

# Disaster prevention literacies: Assessing the knowledge, skills and attitude of Taiwanese students for an earthquake disaster

Norfarahin Binte Abdul Rahim and Bing Sheng Wu

*National Institute of Education, Singapore*

## Abstract

Natural disaster education can play a very important role in mediating the impact of natural disasters. If it is imparted at an early age, it could yield positive results such as reducing the risks and consequences of natural disasters. In Taiwan, disaster prevention literacy begins in elementary schools. A disaster prevention framework requires all schools to impart citizens with knowledge about earthquakes, the skills to act and respond appropriately when disaster strikes, and the attitudes necessary for preparedness. Although the implementation of the framework helps equip citizens with these three integral domains of disaster prevention literacy, it is worth examining if Taiwanese citizens are in possession of the necessary knowledge about earthquakes or have the skills to act and respond appropriately to earthquakes based on their school education. This study is based on questionnaire survey data to evaluate if the implementation of the disaster prevention framework plays a vital role in Taiwan's disaster education. The results reflect that the framework to nurture disaster prevention literacy is successful and could serve as a model to be followed by earthquake-prone countries where people's preparedness for earthquakes is problematic.

## Introduction

Earthquakes can have significant and catastrophic consequences to populations and the areas where they live and work. One way to mitigate the negative effect of the hazard on lives is by building the preparedness of people in at-risk areas (Panić, Kovačević, Miljanović, 2012). However, the level of preparedness for earthquakes in not only developing but also developed countries is still problematic (Shaw, Shiwaku, & Kobayashi, 2004). Traditional approaches such as lecturing or book-reading about natural disasters rarely equip students with the skills and attitude of preparedness to respond effectively and survive future disasters (Panić, Kovačević, Miljanović, 2012). Effective education is especially important for earthquake-prone countries to reduce the vulnerability to death when a disaster strikes (Chang & Lin, 2012).

Ranked by the World Bank as the fifth highest risk country in the world in terms of full-spectrum disaster risk, the social, economic and geologic environment of Taiwan is highly volatile to the real threat of earthquakes (Lai, Lei, Fang, Chen, & Chen, 2012). The destructive impact of the 921 earthquake in 1999 led to 2415 people killed, 11305 injured, and monetary damage that totalled \$300 billion (Seplaki, Goldman, Weinstein, & Lin, 2006). The 921 earthquake along with the recognition that earthquakes have been occurring so frequently in Taiwan has motivated the Ministry of Education (MOE) to revamp

its definition of what the achievement of disaster prevention literacy should encompass. Instead of teaching earthquake prevention through textbooks, Taiwan's educational effort focused on the development of skills to act and respond appropriately during natural disaster and attitudes to improve people's preparedness for disaster in the future (Chen & Lee, 2012). Disaster education in Taiwan now begins in elementary school (Sharpe, 2009). Once taught to students through mere theories in the school curricula, this crucial component has been infused into experiential learning processes which put drills at the centre of the learning cycle (Sharpe, 2009). In addition, all schools are required by MOE to conduct mandatory drills at least once in a semester (Chang & Lin, 2012). This ensures that all students are equipped with the skills needed to respond to an upcoming earthquake disaster, should it occur on school grounds.

This research paper therefore aims to explore if students in elementary school are in possession of the necessary knowledge about earthquakes, as well as the skills to act and respond appropriately. Questionnaires and interviews were used with 30 students at Rui-Gan Primary School, New Taipei City, Taiwan. The findings consider how Taiwan schools educate young generations with not just knowledge about earthquakes, but with the skills and attitudes to respond to a real emergency (Chen & Lee, 2012).

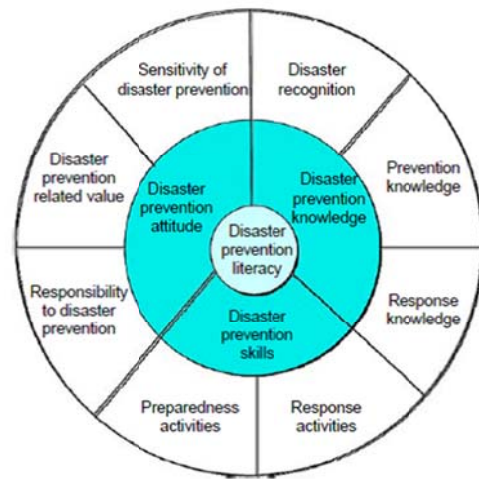
**Literature review**

***Disaster prevention literacy***

The evaluation of disaster prevention literacy helps researchers have a better understanding of the outcomes of disaster education. The core assessment of disaster prevention literacy encompasses three broad categories: knowledge, attitude, and

skills (Chen & Lee, 2012). The first category, knowledge, assesses students' ability to understand and identify the characteristics of disaster and learn the key values of disaster prevention. For instance, if students recognise the power and impacts of earthquakes, they will build better awareness of the ways to mitigate the impact of the disaster and the ways to respond to it (Panić, Kovačević, Miljanović, 2012).

Figure 1: Disaster prevention literacy for effectiveness assessment (Chen & Lee, 2012)



For countries where the threat of earthquakes is real and may happen any time, mere knowledge about earthquake prevention is extremely insufficient (Izadkhah & Hosseini, 2005). Citizens may be knowledgeable and passionate about the subject and may even excel when assessed about earthquakes in high stakes examinations conducted in school. However, what benefit would the possession of earthquake knowledge bring about if they are not able to apply theory to practice and do not possess the necessary skills to fend for themselves when a real earthquake arrives? As a result, equipping the young with skills is equally as crucial as the teaching of knowledge. Skills refer

to the people's know-how to respond correctly when the disaster strikes (Izadkhah & Hosseini, 2005). Different from the process of learning knowledge, skills cannot be merely taught within the classroom or through textbooks. Rather, students must be put through drills (Sharpe, 2009). A drill should be conducted in a school setting, so students can immediately know how to respond when they feel the earth shaking; for instance, to crouch under desks or any sturdy furniture, or to run to an open field where there is an absence of any nearby trees or buildings to safeguard themselves from any falling projectiles caused by the earthquake tremors.

Attitude is the final, but equally important, domain in the overall building of a person's level of emergency preparedness. Attitude refers to the possession of strong values in citizens such as their "sensitivity to the disaster," their "willingness to learn more about the disaster" and their "willingness to upgrade their skills" so that they can respond better in future for the well-being of themselves and their community (Panić, Kovačević, Miljanović, 2012). It is clear that the achievement of disaster prevention preparedness is all-encompassing such that it requires people to be equipped with knowledge, skills and attitudes to respond to disaster. It is also important to note that disaster prevention preparedness is not formed naturally but must be nurtured (Izadkhah & Hosseini, 2005). This effectively highlights the important role education plays in offering the young relevant disaster prevention education. The need to equip the young with disaster prevention literacies is especially urgent for earthquake prone countries.

### ***Disaster prevention education in Taiwan***

Since Taiwan is highly susceptible to the real threat of earthquakes, disaster prevention is taught in schools, following the introduction of the improved MOE's disaster prevention literacy framework. The main goal is to improve citizens' disaster prevention preparedness through school curricula.

In schools, in addition to teaching disaster preparedness, such as "what is an earthquake," "what are the tell-tale signs of an earthquake," and "what does an earthquake feel like," it is strongly believed that desirable attitudes towards disaster prevention must be nurtured. Therefore, teachers conduct character building activities in order to develop positive mind sets about preparedness. Such efforts include developing the willingness to continuously upgrade their skills in order to better prepare for the occurrence of a future disaster. Furthermore, school teachers combine the three categories and help students achieve disaster recognition. For instance, teachers ask students to recall major earthquakes that happened in Taiwan so that they can better relate to the information found in the textbook. Students have earthquake emergency drills at least twice per semester, according to MOE's regulation, to help prepare them for when an earthquake strikes. These practices are good for the engagement of students in "preparedness activities" and "response activities" (Chen & Lee, 2012). Through the development of 'disaster prevention skills,' citizens will be better equipped with the aptitude to respond to a real disaster.

### **Methodology**

This study selected Rui-Gan Elementary School in New Taipei City as the study site since it is located in the mountainous area that is likely to have a

landslide when an earthquake strikes. 30 students from P1 to P6 were randomly selected to fill in a questionnaire. The questionnaire was constructed by following the framework of disaster prevention literacy for effectiveness assessment and divided into three sections: knowledge, skills and attitude respectively to assess participants on each of these competencies (Figure 1). Each section has either multiple choice questions or short essay questions. Section 1 focuses on the assessment of students' disaster prevention knowledge in relation to earthquakes. Two questions in this section are designed to assess students' ability to recognize earthquakes and students' awareness of the potential impacts of an earthquake. Section 2 focuses on students' disaster prevention skills to act and respond appropriately to a real earthquake emergency. Two multiple choice questions in this section are to see if students are sensitive to earthquake tremors and know how to respond under an earthquake situation where they are in a classroom or at home without any adult supervision. Section 3 focuses on citizens' attitudes towards the occurrence of earthquakes and their personal development in terms of improving their skills for a future threat. Questions in this section focus on citizens' level of sensitivity to earthquakes experienced and attitudes toward their personal development in terms of improving their skills for a future disaster.

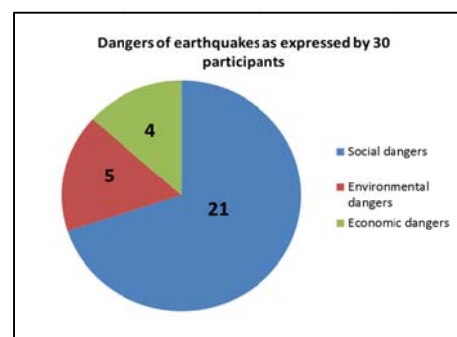
## Findings

### *Students' knowledge*

In the knowledge section, when students were asked how many earthquakes they felt in the past year, the number of responses was between 1 and 30. Moreover, what was also observed is that the older participants (11-12 year olds) felt more earthquakes (e.g. 20-30

earthquakes) than younger participants. Older participants, due to their relatively more mature age, would have experienced more earthquakes and education about the phenomenon in their lifespan (Izadkhah & Hosseini, 2005). They might have a better understanding that in Taiwan, earthquakes occur very frequently, approximately 2200 times a year and of which, approximately 214 can be felt (Tsai & Chen, 2010). This understanding may have motivated them to put larger approximate numbers even though they did not necessarily recall the exact number of earthquakes they have felt over the past one year. Therefore, the assumption made earlier that all Taiwanese citizens will be able to state a number above zero, given that much emphasis has been put into the school curricula to equip them with disaster recognition knowledge, is true. Hence, the hypothesis that any Taiwanese citizen who has at least elementary school education, is in possession of some knowledge about earthquakes, is valid (Chen & Lee, 2012).

Figure 2: Dangers of earthquakes as expressed by 30 participants



When students were asked to describe why it was dangerous when an earthquake occurred, due to the open-ended question, responses were varied. The answers were summarized to three aspects: social, environmental, and economic dangers (Figure 2). "Loss of lives", "buildings collapsing on people", or "objects falling on innocent lives" were considered as

social danger, and 21 participants (70%) believed earthquakes cause these dangers. Environmental danger means “landslides” or “slope failures” and five students (16.7%) highlighted these dangers when an earthquake strikes. Four students (13.3 %) shared that earthquakes cause damage to the economy, all of whom attributed the economic damage to monetary losses as a result of “collapsed buildings” and “broken state infrastructure.”

More sophisticated responses such as the economic damages caused by an earthquake came from the older participants (11-12 years old). The younger participants (7- 10 years old) provided the common impacts of earthquakes such as “loss of lives” and “damage to property.” This may be attributed to the fact that learning about matters pertaining to earthquakes is a progressive one, and the younger students may not yet understand how earthquakes affect the economy. Nonetheless, the fact that all participants could state at least one danger about an earthquake implies that Taiwanese citizens will be able to state, at the very minimum, that earthquakes cause death, given that much emphasis has been placed in the school curricula to equip them with disaster recognition knowledge.

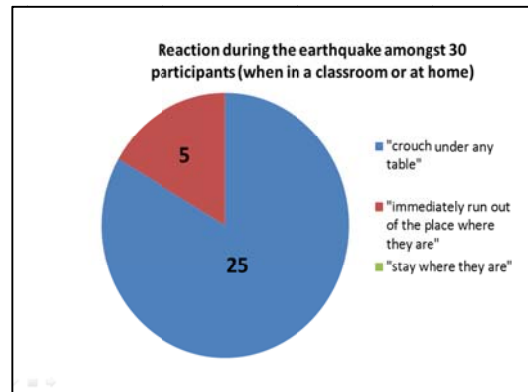
**Students’ skills**

In the skill section, students were asked how to respond if an earthquake hit (Figure 3). 25 participants (83.3%) correctly indicated that they would “crouch under any table.” The remaining 5 participants (16.7%) indicated that they would “immediately run out of the place where they are.” None of the participants indicated that they would stay where they are. Given that most participants (83.3%) could state the appropriate measure of “I would crouch under the table or any sturdy furniture,” most students were able to state

the correct measure, given that much emphasis has been placed in the school curricula to equip them with disaster “response skills.”

However, the learning needs of the remaining 5 participants who indicated that they “would immediately run out of the place” must be considered. Although the results have shown that in general, most students know to “crouch under any table” when in a classroom or at home, the 5 participants who got this question wrong indicate that some students may not know how to respond appropriately when a real threat comes. If nothing is done to equip them with the skills they need, it will prove detrimental to their safety.

Figure 3: Reaction during the earthquake in a classroom or at home



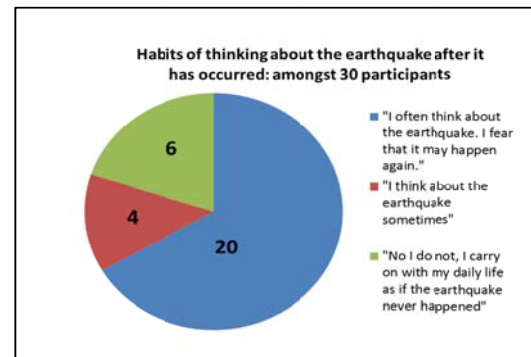
The other question to test students’ disaster prevention skills is to ask students how they take actions when they were outdoors and felt earthquake tremors without the supervision of any teacher or parents. All participants reached the correct answer: “I would move to a clear area where there are no nearby trees and buildings.” Given that all participants could state the appropriate measure of moving “to a clear area where there are no nearby trees and buildings,” the initial assumption that these young Taiwanese students would be able to state the correct

measure, given that much emphasis has been placed in the school curricula to equip them with disaster response skills, is true.

### *Students' attitudes*

In the attitude section, students were asked if and how they think about an earthquake after it occurs (Figure 4). 24 participants (80%) stated that they thought about the earthquake after it has occurred. Among the 24 participants, 4 participants (13.3%) stated: "I think about the earthquake sometimes" and 20 participants (66.7%) stated: "I often think about the earthquake. I fear that it may happen again." The remaining 6 participants (20%) stated: "No I do not. I carry on with my daily life as if the earthquake never happened." Although most of participants pay attention to the earthquake, the 6 participants should be a cause for concern. These participants can be treated as people who potentially have a poor attitude about earthquake disaster prevention, and do not worry about the disaster even after it has occurred. Such poor "disaster prevention attitudes" might be an indication of a lack of motivation amongst these groups to prepare themselves with the necessary knowledge and skills for a future threat (Izadkhah & Hosseini, 2005). While students expressed that they "do not think about the earthquake, as if it never happened," this statement should be interpreted with caution. This is because students may suppress unpleasant events that have occurred, or hesitate to answer honestly and show some amount of fear (Panić, Kovačević, Miljanović, 2012). As a result, it is important to consider to what extent the lack of awareness of the disaster could be a sign of poor attitude towards earthquake disaster prevention.

Figure 4: Habits of thinking about the earthquake after it has occurred amongst 30 participants

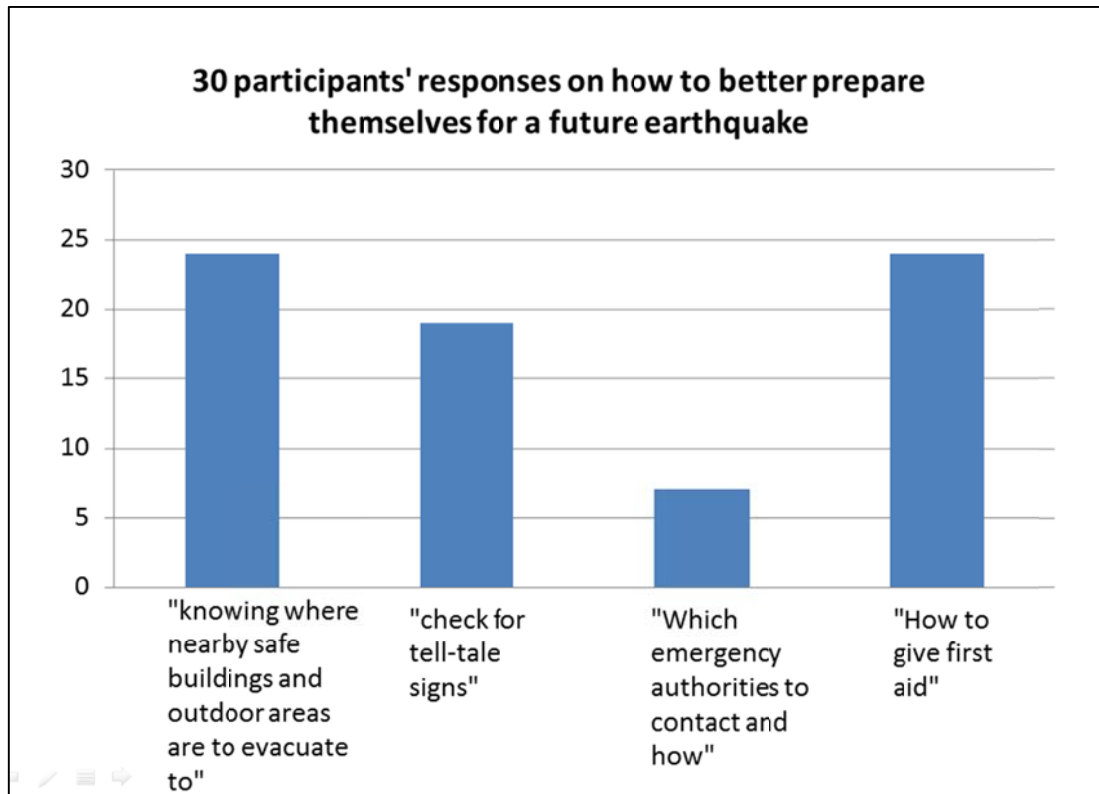


The other question in the attitude section examined if students wanted to learn more so they can better prepare themselves for a future earthquake. All participants ticked 'Yes' and expressed that they would like to learn various combinations of the following factors (Figure 5):

- How to check for the tell-tale signs that an earthquake is coming.
- Where the nearby safe buildings and outdoor areas are from my home so that I know where to evacuate to during an earthquake.
- Which emergency authorities to contact and how to contact them during an earthquake.
- How to give first aid in case there are others around me in need.

Among the four factors, "knowing where nearby safe buildings and outdoor areas are to evacuate to" and "how to give first aid" were what most participants wanted to learn. 24 participants (80%) wanted to learn in each of these respective domains. 19 participants wanted to learn how to "check for tell-tale signs" of an earthquake (63.3%) and 7 participants wanted to learn "which emergency authorities to contact and how."

Figure 5: 30 participants' responses on how to better prepare themselves for a future earthquake



Aside from wanting to learn various combinations of the above four factors, amongst those who expressed “Yes,” some added that they would like to learn “how to put out fires during an earthquake” and “rescue those who are stranded in buildings.” Such intentions are likely to be based on participants’ understanding that there is bound to be a time-lag before emergency authorities and rescue operations arrive at the emergency scene, where in most cases, the damage done by the disaster would have already escalated and many lives would be lost. The onus is therefore on the citizens to help one another while waiting for the arrival of the

authorities (Chen & Lee, 2012). The results imply that students have a positive attitude towards the natural disaster because sensitivity towards disaster prevention has formed a critical component of the school curricula and helps students improve their preparedness for a future disaster.

### Conclusion

At present, the occurrences of earthquakes are still unpredictable. In Taiwan, earthquakes are a serious problem. The country faces approximately 2200 earthquakes a year, of which, about

214 can be felt and some lead to catastrophic consequences for the population and the areas where they live and work (Tsai & Chen, 2010). The 921 earthquake that took place on 21 September 1999 is one such example. The number of deaths and those injured during earthquakes can significantly be minimised if people are equipped with proper preparedness measures (Panić, Kovačević, Miljanović, 2012). Hence, a population that is prepared with the necessary know-how stands a better chance to survive the disaster. This paper adopts a holistic manner encompassing knowledge about earthquakes, skills to respond appropriately to improve people's preparedness when the disaster strikes, and attitudes toward the occurrence of earthquakes in terms of their willingness to prepare themselves for disaster in future.

In Taiwan, schools play an important role in fostering in citizens the various disaster prevention literacies. Apart from equipping citizens with knowledge about earthquakes, citizens are also nurtured with skills to act and respond to an earthquake and develop positive attitudes about disaster prevention (Chen & Lee, 2012). Skills are commonly taught to students through earthquake drills conducted in school at least twice a semester (Sharpe, 2009). Positive attitudes are imparted in students through character building activities during which they are nurtured to develop positive habits such as thinking about the earthquake after it has occurred and their willingness to prepare themselves for the occurrence of the disaster in future. Findings in this research reflect that young Taiwanese students are being trained to learn the necessary knowledge about earthquakes, and skills to act and respond appropriately when the disaster strikes from at least elementary school education. They also learn how to keep a positive attitude towards the occurrence of

earthquakes and their personal development in terms of improving their skills for disaster in future. Compared to other earthquake prone areas of the world, the development of preparedness in Taiwan does not only focus on teaching the formation and natural processes of disasters through textbooks but also seeks to equip students with the appropriate basic skills to respond appropriately to natural disaster. As a result, disaster education in Taiwan can be used as a model for those areas where preparedness for an earthquake is still problematic.

## References

- Chang, T. C., & Lin, W. (2012). Building networks of disaster preparedness schools in Taiwan. *Society for Social Management Systems Internet Journal*, May 2012. Available: <http://kutarr.lib.kochi-tech.ac.jp/dspace/bitstream/10173/1039/1/sms12-5650.pdf>
- Chen, C. Y., & Lee, W. C. (2012). Damages to school infrastructure and development to disaster prevention education strategy after Typhoon Morakot in Taiwan. *Disaster Prevention and Management*, 21(5), 541-555.
- Chen, C. H., Teng, T. L., & Gung, Y. C. (1998). Ten-second love-wave propagation and strong ground motions in Taiwan. *Journal of Geophysical Research: Solid Earth (1978–2012)*, 103(B9), 21253-21273.
- Hough, S. (2009). *Predicting the unpredictable: the tumultuous science of earthquake prediction*. Princeton University Press.
- Izadkhah, Y. O., & Hosseini, M. (2005). Towards resilient communities in developing countries through education of children for disaster preparedness.



*International journal of Emergency Management*, 2(3), 138-148.

Lai, F. C., Lei, H. M., Fang, C. M., Chen, J. J., & Chen, B. A. (2012). Disaster nursing and primary school teachers' disaster-related healthcare knowledge and skills. *The journal of nursing*, 59(3), 16-22.

Panić, M., Kovačević - Majkić, J., Miljanović, D., & Miletić, R. (2014). Importance of natural disaster education – Case study of the earthquake near the city of Kraljevo, *Journal of the Geographical Institute "Jovan Cvijić"*, 63(1), 75-88.

Seplaki, C. L., Goldman, N., Weinstein, M., & Lin, Y. H. (2006). Before and after the 1999 Chi-Chi earthquake: Traumatic events and depressive symptoms in an older population. *Social science & medicine*, 62(12), 3121-3132.

Sharpe, J. (2009). Drills as part of the experiential learning cycle for disaster risk reduction education—a bureaucratic exercise or meaningful experience? *Poster presented at Disaster Risk Reduction for Natural Hazards: Putting research into practice*, University College London, UK.

Shaw, R., Shiwaku Hirohide Kobayashi, K., & Kobayashi, M. (2004). Linking experience, education, perception and earthquake preparedness. *Disaster Prevention and Management: An International Journal*, 13(1), 39-49.

Tsai, C. H., & Chen, C. W. (2010). An earthquake disaster management mechanism based on risk assessment information for the tourism industry—a case study from the island of Taiwan. *Tourism Management*, 31(4), 470-481.

Finnis, K., Standring, S., Johnston, D. and Ronan, K. (2004), Children's understanding of natural hazards in

Christchurch New Zealand, *The Australian Journal of Emergency Management*, 19(2), 11-20.

Yeh, S.C. (2007), Disaster prevention education literacy investigation for Grade 1-9 students and teachers, Ministry of Education Advisory Office, Taipei, Technological Disaster

Prevention Education and Cultivation Experiment Research and Development Programs (in Chinese).

Annex A

Annex A

Name: \_\_\_\_\_

Age: \_\_\_\_\_

**Questionnaire (in English)**

<b>Part 1: Earthquake Knowledge</b>	
1.	<p>Earthquake is a serious problem in Taiwan. In the past one year, roughly how many earthquakes have you felt? (Write a number in the space provided)</p> <p>Answer: _____</p>
2.	<p>Earthquake is known to be dangerous in Taiwan. In your opinion, why is an earthquake dangerous? Give one or two examples. (Possible examples: an earthquake can kill lives/ an earthquake may destroy properties such as homes and buildings)</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p>
<b>Part 2: Earthquake Skills</b>	
3.	<p>Imagine that you are in a classroom or at home. Suddenly, you begin to feel earthquake tremors. How would you respond? Tick any one of the three boxes below.</p> <p><input type="checkbox"/> I would stay at the place where I am.</p> <p><input type="checkbox"/> I would immediately run out of the place where I am.</p> <p><input type="checkbox"/> I would crouch under any table.</p>
4.	<p>Imagine that you are outdoors, without the supervision of any teacher or parent. Suddenly, you begin to feel earthquake tremors. How would you respond? Tick any one of the three boxes below.</p> <p><input type="checkbox"/> I would move to a clear area where there are no nearby trees or buildings.</p> <p><input type="checkbox"/> I would move to the nearest shelter such as a nearby tree or building.</p> <p><input type="checkbox"/> I would stay where I am and not move until the tremors stop.</p>

<b>Part 3: Earthquake Attitude</b>	
5.	<p>Do you think about the earthquake after it has occurred? Tick any one of the three boxes below.</p> <p><input type="checkbox"/> No I do not. I carry on with my daily life as if the earthquake never happened.</p> <p><input type="checkbox"/> I think about the earthquake sometimes.</p> <p><input type="checkbox"/> I often think about the earthquake. I fear that it may happen again.</p>
6.	<p>Do you want to learn more on how you can better prepare yourself for a future earthquake? Tick one of the boxes.</p> <p><input type="checkbox"/> Yes      <input type="checkbox"/> No</p> <p>If you ticked "Yes", what do you want to learn in order to prepare yourself better for a future earthquake? Tick as many of the boxes below.</p> <p>I would like to learn;</p> <p><input type="checkbox"/> How to check for the tell-tale signs that an earthquake is coming.</p> <p><input type="checkbox"/> Where the nearby safe buildings and outdoor areas are from my home so that I know where to evacuate to during an earthquake.</p> <p><input type="checkbox"/> Which emergency authorities to contact and how to contact them during an earthquake.</p> <p><input type="checkbox"/> How to give first aid in case there are others around me in need.</p> <p>If you ticked "Yes" above, is there anything else which you would like to learn to better prepare yourself for a future earthquake? If your answer is "Yes", share with us in one or two sentences what you would like to learn.</p> <hr/> <hr/> <hr/> <hr/>