

Effectiveness of Scientific Learning Approaches with Comic Scientific Media on Mathematics Subjects in Private Elementary School, Bojongsari District, Depok

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Abstract—This study aims to examine the effectiveness of the scientific approach with comic scientific media on mathematics subject which is measured through an analysis of differences in learning achievement, learning interest, and curiosity in learning mathematics between before and after being taught through a scientific approach with comic scientific media. This research approach is quantitative with the type of Quasi Experimental Design method of Time Series Design. The population in this study were fourth grade students, in elementary schools in Bojongsari, Depok, with a sample of SD Nurul Hidayah, SD Tadikapuri, SD Permata Bunda. Data collection instruments were in the form of items, interest learning questionnaire sheets, and curiosity questionnaire sheets. Data analysis techniques in the form of testing hypotheses using statistics Paired Sample t Test with data preconditions must be normally distributed. The results showed that: 1) there were differences in students mathematics learning achievement before and after being taught with a scientific approach with comic scientific media, with an average pretest achievement of 65.7917 and posttest achievement of 79.1458; 2) there are differences in students interest in learning mathematics before and after being taught with a scientific approach with comic scientific media, with an average pretest interest of 66.1667 and a posttest interest of 80.0417; 3) there are differences in curiosity in learning mathematics before and after being taught with a scientific approach with comic scientific media, with an average pretest curiosity of 68,9123 and a posttest of 81,4123.

Keywords—*scientific approach, media comics scientific, learning achievements, interest in learning, curiosity*

I. INTRODUCTION

Permendikbud Number 20 of 2016 concerning Graduates Competency Standards states that every primary and secondary education graduate must have competence in three dimensions, namely knowledge, attitude and skills. As for Suherman [11] states that school mathematics has a role to provide provisions for students in the form of knowledge, attitude formation, and mindset. Based on this, the Competency Standards of Graduates and the objectives of school mathematics have

a vision that is in line with the times. The Competency Standards of Graduates and school mathematics objectives can be achieved if the learning supporting factors can be fulfilled to the fullest. The supporting factors of learning, one of which is the creativity of the teacher in using strategies and media in teaching. This was confirmed by Mustikan [8] who stated that the supporting factors of learning were the creativity of teachers with various teaching methods and approaches, teaching materials used and student activities as central to learning

Based on field observations in elementary schools in the fourth grade mathematics subjects obtained information that the process of learning mathematics was only recorded material through the blackboard, then given sample questions, and finally given practice questions. This method certainly affects interest, curiosity and low learning achievement. This situation was reinforced by initial survey data of 100 students about interest, curiosity, and learning achievement in mathematics presented in the following table 1.

Table 1: Early Data Survey

Variable	Categorization and number (%)				
	Very bad	Bad	Good enough	Good	Very good
Interest	6	49	30	14	1
Curiosity	15	47	27	11	0
Achievement	19	49	22	10	0

Considering the above problems, it requires teaching strategies and teaching media that can help increase students' interest, curiosity, and learning achievement. Through comic media combined through scientific learning approaches can be used as an alternative solution to these problems. This is also strengthened by studies conducted by Jacobson [5], Toh [12], Kurnik [6], Botzakis [3], Wahyuningsih [13], Machin [7]. The results of this study are through the use of comics can increase student learning interest, through the application of a scientific approach is used to foster student curiosity, and have an impact on student achievement.

According to Kurnik [6] argues that the application of a scientific approach can create students' curiosity, fostering students' creativity in finding new things. Comics are art forms that use immovable images arranged in a way that forms a storyline and provides a pleasant learning experience. (Nugraha et al., 2013: 61).

Based on the description of the background above, a research was conducted to find out the effectiveness of scientific approaches and comic media. The formulation of the problem in this study are (1) are there differences in students' mathematics learning achievement before and after being taught with the scientific approach with the help of comic media? (2) are there differences in students' interest in learning mathematics before and after being taught with a scientific approach with the help of comic media?; (3) are there differences in curiosity in learning mathematics before and after being taught with a scientific approach with the help of comic media?

II. METHOD

The approach in this study used a quantitative approach with the Time Series Design type Quasi Experimental Design methodology. The design of this research was Quasi Experiment without using experimental and control classes, but only pretest, and posttest, then compare. The following is a figure 1 of this research design.

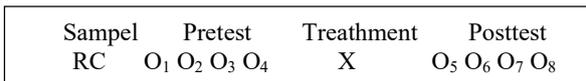


Figure 1. Quasi Experimental Design Time Series Design type

The population in this study were fourth grade students, in elementary schools in Bojongsari, Depok, with a sample of SD Nurul Hidayah, SD Tadikapuri, SD Permata Bunda. The data and data collection instruments used in this study are presented in the following table 2.

After the data is collected, then analyzed using Paired Sample t Test statistics with the data preconditions must be normally distributed. The statistics are used to test each hypothesis to find out differences in learning achievement, learning interest, and curiosity before and after being taught with a scientific approach assisted by comic media.

Table 2. Data and Instruments

Data name	Data collection instrument
Pretest and Posttest Mathematics Learning Achievements	Item of question
Interest in Learning Pretest and Posttest Mathematics	Questionnaire of interest to learn
Curiosity Learning Pretest and Posttest Mathematics	Questionnaire of curiosity

III. RESULT AND DISCUSSION

Differences in students' mathematics learning achievement before and after being taught with a scientific approach with the help of comic media.

Differences in student mathematics learning achievement, obtained through hypothesis testing using Paired Sample t Test statistics. Before testing it, it is necessary to have a prerequisite test in the form of data normality tests with the figure 2.

Tests of Normality

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
selisih	,123	48	,066	,963	48	,134

a. Lilliefors Significance Correction

Figure 2. Output Test for Normality of Learning Achievement Data

Based on the above test of normality output, Kolmogorov-Smirnov sig 0.066 > 0.05 was obtained, the achievement sample data was normally distributed, and could be continued to Paired Sample t Test. The results of hypothesis testing which aims to determine differences in students' mathematics learning achievement before and after being taught with the scientific approach with the help of comic media are described as follows:

H₀ (1): there is no difference in students' mathematics learning achievement before and after being taught with a scientific approach with the help of comic media

H₁ (1): there are differences in students' mathematics learning achievement before and after being taught with the scientific approach with the help of comic media

Based on the output of paired samples test, the sig value is 0,000 < 0,05, so H₁ is accepted. Based on the output paired samples statistics obtained an average empirical pretest achievement of 65.7917, an empirical posttest achievement average of 79.1458. So it can be concluded that there are differences in students' mathematics learning achievement before and after being taught with a scientific approach with the help of comic media. This is reinforced by an average empirical pretest achievement of 65.7917 and an empirical posttest achievement average of 79.1458.

Paired Samples Statistics

Pair	Mean	N	Std. Deviation	Std. Error
				Mean
1 Prestasi Pretest	65,7917	48	12,11638	1,74885
1 Prestasi Posttest	79,1458	48	9,98294	1,44091

Paired Samples Test

Pair	Mean	Std. Deviation	Paired Differences		t	df	Sig. (2-tail)		
			Mean	Std. Error				95% Confidence Interval of the Difference	
								Lower	Upper
1 Prestasi Pretest - Prestasi Posttest	-13,3541	2,35066	-12,65839	-14,04981	-1,846	47	,000		

Figure 3. Output of Learning Achievement Data Hypothesis Test

The achievement differences above, because the previous learning process was only limited to knowledge transfer, such as just recording the material on the blackboard then explained using lecture techniques only, and then given examples of questions. The technique should be varied with learning strategies that enable students, so that the knowledge gained is not limited to remembering, but can be understood by students. After being treated with learning using a scientific approach with the help of comic media, students' mathematical achievements increased by 13.3541. This is because the scientific learning process with comic media is able to activate students so that their knowledge is obtained through independent construction which impacts their learning achievement. When learning takes place, students freely explore their own abilities, such as 1) observing, 2) asking, 3) gathering information, 4) generalizing, and 5) communicating. Students are required to read material in the comic, then questions will arise from students. The question must be answered individually through discussion activities. After the discussion is carried out, then it is concluded as an answer and read in front of the class. These learning activities are very activating students, constructing knowledge independently, and effectively improving student learning achievement.

According to Dewi [4] who suggested that the characteristics of scientific learning include learning to familiarize students with being more active, familiarizing students to find their own concepts related to the material being taught. In addition Learning through a scientific approach is a learning process that is designed in such a way that students actively construct concepts, laws or principles through observing stages (to identify or find problems), formulate problems, propose or formulate hypo thesis, collecting data with various techniques, analyzing data, drawing conclusions and communicating concepts, laws or principles found [7].

Differences in students' interest in learning mathematics before and after being taught with a scientific approach with the help of comic media.

Differences in students' interest in learning mathematics, obtained through hypothesis testing using Paired Sample t Test statistics. Before testing it, it is necessary to have a prerequisite test in the form of data normality tests with the figure 4.

Tests of Normality

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
selisih	,123	48	,067	,962	48	,120

a. Lilliefors Significance Correction

Figure 4. Output Test for Normality of Learning Achievement Data

Based on the above tests of normality output, Kolmogorov-Smirnov 0.067 > 0.05 sig sig value was obtained, so the data of learning interest samples were normally distributed, and could be continued to Paired

Sample t Test. The results of hypothesis testing that aims to determine differences in students' interest in learning mathematics before and after being taught with the scientific approach with the help of comic media are described as follows:

- H₀ (2): there is no difference in students' interest in learning mathematics before and after being taught with the scientific approach with the help of comic media
- H₁ (2): there are differences in students' interest in learning mathematics before and after being taught with the scientific approach with the help of comic media

Paired Samples Statistics

	Mean	N	Std. Deviation	Std. Error Mean
Pair 1 Minat Belajar Pretest	66,1667	48	4,81281	,69467
Minat Belajar Posttest	80,0417	48	5,48871	,79223

Paired Samples Test

	Paired Differences				t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Lower	Upper			
Pair 1 Minat Belajar Pretest - Minat Belajar Posttest	-13,8750	4,33042	-18,3637	-8,3863	-1,250	47	,000

Figure 5. Output of Learning Interest Data Hypothesis Test

Based on the output of paired samples test, the sig value is 0,000 < 0,05, so H₁ is accepted. Based on the output paired samples statistics obtained the average interest in empirical pretest learning by 66.1667, the average interest in empirical posttest learning is 80.0417. So it can be concluded that there are differences in students' interest in learning mathematics before and after being taught with a scientific approach with the help of comic media. This is reinforced by the average interest in empirical pretest of 66.1667 and the empirical posttest interest average of 80.0417.

The difference in interest in learning mathematics above is because prior to learning using the scientific approach and comic media, there were students who felt disliked and were not interested in mathematics, students' attention when explained by the teacher was also lacking, so involvement in the learning process was also lacking. After being treated with learning using a scientific approach and comic media, it can certainly increase the interest in learning mathematics by 13,875. This is because the learning process using comic media can be an attraction for students in learning. Colored and attractive images can certainly add excitement, enthusiasm, and enjoyment in students' mathematics learning. Students are no longer afraid of learning mathematics, students are very active and involved in learning. This situation is supported by a theory that comics are an art form that uses immovable images

arranged in such a way as to form a storyline and provide a pleasant learning experience. (Nugraha et al., 2013: 61).

Differences in curiosity in learning mathematics before and after being taught with a scientific approach with the help of comic media

Differences in curiosity in student mathematics learning, obtained through hypothesis testing using Paired Sample t Test statistics. Before testing it, it is necessary to have a prerequisite test in the form of data normality tests with the figure 6.

Tests of Normality

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
selisih	,093	48	,200*	,960	48	,102

*.This is a lower bound of the true significance.

a.Lilliefors Significance Correction

Figure 6. Output Test for Normality of Learning Achievement Data

Based on the above test of normality output, Kolmogorov-Smirnov sig value $0,200 > 0,05$, the curiosity sample data in learning mathematics is normally distributed, and can be continued to Paired Sample t Test. The results of hypothesis testing that aims to determine the differences in curiosity in students' mathematics learning before and after being taught with the scientific approach with the help of comic media are described as follows:

H_0 (3): there is no difference in students' curiosity to learn mathematics before and after being taught with a scientific approach with the help of comic media

H_1 (3): there are differences in students' curiosity to learn mathematics before and after being taught with a scientific approach with the help of comic media

Paired Samples Statistics

	Mean	N	Std. Deviation	Std. Error	
				Mean	
Pair 1	Rasa Ingin Tahu Pretest	68,9123	48	6,08347	,87807
	Rasa Ingin Tahu Posttest	81,4123	48	6,03324	,87082

Paired Samples Test

	Mean	Std. Deviation	Paired Differences			t	Sig. (2-tail)
			Mean	95% Confidence Interval of the Difference			
				Lower	Upper		
Pair 1	Rasa Ingin Tahu Pretest - Rasa Ingin Tahu Posttest	12,5000	10,1325	14,9148	4,934	,000	

Figure 7. Curiosity Data Hypothesis Test Output

Based on the output of paired samples test, the sig value is $0,000 < 0,05$, so H_1 is accepted. Based on the output paired samples statistics obtained an average empirical pretest of 68,9123, the average empirical posttest curiosity of 81,4123. So it can be concluded that there are differences in students' curiosity to learn mathematics

before and after being taught with a scientific approach with the help of comic media. This is reinforced by the average curiosity of the empirical pretest of 68,9123 and the average empirical posttest curiosity of 81,4123

The difference in curiosity in learning mathematics above is because prior to learning using the scientific approach and comic media students were less in asking questions about learning material, less active in seeking information, and not enthusiastic in the learning process. After being given treatment, learning using a scientific approach and comic media can certainly increase students' curiosity in learning mathematics by 12.5. Through a scientific approach that has 5 learning syntaxes such as observing, questioning, gathering information, generalizing, and communicating highly requires students to have a high level of curiosity. Students are required to actively ask questions, actively gather information, are active in working together, and are active in the learning process. This situation certainly makes students who previously did not want to know, must be demanded to be more curious. This situation is supported in theory according to Kurnik [6] which states that the application of a scientific approach can create students' curiosity, fostering students' creativity in discovering new things.

IV. CONCLUSION

Based on the results of the study and discussion obtained conclusions from this study include: 1) there are differences in students' mathematics learning achievement before and after being taught with the scientific approach assisted by comic media. This is reinforced by an average empirical pretest achievement of 65.7917 and an empirical posttest achievement average of 79.1458; 2) there are differences in students' interest in learning mathematics before and after being taught with a scientific approach with the help of comic media. This is reinforced by the average interest in empirical pretest learning by 66.1667 and the average empirical posttest learning interest of 80.0417; 3) there are differences in students' curiosity to learn mathematics before and after being taught with a scientific approach with the help of comic media. This is reinforced by the average curiosity of the empirical pretest of 68,9123 and the average empirical posttest curiosity of 81,4123.

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