

”Run away or hide”: Teaching material for learning the behavior to protect the life from ballistic fragment

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<Lesson of Ontake-san eruption>

Ontake-san has begun to erupt quietly without a clear presage at 11:52am on September 27th, 2014. A lot of ballistic rock fragments have fallen soon (about 11:55: ”Document Ontake-san large-scale eruption” and Yamakei new publication). There was size of 60 centimeters for the rock which broke through a roof of the mountain lodge (Volcanic Eruption Prediction Liaison Council, Ontake-san geological observation team, 2014). It was so high-density (Kaneko et al., 2014) that more than 10 holes by ballistic fragment were distributed over the area of 4 m x 4 m about 500 m from a crater. Energy of the explosion is equivalent to several tons of TNT gunpowder (Taniguchi and Ueki ,2014). The initial velocity of ballistic fragment is as high as 100 m/ second (Kaneko et al., 2014). 57 people were sacrificed and 6 persons were missing.

<”Run away or hide.” behavior>

”Run away or hide.” behavior is written on survivor’s notes from Ontake-san. For example one survivor put a knapsack on his head and sat down behind the large rock. Such behavior is efficient to raise the survival rate.

<Experimental system>

We developed an teaching experiment material to educate ”Run away or hide.” behavior. It was used in several classes of elementary schools.

The volcanic model is made from papier-mache with a crater on the top part. The air introduced from a side pipe and comes off from a crater. Ballistic rock fragments of papier-mache fall in the reach of the radius 2m approximately.

Keywords: eruption, ballistic fragment, phreatic eruption, evacuation, analogue experiment

Possible disaster preparedness course at the classrooms in junior and senior high schools in Okinawa Prefecture

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Okinawa Prefecture located in the south-westernmost part of Japanese Islands and in the subtropical area is often attacked by devastating natural disasters which are different from those in the other areas in Japan islands, such as, destructive typhoons and their subsequent flooding due to high tides, many earthquakes of both plate convergent type and due to active across-arc fault slip, which may induce tsunamis because their hypo-centres are mostly sub-seafloor.

Disaster preparedness, especially in Okinawa Prefecture is to be taught at the school education. Currently, 'Home Economics' is the only subject in which disaster preparedness is taught in junior and senior high schools in Japan. Recent subject for high schools 'Basic Earth Science' includes also disaster prevention against devastating earthquakes, tsunamis, volcanic activities, etc. Disaster preparedness education should include these two factors (Home Economics and Earth Science).

Japanese government established the system of renewing educational personnel certificates in 2007 and mandated the adoption of it in April 2009. Since 2012, the author has offered a 6-hour educational personnel certificate renewal course titled by 'Disaster preparedness in Okinawa - practicing development of teaching materials for school pupils'. This course is targeted mainly for science and home economics teachers of junior and senior high schools in Okinawa Prefecture, to tell the school pupils how to save their lives in case of devastated natural disasters.

Considering the teaching materials made during the 2014 course, the author would like to propose the following new curriculum through active learning for disaster preparedness 1-day course in the classroom.

1. Lecture: About natural disasters in the tropical area - earthquakes, tsunamis, tropical storms, etc.
2. Hands-on learning: How to evacuate in case of tsunamis - find the most appropriate evacuation route from your school by use of the maps and geographical information.
3. Field work: Practicing the evacuation that you proposed in the previous learning.
4. Reflection of the field work.
5. Hands-on learning: Preparedness for natural disasters - measure for safety.
6. Hands-on learning: Preparedness for natural disasters - social work, Preparation for presentation.
7. Presentation.

Keywords: Disaster preparedness education, Sub-tropical, Earthquake, Tsunami, Tropical storm

Mystery of intraplate earthquakes and education on disaster prevention

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For the purpose of clarifying the generating process of intraplate earthquakes, we developed a new seismic observation system in the next generation, with the initiative of DPRI Kyoto Univ. and Kinkei System Co.. The system is small and light, can record about 9 months continuous seismic data using 32 dry cells, and is easily operated. Since this is almost an ideal instrument, we call it the 'Manten' system and began the 'Manten' project by using this system. This system is utilized in various kinds of field works. The Abuyama Observatory, DPRI, Kyoto Univ. is utilized as the base of this project. Furthermore, we began a program for the education on disaster prevention with a collaboration of the 'Manten' project utilizing the Abuyama Observatory.

Keywords: earthquake, earthquake disaster, inland earthquake, school education

Recent sediment-related disasters and their mitigation measures

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Several major tectonic lines and fracture zones run in Japan, and about 70% of the land area consists of mountains and hills. Accordingly, the fragile geologic structure generally is formed. Consequently, there are usually prone to occur landslides, slope failures, and debris flows when the torrential rains during the rainy season or the heavy rains by typhoon hit in Japan. As for the occurrences of sediment-related disasters for last 15 years, the casualty toll in 2004 and 2011 exceeded about 60 people and 80 people respectively. There were ten typhoon landing, which was quadruple of the yearly average, and was the Mid Niigata Prefecture Earthquake at the end of October in 2004. Moreover, 19 people were killed by the sediment-related disaster due to the Tohoku Pacific Ocean coast earthquake that occurred on March 11 in 2011, and the serious sediment disaster with 56 people of the dead and missing was caused by the heavy rain by Typhoon No.12 around the Kii peninsula at the beginning of September in the same year. It is required to transmit the disaster prevention information thoroughly to residents from peacetime to reduce the human sacrifices by sediment-related disasters. For this reason, the hazard map (area map for sediment disasters) is prepared, and the hazardous location of the sediment disasters is well-known and transmits to the residents, also is essential to evacuate voluntarily if the risk of the disasters are just approaching. Here, I would like to introduce the recent sediment-related disasters, the role of counter measures by using construction facilities such as check dams, and the evacuation systems.

Keywords: Geoscience education in the high school, disaster prevention education

Educational materials for disaster prevention: Development and evaluation of Disaster Mitigation Action Card Game

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1. Introduction

When educational materials for disaster prevention are roughly divided, there are two types. One is the "Have Answer" type whose objective is to give participants knowledge of disaster prevention. The other is the "Have No Answer" type whose purpose is to get them to think what to do when a disaster happens. Now, "Have No Answer" type is desired in terms of education for disaster prevention because participants can think about disaster prevention voluntarily. Therefore we developed a new tool of "Have No Answer" type, "Disaster Mitigation Action Card Game", that elementary and junior high school students can participate. Moreover we evaluated this game by questionnaires.

2. Disaster Mitigation Action Card Game

The rule of this game is easy and similar to a rule of "karuta", but the character isn't written on the cards. They have only the picture which shows an "immediate" behavior when a disaster happens. Additionally, not only one player can put up a card but also all players can do. The run of this game is as follows. 1) Players make a circle by a group of 2-7 people and arrange cards discretely in the circle and a facilitator enters each group. 2) A question sentence, for instance "You're in the classroom at school now. You felt seismic tremor. What do you do?", is read and players take a card within 3 seconds. 3) Within 30 seconds, the player explains the reason why he/she chose the card. 4) When all the players approve his/her explanation, the player can get one point. On the other hand, when other player's opinions about the explanation are divided, they argue it. In this case, the facilitator judges the score. 5) Players return cards to the field. 6) The facilitator explains a point of the question. 2)-6) is repeated. 7) Disaster prevention mini leader authorization ceremony is performed.

3. The feature of the game

This game has the following big features. (1) Players can train an "immediate" decision when a disaster happens, (2) Players can realize and share the risks which they imagine when a disaster happens through discussing them with other players and (3) This game can be conducted in other countries because of universal design.

In terms of (1), by limited 3 seconds, players are required to think "immediately" what to do in the question's situation. So it's expected for them to acquire an "immediate" decision of the various situations by playing this card game repeatedly. In regard to (2), card's picture is so simple and abstract that player's answers depend on player's situation they imagine. Therefore, the more situations players guess, the more risks they can share and realize. In relation to (3), cards have only the pictogram which shows an "immediate" action at the time of an accident. So this game can be played in other countries by adapting it to foreign language and environment.

4. The evaluation of the game

In each event, we carried out a questionnaire and evaluated this game. Questionnaire items include degree of interest, attractiveness, participant's consciousness and so on. According to the results of the questionnaire, more than 80 percent of participants answered that this game is fun, the rule is clear, and they want to play one more time. Moreover, nearly 90 percent of them answered that they want to know more about how to protect themselves when a disaster happens. In fact, we got high evaluation for this game.

5. Future's view

We are preparing the manual of "Disaster Mitigation Action Card Game" to expand use of this game. In addition, high school students can serve as a facilitator so we consider the possibility of the education for elementary school and junior high school students by high school students.

Furthermore, we have done only this game's evaluation. The purpose of this game is to make participants think about what they should do when a disaster happens and train the ability to protect oneself. Therefore we will measure the participant's ability

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Room:106

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change through this game.

Keywords: disaster mitigation, immediate decision, universal design, card game, Educational materials for disaster prevention

The disaster prevention learning activities by the "earthquake disaster learning train" service of Sanriku Railway

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By the 3.11 Great East Japan Earthquake, "Sanriku Railway (for short "SanTetu") which ran through the vicinity of Sanriku was damaged in the facilities, track and came to have the damage point of 317 places of big things and small things and reached the shutdown.

This "Sanriku Railway Company" (1984 (H59) opening of business) is a third sector railroad running at the Pacific coast of Iwate prefecture. "a third sector" is a joint venture of a local government and private businesses. SanTetu is railroads comprised by 2 routes of "north ria line" between Kuji-Miyako and "the south ria line" between Kamaishi-Sakari (Ofunato). Both routes of north ria line, the south ria line suffered big damage caused by earthquake vibration and the tsunami. Particularly, the damage caused by the tsunami was serious.

However, though SanTetu suffered big damage in this way, SanTetu performed partial service of "disaster reconstruction aid train" (fare for free) in section of Kuji-Rikuchu Noda on March 16. It was 5days later of the earthquake disaster. Even a section of Miyako-Taro reopened service on March 20 to follow.

Just after 3.11, local people used it for "safety confirmation" "procurement of the food" as a traffic road on a track of SanTetu. Look at these scenes, it thought that SanTetu must do the life support of local people and support to the revival of the town.

On June 13, 2012 one year later, "Kizuna visit delegation from the United States of strengthening project" (student organization) came to Japan in the "hands-on education travel" program of "Hometown experience learning Association" of Kuji.

Mr. Nihashi who is the employee of the Sanriku Railway, guided the damaged spot then.

The visit group really took Sanriku Railway, and Nihashi explained the damaged spot.

As for the reaction of students of this time,

"I want to tell an earthquake disaster generated in Japan to many people"

"I want to support you from one's country"....etc.

He was impressed very much. From this, including a student, he can realize the need to have general people watch the real damaged spot, the tsunami-hit area etc. He understood that it was a mission to tell in history as the company which was damaged.

Therefore it was decided that the Sanriku Railway performed the service of "the earthquake disaster learning train".

The program of "the earthquake disaster learning train" is as follows. It completely needs reservations, and the vehicle becomes chartered and is traveled by a special train. 1 vehicle has one guide. Disaster in places where the situation can be seen by, for example, slow down or stop the train, such as the earthquake at the time of appearance and now of the affected areas of the situation and problems will be described using the such as a panel. Guide is selected from the Sanriku Railway employees or residents along. Contents of the guide explains is not decided. Guide has been decided to speak to the straight that he think.

After 3.11, there was the request that I wanted to understand that wanted to observe the stricken area spot from the inside and outside the country. However, in the acceptance organization there is no situation, Sanriku Railway became a good acceptance organizations. Since the "earthquake disaster learning train" start of June, 2012, the applications to this program gradually increased.

The past results are as follows.

2012 27 organizations 1472 people

2013 146 organizations 6571 people

2014 251 organizations 10470 people

Currently, the main aim of "earthquake disaster learning train" is as follows.

Inherits to posterity and lessons the Great East Japan Earthquake of experience, we want to contribute as site of the future of disaster prevention education.

By positioning the "earthquake disaster learning train" as our important content, to attract travelers to the Sanriku region for regional reconstruction, and want to contribute to the promotion of local tourism industry.

Keywords: sanrikutetsudou, Reconstruction, earthquake disaster learning train, tsunami, Disaster prevention learning, Great East Japan Earthquake

The disaster prevention educational program using the marketing technique

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In order to correspond to the earthquake of the Nankai Trough in the school in Wakayama pref. after an East Japan great earthquake, the schools which carry out disaster prevention education including an emergency drill have increased in number.

Then, I introduce the disaster prevention educational example in the Takashi Kui junior high school in Nachikatsuura-cho, Wakayama which Wakayama University supported.

Keywords: disaster prevention education, marketing, the East Japan Great Earthquake, emergency drill, shelter management training, Wakayama prefecture

Construction of lecture on high-level disaster education for core human resources at disaster prevention sites.

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1. Introduction

In Shizuoka prefecture, some basic lectures on disaster prevention have established. However the actual scene of disaster prevention demand more technical knowledge. There some core human resources for disaster prevention had been asked to more high level training of disaster prevention.

Therefore, we started “Fuji-no-Kuni Bousai-Fellow lecture course” to meet their expectation.

2. Summary of our lecture

We made two conditions to enter our lecture.

One is students are working in the disaster prevention section of municipality or the company. The other condition is students had studied basic knowledge of disaster prevention.

There are three requirements for completion of our lecture.

- 1) take 10 passes among 22 lectures
- 2) present the result of research at an academic meeting
- 3) join to “Chiiki-bousai Seminar”

All of lecture classes are not only hear speaker, but also must take some practice. For example of practices are calculation of statistical data, or draw figures, simulate a simple physical model, etc.

3. Result and discussion

We sent questionnaire for completed students at later one year to research the effect of our lecture. The result of questionnaire that roughly all students are answer that comes up to there expectation or more expected our lecture. No one answer that disappointment for our lecture.

Add, We sent another questionnaire for completed students and there superiors. We found that there were many good effect around of completed student from the answer of this questionnaire. More detailed results report in meeting.

Keywords: Human resource development, Disaster science, disaster prevention

Campus Precipitation Nowcasting using Digital Signage

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Well-developed thunderclouds cause local downpours. They sometimes bring hourly rainfall amounts that reach 100 mm in areas of a few square kilometers and cause flooding of small rivers, lowland inundation, and underpass damage. The Ministry of Land, Infrastructure, Transport and Tourism deployed 38 X-band polarimetric radars in major city areas to monitor localized heavy rainfalls, each with a spatial resolution of 250m and a temporal resolution of 1 minute. The present paper describes the development of very short range nowcasting of localized heavy rainfalls using X-band polarimetric radar. This nowcasting is based on a correlation method that extrapolates rainfall distribution in a 1.8 km square area with a 250m resolution, every minute, and 10 minutes in advance. To assess the usefulness of this extremely short range rainfall forecast, an on-campus survey of faculty and students has been underway since April 2015 at Kagoshima University. In the experiment, 10 minute nowcasting information is distributed via digital signage, PCs, mobile devices, digital terminals, and cell phones to examine the usefulness of each device. In the signage experiments, additional data such as campus information and messages from past large-scale disasters, showing their mechanisms and countermeasures, are displayed automatically in accordance with a pre-set schedule.

Keywords: nowcasting, precipitation, polarimetric radar, heavy rainfall, thunderstorm

Precise altitude tints map for the intuitive training of tsunami evacuation procedure

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About 18,500 people were killed or became missing by the huge tsunami of the Great East Japan Earthquake. In the victim, despite fled to shelter that was specified by the town office, many cases lost their lives in the shelter or in the route to go there. Considering those affected cases, if they were familiar to the natural terrain, the cases often are considered to be easily survived. However, it was difficult for a general resident to look for suitable place as a shelter and safe route to go there. Therefore it is necessary to develop a tool that help looking for a refuge in the neighborhood and a safe route even for a general inhabitant including a child. We developed a new technique (Precise Altitude Tints Map) that we can treat intuitively for the purpose. The technique consists of two kinds of topographic maps; the red relief image map and altitude tints map. The original altitude data are due to the DEM by Geospatial Information Authority of Japan. In this presentation, we will introduce the method and its application to the real tsunami disaster in Miyagi Prefecture.

Keywords: Tsunami, Disaster prevention education, Precise altitude tints map, Miyagi Prefecture, Great East Japan Earthquake

New Map for Disaster Prevention of Kota-cho, Aichi

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In late years various types of disaster prevention maps were made by the local governments. This kind of maps were made in Kota-cho, Aichi where the Fukozu active fault of the Mikawa earthquake appeared, and these maps were made depending on purpose such as disaster prevention, sightseeing, cultural assets, and so on. However, tourist does not know dangerous places or evacuation areas with a tourist map. It is necessary for the tourist to evacuate at the time of the disaster. Then we tried the making of map which geography information, the disaster information put together on a sightseeing map.

Keywords: Map for Disaster Prevention, Kota,Aichi

On the way to the comprehensive disaster prevention education

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A public session "Education for disaster-prevention and community-restoration" has been held in the JpGU meetings in 2012, 2013, and 2014. The meeting of this year is due to hold "Comprehensive disaster prevention education" as one of the regular sessions. Although the type of this session differs from the previous ones, the goal of our session is the same. The necessity to reconstruct disaster prevention education has been argued by many people after Great East Japan Earthquake (March 11, 2011). For example, one of the advisory committees of the Ministry of Education submitted a report that the contents of disaster prevention education have to be rearranged systematically. However, the educational curriculums shown in the report as examples seem to lead people to have passive behavior to disaster. The comprehensive disaster prevention education includes more subjects than those referred to in the report. In this paper, the author shows a new concept of the disaster prevention education, and suggests the necessity to cultivate more people facing disaster positively.

Keywords: Comprehensive disaster prevention education, Natural disaster, Disaster prevention, Disaster risk reduction

Learning Tsunami Physics by Numerical Simulation(Part 2): A Curriculum of Physical Oceanography Education in High School

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In this study, we have continued our previous study (Niwa et al., 2014) to develop the new curriculum for high school students to learn the physics of tsunami waves. A special feature of this curriculum is that students try to perform numerical simulations to understand the basic behavior and dynamics of tsunami waves. This curriculum is composed of two successive classes of basic physics for second grade high school students (each class is 45 minutes in length). In the first class, we explain the physical characteristics of tsunami waves, the physical laws governing tsunami waves, and the basics of numerical simulation approach. In the second class, every student plays the numerical simulations of tsunami waves by using PC. In the current study, we have conducted questionnaire survey to all the students after each class to investigate how performing numerical simulation improves the understanding of the behavior and dynamics of tsunami waves.

Keywords: Tsunami, Numerical Simulation, High School Physics

Volunteer program of falling down prevention of furniture in cooperation with local residents and its social and educational effects

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1. Introduction

The department of geography and the department of housing studies of Oita University jointly execute the activities for disaster prevention and mitigation by the university students continuously in cooperation with the self-governing body of Fukiura District at Saeki City, Oita Prefecture. The departments researched the consciousness and preparation for disaster prevention and mitigation of the district by the questionnaire for all households in 2013. As a result, they confirmed the realities of its awareness, and also confirmed that there were a lot of households could not accomplish the preparation by themselves. Therefore the both departments jointly planned in 2014 the volunteer program by the university students that fixing the work of furniture in the room for the household that could not practice the disaster prevention and mitigation measures, in consideration of the problem of the district of securing an escape route for many households.

2. Feature of the program

This program is not a mere social contribution activity that the student fixes furniture of the household, such as aged and living alone as mentioned above, but it has several advantages as below.

The first was to have executed it by cooperation with other departments of our university. Unfortunately, there are neither an education nor a research organization related to the disaster prevention and mitigation in our university. This program mobilized the technology and the knowledge that related to this program like the natural disaster, the residential design and the woodworking, etc. by cooperating with other departments.

The second is that the participating student has to be obligated to take the lectures in the university campus before and after the volunteer. The lectures included the contents such as the necessity of the disaster prevention and mitigation activity, the possibility of the natural disaster of Fukiura District and so on by the university staffs and NPO staff outside the university. Therefore, the student widely acquired related knowledge and skills necessary for the furniture fixation in advance.

The third is that each activity for the furniture fixation volunteer was basically executed by the group in a lateral department. The students had their own role in the activity based on their characteristic of each academic field, and they accomplished the activity in cooperation with each other.

The fourth was to receive the local residents' cooperation in the volunteer activity. Each group had one local resident, and they jointly took action in the preparatory research and the furniture fixation work.

3. Social and educational effects of the program

A provision in the region of the natural disaster is one of the major problems of modern Japan regardless of the city region or rural regions. This program was a small practice for our university and the local resident, but it contains an important key concept of as an international research program Future Earth, such as interdisciplinary approach that exceeded the fence in the academic fields of a natural science, the social science, and engineering and so on. And it also includes the concept stakeholder, and this program executed by the university student, the university staff and the local resident.

Questionnaire for the participating student at the start and the end of the program says that the program has improved the knowledge acquisition of natural disaster and the awareness for the natural disaster prevention and mitigation based on the actual region. In the post-program questionnaire, the targeted household mentioned the information about the program to their relatives and neighbors with their gratitude to the student. This program was connected with the durabilities of the awareness and activities of the disaster prevention and mitigation to each stakeholder's.

Keywords: Natural disaster, volunteer, Future earth, stakeholder