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The Implementation of SETS (*Science, Environment, Technology, and Society*) Approach Through Flood Natural Disaster Mitigation

Sugeng Muslimin[1], Iis Yeni Sugiarti[1], Yopi Nisa Febianti[1] & Dian Permana Putri[1]

[1] University of Swadaya Gunung Djati, Cirebon, Indonesia

Correspondence: Yopi Nisa Febianti, University of Swadaya Gunung Djati, Cirebon, Indonesia.

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Abstract

Disaster can happen anytime and anywhere, therefore the solutions offered for students' understanding of disaster, one of them is the SETS approach through disaster mitigation. This research aims to determine the learning process and to know the students' activities, and their responses towards SETS approach through disaster mitigation. This research is a qualitative type with a sample of 37 students. Data collection techniques are the results of observations, questionnaires, interviews, and documentation. The results showed that 90% of students were more active, have the spirit to learn, and the response towards learning is very good. The implementation of SETS approach through mitigation is appropriate to do, because students experience the direct occurrence of flood disaster. With the introduction to disaster mitigation, students can realize the importance of preserving the natural environment and minimize the impact of disasters that can harm the community.

Keywords: implementation, SETS approach, disaster mitigation, flood

1. Introduction

The development of science and technology, as well as the increasing number of needs, humans are surrounded by various forms of objects of his work. For example, in urban areas the environment is dominated by roads, bridges, settlements, offices, industries and hospitality. The natural environment has been replaced or radically changed by artificial environments. Environmental problems occur because of the wrong human view of nature. Humans often violate environmental ethics, because they consider themselves separate from their environment. Humans tend to exploit or take excessive natural resources, resulting in various environmental problems that result in change, even it can lead to disaster.

According to Law no. 24 (2007) concerning Disaster Management that disasters are events or series of events that threaten, and disrupt the life and livelihoods of people caused both by natural and or non-natural factors, as well as human factor, resulting in human lives, environmental damage, property loss, and psychological impact, and beyond the capacity of community with all its resources. Geologically, Indonesia is surrounded by the world's most active volcanic pathway, the Pacific Ring of Fire (Ring of Fire), resulting in collisions of three continental plates, the Indo-Australian Plate from the south, the Eurasian Plate to the north, and the Plate Pacific region from the east. With these conditions, Indonesia has a very high and varied potential disaster. Natural conditions and the diversity of population in Indonesia create a risk of disasters. Indonesia has many areas that are prone to disasters, both caused by nature and disasters caused by human activities.

The importance of disaster recognition must be instilled early, especially at the elementary school level. It aims to provide knowledge, understanding, and skills to minimize the risk of disasters that might occur. Therefore, it needs understanding of disaster mitigation. According to Law No. 24 (2007) concerning Disaster Management, that mitigation is a series of efforts to reduce disaster risk, both through physical development and awareness, and capacity building to face disaster threats. The learning on mitigation is found in the subjects of Social Science in Primary School at fourth grade on the subject of natural phenomena in Indonesia. Natural symptoms referred to in this material include volcanic eruptions, earthquakes, floods, landslides, hurricanes and tsunamis.

SD Negeri 1 Pangenan, Pangenan Sub-district, Cirebon Regency, is the State Elementary which annually faces natural disasters, in the form of floods. This flood is caused by high rainfall intensity, causing the river to overflow and some areas in East Cirebon are flooded.

Figure 1.

Figure 2.

Figure 1 & 2. This is the condition where SDN 1 Pangenan was hit by a seasonal flood. The students utilized the flood to play the water in school ground

Limited information and knowledge about disaster mitigation greatly affect students' understandings of disasters. In the learning process, teachers only provide material mitigation through pictorial stories or through video shows, without directly involving students to understand how the process of disaster occurrs and how to overcome them. Therefore, the need of disaster mitigation is applied in schools that are vulnerable to disasters, and supported by appropriate media according to the needs and characteristics of students.

Science, environment, society and technology (SETS) or Salingtemas is a contextual approach that helps students making the learning more useful (Humairoh, 2015). It is taken from Science Technology and Literacy (STM), Environment Education (EE) and Science Technology and Literacy (STL). The education concept of STM/STL or EE from SETS approach is considered as a unity or every concept become one or as if one (Khasanah, 2015). Similarly, in the SETS learning, to make every elements connected, it is necessary to have a deep identification and analysis on the concept that is being studied (Nugraheni, 2013). In a sense, learning materials must be placed in relation to the element of Science. Seeing Environment, Technology, and Society reciprocally will make us able to gain the benefit of learning outcomes greater than just understanding the concept of knowledge learned without seeing the connection in the context of SETS (Sulistyorini, 2016).

Therefore, in this case the researchers want to know the learning process with science, environment, technology, and society approach (SETS) through disaster mitigation in SDN 1 Pangenan, students' activities in learning with science, environment, technology, and society approach (SETS) through disaster mitigation at SDN 1 Pangenan, and students' responses after learning with science, environment, technology, and society (SETS) approach through disaster mitigation at SDN 1 Pangenan.

2. Method

This research is qualitative (Gunawan, 2014). The place of research or social situation in this research is SDN 1 Pangenan Cirebon Regency. Meanwhile, the research time in this study is during the even semester 2017/2018. The research instruments used are observation sheets, questionnaires, and interview sheets. Sources of data in this study consist of primary data and secondary data. Primary data, i.e. observation sheet used by researchers to observe the learning process and students' activities, and questionnaires distributed to the students of SDN 1 Pangenan, Cirebon Regency and number of students are 37 people as participants. While the secondary data, namely data interviews, and documentation (in the form of photographs). Data collection techniques are the results of observations, questionnaires, interviews, and documentation.

3. Results

3.1 Learning Process

Main condition in the learning process run well and conducive, teacher provided motivation to students so that students were interested and enthusiastic on following the learning. At this stage, the teacher showed a video of the flood disaster that occurred in Kuningan, West Java (Figure 3). Since the beginning of the lesson, students were very enthusiastic and active in teaching and learning activities. Male students were more visibly vibrant and active than female students, because during questioning, more male students raised their hands and asked more frequently than female students (Figure 4).

Figure 3. The atmosphere at the beginning of learning activities, the teacher provides motivation to students about the importance of flood hazards for human activities

Figure 4. Students' enthusiasm when paying attention to flood disaster video

In understanding of learning materials, male students were quicker and easier to understand learning materials than female students. Female students looked more relaxed and calm. Interaction between male students were clearer than female students, because male students often made noise than female students. The noise was positive (loud discussion). Female students often interacted (asking what difficulties are experienced), possibly because of nervousness and shame. Even so, teaching and learning activities were conducive and enjoyable.

Learning with the approach of Science, Environment, Technology, and Society (SETS) through disaster mitigation in the material of Natural Events / Natural Disasters was very good and appropriate to do, because learning was done with practices that required collaboration from all students. When studying, students had to concentrate on receiving information, both obtained from the video shown and from the teacher's instructions on the learning activities to be carried out. It could stimulate the students' curiosity and interest to learn. Students became more active and eager to learn, they also interacted with friends, and dare to ask the teacher about the material being taught. This condition was in accordance with the opinions of Komariah, Azmi, and Gloria (2015), that students' understanding of the environment must be comprehensive and understand the relationship between the concepts of science and technology in meeting people's needs and their influence on environmental conditions, it becomes an important part of the development of learning in the present era. Then according to Listyono (2012), the purpose of SETS education is to help students understanding towards the role of the environment in science, technology, and society so students can take advantage of the knowledge learned and teach students how to apply their knowledge while paying attention on the environment, namely preventing damage and preserving it. In another hand Widyatiningtyas (2009) in Anaperta (2015) states that, the SETS approach can connect the real world life of children as members of society with classes as a learning space. The process of this approach can provide learning experiences for children in identifying potential problems, collecting data relating to problems, considering alternative solutions, and considering consequences based on certain decisions.

3.2 Students' Activities

At this stage, students conducted learning activities through flood simulation activities. This simulation activity involved all aspects, not only rely on knowledge, but also knowing the importance of social interaction among members in the group. Diedrich (Rintayanti, 2011) states that learning activities involve cognitive, affective and

Figure 5.

Figure 6.

Figure 5 and 6. Activities of students doing simulations of floods

Psychomotor aspects and it involves all the senses possessed by humans. Each group consists of 4 to 5 people heterogeneously. Student's activity is an indicator of success in the learning process.

After the learning process is implemented, the next activity is an interview of 10 students. Interviews with students were conducted with the aim of gaining an overview of learning activities using the Science, Environment, Technology, and Society (SETS) approach through disaster mitigation. The researchers obtained results for the first question which read: "Are you happy learning using this approach?" Their answers were that learning with Science, Environment, Technology, and Society (SETS) approaches through disaster mitigation on Nature / Natural Disaster material makes them happy, because they do not have to learn by listening to teacher information and focusing on teachers only, but also practicing the information that they have obtained to make a model of floods. They are happy, because they can learn while playing making a flood.

For the second question: "What makes you happy / hate during learning with SETS approach?" Their answers are that they are happy, because learning is not monotonous and saturated in which they should listen to the explanation of the teacher. They love learning with the SETS approach, because they can watch videos about the flood and have fun creating a flood. They are happy when learning is done while playing.

For the third question: "Would you like to study with this approach on other occasions?" Their answers are that they are eager to learn with the SETS approach on other subjects, as learning by the SETS approach, they can watch videos in addition to listen to teacher's explanations, they can work with friends in making models, they can take courage to ask the teacher about the material being taught, and they can easily understand what is being taught by the teacher. The point is that learning with Science, Environment, Technology, and Society (SETS) approach through disaster mitigation is very interesting and fun.

For the fourth question: "Are there any suggestions about the lessons you have followed?" Their answers are that learning with Science, Environment, Technology, and Society (SETS) approaches through disaster mitigation on Natural Events / Natural Disasters would be better if the practice is for all natural disasters to be learned so that students can easily understand about the existing natural disasters, also they can be more aware of the importance of maintaining the cleanliness of the surrounding environment by doing the most important thing right, that is to throw garbage in the trash.

Learning with Science, Environment, Technology, and Society (SETS) approach through disaster mitigation is very interesting and fun to do, because the material taught can be easily absorbed and understood by the students. In addition, students also become more active and enthusiastic in learning. They interact with friends and teachers in learning activities. They can watch videos and play in making flood models. They can realize the importance of preserving the natural environment in order to prevent the coming of disasters that can harm society. This is in accordance with the opinion of Binadja (2005) cited by Muslimah (2014) that, the SETS approach in its discussion prioritizes the relationship between the topic of discussion with daily life or discussion related to the students' daily life, preferably as an opening horizons so students know that the communities around them are having

problems that must be addressed immediately. According to Nurwahyunani (2011), learning using the SETS approach allows active students (able to solve problems), also students are educated to be able to solve environmental problems by applying the concepts they already have from various related sciences, to increase their awareness of the environmental problems faced and foster an attitude of loving the environment.

3.3 Students'Responses

Students have learned something if they can show changes in behavior, in the form of stimulus and response. Stimulus is given by the teacher to students, while the response is the response or action that has been given by the teacher. This is in line with the opinion of Sarwono (1998), namely that response is a stimulating organizing process in which proximal stimuli are organized, so that phenomenal representation of proximal stimuli often occurs. The response in the study measured the extent of the effect of learning with the approach of Science, Environment, Technology, and Society (SETS) through disaster mitigation through students' feelings of pleasure and dislike. The use of the SETS approach is useful for: (1) students can think thoroughly in looking at a learning theory based on the four elements of science, technology, environment and society; (2) students can know the effect of technology on the rate of growth of science and its impact on the environment; and (3) learning is more interesting during learning because it relates to real things (Yulistiana, 2015 in Amanda, Muharrami, Rosidi, and Ahied, 2018). The SETS approach can also help students provide simple explanations about the material discussed in class, build basic skills in making models, conclude material, provide further explanations about material, and arrange strategies and tactics related to material (Kartimi, 2012 in Amanda, Muharrami , Rosidi, and Ahied, 2018). Based on research that has been carried out through questionnaires, the researcher obtained data in the form of the results of questionnaires conducted to sixth grade students of SDN 1 Pangenan Cirebon Regency. From the results of the questionnaire that the researchers have obtained, then the calculation and percentage of each item of statement that has been answered by the student is carried out. After the data has been presented, the researchers did the recording and description of each statement item, which then continued to the analysis and final conclusions from the results of the questionnaire. The conversion of data into percentages was done by calculating the number of student answers, divided by the number of students who filled out the questionnaire, then multiplied by 100. The results of the questionnaire calculation of the implementation of the Science, Environment, Technology and Society (SETS) approach through disaster mitigation in class VI students of SD 1 Pangenan SDN Cirebon Regency 2017/2018 academic year can be seen in Table 1 below:

Tabel 1. *Results of Students' Questionnaire Recapitulation in Using SETS Approach in the Natural Disaster Mitigation Material*

No.	*Statement*	Optional Answer (%)	
		Yes	No
1.	I can imagine in my imagination how the occurrence of flood.	89	11
2.	I comprehend the cause and effect of flood for human life	100	0
3.	I can re-explain the subject matter about flood natural disasters well.	27	73
4.	I can judge my friend's explanation of a flood natural disaster.	92	8
5.	I can draw conclusions from the explanation of flood natural disasters.	86	14
6.	I can make a model of flood disaster well.	100	0
7.	This model of natural floods has made easier for me to understand how floods occur, as well as their causes and consequences for human life.	95	5
8.	The existence of a model of flood natural disasters stimulates and motivates me to be diligent in self-study, especially the material of flood natural disasters.	97	3
9.	Learning with model of flood disaster provides a great benefit for me to be able to carry out how to prevent flood, one of them is to dispose of garbage in the trash.	100	0
10.	With this flood disaster model, I can see more clearly how floods occur	86	14

Based on the results of the statement number 1 up to statement number 3 which contain understanding, it is known that learning with the approach of Science, Environment, Technology, and Society (SETS) through disaster mitigation in social studies subjects with Natural Events / Natural Disasters, can facilitate students' understanding while learning the material. When learning, students can first imagine how a natural disaster occurs (natural disaster discussed this time was floods), then students can find out what causes of flooding, and what the

consequences for people's lives, as well as what actions must be taken to prevent flooding , and students can explain in detail the natural flood events in class.

The results of the statement number 4 up to statement number 6 which contain skills, it is known that learning with the approach of Science, Environment, Technology, and Society (SETS) through disaster mitigation in social studies subjects with Natural Events / Natural Disasters, can develop student skills in assessing the explanation of one of their friend about the flood natural disaster, can also draw conclusions from the explanations that have been given, both by teachers and friends. They can also make model of natural disasters flood well, according to their imagination or flood video that previously aired in the classroom.

The results of questionnaire number 7 and statement number 8 which contain interest, it is known that learning with the approach of Science, Environment, Technology, and Society (SETS) through disaster mitigation in social studies subjects with Natural Events / Natural Disasters with practice makes easy for students to understand how the floods of natural disasters occur, as well as the causes and consequences for human life. In addition, the SETS approach can also stimulate and motivate students to diligently study independently in creating a flood model.

The results of the statement number 9 and 10 which contain the utilization, it is known that learning with the approach of Science, Environment, Technology, and Society (SETS) through disaster mitigation in social studies with material Natural Events / Natural Disasters with the practice of making models of flood natural disasters, can provide great benefits for students to be able to carry out a flood prevention action, one of them is maintaining the cleanliness of the surrounding environment by throwing garbage into the trash. In addition, the practice of making flood models also allows students to see more clearly and realistically how floods occur.

Thus, learning by using the approach of Science, Environment, Technology, and Society (SETS) through disaster mitigation makes easy for students to understand the material being studied, improves the skills in expressing ideas / opinions in the classroom, makes the learning atmosphere more conducive because of making interesting models. It will improve interest and motivation of student learning, as well as providing great benefits to students in shaping their attitudes and behavior in preserving the surrounding environment as a form of prevention of flooding, namely by always throwing trash into the trash bin. Learning with the approach of Science, Environment, Technology, and Society (SETS) through disaster mitigation makes students able to increase their activeness, also establish interactions with teachers and friends. The result of class VI students' participation SDN 1 Pangenan Cirebon regency as a whole from 10 statements can be seen in Figure 7 below.

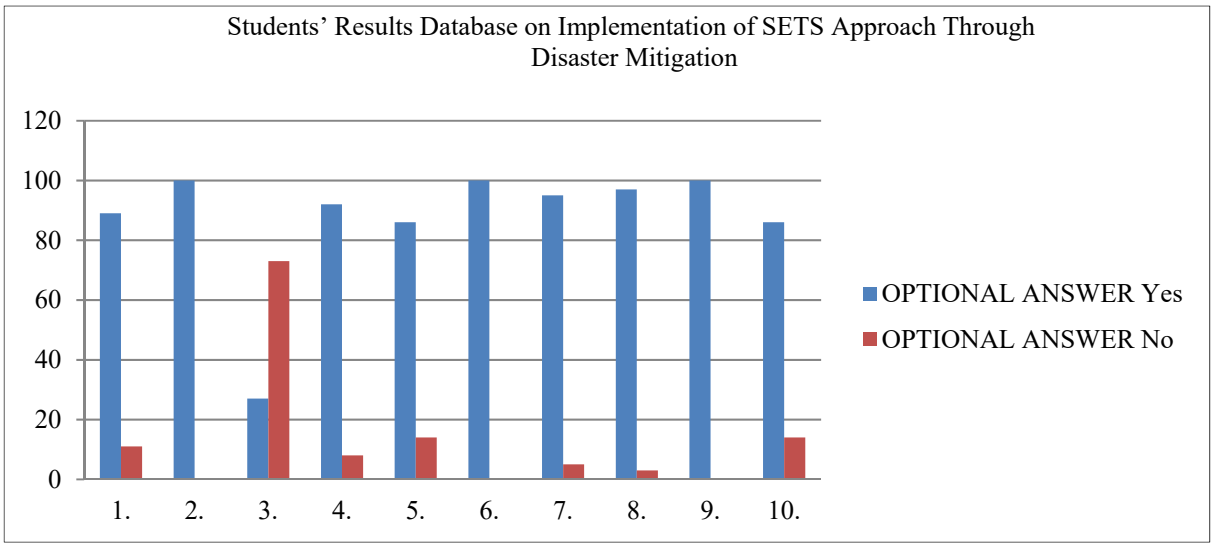

Figure 7. Students' Results Database on Implementation of SETS Approach Through Disaster Mitigation

Based on the results of the research obtained through documentation (photographs), the researchers saw that from the beginning of the learning, the students looked excited because learning felt by them would be different. After the attendance and apperception ended, they were presented video that shows about the natural disasters which they experienced at that time, namely floods. Although the flood video was experienced by other regions, but they seemed interested and focused on watching it. At the core activities, students learn practices about how the seconds of natural disasters occur and what causes them, as well as solutions to prevent flooding. Learning activities are

very conducive, because many students actively ask and interact, both with friends and teachers. Noise is not a negative thing, because they talk to each other loudly with each other in practice. The atmosphere of learning when it was felt very fun, because the students consider that the practice is done through playing activities.

Learning with the approach of Science, Environment, Technology, and Society (SETS) through disaster mitigation, covering aspects of science, namely flooding is an event that occurs when excessive water flows soak the plains. Flooding can be caused by natural and human factors. Environment, flooding can cause damage to facilities and infrastructure, for example in the SDN 1 Pangenan building which is a subscription to floods every year, so learning and learning activities cannot be carried out due to flooding. Technology, namely in the form of simulation media on flood disasters, students can understand the process of flooding, impacts on the community and the environment, as well as flood mitigation efforts. Society (society), namely the flood disaster causes harm to the community, one of them is the paralysis of activities or community activities. This is in line with the opinion of Binandja (2001) that the direction of SETS education is relatively concerned with the environment or the (human) living system which contains elements of SETS than the environment (E), which due to human activities require SETS education to be introduced. Can also be said that, STSE *stems from the belief that a connection between the student and the real world should be established. This process would lead the student to recognize possible problems that s/he has. An environment is created, where students could collect data for the solution of their problems, consider alternative solution ways, determine the best ways to solve the problem and practice them* (Yoruk, Morgil, and Secken, 2010).

With the introduction to disaster mitigation, efforts are made to reduce losses caused by flooding. Disaster mitigation efforts, include pre-disaster or early warning, mitigation, and post-disaster or recovery. This is in line with Coburn's (1994) view that disaster mitigation includes both the planning and implementation of measures to reduce risks associated with human and natural hazards and the planning process for an effective response to disasters that really happened. Therefore, disaster mitigation is needed early, especially in elementary schools because disasters come anytime and happen to anyone, and it is difficult to predict it. Early child empowerment to understand disaster mitigation is the first step to build a disaster-conscious community, so that in the event of disaster the teachers, students and the community do not panic because they understand how to cope with disaster risks.

4. Conclusion

After doing the research, it can be concluded as follows:

1. The learning process with the approach of Science, Environment, Technology, and Society (SETS) through disaster mitigation on material events or natural disasters is very good and appropriate to be done, because learning is done by practice of making models of flood natural disasters that require cooperation from all students.

2. Students' activities in learning with the approach of Science, Environment, Technology, and Society (SETS) through disaster mitigation are very interesting and fun to do, because the material taught can be easily absorbed and understood by students, and they experience the occurrence of floods directly.

3. The responses of students in learning with the approach of Science, Environment, Technology, and Society (SETS) through disaster mitigation have a positive response, because students can recognize flood disaster management efforts and their use in life.

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