The Effectiveness of Using Project Based Learning for Increasing The Flooding Mitigation Knowledge at Grade 7th Junior High School

Lina Rosyidah[1] and Madlazim[2]

[1]Science Education Postgraduate Student, Universitas Negeri Surabaya

rosyidahl@yahoo.co.id

[2]Science Education Postgraduate Lecturer, Universitas Negeri Surabaya

madlazim@fmipa.unesa.ac.id

Abstract: *Indonesia is one of the countries that often getting flood disaster. It causes the vulnerabilities for many aspects in the environment. Reducing the risk of flood disaster vulnerabilities is needed as an our concern. Nowadays, the education of mitigation is the trend to be implemented at school. In class, teachers need the instruction model to teach about mitigation of disaster. In this paper the reasearcher present using of the project-based learning to inform the flood disaster mitigation topic at grade 7th junior high school. The students activities using project-based learning was divided into three types that are pre-flooding, flooding at the moment, and post-flooding. Using the project-based learning can be the effective way to face the flood disaster problem based on increasing the knowledge about flooding mitigation and students activities. From this study researcher got average score 88 that was higher than the pretest average sore result. In particular to researcher got N-Gain of learning achievement test 0,78 with high category. Activities observation that showed the phase of project-based learning implementation was obtained N-Gain 0,82 with high category. It concludes that using the project-based learning have a strong correlation between learning achievement and activities observation by resulting the correlation 0,7.*

Keywords: flood,disaster, mitigation, risk, reduction, project-based learning

1. Introduction

Indonesia is the potential country to occur the earth disaster. One of the earth disasters is flood. It is caused by man behavior. Almost cities in Indonesia have gotten flooding. The efforts of flood perceptively action can be done by teaching in natural science subject because it is the one subject that can be used as media to prevent the disaster [1]. In Indonesia's 2013 Curriculum have entered the topic about disaster based on the each area at grade 7th Junior High School. The topic about flood disaster is a part of Chapter Earth Layer certainly in Subchapter Hydrosfer. It describes about the the mitigation of flood disaster. Mitigation tends to be potentially more efficient and long term more sustainable to flood disaster problems, in particular to reduce the vulnerabilities of human beings and goods exposed to flood risk [2]. Students can enhance their awareness by learning flooding mitigation to change the lifestyle such as throwing the rubbish is not in the right place as pre-flooding action. It is the geoeducation that can minimize the flooding occurence.

Student's participation in flooding disaster mitigation empowers them to make informed decisions concerning the risks of flooding. Though investing in student focused flooding disaster mitigation is a long-term

process, it creates a generation that is better prepared for the flooding or prevent the fooding occurence that caused by human of tomorrow. Student's participation may be a way of encouraging them to be involved in issues of flooding that concern their lives in order to reduce their vulnerability. Therefore it is needed the learning model that involved the students actively to get and increse the knowledge about mitigation. Project-based learning is rooted in the progressive education movement which advocated for more student centered and experiential approaches [3]. Using the project-based learning can enhance the students engagement to learn the flooding mitigation deeper by making a project about pre-flooding action, flooding at the moment action, and post-flooding action. Student is also embedded within the family, this relationship means risk information and mitigation actions may be continually reaffirmed, whereas external messages rely on small windows of opportunity to convey information and influence actions [4].

Students as children are the least listened-to members of society [5]. Hence students need to explore the vulnerabilities when disasters strike from themselves [5]. Students can act as informants within family and informal community conveying the disaster mitigation to reduce the risk of disasters especially flood disaster. This paper explores how the effectiveness of using the project-based learning to increase the flooding mitigation knolewdge is. So, in the next section it will be described about the score obtained from the learning achievement test and activities observation based the learning model phase which show the meaning of the effectiveness using project-based learning for students to increase the flood disaster knowledge.

2. Methodology

This study adopted a quantitative methodology with pre-experimental using one group pretest-posttest design. It employed various data collection instruments such as the learning achievement test (pretest and posttest) and activities observation instrument. This study was implemented at SMPN 1 Mojoanyar, Mojokerto, East Java especially in class 7E that consist of 30 students. Its instruction needed three time meeting. All meetings implemented the phase of project-based learning. The data collection was obtained from the test and project finishing. The project topic about flood disaster is familiar situation with their environment because their living place always occur the flooding disaster. This study was held in November on 10th, 13th, and 17th when the rainy season come over.

3. Result

3.1. Flood Disaster Mitigation

Flooding is the one of natural disasters but flooding can be caused by human too. Flooding can cause the vulnerabilities of many aspects such as health, education, economy, and other national stability. It can disturb the daily activities and give the hazard impact which will result the worst damage for all aspects.

Several studies confirm that disaster and risk education should be part of the national primary and secondary school curricula and be included in several school subjects, such as geography, social sciences, biological sciences, forensics, physics, history, and domestic sciences [6]. In the Indonesia's 2013 curriculum, the topic of flood disaster mitigation is a part of Chapter Earth Layer especially Subtopic Hydrosfer. Be written in the curriculum that disaster mitigation will be taught based on the potentially occurence disaster of each region. Researcher did the research in the region where was potentially to occur the flooding. It could be mentioned as the earth disaster because the disaster occur from the man behavior. For changing the condition which is occured the flood disaster in every year, we must look for the strategy to convey the flood disaster mitigation for the future generation change's sake. Students as children can participate in process of disaster mitigation. Students have a real influence in making the decisions that affect their lives and not just a token or passive presence in adult agencies [4].

Based on the trend, the paradigm about the disaster risk reduction approach have changed. The higher people order thinking the higher disaster risk reduction approach will be done. Nowadays, people knows the disaster mitigation to overcome the disaster problem. Disaster mitigation is the set of efforts to reduce the disaster risk

through develop the awareness for looking after the environment and increase the ability of overcoming the disaster. Mitigation consists of pre-flooding action such as preventing, being prepared and on alert, flooding at the moment action such as doing SAR (search and rescue), and post-flooding action such as rehabilitation and reconstruction (UU No.24 Tahun 2007).

Flooding mitigation education as the disaster reduction education is focused on students understanding about causes, factors, and effects of disaster hazard by increasing the students competency and skill to be proactive within disaster preventing and mitigation [6].

3.2. Project-Based Learning

Project-based learning is the instruction model that using project as a core of the instruction at class. Project is the complex task based on the challenging question or the problem. Using the project-based learning, students involve themselves to solve the problem, make the decision or do investigation, have the opportunity to do the project in long time, and show or present their product [7]. Project-based learning is the instruction approach to lead the student to explore the problem actively in the real life, give the challenges, and enhance their knowledge deeper [3]. The goal of project-based learning is student being independent while learning to finish the task. It needs to be exercised in order to the students being usual with project-based learning approach. Teacher needs direct the students to do the learning at class suitable with learning sintax of project-based learning. There is five phases of project-based learning according to The George Lucas Education Foundation such as 1) start with essential question, 2) design project, 3) create schedule, 4) monitoring the students and progress of project, 5) assess the outcome, and 6) evaluation the experience. In this study, the instruction was held three times meeting. Students were given the project task to be finished. Project finishing was at class with the group that had been classified by teacher. The task of project based on the pre-flooding action, flooding at the moment action, and post-flooding action.

3.3. Learning Achievement

The learning achievement was obtained by using the instrument of learning achievement test which was divided into pretest and posttest. From the test, we can measure the students understanding about what they learn. Pretest and posttest consist of 10 questions multiple choice that need high level thinking. In this study, the questions contain the flooding mitigation concept. Researcher can know the increasing score from the pretest score result and posttest score result. Table I summarises the results of prestest score, posttest score, and N-Gain using the project-based learning.

TABLE I: The Learning Achievement Mastery and N-Gain

Code	Pretest	The Mastery	Posttest	The Mastery	N-Gain	Code	Pretest	The Mastery	Posttest	The Mastery	N-Gain
S1	40	NC	80	C	0,67	S16	40	NC	80	C	0,67
S2	30	NC	80	C	0,71	S17	40	NC	100	C	1
S3	50	NC	90	C	0,8	S18	60	NC	90	C	0,75
S4	20	NC	80	C	0,75	S19	50	NC	100	C	1
S5	50	NC	90	C	0,8	S20	50	NC	80	C	0,6
S6	60	NC	90	C	0,75	S21	50	NC	90	C	0,8
S7	30	NC	80	C	0,71	S22	50	NC	90	C	0,8
S8	60	NC	90	C	0,75	S23	60	NC	90	C	0,75
S9	50	NC	80	C	0,6	S24	30	NC	80	C	0,71
S10	50	NC	90	C	0,8	S25	60	NC	90	C	0,75
S11	50	NC	80	C	0,6	S26	50	NC	90	C	0,8
S12	50	NC	100	C	1	S27	20	NC	80	C	0,75
S13	60	NC	90	C	0,75	S28	50	NC	80	C	0,6
S14	40	NC	100	C	1	S29	30	NC	80	C	0,71
S15	50	NC	100	C	1	S30	50	NC	100	C	1
Average	46		88		0,78		46		88		0,78

Note: NC = Not Complete   C = Complete

The average pretest score was 46 and the average posttest score was 88. In addition, we obtained N-Gain of the pretest and posttest that was 0,78 with high category.

3.4. Activities Observation

The activities of project-based learning was analyzed through the result of activities observation. The observation was done twice on the second and third meeting at class. We can see the result of activities observation score on the Table 2 below.

TABLE II: The Learning Achievement Mastery and N-Gain

Code	2nd meeting Score	3rd meeting Score	Maximal Score	N-Gain	Code	2nd meeting Score	3rd meeting Score	Maximal Score	N-Gain
S1	18	25	28	0,7	S16	18	25	28	0,7
S2	13	24	28	0,73	S17	19	27	28	0,9
S3	18	27	28	0,9	S18	15	25	28	0,77
S4	15	26	28	0,85	S19	13	27	28	0,93
S5	13	25	28	0,8	S20	18	25	28	0,7
S6	16	26	28	0,83	S21	13	25	28	0,8
S7	12	26	28	0,88	S22	18	27	28	0,9
S8	14	26	28	0,86	S23	14	26	28	0,86
S9	17	25	28	0,72	S24	13	24	28	0,73
S10	20	27	28	0,88	S25	14	26	28	0,86
S11	18	25	28	0,7	S26	20	27	28	0,88
S12	13	27	28	0,93	S27	15	26	28	0,85
S13	15	25	28	0,77	S28	17	25	28	0,72
S14	19	27	28	0,9	S29	13	24	28	0,73
S15	21	27	28	0,86	S30	21	27	28	0,86
Average	16	26	28	0,82		16	26	28	0,82

Based on Table II the average the 2nd activities observation was 16 and the 3rd activities observation was 26. The activities observation instrument consisted seven aspects that be observed. Each aspect had the maximal score 4 so the student should had the maximal score 28 but in fact the highest maximal score was 27. From the observation was obtained N-Gain 0,82 with high category.

Each aspect based on the project-based learning phase. So the activities observation result can be shown while students was doing a project. There are the figures while the instruction was held.

Fig. 1: Students started making the project design from the essential question.

Fig. 2: Students finished the project.

Fig. 3: Students presented the product with their group.

4. Conclusion

The effectiveness of using the project-based learning is shown from the learning achievement test and the student activities observation. When the student got the better posttest score than his pretest so the score of activities observation increased too. It described that if the student learn using project-based learning well, they will get the good score on the learning achievement test. In order that we know the corellation both of the learning achievement test and the activities observation, Table III below will show its correlation.

TABLE III: Correlation Between The Learning Achievement Mastery and Activities Observation

N	$\sum A2$ (X)	$\sum LA2$ (Y)	$\sum X^2$	$\sum Y^2$	$\sum XY$
30	1.388	1.320	128.572	117.000	122.380
Analysis Formula					
$N\sum XY$					1.835.700
$\sum X \sum Y$					1.832.160
$N\sum XY - \sum X \sum Y$					3.540
$N\sum X^2 - (\sum X)^2$					2.036
$N\sum Y^2 - (\sum Y)^2$					12.600
r_{xy}	$\frac{N\sum XY-\sum X \sum Y}{\sqrt{(N\sum X^2-(\sum X)^2)(N\sum Y^2-(\sum Y)^2)}} =$ $\frac{3540}{\sqrt{2.036\times12.600}} =$ $\frac{3540}{5.065} =$ $0,7 =$ high correlation				

The conclusion for this study is project-based learning model was categorized effective for the flooding mitigation because researcher gained the result that show the high category for learning achievement test. Not only the learning achievement test but also the activities observation gained the high category. So, using the project-based learning for flooding mitigation topic can be the effective model to give the information about the disaster mitigation and risk reduction for the future life.

5. Acknowledgements

6. References

[1] Hening, W. R. N, Sudarmin, Mustikaningtyas, D. (2013). Pengembangan Modul Hubungan Antar Komponen Ekosistem Berbantuan Flashcard untuk Menumbuhkan Karakter Cinta Lingkungan Pada Siswa SMP. *Unnes Science Education Journal [Online]*, 2 (2), pp. 254-261. Available: http://www.journal.unnes.ac.id/index.php/usej/article

[2] United Nations and Economic Commission for Europr, "Best practice on flood prevention, protection, and mitigation," presented at Germany, September 25, 2004.

[3] Condliffe, Barbara, *Project-Based Learning: A Literature Review,* 1st ed. Chichester, U.S, 2016, ch. 1, pp. 6-7

[4] Mitchell, Tom, Haynes, Katharine, Hall, Nick, Choong, Wei, and Oven, Katie. (January 2008). The Role of Children and Youth in Communicating Disaster Risk. *Children , Youth and Environments [Online]*, 18 (1), pp. 259. Available: https://www.researchgate.net/publication/255610652

[5] Muzenda-Mudavanhu, C., (March 2016). A review of children's participation in disaster risk reduction', *Jàmbá: Journal of Disaster Risk Studies [Online],* 8(1), pp. 1-2. http://dx.doi.org/10.4102/jamba. v8i1.218

[6] Mangione G.R., Capuano N., Orciuoli F., Ritrovato P. (May 2013), Disaster Education: a narrative-based approach to support learning, motivation and students' engagement*, Journal of e-Learning and Knowledge Society [Online]*, 9(2), pp. 129-152. ISSN: 1826-6223, e-ISSN:1971-8829

[7] Ratumanan, T. G, *Belajar dan Pembelajaran serta Faktor-faktor yang Mempengaruhinya*, 3rd ed. Yogyakarta, Indonesia, 2015, ch. 5, pp. 225-230.