Disaster mitigation through disaster education in Indonesia

Muzani$^{1,2}$, Desy Safitri$^1$, Arita Marini$^1$, Apriwahyudi$^1$

$^1$Universitas Negeri Jakarta, Indonesia.

$^2$muzani@unj.ac.id

Abstract

This article explains the urgency of local wisdom-based disaster education curriculum in Indonesia. It is a literature method research. As the country with a potentially huge disasters, Indonesia has to apply disaster curriculum in educational institutions, and therefore, students have disaster knowledge and vision. The disaster education has common goals involving providing overview and reference in the learning process of disaster preparedness. Through the education, it is expected that learners are able to think and act as fast as, as precise as, and as accurate as possible when they encounter disasters. Empathy toward victims can also be developed and so the learners can help others appropriately and carefully. Pattern and diversity of natural disasters also vary. Each region has different characteristics as well. Therefore, the disaster curriculum should accommodate local wisdom, as an effort to provide appropriate education to encounter and handle disasters simultaneously. The local wisdom-based curriculum will explain the relationship between human beings as well as natural and cultural environment surrounding them.

Keywords: disaster education, curriculum, local wisdom

1. Introduction

Various natural disasters in Indonesia mostly relate to geological process (earthquake, volcano eruption, hydrometeorology), such as drought, forest fire, landslide, abrasion, erosion, hurricane, flood. From its topography, Indonesia is the country with high disaster risks. Geologically, the position is located in the meeting of Eurasian, Indo-Australian and Pacific Plate shown in Figure 1 (Muzani, Setiawan, Putri, 2020). They all establish a series of Mediterranean and Pacific Circum Mountains that meet in Indonesia specifically in Banda Sea, Moluccas. Moreover, geographically Indonesia is an archipelago country with various topographies(Muzani, Setiawan, Zid, Akmal, 2020).

The condition potentially can cause disasters with different characteristics, the handling of each disaster differs as well. For the purpose, the identification of natural disaster potency and characteristics definitely requires knowledge in disaster risk reduction at the national and environmental level. The understanding of dynamics on Earth's surface (nature and human beings) totally form a specific system. A natural disaster in a region has direct implication to the society who live in the region. It is particularly important to have public participation. If natural disaster risks want to be
Societies as the main object when the natural disasters occur should have capabilities to know the existing vulnerabilities. They can become the main subject in disaster risk reduction efforts, and therefore, they can minimize losses. It can be realized if they have disaster risk reduction planning and knowledge as well as understanding about what they should carry out before the disasters, during emergency response and after the disasters occur. It is important to improve their understanding and resilience to the disasters, and they have to be educated particularly children at the early age. They remain not know what things they have to take when the unpredicted natural disasters occur. Society is an element that has direct experiences in disaster occurrence, and therefore, the understanding becomes capital for disaster risk reduction (Zein, 2010). In the context of natural disaster management, public response to disaster is definitely important to be understood. The response is the beginning of an adaptation strategy that public carries out through their understanding on the existing natural disasters. Public understanding is knowledge of the actualized perception in attitude and/or action when they encounter disasters. The results of public attitudes and/or actions in encountering the disasters are adaptation strategy meant as adaptation has been conducted as the effect of the environmental threat (Hardoyo, Marfai, Ni’mah, Mukti, Zahro, & Halim, 2011).

There are many volcanic mountains throughout Indonesian territory shown in Figure 2. It has a long of empiric experiences on natural disasters with many casualties. From the experiences, local people generally have local knowledge and wisdom to predicting and carrying out the local disaster mitigation in each region. The local knowledge they get comes from their experience after they interact with the environment. For example, people who reside on the slopes of Merapi Mountain in Central Java have capabilities to predict the possibilities of eruption. Moreover, they have strong spiritual belief. They usually read natural signs through animal behaviors. For example, they observe animals which go down from the summit of mountain or out of the forest, unusual sounds from birds or other animals, or dried and withered trees around the crater.
Therefore, it can be realized that people should have the understanding of natural disaster. It requires concrete efforts if we want to understand and anticipate the natural conditions integratedly. It can be realized through efforts of reducing the community-based disaster risks. Education becomes effective way to reduce natural risks if we enter the subject matter on natural disaster as the compulsory subject matter for each learner in all levels of education particularly schools located in the disaster risk regions. It is expected that the students can accept and understand the local wisdom-based curriculum.

2. Method

Mitigation is an effort to minimize the risks occurring due to natural or social disasters. An important part of disaster mitigation is the education sector. Disaster mitigation carried out in the education level at school includes education activities on disaster and conducting simulation with ongoing basis. This paper aims to study education-based disaster mitigation in Indonesia. The methodology of writing this paper used the literature study method sourced from books, scientific journals, scientific papers, disaster resilient education modules, disaster curriculum development. Constitution Republic Indonesia number 24 in 2007 about disaster management, natural disaster curriculum, local wisdom, decree of minister of domestic affairs number 131 in 2003 about disaster management guidelines refugee handling in regions as well as relevant articles needed for this study. Research data were taken from agencies and institutions related to disasters involving National Disaster Management Agency, Indonesian Institute of Sciences, and others. After the data was collected, it was analyzed to find out the real problems regarding disaster in Indonesia. Analysis was conducted using descriptive analysis method to describe the facts followed by analysis and provide sufficient understanding and explanation. This research illustrates the urgency of disaster education in Indonesia.

3. Results and Discussion
Disaster is an event or a series of events threatening and disturbing public life and livelihood due to natural and/or non-natural factors as well as human factors causing human victims, environmental destruction, material losses and psychological impacts (ConstitutionRepublic Indonesia number 24 in 2007).

The definition of this natural disaster indicates that the level of natural impact risks depends on vulnerabilities of each component that have impact. Hyogo Framework for Action 2005-2015 states that the disaster risks will rise with physical, social, economic and environmental vulnerabilities. Scholars previously have stated three core systems incurring disaster losses consisting of the physical, socio-demographic and built environment (Mileti & Gottschlich, 2001).

The characteristics of these systems determine the degree or the level of natural disaster losses. Hyogo Framework for Action 2005-2015 reveals that disaster losses will become larger and larger in relation to vulnerability causes involving demographic, socio-economic and technological changes, the development in high hazard zones, environmental degradation, climate change, geological hazards, resource scarcity, and epidemic impacts. The disasters are categorized into three types: (1) Natural disaster is a disaster with the causes of a natural event or a series of natural events including earthquake, tsunami, volcanic mountain, flood, drought, hurricane and landslide; (2) Non-natural disaster is a disaster with the causes of a non-natural event or a series of natural events such as failed technology, failed modernization, epidemics, and disease outbreaks; (3) Social disaster is a disaster with the causes of a human-made event or a series of human-made events covering social, inter-group or inter-community conflicts and terrors (Mileti & Gottschlich, 2001).

Disaster management is a series of activities covering the development of policy decisions having disaster risks, disaster prevention, emergency response and rehabilitation. It aims to: (1) provide protection to the community from disaster threat, (2) harmonize existing laws and regulations, (3) ensure the implementation of disaster management in a planned, integrated, coordinated and comprehensive manner, (4) respect local culture, (5) build public and private participation and partnerships, (6) encourage the spirit of mutual cooperation, solidarity, and generosity, and (7) create peace in the life of society, nation and state.

There are four phases of the disaster management, i.e. prevention/mitigation, preparation, response and recovery shown in Figure 3. Firstly, prevention/mitigation is a series of efforts to prevent and reduce disaster risks both through physical development and awareness raising and capacity building to encounter disaster threats. Efforts are made to prevent disasters (if possible, by eliminating hazards) such as banning forest burning for cultivation and rock mining in steep areas. Secondly, preparation is a series of activities carried out to anticipate disasters through organizing activities and appropriate and efficient steps. For example, these include preparation of communication facilities, command posts, evacuation sites, contingency plans, and dissemination of disaster management laws and regulations/guidelines. Thirdly, the response is a series of activities carried out immediately at the time of a disaster event to deal with the adverse effects including rescue and evacuation of victims, property, the fulfillment of basic needs, protection, refugee management, rescue, and the restoration of infrastructure and facilities. Fourthly, recovery is the process of emergency recovery in relation to the conditions of disaster affected people. Infrastructure and facilities will function again in the original condition. Efforts are being made to improve basic infrastructure and services involving roads, electricity, clean water, markets, community health centers and others (Mileti & Gottschlich, 2001).
Disaster mitigation includes activities functioning as action of disaster reduction impact, or efforts made to victim reduction when a disaster occurs whether it is fatalities and property. When carrying out the disaster mitigation actions, the initial step taken is to conduct a disaster risk assessment in the area. Moreover, when calculating the disaster risk in the area, the danger (hazard), vulnerability and capacity of the area must be recognized based on the characteristics of physical and region conditions. The disaster mitigation becomes the duty of various parties, governments, experts and the community (Decree of minister of domestic affairs number 131 in 2003). On the other hand, the recognition and understanding of natural disasters, their processes, and assessments become the duties of experts. Knowledge, understanding and preparedness have to be disseminated to public so that they can anticipate, overcome and minimize the losses.

The disaster mitigation activities should be routine and sustainable, or it is usually called sustainable disaster mitigation. These should have been carried out in a long period of time before a disaster frequently occurs sooner than the estimated time, and even it has a greater intensity than the previous estimation. Moreover, the government should also actively provide appropriate and continuous directions in dealing with disasters. In other words, it is able to adapt to the potential natural disaster risks.

In the context of disaster risk reduction, the disaster mitigation is also understood as an effort to increase community capacity in the disaster-prone areas and it will eliminate or reduce the threat consequences and the disaster level. The education is a determinant sector in the disaster risk reduction. Therefore, concrete efforts are needed. Since 2011, Ministry of National Education has begun implementing a disaster curriculum in the level of elementary to high schools. However, in practice it is not directly entered into the disaster specific subjects or curricula but is factually included in the subject matters on understanding and anticipating natural conditions integratedly (Karyono, 2010). One of its manifestations is through the efforts of community-based disaster risk reduction, and education as one effective means of reducing disaster risk including the subject matter on natural disasters as the compulsory lessons for every student at all levels, particularly in schools in the disaster risk areas.
Disaster education can be inserted in the subject matters of Natural Sciences, Social Sciences, Indonesian Language, Maths, Religion or the others. This disaster education has a general objective to provide overview and reference of disaster preparedness learning process. Teachers and school principals should receive education and training at first and therefore, they are able to apply the disaster preparedness education and skills. Through this education it is expected that students are able to think and act quickly, precisely, and accurately when encountering natural disasters. Empathy attitudes toward the disaster victims are also built, and therefore, they can help the others. However, the education provided in the schools does not include social disasters, such as riots and brawls. Therefore, it is only about natural disasters. The disaster education can be carried out in three ways. If the schools merely need knowledge, the teaching materials will be integrated into the subject matters. It can be included in the lessons having some links, such as geography and natural sciences. If it is deemed to include some trainings, these can be inserted into the local content and Life Skills Education. The implementation of education can also be extended to extracurricular activities.

The disaster learning has been carried out until now and it is only in relation to themes prepared into other subject matters. Therefore, the results are not optimal. As a country having a huge potential for disaster, Indonesia has to implement a disaster curriculum in educational institutions, and therefore, the students have the knowledge and vision about potential disasters in the country. The importance of the disaster curriculum is related to how the students can be directly involved in the disaster management. This effort should be carried out as earlier as possible, and it is through formal education from Elementary School to Higher Education. Particularly, it prepares the curriculum on the natural disaster concepts and its implementation, as well as on the structure and subject matter. It will foster the awareness of disaster preparedness. It is important to carry out from an early age so that children remember how to maintain their own minimum safety from the disaster impact. Moreover, it will be more effective if it is sustainably carried out through the school curriculum (Astuti& Sudaryono, 2010).

The natural disaster curriculum is important in the disaster-prone countries including Indonesia. Therefore, children at the early age have had disaster knowledge. The disaster curriculum is more effective because children easily remember the knowledge in the elementary and secondary school education curriculum if compared to practices (Burhanuddin, 2010). This is naturally what we need including people having understanding about natural disasters, particularly in the region with high earthquake disaster risks. Indonesia is prone to earthquake, tsunami and volcanic eruption disasters. The government has issued the map of tsunami and volcano prone areas, so that education about the issue is needed. Therefore, all Indonesian people could realize potential disasters in their respective regions and could immediately avoid them. If they understand the disaster knowledge deeply, the disaster risks can be reduced.

To have a meaningful disaster curriculum, the curriculum must be developed after it considers the right principles. There are some curriculum development principles including the principles of relevance, effectiveness and efficiency as well as flexibility. The principle of relevance is meant that a curriculum must be relevant to science and technology development. It is also relevant to the needs and characteristics of students and the society (Khaerudin, 2009). The principles of efficiency and effectiveness relate to the costs which will be used and the results which will be achieved when implementing the curriculum. A curriculum is said to
meet the principles of efficiency if the curriculum requires less time, energy, and costs when developing and implementing it. Therefore, the curriculum will be more efficient. However, the application should not neglect the principle of effectiveness. If the curriculum is efficient but not effective, it will be meaningless. The principle of effectiveness relates to whether the magnitude or number of curriculum objectives will be achieved or not. The more many educational goals can be achieved through the learning process (the curriculum implementation), the more effective is the curriculum.

The principle of flexibility is related to flexibility in the curriculum implementation stage. As the principle of flexibility is applied in the curriculum, it must be designed flexibly. Therefore, when implemented it is possible to make changes to meet the existing conditions. It is not predictable when the curriculum was designed. For the curriculum that meets the principle of flexibility, any changes/differences of the conditions do not impede the sustainability of the learning process. As making a little change to the media aspects, the learning can still take place, but it still leads to the achievement of the expected goals.

It is said that the curriculum is good if it is able to facilitate and stimulate students' potential competencies to be used to build their environment in the global era. A curriculum can make students creative and innovative; the students' potential selves and regions have added value. A curriculum is able to educate students to encounter the challenges of globalization and manage it in such a way, it becomes opportunity to get the most from the conditions. This means that a good curriculum must pay attention to at least three aspects involving the students' potential competency, local environmental and global environmental conditions (Khaerudin, 2009).

Besides developing the students' potential competencies, education should be able to educate them to be human beings who can take part in their society (Safitri, Umasih, Ibrahim, Sujarwo, Marini, Wahyudi, 2019; Safitri, Nuraini, Rihatno, Kaban, Marini, & Wahyudi, 2020; Safitri, Umasih, Yunaz, Marini, & Wahyudi, 2019; Safitri, Yunaz, Umasih, Marini, & Wahyudi, 2019; Safitri, Marini, & Wahyudi, 2020; Safitri, Budiaman, Rahmayanti, Marini, & Wahyudi, 2020). For this reason, each individual must have adequate knowledge about the ins and outs of the area of origin and surroundings, and therefore, they know very well about the history, needs, and characteristics of the region. If we associate it with disasters, each region has different characteristics. It also has different patterns and variety of natural disasters. The disaster curriculum must accommodate the existing local wisdom. Almost all regions of Indonesia are prone to disasters. It is necessary to provide appropriate education about dealing with and handling disasters. In the midst of technological limitations in the disaster mitigation, local wisdom can be an alternative in the disaster risk reduction efforts.

In the literature of disaster risk reduction, there are four basic arguments that support the importance of local wisdom. Firstly, the specific practices and strategies of indigenous people have been contained in the local wisdom and it has been proven very valuable in dealing with natural disasters. Therefore, other communities can transfer and adapt it when they encounter similar situations. Secondly, the integration of the local wisdom into the existing practices and policies will encourage the participation of the affected communities and empower the community members to take a leading role in all disaster risk reduction activities. Thirdly, the information contained in local wisdom can provide valuable information about the local context. Fourthly, the informal way of disseminating local knowledge provides a good
example for other educational efforts in disaster risk reduction. Each region has
diverse and different forms of local knowledge and wisdom. Despite the terms they
have used are different and the ways they have become traditional are not the same, it
is potential in building potential local wisdom disaster mitigation. The local wisdom
can be used as a way to anticipate disasters earlier. It is also a step that can be used as
the disaster anticipation. Despite without applying any formulas, or theories from
academia, nature has taught humans many things. Local wisdom is more effective
when it shapes our awareness about disaster than apparatus appeals (Surono, 2013).

Disaster education will be more pervasive if it is carried out through
community leaders. The legacy of local wisdom from the previous generation is
definitely wise if it will be passed to the next generation. The local wisdom is a
comprehensive lesson in detecting disasters in an area. After we have learned it, we
are more familiar with the disasters that frequently occur in the area where we live.
Therefore, the management of mitigation and preparedness dimension has access to
local wisdom, and it should be developed.

Local wisdom practices have been proven to have reduced natural disaster
impacts, such as in three islands in Sumatra (Simeulue, Nias and Siberut). With
different cultures, the three islands which in the past ten years had experienced the
earthquake and tsunami, have brought various local wisdom practices and these have
escaped from the attention of the international community concerning with disaster
risk reduction. The practices include traditional communication facilities, residential
building and planning methods, and related ritual ceremonies.

Simeulue people use the word *smong* for tsunami. The existence of the local
terms for tsunami proves that local people have some level of knowledge in relation
to natural phenomenon. When the 2004 tsunami, the casualties in Simeulue were
relatively small if compared to other regions totaling 44 people. Parents in Simeulue
already have known what they consider as a tsunami sign. If the sea recedes suddenly
and a lot of fish flounder on the coastline, a disaster will come. Moreover, the elders
will order the residents of Simeulue to flee to higher ground (Borokoa, 2010).

*Smong* is the local wisdom of Simeulue people in reading natural phenomenon
on a beach. It has saved many people from the tsunami disaster. Smong screams are
an early warning when there is a situation where the tide is low, and the community
must run to the hills. This is knowledge gained from ancestors learning from the
catastrophic events that have occurred for many decades ago. This smong has saved
the people of Simeulue Island despite it is geographically very close to the epicenter.
Smong for the people of Simeulue Island has been socialized from one generation to
another through folklore and legend among community leaders and this term becomes
inherent and entrenched in the hearts of the island community. With the knowledge of
the Simeulue people, many other coastal communities in Aceh are saved when the
tsunami strike (Wikantiyoso, R. 2010).

Exploration of local wisdom is definitely necessary. It provides understanding
and guidance in the scope of local traditions on how to live everyday life including
knowledge on the disaster characteristics and prohibitions to carrying out activities
that make environment destruction or ruin ecosystem balance. A culture of mitigation
through local wisdom has to be built as earlier as possible in every element of society.
It will create the empowered communities so as to minimize the disaster impact. In
this matter, the mitigation is not only built as an early warning system but also as a
culture in the community behavior. Effective steps include provisioning to the
community both through education at school and training for public in general.
Education at schools for students is definitely strategic to instill knowledge about
disaster from an early age and dissemination of local wisdom in the area. Schools are an effective means. At school, teachers' role towards students can encourage the cultural development of mitigation within the scope of school and family.

In relation to the curriculum of local wisdom-based disaster education, Indonesia needs a curriculum teaching local wisdom in a region and therefore, local people are getting resilient in facing disasters (Wikantiyoso, 2010). Community resilience in dealing with disasters gets a comprehensive understanding from the local wisdom in the region. Therefore, in the context of disaster risk reduction mitigation, the existence of a local wisdom-based curriculum will be able to explain about human relations with nature and culture. The community resilience to disasters is a community that has tolerance to the nature and understands the nature.

4. Conclusion

If being geologically, geomorphologically and geographically viewed, Indonesia is a disaster-prone country with geological and hydro-meteorological disasters. Identification of disaster characteristics and potential in Indonesia and its surrounding environment is required as knowledge of disaster risk reduction. Moreover, community participation to reduce and avoid disaster risks is important, and it can be carried out in a kind of community awareness and capacity building. The disaster curriculum is important on how students can be directly involved in disaster management. These efforts should be carried out from the early childhood education to tertiary institutions consisting of the curriculum preparation from the concepts and its implementation to curriculum based on the structure and subject matter. The disaster curriculum has to accommodate local wisdom. Almost all regions throughout Indonesia are disaster-prone regions. The curriculum will provide appropriate education about dealing with and handling disasters.

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References


[6] Constitution Republic Indonesia number 24 in 2007 about disaster management

[8] Decree of minister of domestic affairs number 131 in 2003 about disaster management guidelines refugee handling in regions


