis siswa dalam pembelajaran matematika. Tujuan penelitian ini adalah untuk melihat keterampilan berpikir kritis siswa saat pembelajaran menggunakan media visual tiga dimensi (3D) dan untuk mengetahui hubungan antara pembelajaran berbasis visual tiga dimensi (3D) dengan keterampilan berpikir kritis siswa dalam pembelajaran matematika. di SD Negeri 3 Perumnas Way Kandis .. Jenis penelitian ini adalah penelitian korelasional dengan pendekatan kuantitatif. Populasi berjumlah 195 dan sampel penelitian berjumlah 60 siswa. Teknik pengumpulan data yang digunakan adalah angket dan dokumentasi. Hasil penelitian ditemukan bahwa terdapat hubungan yang positif dan signifikan antara pembelajaran berbasis media visual tiga dimensi (3D) dengan kemampuan berpikir kritis siswa pada pembelajaran matematika dengan tingkat "cukup kuat".

**Kata Kunci:** Manajemen, Sarana dan Prasarana, Perencanaan, Pengadaan, Inventerisasi

## • INTRODUCTION

Learning in this era requires educators and students to be able to fully adapt to Technology, Information and Communication as a tool to achieve educational goals. In line with this opinion Greenstein in Sugiyarti (2012: 440) states that students who live in the 21st century must master science, have metacognitive skills, be able to think critically and creatively, and be able to communicate or collaborate effectively, this situation illustrates the gap between expectations and reality.

The ability to think critically, communicate actively, collaborate with people outside of themselves, and the high creativity inherent in students is a potential that must be developed in each individual student, so that students have intelligence and potential that can develop activeness, creativity and dynamism in dealing with various problems that exist in the environment.

Critical thinking skills are very important to be taught so that students are able to determine alternative solutions to a problem through critical thinking. Implementing 21st century learning through the 2013 curriculum that emphasizes 4C skills. Schools, especially educators, must be creative in implementing learning. So that the 4C skills possessed by students can develop, educators can use assistance in learning. The use of media in learning can help both educators and students in learning. One of the media that can be used in learning to improve 4C skills in students is three-dimensional (3D) visual media.

The abilities of these students can be developed by increasing the critical thinking skills of students. The process of improving students' critical thinking skills in mathematics learning can use the help of media in learning in the form of three-dimensional (3D) visual media. The media referred to according to Ashar in Asrotun (2014: 16) three-dimensional media means a media that is displayed can be observed from any point of view and has dimensions of length, width and height. Learning using three-dimensional (3D) visual media can visualize the material presented by students in real terms, so that learning does not only use textbooks and the 'form' of mathematical material described by educators is not only a shadow or a fantasy for participants students .

Based on the results of preliminary research conducted by interviewing teachers of SD Negeri 3 Perumnas Way Kandis, the use of three-dimensional (3D) visual media has not been implemented in class, while the use of three-dimensional (3D) media is only limited to showing real examples around the classroom from the pictures in the textbook. Educators also do not understand the use of three-dimensional (3D) visual media. Then it was found that learning was already using the media, but its use was only centered on educators and students only focused on paying attention to the explanations provided by the educators. Then pay attention to critical thinking skills in each class. It was found that the critical thinking skills of students in each class were still quite low, it could be seen from the activeness of students in asking questions related to the material presented. The majority of students in the class only accept what is given by the educator, they just listen to the explanation from the educator. Even when educators gave the opportunity to ask questions, most of them were silent, there were only 1-5 people who asked. The question is just a rote question, not a question that needs problem solving that shows critical questions from students.

**Table 1** The percentage of active questioning of Class IV and V students of SD Negeri 3 Perumnas Way Kandis

No	Class	Number of Students	Active Asking		Tidak Aktif Bertanya	
			Frekuensi	Percentage(%)	Frekuensi	Persentase (%)
1.	IVA	30	6	20	24	80
2.	IVB	30	5	16,67	35	83,33
3.	IVC	30	4	13,33	36	86,67
1.	VA	35	6	17,14	29	82,86
2.	VB	35	3	8,57	31	91,43
3.	VC	35	4	11,43	31	88,57
<b>Jumlah</b>		105	13		92	

Based on the questioning activeness table above, it can be seen that the average percentage of students' questioning activeness in learning is still low, namely with a percentage of  $\leq 20\%$ . The low activeness of asking questions can also be caused when educators tend to be dominant in learning (teacher centered) which causes students to just be silent, listen, and take notes. When educators ask any questions, the questions only range from what and where, not why and how questions, so that the answers received are just memorization, not analysis or explanation, so that students' critical thinking skills are not well honed. This can also occur because in the learning process educators rarely use learning media, one of which is three-dimensional visual media (3D).

Students only memorize material and make guesses, not learn to observe, solve problems, and provide solutions to problems. It should be used in learning the use of media, especially three-dimensional (3D) visual media, to support and develop students' critical thinking skills, given that education currently prioritizes 21st century skills which consist of 4C (Communication, Collaboration, Critical Thinking, and Creativity and Innovation) so that students must be prepared as early as possible to face the challenges of education in the 21st era, especially in critical thinking, so that they do not depend on others and can solve their own problems.

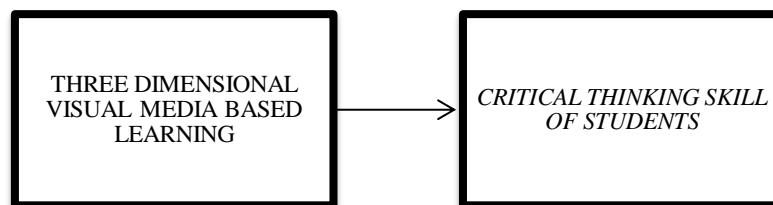
Based on the description above, a research will be carried out with the title "The Relationship of Learning Based on Three-Dimensional Visual Media (3D) with the Critical Thinking Skills of Students in Public Elementary School Mathematics Learning. Implemented at SD Negeri 3 Perumnas Way Kandis.

## • METHOD

This research uses correlational research. This research was conducted to determine the relationship between two variables. This research is a quantitative study in which data is obtained directly from respondents to test the relationship between variables. The research design serves as a guide or basis for conducting research activities. The research design designs a mindset that shows the variables to be studied that reflect the types and problems that need to be answered through research. In this study, there are two variables, namely:

1. The independent variable (X) is learning based on three-dimensional visual media (3D).
2. Bound variable (Y) is the critical thinking skill of students.

Based on the explanation above, the research design in this study is a quantitative approach with a correlational type to find out whether there is a relationship between learning based on three-dimensional visual media (3D) and students' critical thinking skills can be described as follows:



**Picture 1.** Variable relationship

The subjects of this study were high grade students (IV & V) at SD Negeri 3 Perumnas Way Kandis in the even semester of the 2019/2020 school year, with a population of 195 students from 6 classes, namely class IVa, IVb, IVc, Va. , Vb, Vc.

The sampling technique in this study using simple random sampling technique. The sample taken in this study were representatives of each class randomly selected with a total of 10 students from the 6 classes.

The research instrument used was a questionnaire. The questionnaire instrument was used as a tool to obtain data on the relationship between learning based on three-dimensional visual media (3D) and students' critical thinking skills. The assessment indicators used to assess learning based on three-dimensional visual media are 1) practical in use, 2) able to present theory and practice in an integrated manner, 3) involving students in their use, 4) the same message can be disseminated to students simultaneously, and 5) transcend space, time, and the senses. Meanwhile, indicators for assessing critical thinking skills in students are 1) interpreting, 2) analyzing, 3) evaluating, 4) drawing conclusions, and 5) explanation.

In order for the research instrument to be used, it is necessary to test the validity and reliability test for the questionnaire instrument, while for the test instrument the validity test, reliability test, distinguishing power test and difficulty level test are carried out. After that, the researcher tested the instrument on the respondent of the IA class students of SD Negeri 2 All Mider Kota Bandar Lampung with the formula for the validity of the product moment correlation, and the reliability test of the question instrument with the Cronbach Alpha method of halving technique.

After all research instruments have been tested and declared feasible, they will be used in research at SD Negeri 6 Gedong Air. The data in this study will be tested for normality, homogeneity, n-gain test and hypothesis testing.

## • RESULTS AND DISCUSSION

The research was conducted at SD Negeri 3 Perumnas Way Kandis by distributing questionnaires to students as respondents whose results would be used as data for calculating the correlation of this study. This questionnaire was given to determine the relationship between learning based on three-dimensional visual media (3D) and students' critical thinking skills using instruments that had been tested for validity and reliability. After carrying out the research process, the results of the relationship between learning based on three-dimensional visual media (3D) and critical thinking skills of students were obtained.

**1. Learning Based on Three Dimensional Visual Media (3D)**

At the initial stage the research was carried out by giving questionnaires to students to find out data about learning based on three-dimensional visual media (3D). The following is the frequency data from the learning variable based on three-dimensional visual media (3D):

**Table 2.** Frequency Distribution of Learning Variables Based on Three Dimensional Visual Media

No.	Interval	Frekuensi	Persentase)
1	25-29	6	10%
2	30-34	7	11,67%
3	35-39	9	15%
4	40-44	11	18,33%
5	45-49	14	23,34%
6	50-59	8	13,33%
7	55-59	5	8,33%
Jumlah		60	100%

Source: Research Results 2020

The table above shows that the highest frequency is in the 45-49 interval class, which is as many as 14 students (23.34%) and the lowest is in the 55-59 interval class, namely 5 students (8.33%). After calculating the data from the questionnaire, then the normality test is carried out with the interpretation of the calculation carried out by comparing the count  $X^2$  with the  $X^2$  table for  $\alpha = 0.05$  with  $dk = k-1$ . The calculation of the normality test for variable X and variable Y uses the chi-square formula as follows:

**Table 3.** Table Helper for Variable X

No.	Batas Kelas	Nilai Z	Luas 0-Z	Luas Kelas Interval	N	Fe	Fo	fo-fe	(fo-fe) <sup>2</sup>	$\frac{(fo - fe)^2}{fe}$
1	24,5	-2,03	0,4788	0,0509	60	3,198	6	-2,946	8,6789	2,84182
2	29,5	-1,46	0,4279	0,1146	60	6,792	7	-0,124	0,0153	0,00224
3	34,5	-0,89	0,3133	0,1878	60	11,286	9	2,268	5,1438	0,45650
4	39,5	-0,32	0,1255	0,2242	60	13,218	11	2,452	6,0123	0,44694
5	44,5	0,25	0,0987	0,1952	60	11,772	14	-2,266	5,2349	0,44697
6	49,5	0,82	0,2939	0,1238	60	7,512	8	-0,572	0,3271	0,04405
7	54,5	1,39	0,4177	0,0573	60	3,492	5	-1,562	2,4398	0,70967
8	59,5	1,96	0,4750							
$\Sigma$										4,948

Source: Research Results 2020

Based on the helper table above, interpretation is carried out by comparing  $X^2$  count with  $X^2$ table for  $\alpha = 0.05$  with  $dk = k-1 = 7-1 = 6$ , then look for the Chi-Square table to get  $X^2$ table of 12.591. So that in accordance with the applicable rules, it can be stated that  $X^2$ count = 4.003  $\leq$   $X^2$  table = 12.591 which means that the data for variable X is normally distributed.

## 2. Students' Critical Thinking Skill

The following is the data distribution of students' critical thinking skills based on the results of the research by giving questionnaires to students:

**Table 4.** Frequency Distribution of Students' Critical Thinking Skills

No.	Interval	Frekuensi	Persentase
1	26-30	6	10,00%
2	31-35	9	15,00%
3	36-40	9	15,00%
4	41-45	11	18,33%
5	46-50	13	21,67%
6	51-55	8	13,33%
7	56-60	4	6,67%
Jumlah		60	100%

Source: Research Results 2020

The table above shows that the highest frequency was found in the 46-50 interval class with 13 students (21.67%) and the lowest in the 56-60 interval class with 4 students (6.67%). After calculating the data from the questionnaire, then the normality test is carried out with the interpretation of the calculation carried out by comparing the count  $X^2$  with the  $X^2$  table for  $\alpha = 0.05$  with  $dk = k-1$ . The calculation of the normality test for variable X and variable Y uses the chi-square formula as follows:

**Table 5.** Variable Helper Table Y

No.	Batas Kelas	Nilai Z	Luas 0-Z	Luas Kelas Interval	N	Fe	Fo	fo-fe	(fo-fe) <sup>2</sup>	$\frac{(fo-fe)^2}{fe}$
1	25,5	-1,97	0,4756	0,0579	60	3,474	6	-2,526	6,3807	1,5266
2	30,5	-1,39	0,4177	0,1238	60	7,428	9	-1,572	2,4712	0,2291
3	35,5	-0,82	0,2939	0,1952	60	11,712	9	2,712	7,3549	0,0660
4	40,5	-0,25	0,0987	0,2242	60	13,452	11	2,452	6,0123	1,3427
5	45,5	0,32	0,1255	0,1904	60	11,424	13	-1,576	2,4838	0,2525
6	50,5	0,90	0,3159	0,1133	60	6,798	8	-1,202	1,4448	0,2438
7	55,5	1,47	0,4292	0,0501	60	3,006	4	-0,994	0,9880	0,3719
8	60,5	2,04	0,4793							
$\Sigma$										4,003

Source: Research Results 2020

Based on the helper table above, interpretation is carried out by comparing  $X^2$  count with  $X^2$ table for  $\alpha = 0.05$  with  $dk = k-1 = 7-1 = 6$ , then look for the Chi-Square table to get  $X^2$ table of 12.591. So that in accordance with the applicable rules, it can be stated that  $X^2_{count} = 4.003 \leq X^2_{table} = 12.591$  which means that the data for variable X is normally distributed.

## 3. The Relationship of Learning Based on Three-Dimensional Visual Media (3D) with the Critical Thinking Skills of Students in Mathematics Learning in Public Elementary Schools

After doing calculations on learning data based on three-dimensional visual media and critical thinking skills of students and doing a normality test, then doing a data linearity test. Based on the normality test that has been done previously, it was stated that

the data for variable X and variable Y were normally distributed, then the linearity test was then carried out. The results of the linearity test for the X and Y variables that have been carried out found that  $F_{count} = 0.94 \leq F_{table} = 1.99$ . Based on these results, it means that the data in the study is linear, which means it can be continued with further tests, namely hypothesis testing.

Based on the results of the calculation of the hypothesis test, the correlation coefficient between variable X and variable Y is obtained (Appendix 23, p. 121) or  $r_{count}$  of 0.455 is positive with the criteria is quite strong. Contribution of variable X and variable Y is 20.70%. This means that the contribution of variable X (learning based on three-dimensional visual media (3D)) to variable Y (critical thinking skills of students) is 20.70% and the remaining 79.30% is influenced by other factors. Then the next step is to find the significance (significant) of variable X to variable Y.

Based on the calculation results obtained,  $F_{count}$  is 15.165 and then compared with  $F_{table}$  with a significant level of 5% or 0.05,  $F_{table}$  is 4.01, so  $F_{count} = 15.165 \geq F_{table} = 4.01$ . This means that the hypothesis is accepted, there is a relationship between learning based on three-dimensional visual media (3D) with the critical thinking skills of students in mathematics learning at SD Negeri 3 Perumnas Way Kandis.

The results of the study have explained that in this study the results obtained a positive and significant relationship between learning based on three-dimensional visual media (3D) with the critical ranking skills of students in mathematics with a "strong enough" level. This happens because three-dimensional (3D) visual media can be better understood by students. Basically students have a sense of curiosity using three-dimensional visual media (3D) in learning will stimulate students to think critically. So that students are able to test a problem and find solutions to solve a problem on their own. This is in accordance with the opinion of Sadiman (2010: 8).

Three-dimensional (3D) visual media makes students more critical in thinking by observing objects or learning tools. Students can actually touch and feel and see so that students will understand learning more quickly and easily solve a problem. Students always seem enthusiastic in participating in learning using three-dimensional (3D) visual media. So that by using three-dimensional (3D) visual media has an influence in motivating students to learn and increasing critical thinking skills in students and increasing learning outcomes in students. this is in accordance with the opinion of Candra (2012).

Using three-dimensional (3D) visual media in learning, students will be accustomed to having skills in solving problems. Students will be more skilled at evaluating the future consequences of their current actions and the actions of other people. Students will also have alternative solutions and be able to analyze a problem. Problem solving skills can help students solve the questions given by educators. This is in accordance with the opinion of Sulistiani (2016: 610).

Critical thinking skills can familiarize students with being able to be rational in determining and choosing the best alternative choices for themselves. Because critical thinking skill is a process of searching, obtaining, evaluating, analyzing, synchronizing and conceptualizing information. This is in accordance with Hendriana's opinion in Firdaus (2019: 69).

The obstacle that occurs during research activities is when collecting data in filling out the questionnaire / questionnaire, there are some students who have difficulty understanding the statements contained in the questionnaire. Filling in a questionnaire / questionnaire is a little difficult because it is done using google form, where some students

still don't understand using it. The implementation of this research was conducted online because it was in a pandemic period which forced students not to come to school or study at home. The population used in this study was only limited to the number of grade IV and grade V students at SD Negeri 3 Perumnas Way Kandis, namely 195 people. This number should be increased as much as possible to obtain more accurate research results.

Thus, despite having obstacles in the study due to time constraints, limited knowledge due to using online media and a limited population, this study ran quite well with the help of parents.

## • CONCLUSION

Based on the results of the research and discussion, the researcher concluded that the hypothesis in this study was accepted, namely that there was a positive and significant relationship between learning based on three-dimensional visual media (3D) and the critical thinking skills of students in mathematics learning in public elementary schools indicated by the correlation coefficient at the level "strong enough".

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