



## **EARTHQUAKE DISASTER EDUCATION FOR SUSTAINABLE DEVELOPMENT**

Yasamin O. Izadkhah<sup>1</sup> and Mahmood Hosseini<sup>2</sup>

### **ABSTRACT**

Most of the time, disasters hinder the achievements of sustainable development. The Hyogo Framework for Action (2005-2015): ‘building the resilience of nations and communities to disasters identifies education coupled with sustainable planning’ as one of the effective long-term solutions to prepare societies for future natural disasters. In this regard, the aim should be to develop culturally appropriate and locally acceptable and relevant educational materials for preparing people for disasters. There is also a need to establish a network to implement Education for Sustainable Development (ESD) throughout the nation. ESD is regarded as an appropriate framework for disaster preparedness which is interdisciplinary and holistic and therefore important consideration is given to the relationship between disaster impacts, society, the environment, economy and culture. This paper attempts to look at the role of disaster-related education towards achieving sustainable development in developing countries such as Iran for various groups of the society with focus on children activities. Recommendations are presented for increasing the efficiency of earthquake education. In addition, suggestion for future work and expansion of disaster education for sustainable development as well as assessment of the effectiveness of educational materials and tools will be also addressed.

### **Introduction**

Lack of preparedness usually results in significant material and other losses, both on the onset of the disaster and subsequently. The goal is therefore to shift from existing “reactive” approaches of the "disaster recovery" to “proactive” approaches of "disaster mitigation”. These "proactive" mitigation measures focus more on education, with the aim of improving community disaster preparedness. In this respect, education and training are addressed as being among the most practical means of enhancing community preparedness and disaster mitigation. Education is the fundamental “bedrock” of disaster risk reduction. This paper aims to provide a general background on disaster education and training, and present the role of disaster-related education towards achieving sustainable development in developing countries such as Iran, with more focus on children-related activities.

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<sup>1</sup> Assistant Professor, Risk Management Research Centre, International Institute of Earthquake Engineering and Seismology, (IIEES), Tehran, Iran, Email: [izad@iiees.ac.ir](mailto:izad@iiees.ac.ir)

<sup>2</sup> Associate Professor, Board Member of Centre of Excellence on Risk Management, International Institute of Earthquake Engineering and Seismology (IIEES), Tehran, Iran, Email: [hosseini@iiees.ac.ir](mailto:hosseini@iiees.ac.ir)

## **Disaster Education and Training**

Within the past decade, there has been a rapid growth in formal and informal attempts to promote learning about disaster threats in order to increase public knowledge and change behavioral patterns to protect lives. Disaster education has been effectively implemented in some areas for many years. For example, in USA, the American Red Cross has a long history of educating the public about natural and technological hazards and ways to reduce the effects of these hazards on people and their properties.

Evidence of developed public awareness materials from the 1950s onwards does exist with not many printed documents available. In the 1980s, the responsibility for developing and disseminating disaster safety information was spread. For example, those working in Federal Emergency Management Agency (FEMA) Earthquake Program in the 1980s wrote and disseminated earthquake-related materials for the people (Lopes 2001). There is a section on issues in “Earthquake Education” in the technical report prepared by MCEER (the Multi-disciplinary Center for Earthquake Engineering Research) (Ross 1992) since that time, covering articles and case studies relating to earthquake education in general and particularly in school curriculum. Additionally, in recent years, the “Community-Based Disaster Preparedness (CBDP)” and training has been declared to be one of the most effective ways for successful disaster awareness-raising in various communities (UNCRD 2003).

### **Earthquake Disaster Education in Iran**

Iran is an earthquake prone country and 90 percent of the country is located on the Alpine-Himalayan seismic belt which is one of the most active tectonic parts of the world. Based on the statistics, a major earthquake has occurred in Tehran each 158 years. The main reason for this is the location of 15 faults in this area. Three of these faults, each have the potential of an earthquake with a magnitude of more than 7 Richter Scale which can result into a real disaster. Various strategies for earthquake risk reduction have been addressed in the country such as:

- Using the advanced technology,
- Code application and enforcement,
- Improving the management quality,
- Public awareness,
- Increasing the public preparedness for correct reactions before, during and after earthquakes.

In this regard, public preparedness, both physical and mentally for confronting earthquakes as well as strengthening the infrastructures and vital facilities is of great importance for sustainable development. One of the most important factors is to create, maintain and increase the public education and to create a seismic safety culture in all various levels of society (Izadkhah and Heshmati 2007). This has been initiated and continued for the last two decades in the school books and informing children in the kindergarten. Also it has been intended that education and training of issues related to disasters be initiated for various groups of society such as people in residential complexes (Hosseini and Izadkhah 2006), (Izadkhah and Hosseini 2008), women (Izadkhah 2008), taxi telephone drivers (Hosseini and Izadkhah 2007), etc and initial research has been undertaken in this regard. Increasing physical strengthening of the buildings and infrastructures for confronting earthquake forces needs the training of stakeholders such as designers and builders. In this regard, teaching lessons such as earthquake engineering for

bachelors and MSc students has been started in the last few years.

Parallel to disaster educational activities in the country, IIEES has given a great importance to public education. The main objectives of the IIEES education department is to expand the safety culture, prevention and earthquake preparedness in all levels of society and using all applied research and educational methods. The educational indicators have been chosen based on the importance and position of the audience and in this regard, issues such as administrative capacity, speciality, and factors such as age, sex, educational background and population distribution have been addressed. In Iran, disaster educational activities have been undertaken by various organizations such as Red Crescent Society of Iran, the National Committee for Disaster Risk Reduction in Ministry of Affairs, the Natural Disaster Center Management, the Tehran Disaster Prevention and Management Center, Kerman Center for Disaster t, etc, and Non-governmental Organizations such as Earthquake Hazard Reduction Society of Iran, Mojepishro, etc. In this paper, due to the space limitation, only the IIEES educational activities will be addressed (IIEES Website 2009).

### **Public Education**

As mentioned, one of the objectives of public education is to increase people's awareness and education in earthquake risk reduction. Familiarizing with earth sciences and necessary provisions before, during and after earthquakes in home, school and the kindergartens, as well as the offices are presented. There are two sections of productions and tools and the educational activities for children which will be addressed afterward.

### **Educational Productions and Tools**

Part of these productions include general educational books, school books, guidelines for teachers, tapes and films, posters, brochures and other educational tools.

### ***School Books (Theoretical Education)***

School materials have been integrated within the school curriculum in three stages of elementary, secondary and high schools. The objective is to create and develop a safety culture as well as reducing the human casualties and damages due to earthquakes and increase the awareness level. These materials have been designed considering the age and student's physical and social capabilities.



Figure 1. Some of the school books containing scientific materials about earthquake

For example, the scientific issues about earth science and earthquakes in science and geography books addresses the earth, its movement, earthquakes, faults, seismicity and the seismic risk. Other subjects related to strengthening of buildings and preparedness also exist. This program is done with close cooperation with Ministry of Education, (Fig. 1).

### **General Educational Books**

Beside the textbook material which is accessible to all school children, other educational publications on understanding earthquake phenomenon and preparedness measures have been published for various age and class in the forms of workbooks, booklets, brochures, and education-aid materials. One of the IIEES educational books is “E for Earthquake” which is produced for age group 7 to 11 and helps children to teach about the safety personal provisions that they have to learn for protecting themselves in future major earthquakes.

The scientific context in regard to earthquakes and the safety measures have been presented in the form of puzzles, pictures and simple and easy-understanding definitions in this book. This book can also be useful for children in age group 11 to 14. Another bilingual book entitled “Earthquake Preparedness” includes the preventive measures and preparedness before earthquakes, correct behaviour during earthquakes and necessary provisions after the earthquake which a person should consider in home and also work place. A book entitled “Earthquakes” has been translated from English to Persian in relation to scientific knowledge about earthquakes for children and young adults, (Fig. 2).



Figure 2. IIEES publications about earthquake and preparedness for children

### **Educational Films and Tapes**

Educational films have been produced for various age groups relating to earthquake and ways to encounter it. Films such as “Earthquakes”, “Rumour”, “What is an Earthquake?”, “Design and construction of retrofitted masonry, concrete, steel buildings” have been produced. Guidelines and messages in earthquakes with regarding to “Earthquake and Safety” drills in schools, the earthquake song (for elementary and preschool children) and the safety messages in home and office are among the tapes and CD’s which have been produced by IIEES. “Build Light structures” and “strengthening guidelines for buildings against earthquakes” are also other produced short films.

### **Educational Brochures and Posters**

With the cooperation of MOE, the IIEES Children’s Education Dept., has produced a pictorial brochure titled “*Earthquake Hazard Reduction at Educational Institutions*”. The brochure is widely distributed among Iranian school children. Another published brochure entitled “*Educational Guidelines for Earthquake Reduction in Office Buildings*” shows the necessary provisions to be implemented before, during and after earthquakes. A brochure has also been published on “*Earthquake and Safety*” for elementary school children to show the activities and provisions they should take in earthquakes, see example of brochures and posters in Fig. 3.



Figure 3. Educational brochures and posters for public education by Iran’s MOE and IIEES

### **Games**

Educational games have been designed to help children gain a better understanding of disasters. The “*Snake and Ladders*” game has been prepared by IIEES for age group 7 to 9 years old in grades 1 to 3 of elementary schools. The objective of this game is to introduce children, through play to appropriate ways of sheltering from earthquakes. If the children are unsuccessful in the game, they will be asked by the instructor or teacher to explain why they failed - adopted inappropriate sheltering, or used lifts during an earthquake.

### **Teacher Guidelines**

Guidelines have been prepared by IIEES for teachers in schools and instructors in kindergartens in Persian and English in order to familiarize them with the earthquake definition and application, (Fig. 4).



Figure 4. Guidelines prepared by IIEES for teachers in schools and instructors in kindergartens



## **Educational Activities**

These activities include “Earthquake and Safety” drills in schools and kindergartens, earthquake drills in offices, holding workshops, seminars, and educational short courses as well as various national and international drawing competitions.

### ***“Earthquake and Safety” Drills in Schools***

Drills are one of the favourite earthquake education media that children choose. In Iran, the “Safety drills” commenced for the first time in November 1999 in 15499 high schools. The Second National Drill on the subject of “*Earthquake and Safety*” was held on 28 November 2000 in all Iran’s secondary and high schools covering 45,000 schools. The objective of this drill was to prepare the students for appropriate and rapid responses during an earthquake. Subsequently, the drill has been performed annually. In December 2001, the drill was held in the secondary and high school levels in all educational centres in Iran. In 2003, the drill was performed at a national level covering 18 million children in 110,000 educational institutes in different primary, secondary and high school levels across the country.

The Tenth “Earthquake and Safety “Drill has been performed on November 29, 2008, with the presence of three ministers of Ministry of Education, Ministry of Affairs and Ministry of Research and Technology in one of the schools in district 19 in which children practiced the correct sheltering, exiting the building, search and rescue, fire extinguish in the school using the safety school councils. This drill has been developed by the IIEES with the cooperation of MOE, Iran National Television and Radio, the National IDNDR Committee and the Iranian Red Crescent Society. The Drill has become a nationwide annual programme for children and youngsters, (Fig. 5). The upcoming nationwide drill will be held in November 29, 2009.



Figure 5. Earthquake drills in Iran’s schools

### ***“Earthquake and Safety” Drills in Kindergartens***

The First Nursery schools’ drill on the subject of “*Earthquake and Safety*” was held on October 2000 in one of the central parks in the capital city of Tehran. The children have already been educated about earthquakes. The aim of the drill was the demonstration of the safety

procedures performed by the nursery school children. The drill has been subsequently performed annually in May based on the agreement signed between IIEES and Iran Welfare Organization, (Fig. 6).



Figure 6. Earthquake drills in Iran's kindergartens

### ***Holding In-Service Training for Teachers and Instructors***

IIEES Public Education Dept. conducted its first in-service training for the employee staff and teachers of Ministry of Education in 1998. Special books and video tape have been produced especially for the teachers. IIEES had organized various training program for the head teachers. Also the educational courses have been conducted for the nursery school children and the staff with the cooperation of IIEES and Tehran Welfare Organization. The main objective of holding these courses is to increase teacher's level of knowledge, to update their information, as well as to prepare children for protecting themselves during an earthquake.

### ***Workshops, Seminars and Educational Courses on "Earthquake and Safety"***

Holding workshops have been conducted each year on the anniversary of the "Natural Disasters Week". In these workshops, face to face teaching, and using educational media such as computers, maquettes, showing films, etc have been performed for children in various age groups. 14 workshops have been conducted for school students since 16 years ago in various cultural houses in Tehran. Also one workshop has been conducted in 2007 for students with disabilities (deaf students) with the cooperation of IIEES and the specialized section of Ministry of Education, (Fig. 7).

### ***Holding National and International Drawing and Writing Competitions***

One of the most effective ways which can stimulate the curiosity of children for research and study and to promote and encourage awareness among children and youth is to hold competitions. With the objective of holding the exhibition in an international level, the drawing competition and exhibitions are held in the Asian level with the cooperation of UNESCO, UNICEF, IDNDR, UN/ISDR, etc, as well as many local organizations.



Figure 7. IIEES courses on “Earthquake and Safety” in “Natural Disasters Week”

### *Earthquake Safety Councils*

To benefit the maximum participation of the students and their parents toward the improvement of the school safety, the "School Earthquake Safety Council" is being formed in schools consisting of teams such as: Evaluation and Support team; Information team; Search and rescue team; First Aid team; Fire Safety team, and Recovery team. This council with the help of "Teachers and Parents Councils" and using the volunteer parent's expertise aims to improve the school preparedness level. This project has been started optionally in few schools in each city and is expected to be expanded throughout the country.

### **Specialized Education**

As was mentioned, increasing the physical preparedness of structures requires training of the people who are engaged in design and construction. In this regard, teaching specialized lessons in earthquake engineering in Bachelor and MSc levels have been started in the country officially in many universities. IIEES has been one of the pioneers in this area which has trained many students in MSc as well as PhD levels in earthquake engineering shown in Table 1.

Table 1. Specialized earthquake education in Iran

<b>Activity</b>	<b>Description</b>
<b>“Earthquake Engineering” Course in Bachelor Level</b>	<p>Since 1991, a course entitled “Earthquake Engineering” has been inserted as a mandatory course Civil Engineering which contains:</p> <ul style="list-style-type: none"> <li>- Introduction to Structural Dynamics</li> <li>- Seismic Risk Analysis</li> <li>- Fundamentals of Earthquake Resistant Design based on National Code of Iran (Standard No. 2800)</li> </ul> <p>A project is also required for submission from students.</p>
<b>MSc Courses in “Earthquake Engineering”</b>	<p>This course has been initiated since 1991 and includes:</p> <ul style="list-style-type: none"> <li>- Advanced Mathematics</li> <li>- Structural Dynamics</li> <li>- Earthquake Engineering</li> <li>- Soil Dynamics</li> <li>- Effects of Earthquakes on Special Structures</li> </ul>



	- Seismic Retrofitting of Steel and Concrete Buildings.
<b>Specialized Courses on “Seismic Retrofit” for Consulting Engineers</b>	Holding specialized course on a regular basis for consulting engineers. Ten courses have been held so far with the cooperation of “Iranian Earthquake Engineering Association” and some university academics. Special certificate is awarded to engineers who pass this course.
<b>Fundamentals of Seismic Retrofit</b>	Holding various building and earthquake related short courses for validation or extending the period of the “professional engineering license”.
<b>Fundamentals of “Earthquake Engineering in Architecture”</b>	This specialized course has been offered since 2005 as a mandatory course in the MSc program in Technology of Architecture, held in some universities such as University of Tehran.

### **Conclusions and Suggestions for Improvements in Earthquake Education**

In order to improve the earthquake education to be more beneficial to sustainable development, following issues need to be taken into consideration:

#### **Adding the Efficiency**

Considering the existing education mentioned in previous sections and the created background in the country, it seems that it is an appropriate time to expand the public and specialized education. In this regard, following are suggested:

- Using novel educational methods and tools. In relation to the education process, tool and methods should be used in the teaching-learning process that is suitable to the mental, physical and age group or the special characteristics of the audience,
- Producing materials and tools that is simple and understandable to all groups of the society,
- Holding educational courses on “Earthquake and Safety” in places such as cultural houses, mosques, etc in order to familiarize people with considering their needs before, during and after earthquakes,
- Revising and updating the school materials and adding new educational contents to them with amending possible shortcomings,
- Inserting materials in school books to increase the understating of preliminary and secondary risks in the students and to encourage them for active participation in preparedness program and campaigns,
- Inserting materials which enforce student’s attention to correct construction, the necessity of strengthening the existing weak buildings and create preparedness as fundamental points in reducing undesirable consequences of earthquakes,
- Offering “Fundamentals of Earthquakes in Architecture” as a compulsory course in Architecture Bachelor degree in universities.

#### **Evaluating the Effectiveness**

Obviously, without evaluation of the effectiveness of the educational methods and tools, it is not possible to make much improvement in education. To conduct better evaluation it is

suggested that:

- The assessments are done regularly and in a pre-planned manner, each time with some new format, particularly with regard to instructors so that they have to maintain their efficiency all the time, especially by getting updated on newly developed materials and techniques.
- Preparing evaluation tools such as questionnaires, interviews, pre-tests post-test sets, etc. not only based on the features of various target groups, but also considering their knowledge needs, and the required updating.
- Using other tools with the same context and different wording in pre-test post-test sets, so that those whom are tested do not only rely on their memories for responding and also need to use their understandings.

With the hope that creating and expanding the educational activities, especially in earthquake issues and ways to reduce the impact, can increase the awareness of children as the future messengers in the families, reinforce the safety culture in the society and emphasize a sustainable development for years to come.

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