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Seismic education: two experiences compared

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Abstract
Two experiences of earthquake education in two different countries are compared. The differences and similarities of needs, contexts, aims, target populations, approaches and activities are discussed. The CALEEP experience points out the need to move the population attitude from the intentionality to prepare for earthquakes towards an active preparation for the next earthquake. The GNDT experience has to face even a harder problem, since in Italy neither the intentionality to prepare for an earthquake nor an active attitude to take actions regarding seismic risk exists. To find solutions to these problems an educational technology approach seems to be useful.

1. Introduction

In 1980, the Irpinia and Basilicata Earthquake produced many victims and catastrophic devastation, while the Loma Prieta Earthquake, in California (although stronger than the Italian one) produced fewer victims and much less destruction. This is mainly a result of the different ways in which the Californian and Italian societies are prepared for an earthquake. Herein we describe and compare two earthquake education programs: one carried out by the Lawrence Hall of Science, UC Berkeley, in California, the other by the Gruppo Nazionale Difesa dai Terrremoti (GNDT) in Italy, in the hope that we can all learn from these two experiences.

2. Needs and contexts

2.1. *California*

Research (Thier and Schnur, 1982 and Thier and Gratton, 1986) and extensive experience during the development and dissemination of the materials produced by the California Earthquake Education Program has shown that it is quite easy to raise public awareness of the threat of earthquakes and the need for preparedness. For example, a state-supported Earthquake Week and monthly activities in California over the years have brought into focus public interest, actions regarding awareness and to some extent preparedness. These activities have always been carried out in April around the anniversary of the 1906 San Francisco Earthquake. You now see from time to time in the media questions or discussions about «*earthquake weather*». That is, people believe earthquakes take place at warm still, somewhat humid, times of the year (the weather in California in April). Perhaps the occurrence of the anniversary of the Loma Prieta Earthquake in October, when it tends to be cool and windy, will help to at least broaden the concept of «*earthquake weather*».

The great majority of the individuals surveyed during the research carried out in relation to CALEEP expressed the *intentionality* to prepare for earthquakes, while only a small minority actually took *action* to prepare for an earthquake. This difference between *intentionality* and *action*, which we encountered continuously, is es-

pecially critical in schools. Teachers, for example, could reduce significantly the possibility of personal injury to students during earthquakes by taking action beforehand to provide effective earthquake education. This should include both planning and preparedness components in addition to scientific information about earthquakes.

2.2. *Italy*

In Italy the prevailing attitude towards earthquakes is that they are unavoidable catastrophes against which the only possible protection is predicting their time, location and intensity. From a scientific point of view this attitude is incorrect and dangerous for a seismically active country such as Italy, because it undermines a policy of prevention and preparedness. One of the main reasons for this genaral attitude is a lack of information about the mechanism of this phenomenon and the possibility of its control. In order to rectify this situation an earthquake education group has been created as a part of a working group of a national project focussing on geodynamics (Stucchi *et al.*, 1978). When this project was completed, the education group continued its activity in the context of the Gruppo Nazionale per la difesa dai Terremoti GNDT (National Group for Protection Against Earthquakes).

2.3. *The analogy*

An analogy can be described showing the differences and the similarities between two situations. The main difference between the Californian and the Italian situation is that in California people are aware that an earthquake will take place in the future and have to prepare for this event. However there is a gap between the *intentionality* to prepare for earthquakes and the actions taken to face it. In Italy, on the other hand, people, and often public administrations, seem to be unaware of a possible occurrence of an earthquake and tend to ignore the problem of preparedness. The problem of protection is conceived as problem of prediction dealt with by scientists. The main similarity between the two situations seems to be the widespread ignorance of the characteristics of an earthquake and the scientific models which describe it.

3. Aims and target populations

3.1. *CALEEP aims*

Our evidence indicates that, just like the general public, many teachers intend to plan and prepare for earthquakes while far fewer take action to do so. For example after the September 1985 earthquake in Mexico City a survey of 284 teachers carried out by the author and his associates (Thier and Schnur, 1982) clearly indicated this difference between intention and action on the part of teachers in schools directly affected by the event. The analysis of the data collected was carried out using a test for significance and computing eta, a statistically determined index of practical importance, to determine the proportion of the variance associated with the differences between pairs of means. This provided extensive information regarding the differences between intentionality and action on the part of those leaders who experienced the Mexico City earthquake of September 19,1985 (Thier and Gratton, 1986).

These findings regarding the discrepancy between intent and action reinforce the results on these same issues obtained during the early survey research efforts related to CALEEP. In this survey, 75% of over 600 representative Bay Area residents indicated that they expected a large earthquake would strike in their lifetime, that they would be affected by it, and that they did not anticipate receiving emergency services quickly. However, less than a quarter of respondents had done anything to prepare for the event of an earthquake (Thier and Schnur, 1982).

Recently, especially at the community level, a number of efforts have been focusing on motivating people and neighbourhood groups to organize themselves to respond effectively at the time of an earthquake. Many of these efforts also attempt to provide the public with the information they need to better prepare themselves beforehand for the eventuality of an earthquake.

Traditionally, earthquake preparedness and education programs have concentrated on making the public AWARE of earthquakes and the need to prepare for them. Fliers, brochures, slide shows, etc. have been produced which tell people about earthquakes, their causes, and appropriate preparedness measures. The distribution of the flier or brochure and the viewing of the slide show has too often been considered a measure of the success of the endeavour.

Frequently the evaluation of the success of such efforts is based on the number of pieces of information distributed and/or the number of people who attended the events. Both of these are absolutely necessary since if the public you want to effect does not hear your message your chances of bringing about change are zero.

On the other hand, experience clearly shows that simply providing the public with information does not bring about action on the part of a significant percentage of the public. The provision of information by «public earthquake information» efforts increases awareness but is not enough to motivate action. Such long-term concern and action can only be motivated by the kind of educational effort that involves the individual actively in the issue so that they see earthquake preparedness as necessary to make possible the way they want to live their life, *i. e.* earthquake preparedness concerns need to become an integral part of the individual's life.

According to those needs, CALEEP mainly addresses teachers and schools and is aimed:

1) to motivate students and their families to take action to better prepare themselves to survive an earthquake with minimal injury, loss of property, and psychological upset.

2) To teach students about the science of earthquakes and related areas in the physical sciences.

3) To accomplish goals 1 and 2 in the context of a program that helps the teacher accomplish his or her goals for science and related educational experiences in the classroom.

3.2. *GNDT aims*

In Italy, the GNDT earthquake education group has carried out a study to define the requirements of a program for earthquake education and has produced a document in which five target populations have been pointed out:

1) the school,
2) decision makers in the public administrations,
3) public opinion,
4) unions and political parties,
5) people involved in civil defence.

The following are the main aims according to these populations:

– instructing and informing about what an earthquake is and how we can prepare for it (populations 1, 2, 3, 4, 5);
– raising awareness of the fact that most of the Italian population lives in seismic areas (populations 1, 2, 3, 4);
– orienting towards problems related to earthquake preparedness, and the role of prediction (populations 2, 3, 4).

It should be noticed that the above-mentioned study aimed to define a framework for the future activities and avoided constraining the requirements to the available resources.

Later on, in the context of this framework, priorities were defined and the available resources allocated.

3.3. *The analogy*

CALEEP mainly addresses the school and is principally aimed at motivating students and their families to take action to better prepare themselves to survive an earthquake with minimal injury, loss of property, and psychological upset, while the GNDT addresses several populations and is mainly aimed at changing a cultural approach.

Both programs aim to teach the scientific models of earthquakes as a natural phenomenon and conceive earthquakes as a topic which can be *distributed* over different subjects and dealt with in the context of subjects other than science.

4. Approaches and activities

4.1. *The CALEEP program*

The California Earthquake Education Project (CALEEP) is a major activity of the Lawrence Hall of Science, University of California, Berkeley. CALEEP was a cooperative effort between the Lawrence Hall of Science and the California State Seismic Safety Commission. Curriculum development was funded by Chapter 785 of the 1981 Statutes of the State of California. Chapter 1558 of the 1984 Statutes of the State of California provided funds until December 31,1987 for the implementation of these materials state-wide.

Independent evaluation, as well as direct user feedback, has proven these materials to be engaging and effective in school earthquake education and preparedness programs. In addition CALEEP is a program that can be readily incorporated into the *regular* curriculum in science, math, language arts and social studies. The materials are specifically designed to help teachers meet their long-term educational goals in these areas while teaching specifics about earthquakes and how to prepare for them.

4.2. *The GNDT activity*

Following the above-stated aims, the program addressed different target populations, however among these populations schools had the highest priority. In the following, the main activities addressing school and public opinion are briefly described.

Schools

The first step has been the development of a course for high-school students (14-18 years) entitled «What Earthquakes are and How we can Protect Ourselves» (Ferraris *et al.*, 1984a). It was designed to be used by a large audience and in various types of scholastic settings.

After the production, the course was field tested and then distributed on a wide scale. The course is composed of three modules: 1) What are earthquakes? 2) Where do they originate and why? 3) How can we protect ourselves against them? Each module involves an audio-visual part (videocassettes) for group study, which give information about the ground content of the whole module, and a printed part for self-instruction, whose main purpose is to go deeper into particular subjects and to give the students operative abilities in some of the main topics. More details are found in (Ferraris *et al.*, 1984b).

Around the mid '80's, a project was initiated aimed to develop a hypermedia system, *Terremoti* (*Earthquakes*) (Midoro, 1990), which could offer support to training and information initiatives about seismic hazards. *Terremoti* was then tested and used in the context of teacher training courses. The system and its use are described in Frau *et al.*, 1988.

In parallel with these activities, a survey, based on a questionnaire, was conducted to detect students' mental images about earthquakes.

Public opinion

Several brochures have been produced and distributed dealing with earthquakes, their causes, and appropriate preparedness measures (Rosi and Stucchi, 1982).

There is no feedback about these actions; however, like the CALEEP development team, we feel that simply providing the public with information not only fails bringing about action on the part of a significant percentage of the public, but does not even increase public knowledge significatively.

4.3. *The analogy*

The similarity between the activities of the two programs is that the solutions to the problems of earthquake education take the form of learning resources, while the difference is the nature and form of these learning resources.

The resources developed for school settings were tested and monitored in both programs. In these cases, the material proved to be suitable for accomplishing the stated aims. No information is available about the effectiveness of the actions taken for public opinion. It seems that, where an educational technology approach has been adopted, the results have been much better than those obtained with unmonitored initiatives based on brochures, slide shows, etc.

5. The lessons learnt

5.1. *CALEEP*

The lack of public understanding of, and therefore informed reaction to, risk benefit analysis and risk management generally, is a major factor preventing the motivation of the public to take action regarding seismic risk. Another major factor affecting public reaction to seismic risk is the nature of the risk itself (Chemical Manufacturers Association, 1986). All of the research indicates that the public reacts in a more positive, rational manner when it perceives the risk to be controllable, voluntary, familiar, and not catastrophic but spread out over time (American Industrial Health Council, 1986). This is exactly the opposite of the publics perception of seismic risk which they think is uncontrollable, involuntary, unfamiliar, and catastrophic. Unfortunately these perceptions by the public are largely accurate and therefore motivating the public to really take action to mitigate the seismic risk is very difficult. The nature of the risk, the relatively low frequency of occurrence of major seismic events and the catastrophic devastation that can be caused by a major earthquake all tend to cause the public to adjust by psychologically rejecting the possibility that it will happen to them and therefore they do not make any real effort to prepare for it. This occurs because to a large extent they do not believe that anything they do can really make a difference. Our task as educators is to find ways to truly educate the public about the nature of earthquakes and the proven value of preparedness actions beforehand in reducing loss of life and economic devastation. An integral part of such education has to be an understanding of seismic-risk assessment and seismic-risk management so that the public believes that their actions will increase their chances for survival when a major earthquake comes even though we cannot tell them when that will be.

5.2. *GNDT*

Two main problems emerged from the GNDT experience. The first concerns the distribution and use of the produced material. There was a large dissemination and a wide interest in this material just after the occurrence of an earthquake, but nobody seems to be interested in earthquake education in a period in which no earthquake occurs. Far from earthquake occurrence, public institutions responsible for either education or civil defence do not care about earthquake education. The second problem concerns the dispersion of the GNDT funds into many small initiatives.

A main requirement for future projects in this field is that the public institutions responsible both for education and civil defence are actively involved in the development and dissemination of learning resources. They have to provide both financial and human resources. These resources should be used for setting up a permanent structure for risk education responsible for carrying out programs and activities in this field, in cooperation with scientific and public institutions.

6. Conclusions

We have described and compared two experiences of earthquake education in two different countries. The differences and similarities of needs, contexts, aims, target populations, approaches and activities have been discussed. The CALEEP experience points out the need to move the population's attitude from the *intentionality* to prepare for earthquakes towards an active preparation for the next earthquake. The GNDT experience has to face an even harder problem, since in Italy there exits neither the intentionality to prepare for an earthquake nor an active attitude to take action regarding seismic risk. To find solutions to both these problems an educational technology approach seems to be useful. In Italy that requires a strong political commitment and the design and implementation of a permanent structure to manage the problems of education regarding natural risk.

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