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“Knowledge and practice”. Educational activities for reduction of earthquake impact: the EDURISK project

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ABSTRACT

The EDURISK project (Earthquake eDUcation: a journey for seismic RISK reduction) focuses on the development of educational tools and activities centred on earthquakes and the mitigation of seismic risk, for use in courses and campaigns for seismic risk reduction addressed to students of age 4-13 and to adults and on their hand-on experimentation in targeted areas. The project aims to improve the general awareness of seismic risk by disseminating reliable information tailored to the needs, interests and learning abilities of a large and varied public. An efficacious strategy for seismic risk mitigation addressed to the general public must involve all the aspects of human life that are under seismic risk. Earthquakes should be presented not only as physical and geological phenomena but also as social events interacting with people's lives and belongings. The EDURISK project should be perceived as a joint venture between the world of scientific research and the world of basic schoolteaching, working together to build up awareness and knowledge useful to reduce the seismic risk.

INTRODUCTION

The main objectives of EDURISK project are to disseminate information and education to improve awareness of the seismic risk as part of everyday life. The understanding of the vulnerability of the natural and human environment is the first necessary step towards the development of personal and collective responsible behaviours and the mitigation of risk. In our opinion this aim can be best achieved by removing earthquakes from the naturalistic and scientific sphere they are traditionally attached to. Earthquakes should not be seen exclusively as physical and geological events but also as social events interacting with people and therefore having great impact on the society. We believe that an effective strategy for seismic risk mitigation should involve all the different aspects of human life that would be affected by an earthquake.

Therefore, the first task of this project is not motivated by scientific educational aims, such as the dissemination of accurate and updated information on the characteristics of a physical phenomenon. It is rather perceived as a joint venture between the world of scientific research and the world of basic schoolteaching towards the achievement of awareness and knowledge for the reduction of seismic risk.

DEVELOPMENT OF LEARNING RESOURCES

In the first months of activity, the EDURISK staff and the subcontractor Giunti Educational Projects worked on three educational tools and the organization of a testing campaign. The three educational booklets were designed following guidelines outlined in a series of meetings between members of EDURISK and staff from Giunti Educational Projects. Text and graphical drafts were revised in subsequent phases by members of the project and external contributors, amongst these several school teachers involved in the project.

For ages 4 to 7, EDURISK has developed a dedicated educational solution [Costa et al., 2003] with the title “When an earthquake strikes” [Fig. 1]. This is composed of a folder containing a Teachers' Guide and four cardboard pictorial sections. The booklet is addressed to nursery schools and the first two years of primary schools, when unsupervised usage can be achieved. It has been conceived as a classroom activity rather than as individual reading. Its use within small groups of pupils is encouraged. The booklet explains how people should behave in case of an earthquake and gives suggestions on practical activities (games, exercises) that the teacher can launch in class.

With the graphics of Nicoletta Costa (one of the best contemporary children illustrators in Italy), the pictorial sections show four typical environments where children can expect to feel an earthquake: at home, on the street, at school and on the park. Maria Loretta Giraldo wrote the text introducing in rhymes the three most salient aspects of an earthquake occurrence: normality or before the earthquake, what happens when the earthquake is felt and its consequences and, finally, what to do to protect oneself from an earthquake. Guidelines on what to do or not to do in order to protect oneself are given in the final section. Children learn simple guidelines on how to behave in an emergency through the play activities of Anna and Marco, brother and sister, who act according to the guidelines and also through the funny mishaps of Spillo the cat, who on the contrary does always act in a clumsy, if not incorrect, way.



Fig. 1. Graphic layout of the nursery Kit “When an earthquake strikes”.

Prepared by a teaching expert (Beniamino Sidoti), the teachers' guide includes thirteen play activities aimed at improving children's ability to cope in an emergency situation, along with general information on the various aspects of seismic risk and a small glossary.

For ages 8 to 10, EDURISK project has prepared a specific educational solution named “Earthquake Lesson” [Fig. 2]. This

is a guidebook written and illustrated by Roberto Luciani, who has also authored the accompanying teachers' handbook [Luciani, 2003; Camassi and Brugnara, 2004]. The information is intended for years 3, 4 and 5 of primary schools. Its layout, mainly in the form of cartoons, and its rich contents make it nonetheless ideal also for both smaller children and the transition from primary to secondary school. The guidebook can be used both in the class and by pupils individually. It is suggested that its interactive sections be maintained in order to preserve the original purpose as a school resource.

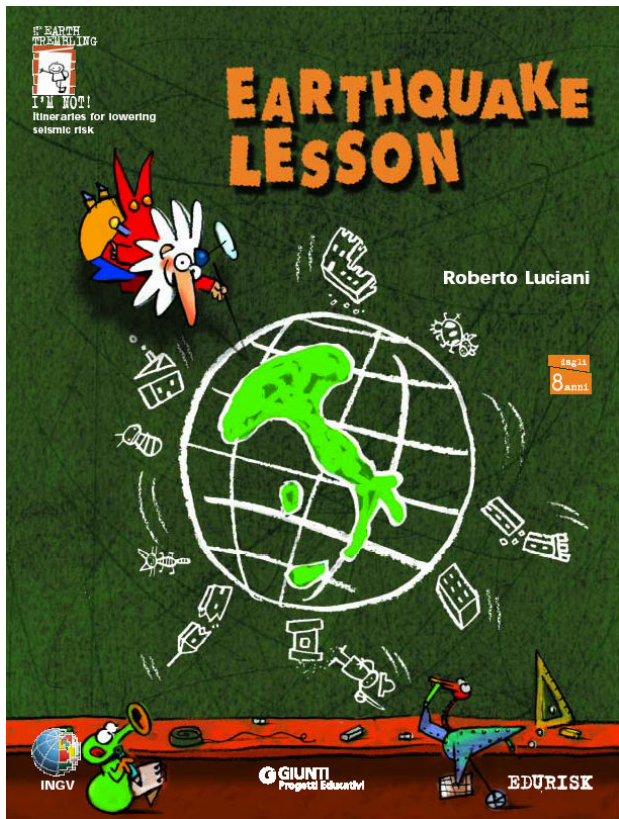


Fig. 2. Cover of the active book “Earthquake lesson” (English edition).

The overall aim is teaching how to behave in an emergency and providing important information on earthquakes and seismic risk. Strong emphasis is also put on the physical geography of Italy and seismic risk mitigation measurements.

The guidebook consists of fourteen double sided printed sections and a final self-assessment list of questions for students. Subjects covered include earthquakes and tsunami triggering mechanisms [Fig. 3], measurements and analyses, seismological characteristics of Italy, major historical earthquakes, prediction, effects, what to do before and after an earthquake and building regulations for the reduction of risk.

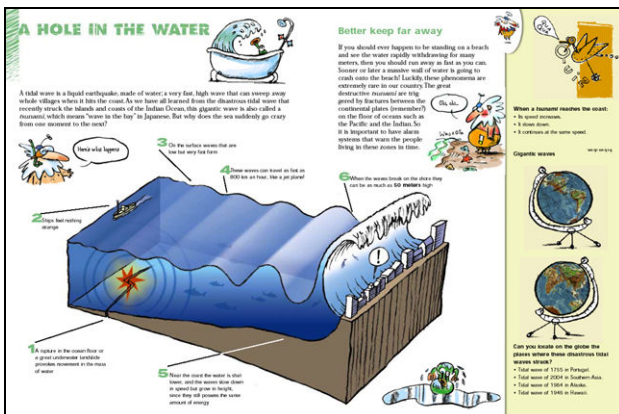


Fig. 3. Graphic layout of the active book “Earthquake lesson”.

Contents are introduced by a cartoon figure, Professor Pof, whose two assistants, Trombetta and Anna, depict and represent the topics under discussion. A side section contains questions, tips and additional information. The booklet is intended to be used over the course of 3-4 years, with groups of thematically similar sections in each year, alongside the educational activities organised by the teacher.

Due to the lack of attention toward specific scientific and naturalistic subjects, topics can easily follow within the realm of different disciplines, such as science, geography, history and social studies. The teachers' notes, included in a separate booklet, contain suggestions for extra activities and further work.

For ages 11 to 13, EDURISK has published the book “Earthquakes: how and why” [Angiolino, 2003]. This is a 64 page booklet with contents by Angiolino Bogliolo, illustrations from Gianluca Garofalo, cartoons by Francesco Fagnani and a highly sophisticated image layout [Fig. 4]. Its contents and graphics make it ideal for a public of 11 to 13-year-olds. However, the scientific accuracy of its subjects and the considerable amount of information on offer allow to expand its usage to older students and adults alike, as a user-friendly and enjoyable source of information and revision. The booklet has also been conceived as a companion to the reading and studying activities of students for both personal use at home and in the school.

The main objectives of this booklet are to provide reliable information on earthquakes, to suggest best behaviours for the reduction of seismic risk and to show what to do when an earthquake occurs.

As previously stated, we privileged examples with a local interest, over those related to foreign countries, which albeit sometimes more catastrophic, would probably be less directly involving and interesting for the readers. This is what we consider to be the unique and distinct contribution of the educational resources we have developed and the relevance of their educational effort. This is aimed at promoting awareness of seismic risk within the sphere of everyday life (here and now) to initiate individual and common actions for risk reduction.

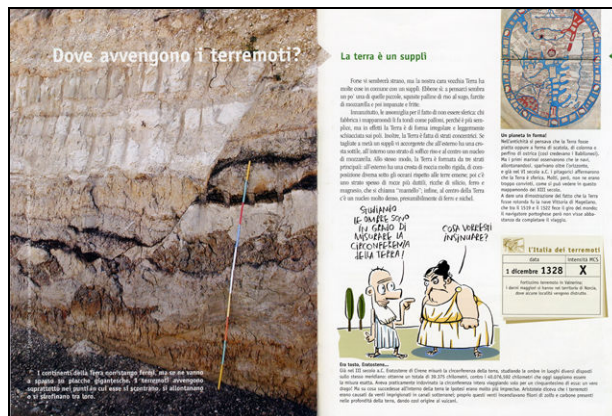


Fig. 4. Graphic layout of the book “Earthquakes: how and why”.

The booklet contains a set of 10 questions, following a layout originally devised by Daniele Postpischl at the beginning of the 1990's. The main contents are accompanied by pictures, realistic representations, maps and sketches with notes that often greatly expand the informative content of the main parts. Funny cartoons are used to attract the attention of even the less interested students. A reference list of the main past Italian earthquakes is also included.

The booklet is intended to be used over the entire course of the school year, with groups of thematically similar sections each containing three to four questions, alongside the educational activities organised by the teacher. Topics can be easily covered within the boundaries of different disciplines.

PLANNING THE TESTING CAMPAIGN

Any learning activity within the school must be preceded by a detailed project to be submitted to the School Authorities. A comprehensive learning project was defined and submitted to several schools within the selected areas. Learning initiatives submitted to the attention of schools included: a) production and distribution of learning material (booklets); b) training for teachers; c) support and consultations throughout the school year; d) final assessment of the learning initiatives

It was decided that the testing campaign would be take place in a few areas only, to be chosen as representative of different seismic situation to be found in Italy. The final choice fell on the regions of Friuli-Venezia Giulia, Emilia Romagna and Calabria, on account of their widely different cultural backgrounds and seismic characteristics. The choice of schools in each area was based on different principles. In Emilia Romagna, with the help of local government offices, we selected the area of the Comunità Montana Appennino Forlivese, including the towns of Santa Sofia, Civitella di Romagna, Meldola, Predappio and Bagno di Romagna.

In Friuli and Calabria, schools were chosen trying to achieve a selection that was representative of the different social and cultural regional situations. Two Comprehensive Schools and two Junior Schools took part in Friuli; in Calabria four schools decided to take part from the early stages with a further one joining at a later date.

TRAINING TEACHERS

Training teachers is an important element to guarantee that learning initiatives are effective in the reduction of the risk. On the basis of the analysis of the teachers' requirements and of past experiences, an experimental programme, linked to the different stages of the project, was drawn up.



Fig. 5. The earthquake machine (Primary school, Class 2C, Meldola).

Learning initiatives included: a) a training course for teachers in the early stages; b) a distance learning course over the web (www.edurisk.it), with limited access areas for the distribution of learning resources and informational material; c) a 5 issue periodical newsletter. The aim was to allow participants to acquire general and local knowledge and information on seismic risk.

TABLE 1: Contents of the training course

| Module | Topics |
|-----------------|---|
| EDURISK project | general aims of the project; introduction to the learning resources; evaluation stages; distance learning web site for teachers and students. |
| Seismicity | general principles, seismicity characteristics of Italy and its regions, historical local events. |

| | |
|-------------------------|--|
| Hazard and Risk | seismic hazard; hazard maps as a tool to understand the local environment; seismic risk; risk defining elements; mitigating the risk in your town, at school and at home. |
| Psychological emergency | psychological emergency and mitigating actions; psychological effects in an earthquake: physical and pathological aspects; what to do in case of an earthquake; the role of educators as the initial source of psychological assistance. |



Fig. 6. The earth is trembling (collage by Nursery school, Section II, Guardavalle Marina).

The course was divided into four learning units, each lasting two hours with the aim of providing teachers with the necessary skills and knowledge [Tab. 1].

Additional booklets, with local differences, were compiled for each module and made available to teachers both on paper and on the web site. Teaching during the course occurred through interactive methods, with great emphasis on individual interventions and constant reference to the learning resources available during the course and from the web site. At the end of the training workshops, informational meetings took place in each school aimed at creating interest and motivation towards the evaluation process. A specific section of the web site was added to provide teachers with distance learning resources.

This area has been developed as an opportunity to discuss subjects of relevance, give support to the learning initiatives on the basis of the guidelines defined for each school term and, finally, offer ideas and additional data for each learning module.



Fig. 7. Ex voto on earthquake (Secondary school, Class 1A, Tolmezzo).

The newsletter EDURISK has provided teachers and schools with a tool for sharing ideas, experiences, working material and the opportunity to establish closer links amongst the participants under a common objective: to develop a forum on seismic risk with news and information relevant to the

project. Five issues have been so far published, at approximately monthly intervals.

EVALUATION PROCESS

Learning tools and resources have been subjected to an evaluating process aiming at establishing the effectiveness of the educational proposals in the light of their expected results. This process will prove useful for the delineation of future actions and guidelines within the activities of interested scientific organisations and the units of the Department of Civil Defence.

The learning effectiveness has been assessed by comparison with the stated objectives: a) *Information objective*: to promote awareness and knowledge of seismic risk as part of everyday experiences; b) *Learning objective*: to generate the adoption of suitable individual and common actions for the mitigation of risk. The objective of the evaluation process has been to determine whether the learning resources and materials developed have generated amongst the participants greater knowledge, improved actions and better awareness, all factors contributing towards the mitigation of seismic risk.

The observation of results in comparison with the stated learning objectives has been adopted as the main evaluation criteria, in preference to a scientific approach, which would have proved fruitless when applied to the analysis of skills acquired by children at the end of the learning activities.

A two-fold approach was therefore followed: a) an indirect approach, where teachers acting as assessors have judged the effectiveness of the learning process in each school stage and the value of the learning materials developed by EDURISK project; b) a more direct approach, where evaluation forms from junior students have been used to establish the effectiveness of books as a type of learning resources and their success in promoting positive attitudes towards the mitigation of seismic risk.

The evaluation process has been developed as a series of staged activities:

- development and refinement of the evaluation tools: a 50-item questionnaire was put together, to be given to teachers, with a mixture of multiple choice and articulated questions. Multiple-choice questions were devised to obtain direct answers in areas where precise measures were required. More articulated answers were instead formulated for subjects that could not be easily judged following a quantitative approach, requiring instead the assessment of qualities and often abstract measures. For junior students, in light of their different educational level, a simplified 15-item questionnaire was written, with multiple choice questions.

- learning workshops: workshops were held in each region to develop methodologies for the evaluation process. A newsletter issue was also written during the workshops, entirely dedicated to this subject, with the aim of providing information and support on this important aspect of the project.

- distribution of the assessment tools: this was a 2-point stage at the end of the school year: a) online distribution of the *teachers' questionnaire*, for all regions; b) online distribution of the *students' questionnaire*, carried out inside the "Earthquake week" dedicated to the recollection of the most relevant historical earthquakes for each region.

- collection and analysis of the information: data from the web site and the evaluation forms were collected and analysed.

- data were confronted with the project stated objectives and the learning goals of each educational resource.

- meetings with school officials and students to present the project results.

FINAL RESULTS

The activities of the project in last three years had two main objectives: a) preparing, for each of three basic (nursery, primary and secondary) school levels an educational tool structured, as to formats and contents, to met the educational

requirements and learning abilities proper to each age level and offering the best scientific information available in Italy; b) testing the educational tools to provide a cost/benefit evaluation of the finished products. This evaluation is one of the final results of the Project, as a tool to be put at the disposal of any scientific structures and/or Civil Protection departments wanting to plan educational campaigns.

The experimentation in teaching methodology has been completed involving about 400 teachers and 5,000 students in three different areas of Italy (Calabria, Emilia Romagna and Friuli).



Fig. 8. "Earthquakeproof": a teachers' guide.

An important result of the project is the publication of an educational guide for teachers ("Earthquakeproof"), collecting all didactic units proposed by teachers at the end of experimentation [Sidoti, 2005; Fig. 8].



Fig. 9. Learning seismic vulnerability (Primary school "Collodi", Trieste).

CONCLUSIONS

During the two years of activities, the EDURISK Project has produced three educational tools dedicated to the basic school and a teachers' guide. In addition, it has organized an

experimental test of the booklets involving nearly four hundred teachers and five thousands students of three seismic regions, in Italy.



Fig. 10. Under the school desk (Nursery school, 4-5 years old section, Meldola).

The experience made suggests some considerations that can be synthesized as follows:

- ✓ the educational tools prepared by EDURISK and GIUNTI teams are innovative because they are focused on examples linked to Italian seismic peculiarities and experiences, including well-known recent episodes (up to 2004), a factor that enhances the perception of seismic risk as an element of daily life;
- ✓ another innovative element, not included in any of the previous initiatives of the same kind is the test performed on the results of the practical usage of the booklets in schools: it stresses that in planning an information-education campaign it is necessary to combine the distribution of printed material with an adequate preparation of the teachers, as without this support (that in its turn requires both logistics and specialistic capabilities) the goal of seismic risk reduction would not be satisfyingly reached.

Finally, most of the teachers involved in the test campaign (100% in nursery school and the first stage of primary school, 97% in the second cycle of primary school, 100% in secondary school) believe that seismic risk education can add a significant content to learning activities in schools. This opinion, together with the fact that all the participating schools have asked for the project to be extended to the new school year and for extra teachers and students to be involved, confirm us in our belief that the EDURISK project is going the right way.



Fig. 11. Inventing nursery rhymes: an anti-fear charm (Primary school, Class 2C, Meldola).

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