

Development of OrSAEv Model Learning Materials to Improve Tsunami Disaster Mitigation Skills (Preliminary Study)

Sapitri Rahayu

Postgraduate Program of Science Education Study Program
Universitas Negeri Surabaya
Indonesia
sapitri.18024@mhs.unesa.ac.id

Madlazim

Physics Department
Universitas Negeri Surabaya
Indonesia
madlazim@unesa.ac.id

Tjipto Prastowo

Physics Department
Universitas Negeri Surabaya
Indonesia
tjiptoprastowo@unesa.ac.id

Eko Hariyono

Graduate Program of Science Education Study Program
Universitas Negeri Surabaya
Indonesia
ekohariyono@unesa.ac.id

Abstract—This study aims to determine the tsunami evacuation skills that have been applied in schools. This research is qualitative and quantitative. This trial phase was conducted at State Junior High School 1 Besuki, tested to 15 students of class VII. The sample selection is chosen from the population using a purposive sampling technique. The type of data obtained is from interviews and questionnaires. Interviews were conducted with the science teacher and the vice-principal and the questionnaire given to the students. The type of data obtained is qualitative and quantitative data. Quantitative data in the form of answers (scores) of students to the questionnaire tested on it. While qualitative data is obtained by converting quantitative data into percentages (%) then described and by teacher interviews. Based on the results of the analysis and discussion that has been described, it suggests that students can understand what must be done before a tsunami occurs, during a tsunami and after a tsunami. However, students' tsunami disaster mitigation skills are deficient, this can be proven by the results of teacher interviews and questionnaires. So the need to improve evacuation skills at State Junior High School 1 Besuki.

Keywords—OrSAEv Model Learning, Tsunami Disaster Mitigation Skills

I. INTRODUCTION

Geographically, Indonesia is an archipelago located at the meeting point of four tectonic plates, namely the Asian Plate, the Australian Plate, the Indian Ocean Plate, and the Pacific Ocean Plate. The southern and eastern part of the country consists of a mountainous fire region stretching from Sumatra - Java - Nusa Tenggara - Sulawesi [1]. Old volcanic mountains

and lowlands are still mostly dominated by the swampy area, so it is potentially prone to disasters, including volcanic eruptions, earthquakes, tsunamis, floods, and landslides. One of the areas prone to tsunami disasters in Indonesia is the southern coast of Java. The region is directly adjacent to the expanse of the Indian Ocean and has the potential to experience a tsunami [2]. Based on the 2010-2014 disaster map compiled by the East Java National Disaster Management Agency (BNPB), one of the 16 disaster-prone provinces. One of the 150 districts/cities in 16 tsunami-prone provinces is the Tulungagung district. The southern coastal region of Tulungagung, East Java, especially in the four main sub-districts, namely Besuki District, Tanggunggunung District, Kalidawir District, and Pucanglaban Subdistrict, is prone to tsunami [3].

Overall the conditions of the Indonesian people are still very vulnerable to the threat of the disaster. The ability of students to understand the potential of disasters around their homes is crucial, knowledge and skills are beneficial information in the event of a disaster as anticipation through attitudes and values that encourage students to act prosocial, responsible and responsive when the family and the community is threatened [4]. However, the problem that arises is that the Indonesian people still do not have a sufficiently high level of awareness of disasters. Lack of awareness can increase people's risk of the threat of disaster. Disaster risk is a strong foundation for the Indonesian people to jointly carry out these efforts in an integrated and directed manner [5]. Based on geographical and historical considerations, one of the areas prone to tsunami disasters in Indonesia is Tulungagung Regency [6]. Disaster events will cause many casualties. The number of victims in natural disasters can show that the local community still knows little about natural disasters. One of the actions that can be taken

to reduce the number of fatalities is to provide knowledge about disaster mitigation and disaster preparedness. Disaster mitigation is an effort made to prevent or reduce the impact of disasters [7]. According to Government Regulation No. 21 of 2008, disaster mitigation is a series of efforts to reduce disaster risk, both through physical development and awareness and capacity building in the face of disaster threats [8]. Disaster mitigation is an effort to prevent or reduce the impact of a disaster. Based on this limitation, disaster mitigation is intended to be preventive before it occurs [9].

Schools are an essential means of instilling preparedness with the community. Through school, students find out how attitudes in disaster management are then disseminated to their families and environments [10]. Early knowledge of disaster management is needed so that community preparedness can be higher. School, as a formal means of planting knowledge about disasters, should recognize and familiarize students to live side by side with natural disasters that have the potential to occur around the school environment [11]. One way to convey disaster mitigation is through learning in education. This idea is following the opinion of Rusilowati (2012), saying that to provide public understanding of disaster can be done through integrated learning in several subjects. One of the subjects that can be integrated with natural disasters is natural science lessons because science learns about the universe and its causes and is related to daily life that provides direct knowledge to be sought by systematically using scientific methods [12].

As an educator, the research team will contribute to improving evacuation skills in dealing with the tsunami disaster, through learning the OrSAEv learning model. The teacher transfers information and tsunami disaster mitigation skills. Teachers are one component that has a strategic role in preparing young people from an early age to better understand tsunami disaster mitigation [13]. The concept of tsunami disaster mitigation will be easily understood if explained using the OrSAEv learning model. The OrSAEv phase includes (1) Orientation (2) Ready for Disaster Preparation (3) Action (4) Evaluation. The innovative OrSAEv Learning Model is specifically designed and is expected to be implemented in 3-4 meetings to improve disaster preparedness (knowledge of disaster, disaster response, and post-disaster evacuation skills) of prospective teachers and does not require implementation in not many years [14].

One of the science materials taught to VII grade junior high school students listed in Permendikbud Number 24 of 2017 is material on Basic Competencies 3.10 Describes the earth's layers, volcanoes, earthquakes, and risk reduction actions before, during, and post-disaster according to disaster threats in the area [15]. The Minimum Completion Criteria value of science subjects at State Junior High School 1 Besuki is ≥ 80 . The percentage of students who obtain scores below the KKM in natural disaster material is 60% of students. The results of interviews with science teachers in State Junior High School 1 Besuki. The teacher said that the lack of completeness in natural

disaster material is because students often have difficulty understanding the material concepts they have learned because of the many concepts students must understand because natural disasters are abstract material [16]. So it is necessary to increase disaster mitigation skills to improve the learning outcomes. The Distance of State Junior High School 1 Besuki with the beach is 7 kilometers [17].

The results of interviews conducted with Science Teachers at State Junior High School 1 Besuki that teachers more often present learning in a conventional way (lectures and problem training), in addition, the teacher states that school learning activities have never implemented evacuation skills learning in the event of a tsunami [18]. There are no directives for dealing with the tsunami disaster in State Junior High School 1 Besuki, and there is no sound siren for the tsunami. Schools do not have an infrastructure in the event of a tsunami. The results of interviews with teachers of State Junior High School 1 Besuki, which also included members of the Tulungagung BPBD, were two villages that had sirens, namely, Besuki sub-village in Sidem beach and Popoh beach. Regular socialization has been carried out to the community whose houses are close to the coast regarding the existence of evacuation sites and existing evacuation routes and evacuation procedures so that they know what to do when a tsunami strikes. So that students whose homes near the beach already know what to do when a tsunami occurs [19]. Seeing the landscape conditions which are dominated by hills, evacuation planning is more directed to use hills that are located relatively near the coast. Thus, research is needed on "Development of learning materials for OrSAEv models to improve tsunami mitigation skills".

II. METHOD

This research is a qualitative and quantitative study. This trial phase was conducted at State Junior High School 1 Besuki. Tested to 15 students of class VII. The sample selection is chosen from the population using a purposive sampling technique. The type of data obtained is from interviews and questionnaires. Interviews were conducted with the science teacher and the vice-principal and the questionnaire given to the students. The type of data obtained is qualitative and quantitative data. Quantitative data in the form of answers (scores) of students to the questionnaire tested on it. While qualitative data was obtained by converting quantitative data to a percentage (%) then described and by teacher interviews.

III. RESULTS AND DISCUSSION

Results of the percentage of questionnaire answers about tsunami disaster mitigation skills at State Junior High School 1 Besuki (see Table 1). Table 1 shows that as many as 7% of students answered that there were disaster warning systems such as sounds or sirens warning of a tsunami. Because in the Tulungagung district, there are sirens in a place close to the beach, namely on the Sidem beach and Popoh beach located in the Besole village of Besuki sub-district. 0% of students answered that there were directions to get to the tsunami

evacuation route. In Tulungagung Regency, there is an evacuation route near the beach, Sidem Beach and Popoh Beach, Besole Village, Besuki Subdistrict. As many as 60% of students answered near the school, there is a higher place. Besuki sub-district is an area that is close to a hill so that it can carry out security to a higher place. A total of 100% of students answered knowing what has to be prepared to deal with the tsunami disaster that could come at any time. Also, 100% of students answered determines the actions that should be carried out when he heard the sound or siren tsunami hazard. As much as 100% of students answered to know the action when it is in class and tsunami, what should we do with friends around us, 100% of students answered knowing what to do before the tsunami, 100% of students answered knowing what to do during a tsunami, 100% of students answered Knowing what to do after the tsunami, 100% of students answered knowing what to do when they were at the beach and the tsunami. Students whose homes near the beach are given regular socialization about the existence of evacuation sites and existing evacuation routes as well as evacuation procedures so that they know what to do when a tsunami disaster occurs. So that students whose homes near the beach already know what to do when a tsunami occurs.

TABLE 1. TSUNAMI MITIGATION SKILLS QUESTIONNAIRE

No.	Instrument	Percentage Answers	
		Correct (%)	Incorrect (%)
1.	There are disaster warning systems such as sounds or tsunami hazard sirens	7	93
2.	There are directions to get to the tsunami evacuation route	0	100
3.	There is a higher place near the school	60	40
4.	Know what to prepared to deal with tsunami disasters that can come at any time	100	0
5.	Know the actions that should be taken when hearing sounds or tsunami alarm sirens	100	0
6.	Know the actions when in class and tsunami, which we should do with friends who are around us	100	0
7.	Knowing what to do before a tsunami occurs	100	0
8.	Knowing what to do during a tsunami	100	0
9.	Knowing what to do after a tsunami	100	0
10.	Know the actions that should be taken when on the beach and a tsunami	100	0
Averages		76.7	23.3

Based on the data above, the average percentage of students' tsunami mitigation skills is 76.7 in either category. So it can be said that students can understand what they must do before the tsunami, during the tsunami, and after the tsunami. However, in tsunami disaster mitigation skills, students have

never been given direct learning, so there is a need for tsunami disaster mitigation skills to improve student evacuation skills.

The lessons to be applied provide direct lessons about tsunami in class VII. So that it can help schools improve tsunami evacuation skills planning and procedures. This learning is also to increase awareness and to help teachers prepare their students for how they can protect themselves and their families when a tsunami occurs. Life-saving knowledge - what to know, if at school, at home, if on the beach, if on a boat, plan for earthquakes and tsunamis, facts about saving lives, what to do after a tsunami. So this learning allows students to investigate how tsunamis occur and how to stay safe if tsunamis occur.

Based on interviews with science teachers that have realized that the school is prone to tsunami disasters, but the school does not provide facilities to deal with disasters. Besides this, deficient evacuation skills can be seen that students have never learned about the tsunami disaster. There are several reasons why this can happen, namely because there are no appropriate learning materials for disaster mitigation, lack of support from the government to conduct counseling related to disaster mitigation, and there are no facilities such as disaster mitigation books, posters, evacuation routes that provide to support mitigation disaster. Regarding learning in class, the material learning process is only conveyed by the lecture method.

Based on interviews with the vice-principal said that previously, there had never been counseling or outreach related to overall disaster mitigation. Socialization was only obtained by students whose homes were near the beach. Students whose homes near the beach are given information about the existence of evacuation sites and existing evacuation routes and evacuation procedures so that they know what to do when a tsunami strikes. So that students whose homes near the beach already know what to do when a tsunami occurs. In addition, he explained that there was no disaster evacuation route at school. However, there is an evacuation route in a place close to the beach, which is on the Sidem Beach, and Popoh Beach is located in Besole Village Besuki Subdistrict. In Tulungagung, which has a siren in a place close to the beach that is on the beach Sidem and Popoh beach is located in the Besole village Besuki district.

So it can be said that the lack of awareness regarding the tsunami disaster, can be proven by the absence of facilities that support disaster mitigation such as evacuation routes, posters, sirens and learning about disaster mitigation. They understand the location of the school on the hill while the nearest beach location is Popoh Beach and Sidem Beach, which is located below the hill. They consider the disaster that was likely to occur was an earthquake, even though their school near the beach. However, students must be given insight into disaster mitigation, so they can save themselves when the tsunami disaster comes. In the learning process, it is better if the material on disaster mitigation is not only delivered by the lecture method, but also by showing them how to deal with disasters when suddenly they come in the form of posters and simulating

evacuation skills activities. In addition, the government also plays a role in providing counseling related to disaster mitigation in schools. So that students' experience in student evacuation skills can be done very well.

IV. CONCLUSION

Based on the results of the analysis and discussion that has been described can be concluded that students can understand what must be done before the tsunami, during a tsunami, and after a tsunami. However, students' tsunami disaster mitigation skills are deficient, and this can be proven by the results of teacher interviews and questionnaires. So the need to improve evacuation skills at State Junior High School 1 Besuki.

REFERENCES

- [1] D. Alrazeeni, "Saudi EMS Students' Perception of and Attitudes toward Their Preparedness for Disaster Management Aceh" *Saudi Arabia: Journal of Education and Practice*, vol. 6, no. 35, pp110-116, 2015.
- [2] H.Z. Anwar, "Fungsi Peringatan Dini dan Kesiapan Masyarakat dalam Pengurangan Resiko Bencana Tsunami di Indonesia: Studi Kasus di Kota Padang", *Jurnal Riset Geologi dan Pertambangan*, vol. 21, no. 2, pp 75-88, 2011.
- [3] F. Imamura, A. Muhari, E. Mas, M.H. Pradono, J. Post, and M. Sugimoto, "Tsunami Disaster Mitigation by Integrating Comprehensive Countermeasures in Padang City, Indonesia", *Journal of Disaster Research*, vol. 7, no. 1, pp.48-64, 2011.
- [4] I. Hasanah, S. Wahyuni, and R.W. Bachtiar, "Pengembangan Modul Mitigasi Bencana Berbasis Potensi Lokal yang Terintegrasi dalam Pelajaran IPA di SMP", *Jurnal Pembelajaran Fisika*, vol. 5, no. 3, pp 226 – 234, 2016.
- [5] W.S. Hastuti, Pujianto, Supartinah, "Pengembangan Model Rekayasa Mitigasi Bencana Geologi Berorientasi pada Emergency Preparedness dan Disaster Awareness Untuk menumbuhkan Karakter Tanggap Bencana dalam Pembelajaran IPA di Sekolah Dasar", *E-Journal Universitas Pendidikan Indonesia*, 2016.
- [6] K. Ohnishi, H. Mitsuhashi, "Geography Education Challenges Regarding Disaster Mitigation in Japan", *Review of International Geographical Education Online*, vol. 3, no.3, pp 230-240, 2013
- [7] Madlazim, F. Rahmadiarti, Masriyah, S. Indana, T. Sunarti, "Pengembangan Model Pembelajaran OrSAEv untuk meningkatkan kesiapsiagaan bencana bagi mahasiswa calon guru", Surabaya: Unesa University Press, 2019
- [8] R. Makarami, "Education Technology and Innovative Teaching Strategies on Tsunami Learning for Teachers and Children", *E-Journal Suan Sunandha Rajabhat University*, Bangkok, Thailand, 2016.
- [9] Mantasia, H. Jaya, "Model Pembelajaran Kebencanaan Berbasis Virtual Sebagai Upaya Mitigasi dan Proses Adaptasi Terhadap Bencana Alam di SMP", *Jurnal Penelitian Pendidikan*, vol. 19, no. 1, pp 1-14, 2016.
- [10] Minister of Education and Culture, Regional Regulation of Tulungagung Regency Number 11 of 2012. Jakarta: Minister of Education and Culture, 2016.
- [11] G. Priyowidodo, J.E. Luik, "Literasi Mitigasi Bencana Tsunami untuk Masyarakat Pesisir di Kabupaten Pacitan Jawa Timur", *Jurnal EKOTRANS*, vol.13, pp 47-61, 2013.
- [12] Permendikbud, "Peraturan Daerah Kabupaten Tulungagung Nomor 11 Tahun 2012" Jakarta: Menteri Pendidikan dan Kebudayaan, 2013.
- [13] Peraturan Kepala Badan Penanggulangan Bencana Republik Indonesia Nomor 02 Tahun 2012 Tentang Pedoman Umum pengkajian Risiko Bencana. Jakarta.
- [14] Peraturan Daerah Kabupaten Tulungagung Nomor 8 Tahun 2013 tentang Pembentukan dan Penyelenggaraan Badan Penanggulangan Bencana Daerah kabupaten Tulungagung. Tulungagung
- [15] A. Rusilowati, A. Supriyadi, Binadja, S.E.S. Mulyani, "Mitigasi Bencana Alam berbasis Pembelajaran Bevisi Sciences Environment Technology and Society", *E-Journal Universitas Negeri Semarang*, vol. 21, no. 2, pp 76.
- [16] Thiagarajan, D.S. Semmel, & Semmel, "Instructional Development for Training Teacher of Exceptional Children a Sourcebook", Bloomington: Center for Innovation on Teaching the Handicaped.
- [17] K.S. Utomo, C. Muryani, S. Nugraha, "Kajian Kesiapsiagaan Terhadap Bencana Tsunami di Kecamatan Puring kabupaten Kebumen Tahun 2016" *Jurnal GeoEco*, vol. 4, no. 1, pp 68-76, 2018.
- [18] Sekretaris Negara Republik Indonesia, Undang – Undang Republik Indonesia Nomor 24 Tahun 2007 Tentang Penanggulangan Bencana, Jakarta: Sekneg RI, 2007.
- [19] Teng, Y. F. Jane, Yusof, and Qismullah, "Surviving Women's Learning Experiences from the Tsunami in Aceh", *Adult Learning*, vol. 25 no. 1, pp. 20-27, 2014