

DEVELOPMENT OF NERSS TRAINING PROGRAM FOR EARTHQUAKE EMERGENCY RESPONSE CAPACITY BUILDING OF LOCAL GOVERNMENTS*

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ABSTRACT :

Response to earthquakes of medium magnitude is as significant as to catastrophic earthquakes, since the occurrences of the former one are as many as dozens times of the latter ones so far from 1900. In China, the obligation is assigned to local government to protect people against earthquakes under magnitude of Ms. 6.0. But some obstacles such as inadequate planning for disasters, lack of public awareness of earthquakes, and shortage of qualified emergency managers, are in the way that local governments perform their obligations. When earthquake hits, those hazards unaware may break out concurrently and put thousands lives and millions property in danger. The response capacity of local government is crucial.

To enhance the capacity of local governments of response to earthquake emergency, the National Earthquake Response Support Service (NERSS) of China started to work on a training program from years ago. With the cooperation with JICA and Japanese scientists in recent five years, based on lessons-learned from past earthquakes and disasters in China, a prototype of earthquake disaster management curriculum has been created, demonstrated and continuously improved. This paper reviews the prototype curriculum and its development methodology, presents the demonstrative deliveries of the curriculum, and discusses the training effectiveness and further improvements. Applying international emergency management framework and experience, focusing on local government capacity building, the demonstrative trainings have been proved to be beneficial to response activities of local governments and the latest amendment to earthquake preplan in China. Future systematic tracking research of training effectiveness is proposed to keep curriculum updating and appropriate as times change.

KEYWORDS:

Earthquake, Emergency Response, Training Program, Capacity Building, Local Governments

1. INTRODUCTION

1.1 More Occurrence of Minor Earthquakes

In the year of 2008, including the catastrophic earthquake of Ms.8.0 occurred in Sichuan Province, earthquakes with magnitude larger than Ms. 5.0 hit mainland China as many as 99 times. Statistics show that the occurrences of earthquakes with Ms. 6.9 and lower are as many as dozens times of the occurrences of Ms. 7.0 and larger earthquakes in mainland China so far from 1900. Minor earthquakes act more frequently.

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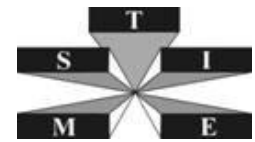


Table 1 Earthquake Occurrences Statistics(Mainland China, since 1900)

Magnitude	Frequency (times per year)
Ms. 5.0 – 5.9	16
Ms. 6.0 – 6.9	4
Ms. 7.0 – 7.9	0.667
Larger than Ms. 8.0	0.083

1.2 Local Governments Dominate in Response to Minor Earthquakes

In National Earthquake Emergency Plan of China, territorial based graded response to earthquakes is one of its principles. According to the impacts of earthquakes, response is divided into four levels. The highest level, Level I response, means national response that may mobilize resources of the whole country as relief efforts. And Level II, III and IV response are dominated by provincial, city and county government respectively.

1.3 Need of Training Program for Earthquake Emergency Response Capacity Building of Local Governments

In an earthquake disaster, disaster responders from local governments are required to gather and send information, make decisions, and coordinate with other sections, departments, and relevant organizations, etc. rapidly and appropriately under extraordinary circumstances. But inadequate planning for disasters, lack of public awareness of earthquakes, and shortage of qualified emergency managers, etc., make the situation even more difficult. When earthquake hits, those hazards unaware may break out concurrently and put thousands lives and millions property in danger.

The need of training for earthquake emergency response capacity building of local governments has been identified by ZHANG J.(2013). But no such training program has been reported. Therefore, for effectively response to frequently-occurring earthquakes, it is urged that a training program be developed to enhance the response capacity of local governments in China.

2. METHODOLOGY AND APPROACH

In China, earthquake administration system consists of three sub-systems: surveillance and early warning, prevention, and disaster management, which are three cycles as shown in Fig. 1. The outermost cycle is surveillance and early warning sub-system, which was firstly established among the three sub-systems in 1966. The middle cycle is to prevent or to mitigate structural damage in case that earthquake hit. Prevention sub-system was set up after Tangshan earthquake on July 28th, 1976. In 1988, after a Ms. 7.6 earthquake following by a Ms. 7.2 aftershock in Yunnan Province, 743 were killed, 4,105 were injured, and about 2 million people were made IDPs. It was found that the recovery and reconstruction from earthquake cost so much that may beyond local capacity. Assistance from national and provincial government was highly expected. It was also the first time that international assistance for natural disaster was accepted by Chinese government (Chen Shouliang, Zhong Yicun, 1989). Later in 1989, earthquake disaster management became the third sub-system of earthquake administration system at national level, which includes three phases: preparedness, response and recovery.

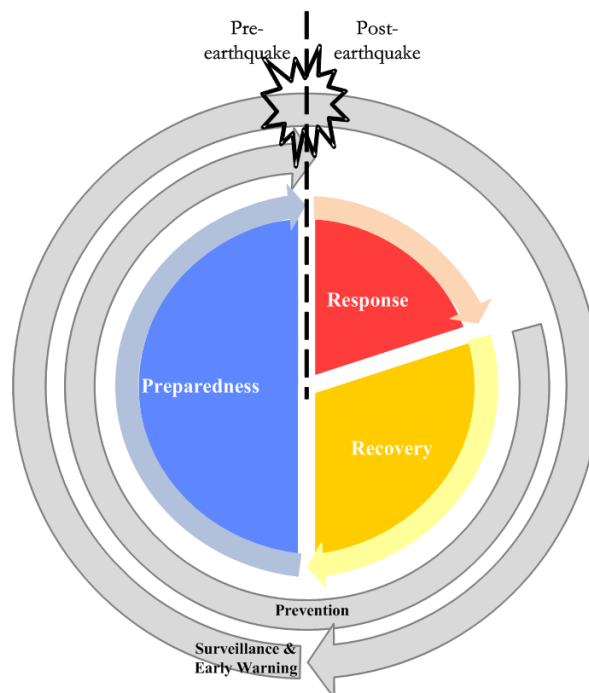
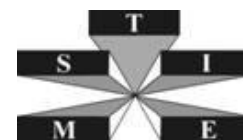


Figure 1 Earthquake Administration System of China

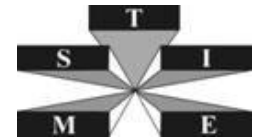
Based on the concept model of Chinese earthquake disaster management cycle, with support of China Earthquake Administration (CEA) and Japan International Cooperation Agency (JICA), trainers from National Earthquake Response Support Service (NERSS) of China have been working closely with Japanese scientists, to develop a tailored training system for emergency managers in China since May 2009.

2.1 Training Needs Assessment

In order to develop a practical curriculum, NERSS also collaborate closely with local authorities, including Sichuan Province, Qinghai Province, Shanghai and the three model provinces picked by the Joint Committee of CEA-JICA project. Questionnaire and interview methods are employed to identified training needs, and to generalize basic materials for the later development of courses.

Table 2 Interview Matrix of Training Needs Assessment

Seismic Background	Historical Earthquake
	Seismic Activity Trend
	Active Faults
	Design Seismic Intensity
	Geological and Geographical Environment
Economic & Social Development	Demography
	Buildings
	Transportation
	Power Supply
	Communication System
	Gas Supply
	Industry
	Education
Medical Services	
Emergency Management System	Organizational Arrangements



	Planning
	Human Resources
	Equipments & Relief Goods
	Technological Support System
Cases of Earthquake Response	Seismic Parameters
	Direct Damages
	Secondary Hazards and Impacts
	Organizational Adjustments
	Timelines of Response Activities

And furthermore, after training, the issues and ideas of trainees from local authorities are shared among trainees, trainers and Japanese professors, which are reflected in “After Training Review”.

2.2 Learning Model for Curriculum Design

Learning is a process of imitation and emulation to acquire certain knowledge, skills, and attitudes. Bransford (2000) states that “To develop competence in an area of inquiry, students must not only have a deep foundation of factual knowledge and understand facts and ideas in the context of a conceptual framework, but also organize knowledge in ways that facilitate retrieval and application”. Hayashi(2009) also defined a learning process that combines three elements of development of human resources: "learning", "drilling", and "exercising". From the specific aspect of training emergency responders, lecture, discussion, critical thinking and practice should be weighed as equal importance. Both lectures and exercise should be incorporated into the curriculum, to provide trainees with sufficient opportunities to develop competence in earthquake disaster management.

To effectively combine lectures and exercise in curriculum design, a learning model as shown in Figure 2 is developed. The information collected in needs assessment is used not only to understand the background of trainees, but also as a whole package of emergency response experience full of "implicit knowledge". Utilizing cluster analysis technique and timeline analysis technique upon those basic materials, some of knowledge become easy to understand and to interpret. It is so called "explicit knowledge" that is delivered and emphasized in lectures. Scenarios of exercise are developed based on cases of earthquake response collected in needs assessment interview. At this step trainees may integrate those explicit knowledge with their own experience, and acquire skills to apply them in a simulated scenario presented by a tabletop exercise. And their attitude will be taught through full-function exercises or in a real mission.

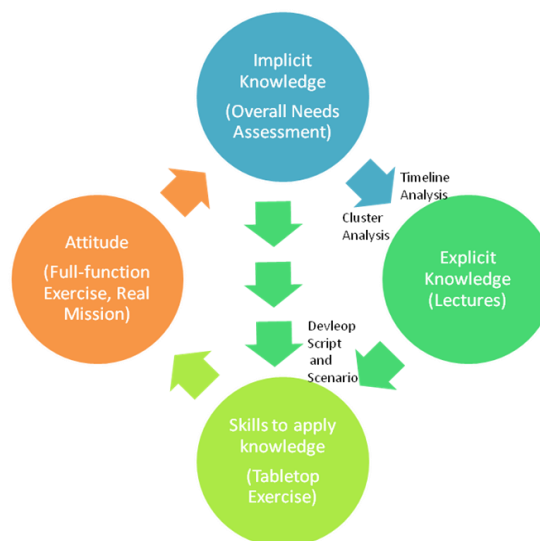
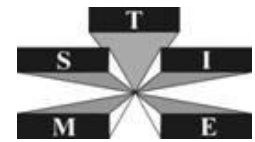


Figure 2 Curriculum Design Model



2.3 Curriculum Develop Flow

In the aspect of curriculum development, quality of every course has been recognized as crucial. Thus a Plan-Do-Check-Action (PDCA) methodology has been employed to manage the whole process. Specifically, “P” is to plan and design curriculum and to develop courses, “D” is to deliver lectures and conduct tabletop Exercise, “C” is to test how much trainees master knowledge transferred in lectures, to evaluate skills that trainees develop in training, to gather feedbacks from trainees, and to analyze strengths and weakness of the training system, and “A” is to compile action plan for further improvement.

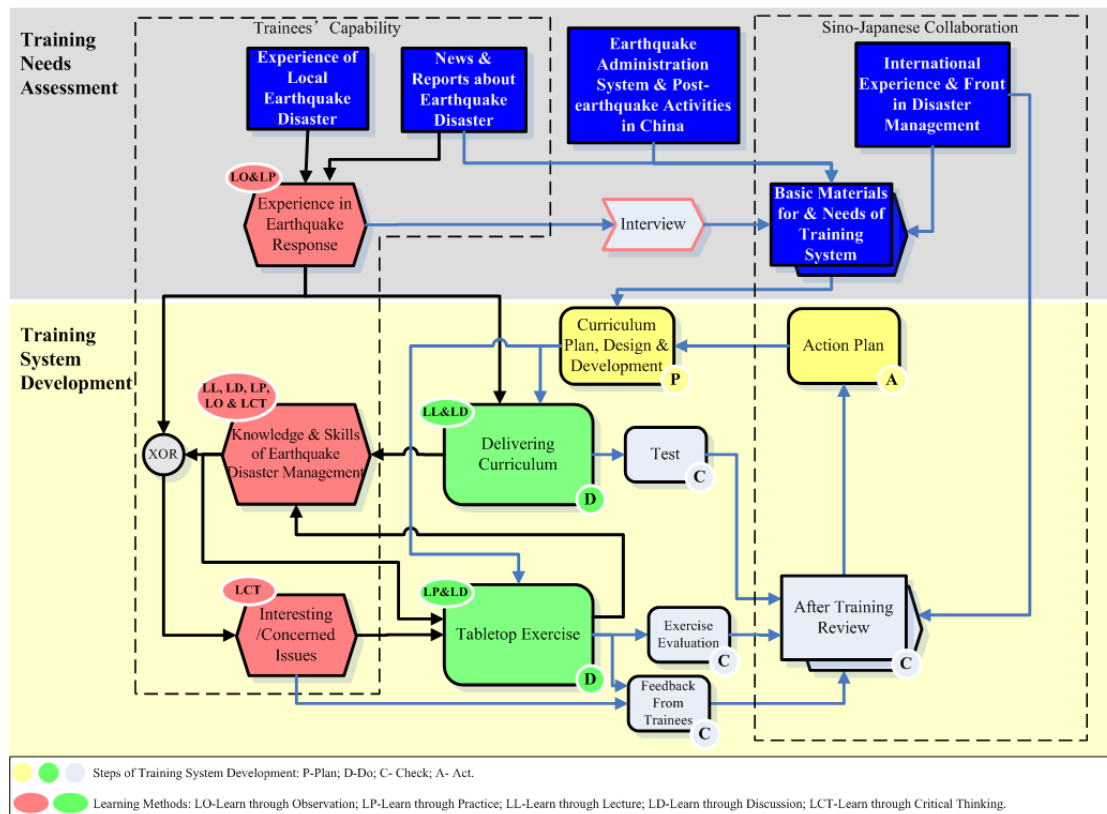


Figure 3 Development Flowchart of Earthquake Disaster Management Training System

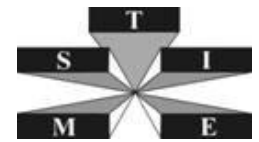
3. RESULTS

3.1 Demonstrative Trainings

From March 2012 to April 2014, six demonstrative trainings have been held respectively for trainees from Beijing, Yunnan Province, Jiangsu Province, Hebei Province, Dalian, and Shanghai. Details of the demonstrative trainings are shown in Table 3. During each delivery, the trainees were encouraged to share their points and experience from their daily work in lectures, and in table-top exercise, they were divided according to their affiliations into three groups, to simulate response activities after a Level-II earthquake disaster strikes.

Table 3 Demonstrative Trainings

Time	March, 2012	May, 2012	July, 2012	October, 2012	November, 2012	March, 2013	April, 2014
Location	Beijing	Kunming	Nanjing	Shijiazhuang	Beijing	Beijing	Shanghai
Where Trainees are from	Hebei	Yunnan	Jiangsu	Hebei	Dalian, Beijing	Hebei, Jiangsu, Yunnan	Shanghai
Population of trainees	22	39	50	24	24	42	25



Trainees mainly came from three different systems:

- (1) Earthquake Administration system, which is responsible for policy-making of earthquake disaster management;
- (2) Civil Affairs system, which is in charge of the preparation, deployment and distribution of relief supply that related to basic survival needs of victims (Water, instant food, tents, etc.), and also in charge of the treatment of the remains of the deceased, in each kind of disaster; and
- (3) The local governments.

They are quite diverse in the aspect of experience in disaster management. The distribution of gender, served agencies and years of service of the trainees are shown in Figure 4.

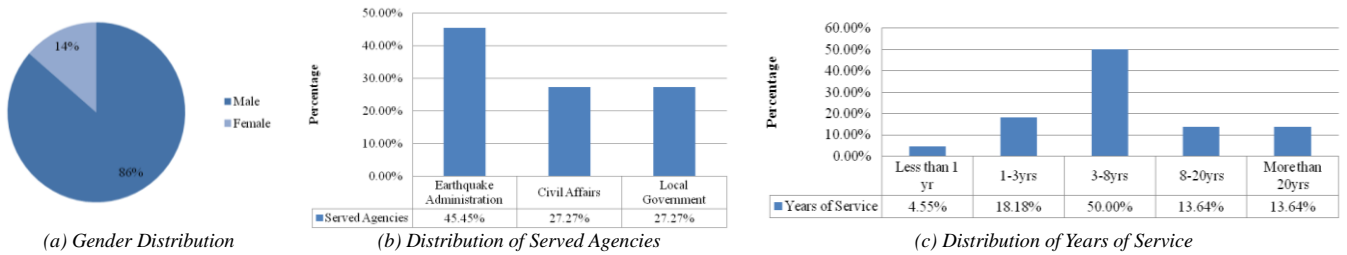


Figure 4 Statistics of trainees from Hebei Province (in the demonstrative training in March, Beijing)

3.2 Confirmatory Evaluations

After each lecture in the demonstrative trainings, a confirmatory evaluation (knowledge test) was taken by the trainees used pre-prepared papers. As an example, the result of each test in the demonstrative training in Kunming, May 2012 are shown in Figure 5. The results of confirmatory evaluations are negative skew distributions, which proved a high mastery of relative knowledge by the trainees through demonstrative trainings.

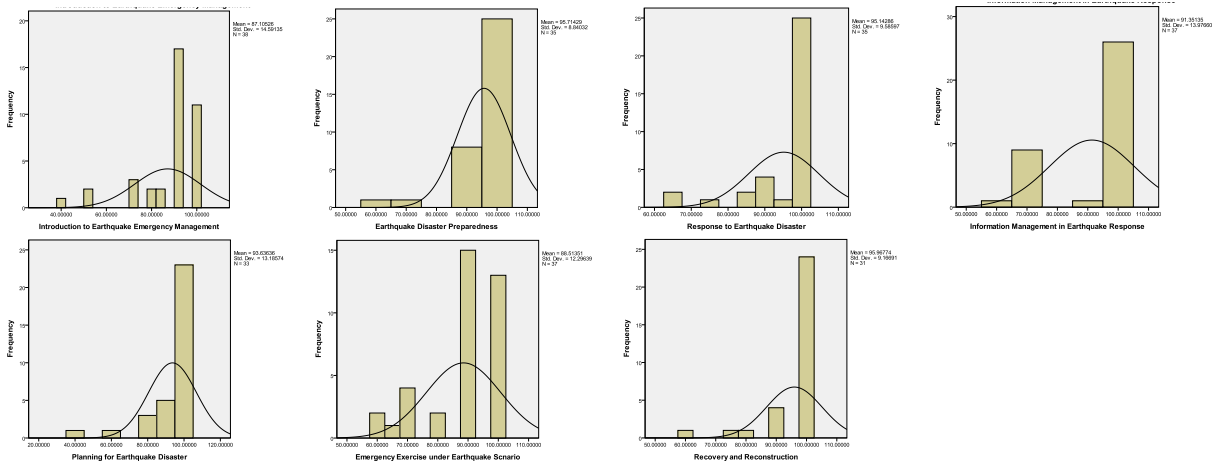


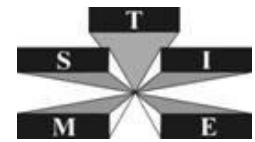
Figure 5 Confirmatory evaluation results (demonstrative training in Kunming, May 2012)

3.3 Feedbacks from Trainees

Feedbacks from trainees were collected through questionnaire. The questionnaire consists of twenty questions, including four fact questions, thirteen ordinal-polytomous questions and three open-ended questions. All questionnaires have been recycled. The results of feedbacks are shown in Table 4.

Table 4 Feedback from Trainees

No.	Feedback Aspect	Average	Highest	Lowest
1	Curriculum concentrates on the theme of	93.6%	100%	80%



	“Earthquake Disaster Management” (Out of 100%)			
2	Curriculum Practicality (Out of 100%)	72.7%	100%	40%
3	Curriculum Novelty (Out of 5)	4.45	5	3
4	Curriculum Consistency (Out of 5)	4.55	5	3
5	Send-outs (Out of 5)	4.60	5	4
6	Trainers’ Skills (Out of 5)	4.59	5	3
7	Design of Tabletop Exercise, including scenarios setup, injections, etc. (Out of 5)	4.60	5	3
8	Tabletop Exercise Add-values (Out of 5)	4.67	5	4

4. DISCUSSIONS

4.1 Customize Curriculum to Local Needs is Essential

Local needs assessment is very important to courses selection and curriculum design. Pre-training assessment should cover not only trainees' opinion but also local knowledge including seismic background, economic and social development, emergency management system and cases of earthquake response which should reflect and specifically addressed in curriculum.

4.2 Scenario-based Teaching Method Enhances Training Experience

Earthquake response training belongs to the science of management in which case study is vital. In lectures, we should combine interpretation with best practice to precisely and vividly deliver ideas; and in exercises, time pressure and visual and auditory information of disaster scenario stimulate trainees to release their own potential dealing crisis. A direct evidence obtained in the demonstrative trainings is that trainees valued the add-value of tabletop exercise as an average of 4.67 (out of 5), which is the highest evaluation in all items.

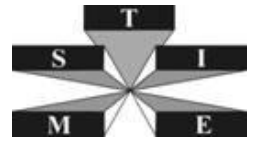
4.3 Flow of Knowledge is Core of Training Program

This study developed a learning model for curriculum design, which promotes learning systematically, effectively and efficiently. Several tools including timeline analysis, cluster analysis, scenario reproduction are found useful in extracting knowledge from experience and in testing the knowledge. Flow of knowledge that is carried by lectures and exercise through the whole process of learning is the core of and contributes to the consistency of the training program.

5. CONCLUSIONS

Generally the feedbacks of the demonstrative trainings are good. The learning model "lecture, drilling, and exercising" has been validated. Further work should be done in eliminating the outer effects and then revealing more significant factors that function on training effects. Applying international emergency management framework and experience, focusing on local government capacity building, the demonstrative trainings have been proved to be beneficial to response activities of local governments and the latest amendment to earthquake preplan in China. Future systematic tracking research of training effectiveness is proposed to keep curriculum updating and appropriate as times change.

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