

The effect of different disaster education programs on tsunami preparedness among schoolchildren in Aceh, Indonesia

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After 2004 tsunami efforts have been made to build school disaster resilience yet study of its effectiveness is limited. This study examines the effect of different disaster education programs on school children's knowledge, risk perception, awareness and preparedness behaviour. Data gathered from 169 school children (Group 1=98 and Groups 2=71) in 3 elementary schools in Aceh. Using the MANOVA analysis revealed that there was significant difference of knowledge, risk perception, individual preparedness and school preparedness but not for critical awareness among school children. This study provides evidence that the curriculum-based disaster education program was effective.

Keywords: *school, tsunami, preparedness, curriculum, Aceh Indonesia*

1. Introduction

The 2004 December tsunami triggered by earthquake measuring 9.0 on Richter scale in northern Sumatra Island had severely impacted on social, economic and people's livelihood. Among countries situated along Indian Ocean affected by tsunami, Aceh was the worst areas leaving 123,000 people killed, 113,000 people missing and 406,000 people displaced¹⁶⁾. The higher people killed was believed because of the absence of early warning system and people's lack of preparedness⁷⁾. People especially in Banda Aceh did not have experiences about tsunami compare to Simeleu Island where only 44 people killed because people in Simeleu hold the traditional story from their ancient about tsunami³⁾.

Governments, local, national and international institutions and non-government organizations paid attention to educate people to be more aware of disaster and become prepare when disasters occurs. As children are one of the vulnerable groups to the disasters, governments had made efforts by introducing school based disaster education including incorporating disaster risk reduction into school curriculum. The introduction of the curriculum-based disaster education in the school was expected that school become more aware about natural disaster²⁾.

In 2009, the government started developing a pilot project of the integration of disaster education into curricula in school called in Indonesian language as *Sekolah Siaga Bencana* (SSB) or School-based Disaster Preparedness Program (SDPP). The SDPP was focused on developing of structure, infrastructure and school systems. The structural and infrastructural include development of building school, while school systems cover enhancing the knowledge, skills, modules, school early warning system, school emergency planning, and school's resources mobilization capacity during disaster⁷⁾.

While only a limited school has such opportunities, some non-government organizations (NGO) tried to develop school disaster education in different school not covered by SDPP. Supported by an international funding called DRR-A, in 2011, The Tsunami Disaster Management Research Centre (TDMRC) started to replicate the SDPP model in different schools in Aceh. Instead of applying curriculum-based disaster education, TDMRC started the project by training about disaster course to the teachers and schoolchildren independently from the school subjects and school time.

Although different approaches applied in educating disaster in school, both programs have the same objectives: building knowledge, awareness, and skills in supporting school to be able prepare for and respond to and recover from disaster^{7, 28)}. Therefore it is important to evaluate the effectiveness of both programs in increasing school's knowledge, awareness, risk perception, and preparedness on tsunami disaster. Studies on the school-based disaster preparedness program have been limited especially in Indonesia. This study examines the effectiveness of curriculum-based disaster education and non-curriculum-based school on

students' knowledge, risk perception, awareness and preparedness behaviour. Different approaches of disaster's education in school will be also discussed.

2. The important roles of school in disaster risk reduction

Disasters do not discriminate race, gender, age, and places²⁾. Even it often affects vulnerable groups such as children, elderly people, women and poor people. Especially children, they are the most vulnerable community members to disaster as they have limited capacity and resources to cope with the disaster. There has been widely acknowledged that the effective disaster education should be begun at the level of individual, family, school, and community²⁰⁾.

As the school plays a critical role in contributing to the disaster awareness in community, efforts have been made focusing on how to build school disaster resilience²⁷⁾. School has several functions in disaster risk reduction including facilitating and cooperating with neighbourhoods, improving community's capacity, centre for evacuation shelter when disaster occurs, and providing model of earthquake proof school building to the community^{23, 24, 13)}. Learning from Japan case, about 60% evacuation shelter is school buildings among public facilities, government office building, fire department office buildings and police office buildings²⁷⁾. In terms of public awareness, school can act as an agent in the community who responsible to disseminate disaster information to school children's family and community members^{1, 29)}.

The common approach used to build school disaster resilience is often by incorporating disaster course into school curriculum. The definition of curriculum refers "to education as a platform for a culture of safety"²⁷⁾. After Kobe earthquake in 1995, for example, teachers and local government developed disaster management into subjects such as geography, history, science, health and physical education, environment^{21, 23)}. Other approaches include gaming simulation, workshop, map-making, disaster drilling, quiz and drawing competition^{2, 25)}.

Mainstreaming disaster risk reduction is expected to enhance school community members' knowledge, level of awareness and risk perception, and readiness in responding the future disasters. Hazard awareness is one of the important factors that can influence people in preparing on disaster events¹⁴⁾. Paton et al.,¹⁴⁾ concluded that critical awareness determined people's preparedness in the case earthquake and bushfire hazards. In addition, a positive correlation between public awareness and disaster preparedness was proposed by the University of Colorado Natural Hazards Center¹¹⁾.

How people perceive to risk is often regarded as an important predictor of people decision to take preparation from natural hazard. Risk perception refers the likelihood that hazard would be happened and the severity the impact to him/her^{11, 18, 19)}. While, the higher level of risk perception can motivate people to take action for preparedness, in contrary a low perception decrease to adopt preparedness adjustment on disaster. Johnston et. al.,⁶⁾ identified the important roles of risk perception and level of hazard's knowledge in influencing people to take preparation of disaster events. The result of study carried out by Shaw²²⁾ showed that a school education on disaster contributes to develop the knowledge and perception of earthquake disaster but limited for earthquake preparedness.

Research studying disasters in developing countries found that people perceive hazard based on cultures and religious beliefs instead of modern science¹⁰⁾. The perception that disasters were caused god's punishment due to the human sins still remains exist in Indonesia^{17, 10)}. As Aceh is a special province in Indonesia applied Islamic rules, the knowledge of tsunami will be valuable to investigate the student's perception of tsunami disaster.

Some experts have suggested that the objectives of public education including in school is not only limited to improve the knowledge, increase risk perception and awareness but it should also address the preparedness behaviour¹⁷⁾. Murata et.al.¹²⁾ concern about the importance of the process of translating knowledge into action by giving community education both in school and community so they will be preparing in encountering tsunami.

The works of GeoHazard International⁴⁾, Sugimoto et.al.,²⁶⁾, ICHARM-UNESCO⁵⁾, and Murata et.al.,¹²⁾ provide guidelines how to assess the hazard preparedness. Murata et. al.,¹²⁾ advises to reduce the impact of tsunami community should create a "disaster culture" through learning (equipping specific knowledge about tsunami), drilling (practising regularly to avoid losing the knowledge) and exercising (confirm mastery by actual exercise). GeoHazard International⁴⁾ recommends that making tsunami hazard and evacuation maps are the best way to begin preparedness efforts.

Sugimoto et., al.,²⁶⁾ states that building the unique device of tsunami height poles may bring people remember the impact of the tsunami over a longer period of time. In addition, regularly practice and

recognise evacuation route is very useful for people when tsunami occurs^{4, 5,12, 26)} as during the disaster, panic situation is often happened. Becoming familiar with the evacuation route will help people in finding safer place when tsunami disaster strikes. Therefore visiting or practicing tsunami evacuation route is one of important behaviour in tsunami preparedness. Another level of preparedness students can be also seen from the frequency of the visits of tsunami museum, stranded vessel and grave yard as assigned by the government as tsunami disaster educational facilities and emergency facilities^{1,5)}. As the participants of this study are mainly schoolchildren, individual preparedness is emphasized school children's activities related to disaster facilities and memorial, instead of "real" preparation should be done by adults.

In sum, the past research has evaluated the importance factors associated with people disaster preparedness such as knowledge, risk perception, and critical awareness. Theoretical and practical perspective highlighted that the disaster education program in school not only address school children's knowledge, critical awareness and risk perception but also their change in preparedness behaviour.

3. The development of school-based disaster preparedness program in Indonesia

Soon after devastating tsunami 2004, the Indonesia government had been forced to adopt disaster curricula into school. Due to the complexity of educational bureaucracy, the discussion of disaster risk reduction into school was raising debate whether disaster risk education should be established a new specialised subject of disaster or incorporated into existing school course/subjects. These different methods have an advantage and disadvantage. Establishing a new subject of disaster theme into curriculum would create difficulties and take long time to implement it because it related to the need of change the regulation, developing curriculum covering national and adopting local characteristic into disaster subject.

After enacting Law on Disaster Management No. 24/2007, the government developed disaster curricula by implementing pilot project in some schools both for primary, secondary and junior schools. In 2009, the Centre of Curriculum Development, Ministry of Education launched the modules of teaching on mainstreaming the disaster risk reduction based on the type of disaster such as earthquake, tsunami, fire, landslide and flood¹⁵⁾.

At the same time Indonesia Institute of Science (LIPI) developed a pilot project for school-based disaster education called *Sekolah Siaga Bencana* (SSB) or literally meant School-based Disaster Preparedness Program (SDPP). The SDPP supported by UNESCO had been successful implemented in different places in Indonesia^{7, 9, 28)}. The basic program of the SSB was the developing disaster curricula through different activities including training of trainers for teachers, workshop, development of modules, training for school community, equipping with the experiment of activities related to disaster subject. Other activities were installing signs and messages about disaster education, distributing materials related to disaster information and assessment of earthquake-resistance school building^{7,28)}.

The policy of mainstreaming disaster education into school was notably marked by the issuance of Circular Letter of Minister Education (Kemendiknas) No. 70a/MPN/SE/2010 on Mainstreaming Disaster into School by the Ministry of Education²⁷⁾. This policy implies that the local governments should adopt and develop the school-based disaster education program based on local needs and characteristics yet should be based on the general guidelines of the central government policies on disaster management.

In 2009, the pilot projects of SSB were started to implement in Aceh supported by LIPI, UNESCO and TDMRC⁹⁾. There were one primary school, secondary school and junior high school in Banda Aceh city. Disaster themes were integrated into mainly the subject of Religion, Indonesians Language, Social Science, Science and local content. The modules were developed by local stakeholders such as City Education Office, teachers, TDMRC based on the national guideline for disaster curriculum.

Disaster course basically was given to all grades. In one subject taught in one semester, there is at least more than 3 times (2 hours) discussing the disaster themes. In cases of natural and social science, the disaster issues were discussed in more depth and details. Initially, teachers were given training how to develop and teach the disaster theme to the school children. They were also encouraged to develop different method to teach students such as developing simple experiment related to subject and other forms such as extracurricular activities and conducting public lectures inviting resources person from outside school. School also should develop the school's guideline of disaster management, emergency plan, installing emergency sign, public education display, and disaster drill.

Although the Circular letter of Ministry of Education encourages the local governments to adopt the school-based disaster education, however in Aceh such policy has been yet officially implemented widely to all schools. Having experiences of developing SSB, supported by international funding called DRR-A, in

2011, the TDMRC started to replicate the SSB model in the 28 schools in different places in Aceh. Instead of applying curriculum-based disaster education, it started the project by training about disaster issues directly to the teachers and schoolchildren independently from the school subjects and school time. Although at the end, the project would implement school curriculum-based disaster education, the program was taught more interactive and using various methods such as role playing, discussion and other methods. Every month TDMRC involves local government, Red Cross organization conduct the different activities in school as scheduled. Although there were similar activities related to disaster education conducted in schools, the different way in incorporating officially curriculum-based disaster theme and time of the implementation are significantly different.

In brief, the differences method in the school with curriculum-based disaster education and school non-curriculum are, in school with curriculum: (1) facilitated and funded by central and local government while in non-curriculum by NGO, (2) disaster issues has been integrated into school courses (language, social science, science, religion, etc) while in non-curriculum has not, (3) disaster topic taught by teachers responsible for each subject while in non-curriculum taught by staff of NGO.

Given such differences we hypothesised that school adopted curriculum-based disaster education is more effective compare to school adopted non-curriculum in terms of knowledge, awareness, risk perception, and preparedness for tsunami disaster both institutionally and individually. The effect of disaster education not only influence on knowledge, critical awareness, and risk perception but also on preparedness behaviour.

4. Method and measures

A questionnaire survey was distributed among schoolchildren in three schools in Banda Aceh (25- 26 November 2011) and Aceh Jaya district (27 – 28 November 2011). The school A which adopted disaster theme into school curriculum (n=98) was grouped into School Group 1 and school B and C were grouped into non-curriculum-based disaster education (n=71) or School Group 2. In-depth interview was done to discuss aspects related the implementation of disaster risk reduction's curriculum with teachers, local government officers, and non-government organizations.

The distribution of questionnaires was conducted by researcher with the assistance of teachers, staff of local government officers and NGOs. Teachers and local staffs were briefed and supplemented the "explanation of questionnaires" to ensure the students correctly filling out questionnaires. Initially 110 set of questionnaires were distributed and 110 were returned (100%) in School 1 but only 98 (89%) were analysed due to incomplete responses, while School 2, out of 80 questionnaires 75 were returned (93%) yet only 71 (88%) included in the analysis due to incomplete answers.

Questionnaire was divided into three parts: demographic characteristic, experiencing with 2004 tsunami, and school children's knowledge, risk perception, critical awareness, individual's tsunami and school tsunami preparedness. Knowledge about tsunami was derived from the two questions such as "what is the cause of tsunami" and "when the next tsunami would be happened". The responses have only one correct answer range from 0 to 2 (total correct response = 2).

Risk perception was evaluated by 4 items (Cronbach's Alpha= .574) consisted of 1 item of "How likely do you think tsunami would occur in the next time" and 3 items "If a tsunami would occur in your area, how likely do you think it would affect/cause to harm you/your family (damage properties and disturb family to earn money), (very unlikely/very likely)". Critical awareness was assessed by 3 items (Cronbach's Alpha= .562) using Paton's et. al.¹⁴⁾ work that are "I am thinking about the tsunami events and the impact on our life", "I am talking (discussing) about the tsunami with member of family (father, mother, grandmother, grandmother, brother, sister, etc)", "I am talking (discussing) about the tsunami with friends in my school/village" (never/always).

There were 7 items (Cronbach's Alpha= .738) of individual preparedness including " within last six months, how often you: (1) visited (heed) the evacuation route and shelter, (2) visited tsunami siren tower, (3) participated tsunami disaster drill/simulation, (4) visited the mass grave yard, (5) visited tsunami museum, (6) tsunami height poles, and (7) visited stranded vessel". The answer was evaluated by providing 3-point scale "never, 1 times, 2 times and 3 or more than 3 times".

School preparedness was developed from LIPI (2009) and literature reviews consist of 7 items (Cronbach's Alpha= .781), by asking students "the agreement that school has already (1) taught about tsunami to students, (2) taught how to respond tsunami, (3) developed evacuation plan and prepared emergency kits, (4) developed early warning system or emergency communication, (5) installed evacuation

signs, (6) provided information, (7) conducted disaster drill”. The answer was assessed by providing 5-point scale “strongly disagree, disagree, neither disagree or agree, agree, and strongly agree”.

Table 1 Schoolchildren’s Characteristic

| Characteristics of school children | Curriculum N(%) | Non-Curriculum N(%) |
|------------------------------------|------------------|---------------------|
| Grade | 97 (100%) | 71 (100%) |
| 4 | 0 (0%) | 20 (28%) |
| 5 | 54 (55%) | 26 (37%) |
| 6 | 43 (44%) | 25 (35%) |
| Age | 89 (100%) | 71 (100%) |
| <10 year | 9 (9%) | 14 (20%) |
| 10 year | 42 (43%) | 19 (27%) |
| 11 year | 38 (39%) | 30 (42%) |
| 12 year | 9 (9%) | 5 (7%) |
| 13 year | 0 (0%) | 3 (4%) |
| Gender | 98 (100%) | 69 (100%) |
| Male | 50 (51%) | 37 (54%) |
| Female | 48 (49%) | 32 (46%) |
| Living with | 96 (100%) | 71 (100%) |
| Parent | 89 (93%) | 58 (82%) |
| Father only | 1 (1%) | 5 (6%) |
| Mother only | 1 (1%) | 1 (2%) |
| Grand father/mother | 0 (0%) | 1 (2%) |
| Brother/sister | 3 (3%) | 3 (4%) |
| Others | 2 (2%) | 3 (4%) |
| Living length in this areas | 98 (100%) | 70 (100%) |
| Less than 1 year | 11 (11%) | 8 (11%) |
| 1- 3 years | 21 (22%) | 11 (16%) |
| 3- 5 years | 12 (12%) | 10 (14%) |
| More than 5 years | 54 (55%) | 41 (59%) |
| House distance to coastline | 95 (100%) | 68 (100%) |
| <500 m | 19 (20%) | 19 (28%) |
| 0.5-1 km | 18 (19%) | 12 (17%) |
| 1.1 – 2.0 km | 11 (12%) | 21 (31%) |
| 2.1-3.0 km | 7 (7%) | 10 (15%) |
| >3 km | 40 (42%) | 6 (9%) |

Table 2 Schoolchildren’ experiences of 2004 tsunami

| Experience of 2004 tsunami | Curriculum N (%) | Non-Curriculum N (%) |
|-----------------------------------|------------------|----------------------|
| 2004 Tsunami’s experiences | 97 (100%) | 69 (100%) |
| Yes, seeing wave at coastline | 10 (6%) | 12 (17%) |
| Yes, seeing water inland | 36 (22%) | 23 (33%) |
| Told by family/mass media | 51 (31%) | 34 (50%) |
| House hit by tsunami | 98 (100%) | 70 (100%) |
| Yes | 65 (66%) | 49 (70%) |
| No | 20 (21%) | 7 (10%) |
| Don’t know | 13 (14%) | 14 (20%) |
| Loss of family members | 98 (100%) | 69 (100%) |
| Yes | 55 (56%) | 37 (54%) |
| No | 43(44%) | 32 (46%) |

Table 3 Schoolchildren’s knowledge about tsunami

| Knowledge | Curriculum N(%) | Non-Curriculum N(%) |
|--------------------------|------------------|---------------------|
| Causes of tsunami | 98 (100%) | 70 (100%) |
| God’s wrath | 30 (31%) | 28 (40%) |
| Natural phenomenon | 37 (38%) | 4 (6%) |
| Man-made activities | 20 (22%) | 25 (36%) |
| Don’t know | 9 (9%) | 11 (15%) |
| Others | 2 (2%) | 2 (3%) |
| Future tsunami | 97 (100%) | 70(100%) |
| Anytime | 82 (84%) | 50 (71%) |
| Within this year | 4 (4%) | 3 (4%) |
| Within next year | 2 (2%) | 5 (9%) |
| Within next 25 year | 2 (2%) | 2 (3%) |
| Within next 50 year | 2 (2%) | 3 (4%) |
| Within next 100 year | 5 (5%) | 6 (9%) |

Table 4 Mean, Standard Error and MANOVA test for school children’s knowledge, risk perception, critical awareness, individual preparedness and school preparedness scores for each school group

| Dependent Variables/School Groups | (Min-Max) Mean | Standard Error | df | F | Sig (p) | Partial Eta Squared |
|-----------------------------------|----------------|----------------|----|--------|---------|---------------------|
| Knowledge | (0 - 2) | - | 1 | 18.094 | .000 | .147 |
| Curriculum | 1.12 | .081 | - | - | - | - |
| No-curriculum | .596 | .092 | - | - | - | - |
| Risk perception | (1 - 5) | - | 1 | 5.810 | .018 | .052 |
| Curriculum | 3.788 | .089 | - | - | - | - |
| No-curriculum | 3.463 | .101 | - | - | - | - |
| Critical awareness | (1 - 5) | - | 1 | .578 | .449 | .005 |
| Curriculum | 2.416 | .110 | - | - | - | - |
| No-curriculum | 2.427 | .129 | - | - | - | - |
| Individual Preparedness | (1 - 5) | - | 1 | 11.405 | .001 | .098 |
| Curriculum | 2.686 | .097 | - | - | - | - |
| No-curriculum | 2.191 | .110 | - | - | - | - |
| School Preparedness | (1 - 5) | - | 1 | 32.627 | .000 | .237 |
| Curriculum | 4.507 | .065 | - | - | - | - |
| No-curriculum | 3.945 | .097 | - | - | - | - |

5. Findings and discussion

As presented in table 1, in general there was no different characteristic of school children between two schools. Table 2 shows information about the experiences of 2004 tsunami of whether they had direct or indirect experiences, their house had been hit by tsunami and losing family members or not. In terms of knowledge, descriptive results show that the proportion of correct answer about the cause of tsunami and when the tsunami would occur were low accounted 38% in school adopting disaster-integrated curriculum and only 6% in school no adopting disaster-integrated curriculum. Table 3 shows that tsunami disaster was caused by God's wrath remain equally high in both school with 31% and 40% respectively.

The means or average score of school children's knowledge, risk perception, critical awareness, school preparedness and individual preparedness can be seen in table 4. In general, the means of all dependent variables in the school adopting disaster curriculum were higher than school non curriculum except for critical awareness. In case of knowledge, two groups of school can be categorised as a low with school adopting disaster curriculum only with Mean=1.1, was slightly higher than school non adoption (Mean=.6). In terms of risk perception, critical awareness, school preparedness and individual preparedness, the score's means of school adopting disaster curriculum was higher than school non adoption except for the critical awareness. The scores of critical awareness in both school were quite low or under the mid 5-point scale (2.5). Overall, the lower score of standard errors means the lower standard deviation of sample-means toward population mean.

The MANOVA analysed revealed that Box's M was not met the homogeneity of variance assumption ($F_{(15, 39121)}=2.339$, sig=.002). Result of Lavene's test showed that only perception ($F_{(1, 105)}=4.626$, sig=.034) and school preparedness ($F_{(1, 105)}=19.465$, sig=.000) variables were not met homogeneity of variance assumption. However as the samples were nearly equal size, the MANOVA procedure is generally robust³⁰.

Our findings provide support for the effective different effect of disaster education program in school. There was a significant effect of curriculum-based disaster education program on the combined dependent variables such as school children's knowledge, risk perception, critical awareness, individual preparedness and school preparedness ($F_{(5,101)}=10.55$, $p=.000$; Wilks' Lambda= .66; Partial Eta Squared = .343).

As shown table 4, however analysis of each dependent variable showed that the implementation different approaches of disaster education in school was not significant effect on critical awareness ($F_{(1,105)}=.578$, $p=.449$). On the other hand, there were effects of the implementation of the curriculum-based disaster topic on school children's knowledge ($F_{(1, 105)}=18.094$, $p=.000$), risk perception ($F_{(1,105)}=5.810$, $p=018$), individual preparedness ($F_{(1,105)}=11.405$, $p=011$) and school preparedness ($F_{(1,105)}=32.627$, $p=000$).

The greater number of school children's answer on the cause of tsunami in both schools shows that the role of religion in understanding natural phenomenon was very important. In developing disaster risk reduction materials in a country where the majority of Moslem like Indonesia, the belief that disasters are caused the god's punishment should be carefully paid more attention. Such belief however will not significantly affect the effective disaster risk reduction if people have willingness to take appropriate preparedness. It is imperative to develop the knowledge of disaster based on the religious perspectives.

The findings showed that the effect of school adopting curriculum-based disaster issues on school children and school related to disaster risk reduction was partially proved. The non-significant effect on critical awareness due to different approaches of disaster education in school was possibly caused that the school children in both schools perceived that because it has been already conducted disaster education in school, it is not necessary to discuss the problem of tsunami disaster in school and home. This finding was consistent with the previous research that disaster education in school not affected the level of disaster awareness instead of risk perception²³.

Another important finding is that the effect of the implementation of the curriculum-based disaster issues in school could promote school children's preparedness behaviour although limited only visiting disaster education facilities (tsunami museum, stranded vessel, mass grave yard and escape buildings). This finding is met the general expectation that disaster education should not only focuses on transferring knowledge on disaster but also how to respond it²³.

Transferring knowledge about disaster in disaster education program is not so hard task. The challenge is that how disaster education program can encourage people to update the information, increase the level of risk perception, keep aware, and do and update a proper preparation of future disaster. Consequently it is necessary to develop the various teaching and learning approach that will be able to achieve the ultimate goal of disaster risk reduction: making culturally people prepare from disaster. The lectures method in the learning approach will not be effective unless it is supported by different methods including gaming

simulation, field visit, experiment and disaster drill. As supported by Johnston and Ronan¹⁷⁾, involving children in different disaster education will gain significant benefits rather than a single program.

The tsunami preparedness standard proposed in this study that described as the frequency of visits to the disaster educational facilities and emergency facilities will be useful as one of the protective behaviour needed to adopt not only school children but also for the whole community members. Visiting the evacuation routes, shelter building, siren tower, and tsunami museum will make people familiar with such facilities. When tsunami occurs they would easily find such safe places in the timely and right places. Visiting the grave yard, stranded vessel and tsunami height poles can also be categorized as an action of preparedness because it will keep people aware on the future disaster.

This study that only included the tsunami preparedness on school children as an effect of the implementation of the curriculum-based disaster education was one of the limitation of this study. Another limitation of this research was not to include the control school group that never applied disaster education programs. Future research should be focused the effect of disaster education program in school on either the households or community's preparedness on tsunami disaster.

6. Conclusion

The result of the present study demonstrate that the effect of school adopting curriculum-based disaster issues on school children related to disaster risk reduction was effective in enhancing disaster knowledge, increasing level of risk perception, individual and school preparedness. The important finding is that the effect of the implementation of the curriculum-based disaster issues in school can promote the school children's preparedness behaviour although limited only visiting disaster education and emergency facilities. The common knowledge that god punishment is as the main cause of tsunami should be addressed comprehensively—not limited in school. Teachers and students play the important role in raising public awareness, spreading correct knowledge about disaster and promoting behavioural preparedness on disaster in the wider community rather than limited in school.

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