ME – 9

THE APPLICATION OF THE PROJECT BASED LEARNING MODELS ON THE REASONING MATHEMATICS OF THE FOURTH GRADES STUDENTS OF ELEMENTARY SCHOOL KARANGWUNI 1 IN THE IMPLEMENTATION OF CURRICULUM 2013

Satrianawati[1] and Anindita Rahardini[2]
1) Pendidikan Dasar UNY, Satrianawati@gmail.com, 0853-4058-1089
2) The Teacher of the Fourth Grade Elementary School of Karangwuni 1

Abstract

This research aimed to describe the effect of project-based learning models on the reasoning mathematics of the fourth grade elementary school students of Karangwuni 1.

This research was a pre experimental design using one group pretest posttest conducted in one group without comparison groups. The population was 13 students of the fourth grade elementary school students of Karangwuni 1.

The results of this research showed the value of pretest before the applied project-based learning model suggested students was on the category D and D^+. The category D^+ as much as 6 students or with the value of 46,15% while the rest was on category D as much as 7 students or with the value of 53,84%. These results indicated the success student learning had not occurred or the value of 0% was below the value of B. The result of posttest showed all the students was on the category A^+ or with the value of 100%. This percentage value exceeded the standards established 80% of students was success student learning standards was defined in the research. The results of the research using the t-test earned data $t_{val} > t_{tab}$ or $629,561 > 2,064$. Accordingly, the model of project-based learning had a positive and significant effect on the mathematical reasoning of the fourth grade elementary school students of Karangwuni 1.

Keywords: project-based learning & reasoning mathematics students.

Introduction

Education is faced with a variety of phenomena. The phenomena of change curriculum and an ASEAN community have a positive and negative effect for our country. The phenomena gives an indication for the young generation to actualize their competention. of course, it can be improved by teaching and learning process. The teaching and learning process is one of the aspects in the implementation of the curriculum to develope potency of all students. Because, the implementation of curriculum 2013 is the carrying out of something or the practical application of a scientific approach. Using scientific approach in teaching and learning process have five step, such as: observing, questioning, trying, reasoning, and communicating. It is believed can increase competention and help students to read opportunities and challeng in the ASEAN community.

The same of previous statement, to help all students increase their reasoning abilities to compete and to challenge in ASEAN community, must involve theirself in teaching and learning process. To increase reasoning abilities of the sudents in school, the teacher must apply learning models that making students active. Using models in learning can increase reasoning abilities mathematics students. Reasoning abilities mathematics must train to develop students

thinking. Therefore, reasoning mathematics can help students to actualize theirself to compete and to challeng in ASEAN community.

The necessity of good reasoning ability was not apparently in the elementary school of Karangwuni 1. It was known observationally conducted in fourth grade. In fourth grade has yet to demonstrate the good reasoning in answering the questions and make conclusions. Therefore, to train the reasoning ability of students, it took the right steps. This condition gave solution that can improve the reasoning ability of students. The reasoning ability of students in this research was done through the study of mathematics. Learning math is the learned that can be associated with a variety of other subject matter. This was related to the implementation of a scientific approach in the curriculum of 2013. The study of mathematics curriculum in 2013 may be taught through project-based learning. Project-based learning model was chosen because according to the steps in the scientific approach.

Based on the description, researchers want to examine about mathematical learning in the fourth grade on the theme of various jobs using project-based learning model for to increase the reasoning ability of students. Therefore, the problem in this research is "how math learning themes of various jobs using project-based learning model increase reasoning ability students in the fourth grade of elementary school Karangwuni 1?

The purpose of this research was to describe the mathematical learning themes of various jobs using project-based learning model to increase reasoning ability students in the fourth grade of elementary school Karangwuni 1. Muresan (2014: 304) said that "project-based learning is a student-centered learning model, ensuring the development of knowledge and skills in a specific area or several areas, through extensive work tasks that promote inquiry and authentic demonstrations of result oriented learning". Hârtescu (2014: 224) is said also "project based learning organizes learning around projects and involves the students in authentic situations where they can explore and apply the subject matter to problems that are complex and relevant to the professional practice for which they are preparing. Students work independently, to a variable extent, and are encouraged to plan their actions, make their own decisions, and work together in order to produce the desired outcome. According to Bell, project-based learning supports the development of skills relevant to being a professional in the 21st century, such as accountability, independent learning, and collaboration. The curriculum 2013 describes the steps of project based learning model is:
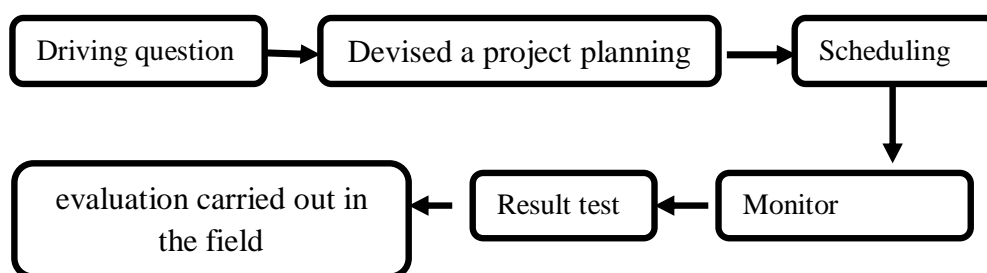

Figure 1. Designing project based learning in curriculum 2013

The essential components of designing project based learning as ilustrated below (Satrianawati, 2014):
a) the determination of fundamental question is the driving question. This question determines the direction and purpose to do learners to generate the work or the result of learning as learning products.
b) Devised a project planning or devise a plan. The plan is structured to facilitate settlement or resolution.
c) Scheduling. The schedule drawn up by the consideration that everything will be done must be determined so that all its execution time is right on target.

d) Monitor is undertaken when machining process of the project.
e) Result test is performed after the product or the work has been completed by students.
f) If the evaluation carried out in the field or apply in a different place with a focus on the same issues so obtained eligibility, careless says there was profanation needs to be revised or returned products that have been created.

Westwood (2008: 33-34) said advantages of project based learning are:

a) The project approach can be applied in almost all areas of the curriculum.
b) Projects have a 'real world' orientation and promote meaningful learning by connecting new information to students' past experiences and prior knowledge.
c) Students learn valuable processes and skills for gathering and analysing data.
d) Students are responsible for their own learning, thus increasing self direction and motivation.
e) The learning process encourages various modes of communication and representation.
f) The approach encourages use of higher-order thinking as well as acquistion of facts.
g) The approach developes deeper knowledge of subject matter.
h) The approach also increases team-working and cooperative learning skills.

Westwood (2008: 34) also said difficulties with project-based learning are:

a) Some students lack adequate skills for researching and collating information.
b) Some students may give the impression of productive involvement in the work, but may in fact be learning and contributing very little.
c) Where projects involve the production of posters, models, charts, recordings, photographs and written reports on display, there is a danger that these are actually 'window dressing' that hides a fairly shallow investigation and a week understanding of the topic.
d) When different aspects of a topic are given to different group members to research, there is a danger that individual members never really gain an overall understanding of the whole topic.

Boyatt & Joy (2010: 6) said "mathematical logic is an area of mathematics that includes a broad range of topics such as set theory, propositional logic, predicate logic and proof (e.g. axiomatic systems, natural deduction)". Pullman (2013) said also "The logic and reasoning skills needed to examine the process of a mathematical argument can also be applied when considering a persuasive argument in a speech or the merits of government spending cuts". Byrnes (2008: 295) explained about reasoning abilities and proof standard "instructional programs from pre-kindergarten through grade 12 should enable all students to: (a) recognize reasoning and proof as fundamental espects of mathematics; (b) make and investigate mathematical conjectures; (c) develop end evaluate mathematical arguments and proofs; (d) select and use various types of reasoning and methods of proof.

Based on description, logical thinking and corresponding to reality that there is relation between the study of mathematics and reasoning abilities. The subject matter of mathematics and mathematical reasoning are two things that can not be separated. Mathematical material conceived through reasoning, and reasoning understood and drilled through the learning of mathematics. Thus, developiment mathematics thinking must require and involve critical thinking, systematic, logical, innovative, and creative. Mathematics became a part of the development of mathematical reasoning ability because concept reasoning becomes logical requirements. The reasoning ability of mathematics is logical thinking require critical thinking, systematic, logical, and creative. Logical thinking is used to connect ideas or mathematical objects; to make, to investigate and to evaluate mathematics asumption; to develop the argument and mathematic evidence.

Methods

Type of this research was quantitative description using the research method of experimental design pre form one group pretest posttest that experiments conducted in one group without comparison groups. Design research was done twice: before the experiment and

after the experiments. Tests were conducted before treatment and after treatment called pretest posttest called.
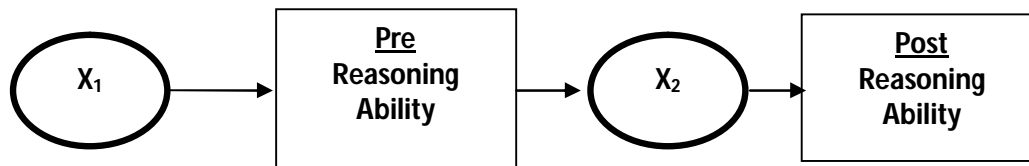
Desain research was used:

Figure 2. Design pre experimental (one group pretest posttest)

Note:

X_1: class experiments before treatment (pretest)

X_2: class experiments after treatment (posttest)

Research was carried out in the elementary school of Karangwuni 1 Depok Sleman Yogyakarta, in November 3rd – 22th, 2014/2015 in odd semester. Population and sample of the study was grade four of elementary school Karangwuni 1 in Yogyakarta. The technique of data collection was carried out with two stages were the pra research and the research process. To collect data in pra research was used interview and observation, and to collect data in research process were:

a) completing the research instrument.

b) Asking lecturers to validate research instruments.

c) doing pretest to each treatment group class.

d) conducting research together with teacher.

e) doing the posttest after treatment.

The instrument used in this research was essay test. Essay test was used to measure the reasoning abilities undertaken in writing of essay as much as seven questions. Pretest questions the reasoning abilities, details score of the matter which is set to number 1 = 24, number 2 = 36, number 3, number 4 = 32 = 28, no. 5 = 24, 6 = 10, and no. 7 = 40, while the details of the scoring guidelines reserved posttest = 24 number 1, number 2 = 28 = 24, number 3, number 4 = 28, no. 5 = 24, # 6 = 10, and no. 7 = 28. The maximum score for a pretest is 194 while the maximum for the posttest score was 166. To test the research using the t-test (Sugiyono, 2013: 138) with the formula:

$$t = \frac{\bar{x}_2 - \bar{x}_1}{\sqrt{\frac{S_1{}^2}{n_1}} + \sqrt{\frac{S_2{}^2}{n_2}}}$$

In this research, pretest and posttest to measure the reasoning ability mathematics used project based learning models were:

Table 1. Grating Instrument Pretest and Posttest Reasoning Ability

Aspect	Indicator, all students can:
Ability to connect ideas and mathematics objects.	connect ideas and mathematics objects.
Ability to make, to investigate, and to evaluate mathematics assumptions	make mathematics assumptions.
	investigate mathematics assumptions.
	evaluate mathematics assumptions.
Ability to develop the argument and mathematic evidence.	develop mathematics argument.
	make mathematics evidence.

Success learning classical was defined in this study if students get the value of B 80% or with the value 3.00. The formula to measure of success learning in classical was:

$$\text{success learning in classical} = \frac{The\,number\,of\,student\,to\,get\,B\,value}{The\,number\,all\,students}\,x\,100$$

Scoring gave pretest and posttest instrument that students did refers to government article No. 104 in 2014 about assessment of learning results was used by Educators in elementary education and secondary education. Thus, the formula for the value was:

$$\text{Students Score} = \frac{total\,score\,each\,question\,that\,students\,get}{score\,\max}\,x\,4$$

Table 2. the Score of Reasoning Ability of Mathematics Students

Reasoning Ability			
Predicate	**Modus**	**Range**	**Value**
4,00	SB (excellent)	3,85 – 4,00	A
		3,51 – 3,84	A^+
3,00	B (Good)	3,18 – 3,50	B^+
		2,85 – 3,17	B
		2,51 – 2,84	B^-
2,00	C (Average)	2,18 – 2,50	C^+
		1,85 – 2,17	C
		1,51 – 1,84	C^-
1,00	K (Below Average)	1,18 – 1,50	D
		1,00 – 1,17	D^+

Result and Discussion

Based on result in this research, obtained the data reasoning abilities of mathematics students through two phases were pretest and posttest. The data of pretest and posttest reasoning abilities of mathematics students carried out on the experimental class. Student pretest data description was:

Tabel 4. Pretest Data

No.	Name	The number of Question							Score	Value	
		1	2	3	4	5	6	7			
1	Anggar	8	8	8	8	9	3	8	52	1,0722	D^+
2	Ayu W	8	8	8	9	12	3	8	56	1,1546	D^+
3	Dytha	12	10	6	9	9	6	8	60	1,2371	D
4	Farhan	8	10	8	9	8	6	8	57	1,1753	D^+
5	Fira	12	8	4	10	4	3	8	49	1,0103	D^+
6	Lilis Ismaliah Sulaiman	6	8	8	8	10	3	6	49	1,0103	D^+
7	Ozy	15	8	6	9	9	3	8	58	1,1959	D
8	Rafiq	12	9	8	9	8	3	6	55	1,134	D^+
9	Rina	12	12	9	10	9	3	12	67	1,3814	D
10	S. Putri H	12	9	12	9	2	3	12	59	1,2165	D
11	Vania Ardelia Septiana	8	10	8	8	15	3	12	64	1,3196	D
12	Yoga	12	8	8	9	9	3	12	61	1,2577	D
13	Yusuf	10	12	12	12	9	3	8	66	1,3608	D
	Average									1,1943	

	Standar Deviation									0,1201	

Pretest results indicate that students were on grade D and D^+ category. Six students were on category D with percentage 46,15%. Seven students were on category D^+ with percentage 53,84%. These results indicate that Success learning had not occurred with percentage 0%. All students had the value of B. posttest results were listed in the table:

Tabel 5. Posttest Data

No.	Name	The number of Questions							Score	Value	
		1	2	3	4	5	6	7			
1	Anggar	24	28	24	18	24	10	20	148	3,5663	A^+
2	Ayu W	24	28	24	18	24	10	28	156	3,759	A^+
3	Dytha	20	28	24	20	24	10	28	154	3,7108	A^+
4	Farhan	23	28	24	18	24	10	28	155	3,7349	A^+
5	Fira	20	28	24	18	24	10	28	152	3,6627	A^+
6	Lilis Ismaliah sulaiman	22	28	24	20	24	10	28	156	3,759	A^+
7	Ozy	23	28	24	18	24	10	28	155	3,7349	A^+
8	Rafiq	24	24	24	18	24	10	28	152	3,6627	A^+
9	Rina	20	24	24	18	24	10	28	148	3,5663	A^+
10	S. Putri H	24	28	24	20	24	10	28	158	3,8072	A^+
11	Vania Ardelia Septiana	24	24	24	20	24	10	28	154	3,7108	A^+
12	Yoga	24	23	24	18	24	10	28	151	3,6386	A^+
13	Yusuf	24	20	24	28	24	10	28	158	3,8072	A^+
	Average									**3,7016**	
	Standar Deviation									**0,079**	

Posttest results showed that all the students were on grade A^+ category. Posttest results indicated that students were learning of succes learning clasical had 100% completely. This percentage value exceeds the standards established that 80% of succes learning classical standards had been achieved in the research.

The results of research using the t-test test earned data that the value of t_{hitung} was t_{table} and the value of 629,561 with dk = 24 and 5% significance level was 2,064. This indicates $t_{val} > t_{tab}$ or 629,561 > 2,064. Accordingly the result of research, there was a difference of influence model of project-based learning before treatment and after treatment.

Conclution and Suggest

Based on results, the application of the project based learning models can enhance the reasoning ability of mathematic students. This was in accordance with the percentage of success learning in classical 100% which means that more than 80% of the standard was applied. Thus, suggestion taken in this research:

1. for teachers to expect improve the quality of mathematics learning in elementary schools can use project-based learning models. it can make students enhance the capabilities of his thought, critical thinking, creative and innovative.
2. For Subsequent Researchers were expected to make this research as a reference for advanced research when applying project-based learning models.

References:

Borg, W.R., Gall, M.D., & Gall, J.P. (2007). *Educational research: Eighth Edition.* Arlington Street, Boston, MA: Pearson Education.

Boyatt, R & Joy, M. (2010). *Developing an ontology of mathematical logic.* Scientific Bulletin. Series, Mathematical Modeling in Civil Engineering, suppl. Special Issue: 6-11. Bucharest: Technical University of Civil Engineering from Bucharest. (Nov 2010). diakses tanggal 22 Agustus 2014 pukul 11.57 WIB dari http://search.proquest.com/docview/?accountid=31324.

Byrnes, J.P. (2008). *Cognitive development and learning. In instructional contexts.* Arlington Street, Boston, M.A: Pearson education, Inc.

Hârtescu, I. (2014). *Providing technology support for project-based learning.* The International Scientific Conference eLearning and Software for Education 3: 223-229. Bucharest: "Carol I" National Defence University. diakses tanggal 14 Juli 2014 pukul 14.32 WIB dari http://search.proquest.com/docview/1534145093?accountid=31324.

Hosnan. 2014. *Pendekatan saintifik dan kontekstual dalam pembelajaran abad 21.* Bogor: Ghalia Indonesia.

Muresan, M. (2014). *Project based collaborative learning for adult education.* The International Scientific Conference eLearning and Software for Education 3: 303-309. Bucharest: "Carol I" National Defence University. Diakses tanggal 26 Agustus 2014 pukul 15.13 WIB dari http://search.proquest.com/docview/?accountid=31324.

Satrianawati. (2014). *Model project based learning dalam tantangan pembelajaran sains abad XXI. Prosiding, Seminar Nasional Pendidikan Sains diselenggarakan oleh Program Studi Pendidikan Sains Pascasarjana UNY, tanggal 01 November 2014.* Vol. 2 No. 1 Th. Jan-Des 2014. ISSN: 2339-1219.

Sugiyono. (2012). *Statistika untuk penelitian.* Bandung: Alfabeta.

UU RI No. 104 Tahun 2014. *Tentang penilaian hasil belajar oleh pendidik pada pendidikan dasar dan pendidikan menengah*: Salinan Lampiran Peraturan Menteri Pendidikan dan Kebudayaan Republik Indonesia.

Westwood, P. (2008). *What teachers need to know about teaching methods*. Camberwell, Victoria: Acer Press.