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Development of Knowledge and Attitude Measurement Tools in Disaster Preparedness Schools

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Abstract—Indonesia is the largest archipelago country in the world located at the confluence of four tectonic plates. This condition makes Indonesia potentially and become vulnerable to natural hazard that have a significant impact and reach various sectors. One of the impacts of natural hazard that occurred in Indonesia is the education sector. This natural hazard has an impact on the physical building of schools and also hinders the process of teaching and learning, causing trauma, and even fatalities at school. The Indonesian Institute of Sciences (LIPI) through the Community Preparedness (COMPRESS) program inaugurated disaster preparedness education at the school community level. In 2008, LIPI began implementing disaster risk reduction by developing a model of disaster preparedness schools. Then LIPI published Guidelines for Implementing Disaster Preparedness Schools in 2013. This guide does not yet have a specific Knowledge and Attitude category and can be used as a reference. Therefore, the development of the Disaster Preparedness School Implementation Manual needs to be done. The development of this measuring instrument was analysed by compiling a comparison matrix using the AHP method so as to produce a new development system from the Knowledge and Attitude assessment category. This study produced 3 sub-categories of Knowledge and Attitude assessment, namely (1) Standard Operating Procedure (SOP) for Teaching and Learning Disasters with a weight of 33%, (2) Knowledge about Disasters and Disaster Management with a weight of 43%, and (3) Knowledge Access About Disasters and Disaster Management with a weighting of 24%. Such approach can be used in advancement of others variables of measuring tool for school preparedness.

Keywords—*disaster teaching and learning, knowledge and attitudes, disaster preparedness schools, natural hazard, disaster management*

INTRODUCTION

Indonesia is the largest archipelago country in the world located at the confluence of four tectonic plates. This condition makes Indonesia potentially and vulnerable to natural hazard that have a significant impact. During 2018 there were 4231 fatalities from natural disasters in Indonesia (Halim, 2018; BNPB, 2019). One of the biggest earthquakes in Indonesia occurred in the western waters of Aceh caused by the interaction of the Indo-Australian and Eurasian plates. The quake had a magnitude of 9.1 on the Richter scale which caused the death toll to reach 170,000. The incident is a reminder of the importance of knowledge about natural hazard, especially for the Indonesian population.

According to Act No.24 of 2007 concerning Disaster Management Article 26 (1b), "Everyone has the right to receive education, training, and skills in carrying out disaster management" (p.14). The Indonesian National Agency for Disaster Countermeasure (BNPB, 2019) reported the survey on the Great Hanshin Awaji earthquake in 1995, showed that survivors were caused by themselves by 35%, family members by 31.90%, friends or neighbours by 28.10%, people passing by 2.60%, SAR teams by 1.70%, and others 0.70%. Based on that survey, the most determining factor for one's safety when natural hazard occur is the mastery of the knowledge possessed by oneself. Therefore, the education sector is responsible for conducting the mandate in Act No.24 of 2007.

In the education sector, disasters affect schools, students, teachers and other school components. Data from the National Agency for Disaster Countermeasure (BNPB, 2019) shows that more than 130,000 school buildings in Indonesia are exposed to the threat of an earthquake. Act No.24 of 2007 concerning Disaster Management states, a disaster is an event or series of events that threaten and disrupt people's lives and livelihoods caused, both by natural factors and / or non-natural factors as well as human factors resulting in human casualties, environmental damage, property loss, and psychological impact. And natural disasters are disasters caused by events or a series of events caused by nature (BNPB, 2019) such as earthquakes (Sunarjo & Pribadi, 2012), tsunamis (Richard, 2018), volcano eruption (BNPB, 2019), floods, drought (Ministry of Energy and Mineral Resources, n.d.; Petra, 2020), hurricanes (Ministry of Health Crisis Center for Health, 2017; Pariaman, 2015), and landslides (Ministry of Energy and Mineral Resources, n.d.). Meanwhile according to the United Nations Secretariat for International Strategy for Disaster Reduction (UNISDR, 2017), disasters are "A serious disruption of the functioning of a community or a society at any scale due to hazardous events interacting with conditions of exposure, vulnerability and capacity, leading to one or more of the following: human, material, economic and environmental losses and impacts".

The implementation of disaster management in the pre-disaster phase is divided into two, namely (1) In the event of a disaster not occurring which includes disaster management planning, disaster risk reduction, prevention, integration in development planning, disaster risk analysis requirements, implementation and enforcement of spatial plans, education & training , and disaster management technical standard requirements, (2) In a situation there is a potential for a disaster to occur, including preparedness, early warning and disaster mitigation.

Knowledge and attitude become one of the important elements in disaster management in the pre-disaster stage. Knowledge is all information that has been known and integrated with understanding. Knowledge can come from scientific research and experience. Knowledge contains a number of facts, theories, and understandings as the basis for one's consideration in making decisions. Knowledge is divided into four types, namely: Implicit knowledge, explicit knowledge, empirical knowledge, and rationalism knowledge.

According to Purwanto and Notoatmodjo (1997), as cited in Wahyuningsih, (2013), attitude is an individual way to react or respond to a situation. Attitude is the response or reaction of someone who is still closed to an object or stimulus. Human attitude is divided into three aspects: Cognitive, Affective, and Psychomotor aspects.

As uncertainty are unavoidable in natural hazard, preparedness is become the key to reduce such disaster. Furthermore, preparedness is closed related with knowledge and attitude. Therefore, the provision of basic knowledge is vital for school preparedness. In order to assess school preparedness, the availability of an assessment instrument is a prerequisite as part of risk reduction strategy. In this context, an assessment instrument as a tool to measure knowledge and attitude of school's preparedness need to be available. In light of such idea, this paper intends to develop the assessment tools for school preparedness related to knowledge and attitude parameter.

METHOD

This research began by studying the phenomenon of human response during natural hazards. Followed by a review of theories, previous research relating to the first countermeasures when they occur or when natural disasters do not occur to humans and the environment as well as document of preparedness assessment tools developed by several parties. Figure 1 provides the work steps of this research.

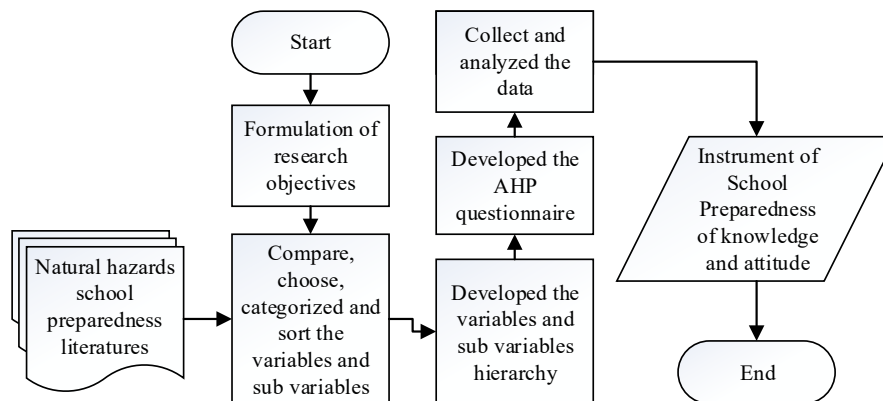


Figure 1. The Methodology of Development of School Preparedness Measurement

Five literatures are used to compile a measurement tool related to knowledge and attitudes parameters. Those are Guidebook for Implementing Disaster Preparedness Schools (UNISDR, 2010; Indonesian Disaster Education Consortium, 2011); Handbook of Disaster Preparedness Training; School Disaster Risk Management Guidelines for Southeast Asia (ASEAN, 2016); Multi-hazard Early Warning Systems (World Meteorological Organization, 2018); Global Survey of Early Warning Systems – a document from the Third International Conference on Early Warning; and Assessing School Safety from Disasters a Global Baseline Report (UNISDR, 2013; UNISDR, 2017).

Each literature has its own structure of categories as well as the name of variables or indicators. By comparing, choosing and categorizing as well as sorting the variables and as sub-variables, a new structure of measuring instrument for school preparedness is compiled. However, in order to understand which category are more important among others, as well as the indicator and sub-indicators, the index weighting must be established. This research used the Analytical Hierarchy Process (AHP) as the method to weight each categories, as well indicators and sub-indicators.

RESULT AND DISCUSSION

The Process of Making a Measuring Instrument

Three categories are arranged in relation to the development of the assessment of the knowledge and attitude: standard operating procedure for teaching and learning disasters; knowledge about disasters and disaster management; and access to knowledge about disasters and disaster management. These three categories comprise of eight indicators and fifteen sub-indicators. Table 1 shows the detail structure of this assessment tool.

Table 1. Structure of Knowledge and Attitude School Preparedness Assessment Tools

Category	No.	Indicator	No.	Sub Indicator
A. Standard Operating Procedures (SOP)	1	Availability of Disaster teaching material SOP	1	Does the school have a specific SOP on how to teach disaster material
			a	Yes
			b	No
	2	Teacher's understanding the SOP	2	Are socialization and training for teachers of Standard Operating Procedure (SOP) teaching disaster materials available?
			a	Yes, socialization and training are conducted
			b	Only socialization is conducted
	3	Implementation of disaster SOP	3	Does the teaching staff apply SOP teaching disaster material
			a	Yes
			b	No
B. Knowledge of disasters and disaster management	1	Non-physical	4	Which of the following events caused a disaster? (May select more than one)
			a	Earthquake
			b	Flooding
			c	Mount erupted
			d	Landslides
			e	Drought
	f	Tsunami		
	2	Physical	5	Are students provided with material and simulations about disaster and its mitigation
			a	Yes. Equipped and simulated every semester
			b	Yes. Equipped and simulated once a year
			c	Yes. Equipped but never simulated
			d	No
e			Are students provided with knowledge about the history of disasters in locations around the school	
f	Yes			
g	No			
3	Physical	7	Are there school activities for students to observe the hazards, vulnerabilities, capacities and risks that exist in the school environment	
		a	Yes, less than once a year	
		b	Yes, it is held once a year	
		c	Yes, it is held once a semester	
		d	Nothing	
		e	Does the school regularly test the quality of building structures	
f	Yes, less than once a year			
g	Yes, held once a year			
h	Yes, it is held once a semester			
i	Never			
9	Does the school identify facilities that can be used to save themselves			
a	Yes			
b	No			

Table 1 (Continued)

Category	No.	Indicator	No.	Sub Indicator
C. Access to Knowledge about disasters and disaster management	2	Media for delivering disaster knowledge	10	What media are used by schools to convey knowledge about disasters
			a	Wall Magazine
			b	Local content
			c	Electronic Mail (E-Mail)
			d	Social Media
			11	Is there a syllabus document, Learning Implementation Plan (RPP) that integrates preparedness material into relevant subjects
	a	Yes		
	b	No		
	12	Are there syllabus documents, lesson plans in preparedness (extracurricular) subjects		
	a	Yes		
	b	No		
	C. Access to Knowledge about disasters and disaster management	2	Reach of knowledge and information	13
a				100% of the number of students get information and knowledge about disasters
b				75% of students get information and knowledge about disasters
c				50% of the number of students get information and knowledge about disasters
d				25% of the number of students get information and knowledge about disasters
e				Nobody gets information and knowledge about disasters
3		Information Material	14	Is there a map of potential disasters in schools
			a	Yes. Updated every semester
			b	Yes. Updated every year
			c	Yes. Never updated
			d	Nothing
			15	Are information available about the history of disasters in schools
a	Yes, the history of the disasters of the past 10 years			
b	Yes, the history of the disasters of the past 5 years			
c	Yes, the history of the disaster in the past year			
d	Nothing			

In order to complete the assessment tool, scoring system must be established. This scoring system related to the importance of every categories, indicators as well as the sub indicators. The relative important represent in weighting score, therefore this research work utilizing AHP to determine the weight. Five respondents which they are experts in disaster management from the National Search and Relief Agency are chosen. Table 2 shows the AHP questionnaire and Table 3 shows the result of comparison matrix.

Table 2. Sample of AHP Questionnaires

A.1. Availability of Disaster teaching material SOP	Scale														A.2. Teacher's understanding the SOP			
	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	
A.1. Availability of Disaster teaching material SOP	Scale														A.3. Implementation of Disaster SOP			
	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	
A.2. Teacher's understanding the SOP	Scale														A.3. Implementation of Disaster SOP			
	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	

Table 3. The Result Comparison Matrix from Five Respondents

# Respondent	A1-A2	A1-A3	A2-A1	A2-A3	A3-A1	A3-A2
1	7.00	0.20	0.14	0.14	5.00	7.00
2	7.00	1.00	0.14	1.00	1.00	1.00
3	5.00	5.00	0.20	1.00	0.20	1.00
4	3.00	0.25	0.33	0.25	4.00	4.00
5	0.50	0.50	2.00	0.50	2.00	2.00

The results of index weighting for each category, indicators as well as the sub-indicator provide in Table 4. Based on the categories results, the knowledge of disaster and disaster management categories was chosen as the most important category compare to the other two. This is not the surprising results since knowledge contributed to the action or attitude toward school preparedness, or in other words or in other words action is followed by the knowledge.

Table 4. The Weighting Results for Developing Knowledge and Attitude Measurement Tools

Knowledge and Attitude Category		Percentage (%)
A	Standard Operating Procedures (SOP) of Teaching and Learning Disaster	33
B	Knowledge of Disasters and Disaster Management	43
C	Access to Knowledge about Disasters and Disaster Management	24
A. Standard Operating Procedures Indicator		Percentage (%)
A1	Availability of Disaster teaching material SOP	39
A1	Teacher's understanding the SOP	16
A1	Implementation of disaster SOP	45
B. Knowledge of Disasters and Disaster Management Indicator		Percentage (%)
B1	Non-physical	45
B2	Physical	55
C. Indicators of Access to Knowledge about Disasters and Disaster Management Indicator		Percentage (%)
C1	Media for Disaster Knowledge Delivery	20
C2	Reach of Knowledge and Information	45
C3	Material Knowledge and Information	35

Table 4. (Continued)

B1. Non-physical Sub-indicators		Percentage (%)
B11	Cause of Disaster	38
B12	Equipped with Disaster Management Materials and Simulation	49
B13	Equipped with Disaster History Knowledge in the School	13
B2. Physical Sub-indicator		Percentage (%)
B21	Observing Dangers, Risks, Vulnerabilities and Capacity in the School Environment	51
B22	Testing the Quality of School Structure	24
B23	Identifying Facilities That Can Be Used to Save Yourself	25
C1. Media of Disaster Knowledge Delivery Sub-indicators		Percentage (%)
C11	Media Used by Schools in Conveying Disaster Knowledge	19
C12	Integration with Subjects	45
C13	Extracurricular Preparedness	36
C3. Disaster Knowledge and Information Sub-indicator		Percentage (%)
C31	Availability of Disaster Potential Maps	76
C32	Availability of Calendar of Disasters Occurring History	24

DISCUSSION

Developing Knowledge and Attitude Measurement Tools

The literature in this research is based on the “Guidelines for Implementing Disaster Preparedness Schools” published by the Indonesian Institute of Sciences (LIPI) in 2013. The LIPI’s guidelines assess two aspects, the structure and non-structure preparedness of schools. The structure aspect concern with the building and infrastructure and school environment, while the non-structure related to five different variables or indicators, those are: policy, emergency planning, warning system, mobilizing resource capacity as well as knowledge and attitude. Focusing to Knowledge and attitude indicator, the guidelines just mention about history, definition, type and cause of natural hazards, type of disaster following the earthquake event, characteristics of strong earthquake, action needed if earthquake happen while attend the school, and source of natural hazard information and knowledge, natural hazard lesson, as well as tsunami notification. By compiling from other literatures on disaster preparedness, this measuring tools for knowledge and attitude is structured into categories, indicator and sub-indicators. Therefore, this measuring tools for knowledge and attitude school preparedness is more advanced. Detail about each category of this measuring tools are described below:

Standard Operating Procedures (SOP) of Disasters Teaching and Learning

Standard Operating Procedures (SOP) of disasters teaching and learning was issued by the Ministry of Education and Culture as an educational effort to prevent and reduce disaster risk for teachers and education personnel in schools. The understanding of teaching staff and education staff towards SOP is an important component in creating a safe school for students and teachers. And through correct understanding, teaching staff can make the right decisions at the steps of implementing Disaster Learning Teaching and Learning at school.

Knowledge of Disasters and Disaster Management

Knowledge about disaster and disaster management is measured by non-physical indicators and physical indicators. Based on Act No.24 of 2007, identification of the causes of disasters includes natural events that can cause disasters and characteristics of the potential hazard. Followed by analysing the characteristics of potential natural hazards (intensity, frequency and opportunity) and evaluating historical data. In the book of Participatory School Disaster Management Toolkit states that schools are responsible for assessing school risks, hazards, vulnerabilities and capacities.

The school personnel receive training on disaster management including skills in building and evacuation areas, search & rescue of victims in the event of a disaster, and evacuation as the first act of evacuation for disaster management. Schools need a Disaster Management System which must be reviewed and updated periodically and continuously. During post disaster, plans for the continuation of teaching and learning process also need to be provided as a next step in disaster management for all school personnel, both teaching staff, education staff, and students of the school. The continuation of the post-disaster teaching and learning process is part of the emergency response actions in the category of Emergency Response Plans.

The book of participatory school disaster management toolkit states that schools are responsible for observing hazards, risks, vulnerabilities and capacities in the school environment. This relates to the analysis of the characteristics of potential natural hazards. Schools are also required to take care of the quality of school buildings and land by means of conducting periodic quality tests of building structures. The test results are used to assess the physical care or maintenance of the school buildings.

Meanwhile in the book of emergency and disaster preparedness school said the importance of identifying school facilities that can be used or used as a saviour of self and shelter. The school identifies related facilities that can be used to save themselves. This relates to the priority of planning the care and physical maintenance of the school building facilities.

Access to Knowledge about Disasters and Disaster Management

Access to knowledge about disasters and disaster management is measured by media indicators of the delivery of disaster knowledge, the range of knowledge and information, as well as material knowledge and information.

The book of Indonesian tsunami early warning system states that the structure and content of school curricula are required to contain knowledge about disasters and disaster management as outlined in the syllabus and learning achievement plan which integrates preparedness material into relevant subjects. The implementation is part of extracurricular activities that can be used to reduce the risk of disasters for all school personnel. This extracurricular activity is intended so that students can develop their personality, talents, and abilities in the field of disaster management by referring to the book of disaster preparedness framework school and Indonesian disaster education consortium.

On the 1945 Constitution of The Republic of Indonesia No.31 paragraph (1), stated that every citizen has the right to receive proper education as regulated in the 1945 Constitution, including knowledge about disasters.

Information access in the form of communication and dissemination of warnings covers the entire population. The communication system and its distribution system is adjusted to the needs of every community

In the disaster preparedness school framework book, the Indonesian Disaster Education Consortium is also intended to educate teachers to teach about disasters through maps of potential natural disasters by giving striking signs to high risk zones.

Meanwhile Head of National Disaster Management Agency Regulation No. 4 of 2008 (Maarif, 2018) changing world outlines the guidelines for implementing disaster-safe schools/madrasas and knowledge of the history of disasters that occur in schools or their regions.

CONCLUSION

Advancement of measurement tools for knowledge and attitude of school preparedness has achieved. The measurement tools have structured into categories, indicators and sub-indicators as well as the weighting index. Those categories are: 1) standard operating procedure (SOP) (33%), 2) knowledge of disasters and disaster management with (43%), and 3) access to knowledge about disasters and disaster management (24%). This approach can be duplicated for advancement the other aspect of school preparedness.

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REFERENCES

- Act No.24 of 2007. (2007). About Disaster Management. Jakarta: Government of the Republic of Indonesia.
- ASEAN. (2016). School Disaster Risk Management Guidelines for Southeast Asia. Available: <http://www.rcrc-resilience-southeastasia.org/wp-content/uploads/2016/11/Full-SDRM-Guidelines.pdf-27-May-2016.pdf>. Association of Southeast Asian Nations
- BNPB. (2019). Definition and Types of Disasters. Badan Penanggulangan Bencana (BNPB). Available: <https://www.bnpb.go.id/home/definisi>
- Halim, D. (2018). Disasters Decrease but Victims Increase to 1,072 Percent. Available: www.nasional.kompas.com: <https://nasional.kompas.com/read/2018/12/19/17524741/bnpb-2018-jumlahbencana-turun-tetapi-korban-meningkat-hingga-1072-persen>
- Indonesian Disaster Education Consortium. (2011). Disaster Preparedness School Framework. Perkumpulan Lingkar.
- Maarif, S. (2008). National Disaster Management Agency Regulation No. 4 of 2008.
- Ministry of Energy and Mineral Resources. (n.d.). Introduction to Land Movement. Available: www.esdm.go.id: https://www.esdm.go.id/assets/media/content/Pengenalan_Gerakan_Tanah.pdf
- Ministry of Health Crisis Center for Health. (2017). Causes of Hurricane. Available: [www.pusatkrisis.kemkes.go.id](http://pusatkrisis.kemkes.go.id): <http://pusatkrisis.kemkes.go.id/penyebab-terjadinya-angin-topan#>

- Petra, T. (2020). GEOG 30N: Environment and Society in a Changing World. PennState College of Earth and Mineral Sciences. The Pennsylvania State University. Available: www.e-education.psu.edu/geog30/node/378
- Richard, T. (2018). These are the 5 most common causes of tsunami. Available: <http://jabar.tribunnews.com/2018/09/28/ini-5-penyebab-tsunami-nomor-1-yang-paling-umum?page=3>.
- Sunarjo, G. & Pribadi, S. (2012) "The Popular Edition Earthquake", Jakarta: Climatology and Geophysics Meteorological Agency, 2012.
- UNISDR. (2010). School Emergency and Disaster Preparedness: Guidance for Schools. UNISDR Asia and The Pacific.
- UNISDR. (2013). Assessing School Safety from Disasters A global Baseline Reports. ISDR Thematic Platform for Knowledge and Education 2012. United Nation International Strategy for Disaster Risk Reduction.
- UNISDR. (2017). Available: United Nations Office of Disaster Risk Reduction: www.unisdr.org. United Nations Secretariat for International Strategy for Disaster Reduction
- Wahyuningsih, T. (2013). "The Influence of Public Knowledge and Attitudes Towards Preparedness in Facing a Flood Disaster in Joyotakan Sub-District, Serengan District, Surakarta City, Thesis Universitas Muhamadiyah Surakarta.
- World Meteorological Organization. (2018). Multi-hazard Early Warning Systems. *Outcome of the first Multi-hazard Early Warning Conference 2017*. Cancún Mexico.