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Public Education for Earthquake Hazards

by

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Why Educate about Earthquakes?

The goal of most public education efforts is to change people's behavior. Earthquake education attempts to increase protective actions by people, groups, and institutions by presenting information about the hazard and the risk it poses. If done effectively, it fosters uncertainty, causing people to wonder about their environment and to question their safety in it. A good public education project gives people something to mull over and to discuss with friends, family, and colleagues. It induces them to seek more information to answer their questions, and its specialists are there with clear information and answers when the

questions are asked. Despite all that, the desired changes in behavior may come years later, if at all.

Other successful public education campaigns follow that model. Quit smoking. Fasten your seat belt. Don't litter. Those famous campaigns all began by showing the risks or problems associated with particular behaviors. They had three things going for them:

- they raised questions in the minds of their audiences,
- they offered fairly simple answers, and
- they had authorities available over time to reinforce the message.

Generous funding by one or more interest groups helped with the latter. An effective public education program posits a problem and then says how to solve it—over and over again. And, even though public education involves colorful pamphlets, eye-catching posters, and provocative public interest announcements on TV and radio, even more valuable is an understanding of the dynamics of human behavior, effective ways to change it, and a systematic approach to carrying it out over time.

Those Who Take Heed, and Those Who Don't

Certain personal and social characteristics of individuals make them more or less likely to heed information about hazards and do something to increase their safety. Previous experience with a natural disaster, higher levels of formal education, middle age, and family connections may make people more apt to take protective actions. For example, a middle-aged person whose house was seriously damaged in the Northridge earthquake is likely to live in a bolted and braced one today. On the other hand, youth and gender make people less likely to increase their safety. A 1989 survey that asked people what they did during the Loma Prieta earthquake revealed that most 20-something males did not try to protect themselves from injury while the shaking was going on.

Public education doesn't change any of those variables, but takes advantage of them to deliver information to various groups to generate questions about risk, options, and actions. Good information can prompt almost anyone to question their environment and search for more information: the first steps in the sometimes long journey to changed behavior and increased protection.

Research into the psychology of perception and belief indicates that—as counterintuitive as it may seem—perceived risk does not contribute directly to taking protective action.

Perversely enough, most humans do not behave in accordance with their perceptions or attitudes. That is, a person living in San Leandro, California, may understand the considerable risk from a Hayward fault earthquake, but may not have done one thing to make his or her house resist the ground motions such an earthquake will produce.

Nor do people think in probabilities. Typically, the human thought process about future events is pretty binary: it will happen/it won't happen; it will affect me/it won't. Fancy probability estimates for an earthquake on the San Andreas fault won't change that. The official probability will be added to other pieces of information, beliefs, and experiences, and may—if accompanied by continuous, credible information over time—inspire some questioning and fact-seeking in the future.

Public educators have learned through trial and error that people are generally not motivated by sermons on why they ought to do something. Neither moral exhortations nor discourses on ethical or legal imperatives produce the desired behavior change in the average citizen or organization. People are more apt to follow our agenda if they work out a solution themselves, with helpful information from specialists. Not surprisingly, most people are motivated to change their behavior when they think it's their own idea.

What's Worked in EQ Education

Much research has been done, in numerous disciplines, on how human behavior can be changed. However, very little research has been done on whether public education initiatives on hazards are successful in increasing protective actions, although a few efforts have been systematically evaluated.

One study in the early 1980s assessed the responses of Los Angeles residents to news coverage of the Palmdale uplift, a rare geological phenomenon in an area along the

The Natural Hazards Informer

The *Natural Hazards Informer* is peer-reviewed series that summarizes current knowledge about various aspects of natural hazards for practitioners, researchers, public policy makers, and others. It is distributed free to all subscribers of the *Natural Hazards Observer*. If you already receive the *Observer*, do nothing. You will automatically receive upcoming issues of the *Informer*.

What This Informer Does

This issue of the *Informer* explains current knowledge about educating the public on earthquake hazards. With minimal tailoring, principles of effective earthquake education can be transferred to public education efforts for other hazards. This *Informer* suggests effective approaches and offers tips for developing and implementing successful projects. Case studies and examples help to give the discussion some context, and a list of resources suggests places to go for further information.

Who Should Read It and Why

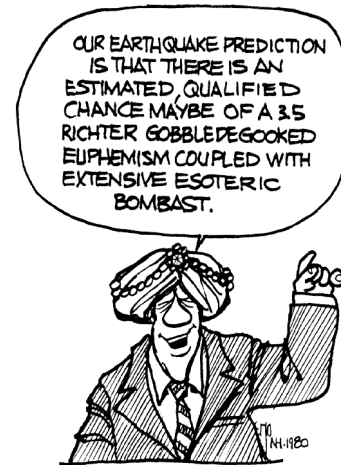
If you are concerned about the vulnerability of a community, county, or state to earthquake hazards, interested in raising the citizenry's awareness of the risk, and hopeful that people or their organizations will take steps to reduce potential losses, this *Informer* will give you tools and strategies for effective action. A quick review of what experience and research have taught us about past public education projects and campaigns will yield a deeper understanding of what works and what doesn't. Since time, energy and money are so frequently short, we hope to save everyone from wasting resources on ineffective approaches. Emergency managers, academic researchers, community activists, and federal or state funding agencies will find the information helpful as they create or evaluate public education initiatives on earthquakes or other natural hazards.

San Andreas fault which was thought, between 1976 and 1979, to be a precursor to an earthquake. Social scientists surveyed hundreds of people to determine where they received their information on earthquakes and how they evaluated what they got. They concluded that scientists and the media should make available credible information regarding an event that arouses widespread curiosity. Otherwise, when reliable information is not available, rumor fills the gap.

In the late 1980s, another research effort analyzed the effectiveness of a pamphlet in raising awareness of earthquake risk among residents in communities near Parkfield, California. The U.S. Geological Survey had announced that the Parkfield segment of the San Andreas fault in central California was likely to experience a moderate earthquake between 1986 and 1993. The California Office of Emergency Services mailed a comprehensive pamphlet to residents in the affected area that described the probabilities and the possible impacts of the quake and recommended certain actions to reduce damages. The study evaluated which pieces of information moved residents to take protective action.

Some of the findings of the study have been elevated to immutable laws of effective public education:

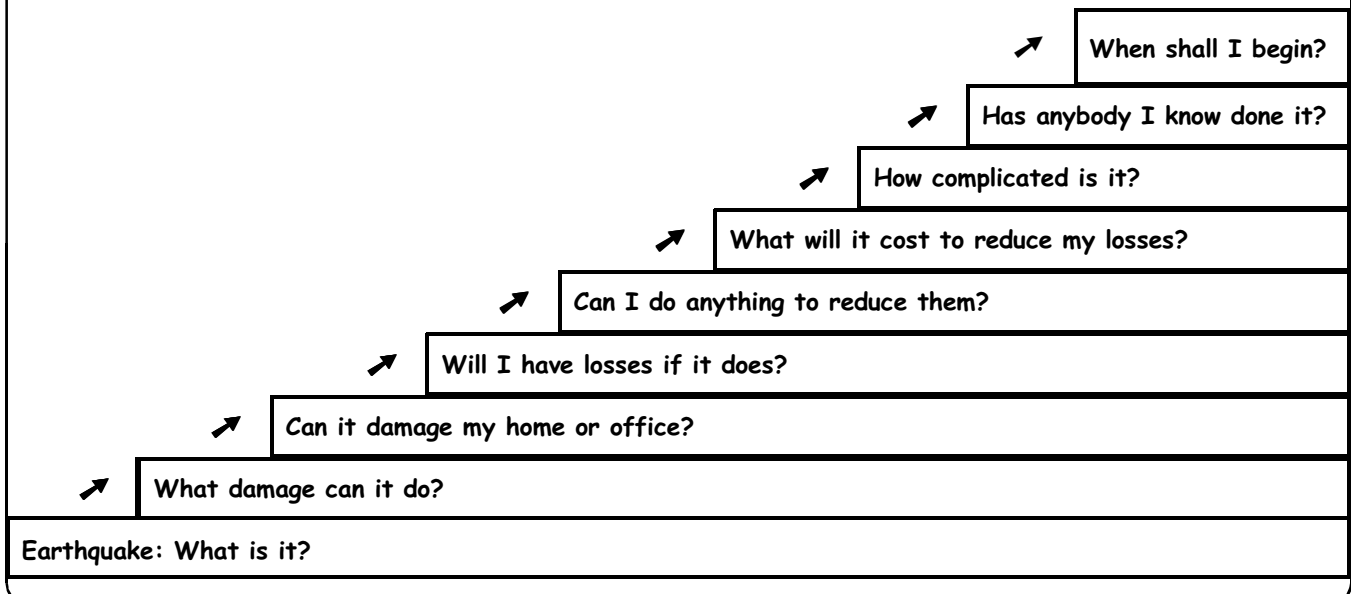
- complicated phenomena must be explained in non-technical terms;
- information must come from various, credible sources;
- consistent information should be repeated in many different media;



- messages on TV and radio are somewhat effective, but people like to have a written document to which they can refer as they think about their risk;
- information should tell people what they can do before, during, and after a disaster; and
- discussion with peers helps people to believe the information and act upon it.

In the early 1990s a similar study concerned a publication in the Bay Area that explained in lay language the findings of a scientific report on earthquake probabilities. Following their release of a (very) technical report, the U.S.

Continuum of Thinking Provoked by Earthquake Education



Geological Survey thought it wise to explain to the public what it meant and what they ought to do about it. In concert with a number of other agencies, a booklet—*The Next Big Earthquake in the Bay Area*—was developed and distributed to millions of residents as a Sunday newspaper insert. Shortly after, researchers queried a large number of readers about their responses to the booklet and its information.

The findings of this research added to the collection of rules of earthquake education:

- When clearly informed about risk, people can comprehend the basics and remember what they read. When people understand that there is something they can do about reducing vulnerability, they are more apt to act.
- People consistently search out more information to validate what they've already heard.

Many people and organizations reported that they took actions after reading the insert, not only because it made them aware of specific actions to take, but also reinforced things they had already heard elsewhere.

At almost the same time, a different but complementary investigation was underway, also in the Bay Area. This one asked people about their preferred sources of information on earthquake risk and mitigation. Though this study did not set out to determine whether the information actually changed behavior, its findings are instructive and corroborate the observations of earlier research. In general, people prefer public education programs that do the following:

- convey scientific and technical information from credible authorities,
- communicate it clearly,
- present it attractively, and
- disseminate it through various community or professional networks to decision makers.

Educational organizations with a high-profile presence in the area over time were more trusted than those without a track record. Deemed unsuccessful were education programs

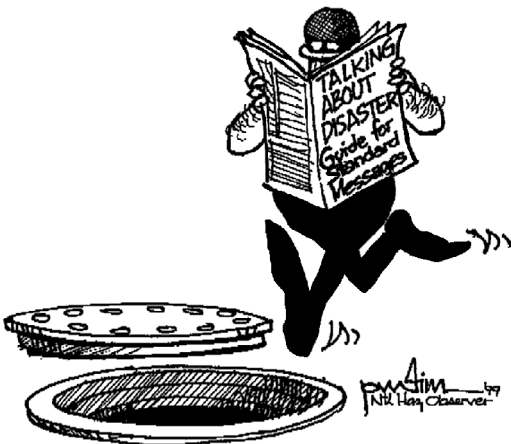
that do not feature specialists, do not adapt the material to their constituents, and take only the grocery bag or mass mailing approach. This study highlighted the error of assuming a very homogeneous public and advocated tailoring information materials to the many special groups in an area. For example, the approach to, and materials for, middle class homeowners will be different from those for renters, and those for school districts will not be like those for large corporations.

A study of public education outside California was undertaken by a professional staff member of the American Red Cross in affiliation with the University of Maryland. The 1992 study of message content and images supported a popular hunch that too much gloom and doom is just as bad as no information at all. A few well-chosen images of destruction have a useful impact on most people early in a presentation. However, when verbal messages on how to prepare for an earthquake are juxtaposed with photos of collapsed structures, people have trouble dealing with the verbal/visual mismatch. People tend to remember the visual message more clearly than the verbal, and repeated images of damage sometimes convince people there is nothing they can do about earthquakes. Far more effective are coordinated verbal and visual representations of what to do and how. Finding the right mix of information on potential losses and on effective actions is critical to the success of public education.

The Gold Standard

The U.S. Geological Survey collaborated with a number of specialists—earth scientists, engineers, architects, community-based organizers, and public educators—to create *The Next Big Earthquake in the Bay Area: Are You Prepared?* Designed to take into account the recommendations for effective education that emerged from the Parkfield study, the multi-color booklet had easy-to-read maps, translations of probabilities in words and graphics, explanations of building vulnerabilities, and suggestions on steps to take to reduce personal and organizational losses in an earthquake. First distributed as a Sunday newspaper insert, the booklet has been reprinted many times at the request of earthquake educators in the Bay Area. It was also translated into Chinese, Spanish, and Braille. So widely admired is it that groups elsewhere have developed similar booklets to explain their vulnerabilities: southern California, the north coast of California, the Puget Sound area, and Alaska.

One last study bears mentioning; it concerned public response to a spurious 1990 earthquake prediction on the New Madrid fault in the Central United States. The findings confirmed the need for governments and scientists to place accurate information before the public to counter inaccuracies that may be receiving media attention. When



Iben Browning—a scientist, albeit not an earth scientist—predicted a large quake on the New Madrid fault on December 3, countless people believed him and reacted accordingly. The populace in the heartland, which had never been taught much about earthquakes, did not have the analytical tools to question Browning’s prediction. Credible scientists and government spokespersons were slow to disagree with Browning, perhaps because they hadn’t learned the lesson of the Palmdale uplift study mentioned above. Once they responded and released accurate information, however, the “prediction” provided an opportunity for solid public education.

The Window of Opportunity

Both empirical research and seasoned observation support the golden rule of public education for hazards: all the sophisticated materials and behavior modification techniques do not have the force of one good disaster to change both behavior and public policy, at least in the short term. Losing something in an earthquake, or knowing somebody who did, has inspired many people and organizations to take protective actions. During the well-known “window of opportunity” that opens following a disaster, abundant information from various credible sources in the affected locale will increase the chances for behavior change.

However, while people and organizations are more apt to alter behaviors after a disaster strikes, change is most likely when public educators have already worked to make sure the problem is recognized, the solution is known, and some advocates are already in place. Do not wait for the window to open; build a sustained advocacy program beforehand. Not working constantly may result in waiting forever.

Take advantage of a window opening someplace else. After the 1995 earthquake in Kobe, Japan, for example, there was fleeting but pronounced interest in earthquake risk in both the Bay Area and Seattle—each with a built

environment and setting similar to Kobe. A number of earthquake organizations on the West coast seized this golden opportunity to draw comparisons between the Kobe quake and expected impacts due to local temblors.

Use it while you can, for the window is not open long! The fleeting interest wanes. A population that jams the phone lines requesting earthquake loss reduction information in January of one year will not be doing so the next. A public policy maker’s memory and attention are even shorter than the public’s. Typically, she or he will not keep hazard mitigation high on the list of big issues for more than two or three months.

Information at Your Finger Tips

The Earthquake Information Network (EQNET) is maintained by a consortium of national, regional, and state organizations working to share earthquake-related information and promote earthquake safety. The purpose of EQNET is to provide access to a comprehensive and up-to-date list of Internet resources about earthquakes and the issues surrounding them. The Web page offers links to a wide variety of information sources. Among the many areas of interest are: education, disaster management, seismology/geophysics, policy/planning/socioeconomics, structural engineering, government agency initiatives, products and services, and calendar/conferences. Point your search engine to: <http://www.eqnet.org>.

What We Know for Sure

Below are suggestions for successful public education about earthquakes, derived from the systematic research mentioned above and from the authors’ years of campaigns and programs. First we explain the ideal message, and then we recommend ways of delivering it. The bulleted items are not in descending order of importance; each is critical.

The Message

- **Translate and manipulate information about the earthquake hazard in order to make it accessible.** Reading in the newspaper the technically sophisticated and generally incomprehensible statements of geoscientists, engineers, or actuaries will not give most people an elementary understanding of earthquakes and likely impacts on their lives. Simple language in manageable amounts is absolutely necessary. Though credentialed spokespersons are one of the most important sources of information,



specialists who speak only in the jargon of their discipline will not be effective. Authoritative interpreters of technical information should be cultivated, encouraged, and paid well. Fit the specialist to the topic: geologists and seismologists should talk about earth science, engineers and architects should talk about structures, and firefighters and emergency responders should talk about home safety and neighborhood organization.

- **Keep the information consistent.** Since most people are exposed to information through a number of media and from various sources, it must be consistent in order to be credible. Inconsistent information confuses people and allows them to discount some or all of it. Educators should work together, across jurisdictions and organizations, to see that messages are similar. For example, numerous organizations—state agencies, the Red Cross, school authorities, and media outlets—in California met in the immediate aftermath of the Loma Prieta quake just to discuss and agree upon the wording all of them would use for the “Drop, Cover, and Hold!” message.
- **Package information for the media.** One of the hallmarks of an effective public education program is plenty of material on hand when the TV and radio stations start calling and the feature writer from the paper shows up looking for the local angle. For example, if the issue is vulnerable wood-frame housing, provide clear bolting and bracing illustrations the newspaper can run next to its article. Get photos, maps, and checklists ready so the hazard education article makes it in under deadline and gains its rightful place on the front page. As Hamlet presciently observed, “the readiness is all.”



Helpful Tip

The National Disaster Education Coalition is a group of federal agencies and nonprofit organizations that support common goals in disaster education. This group has developed a standardized guide on disaster safety messages, providing information that all organizations agree on for national use. The guide covers 13 hazards, as well as general preparedness issues. It is in the public domain and can be used by anyone. It is available in print from any local Red Cross chapter, or can be downloaded from <http://www.redcross.org/disaster/safety/guide.html>.

- **The message presented to the public should clearly explain three critical issues: 1) potential losses, 2) the chances that the losses will take place in a certain amount of time, and 3) how to cut the losses.** This can be thought of as the tripod on which good hazards public education rests. Without any of the three legs, an initiative will teeter and ultimately fail.

1) Describe potential losses. Generally, people can't imagine the impact an earthquake could have on their community, their house, or their place of work, so they must be assisted by descriptions of other earthquakes, pictures, scenarios, or computer-based loss estimation maps. The essence of this task is working to overcome the almost universal human tendencies to conclude that it can't happen here or it won't happen to me. The more relevant the description can be to the situation of the audience, the more likely it is that they will attend to it. A good educator can find “the local angle” in any earthquake—even in a far-off land—and work it.

2) Discuss the odds that the losses will take place in a certain amount of time. Once people understand that it could, indeed, happen here, they must be further convinced that it may happen to them: in the next 10 years, the lifetime of their mortgage, or during their watch. Although almost no one but mathematicians and professional gamblers really understands odds, most people will want to know the likelihood of a quake in an uncomplicated sort of way and in a smallish number of years. Probability estimates will not, in themselves, motivate people to take action, but the information will assist in creating the uncertainty that is so important to behavior change. Earthquake prediction is a very inexact science, but where geoscientists have some understanding of the behavior of specific faults and the frequency of quakes on them, they should offer these rough forecasts. For this reason, the U.S.

Geological Survey updated its probability estimates for earthquakes in the Bay Area on the 10th anniversary of the Loma Prieta quake.

3) Explain how to cut losses. A person with a clear picture of his or her possible losses must quickly be offered suggestions and directions for how to reduce them. Without these blueprints, people can fall prey to a fatalistic inertia. Appropriate assistance may take many forms: a how-to video for homeowners on strengthening a cripple wall; evacuation guidelines for a school; a business resumption planning process for a corporation or a city government; encouragement and help from a neighborhood emergency response team; or recommended policy changes for a water system. People can be guided to mitigation in endless ways.

- **Specify who is at risk in a potential earthquake for both education and planning purposes.** For example, explaining the relative weaknesses of various building types—unbolted woodframe, unreinforced masonry, nonductile concrete, multi-unit apartments with tuck-under parking—will help people understand they might be injured if they live or work in them. Such information will also help emergency planners anticipate response needs. Beyond physical effects, people should be helped to recognize that they will be economically damaged, socially isolated, psychologically troubled, and just plain inconvenienced. Detail the exact impacts of the earthquake on all groups in the community, on utilities, on transportation systems, and on governmental and nonprofit organizations responsible for public health and well-being.



- **Be clear about the lack of certainty in predicting the incidence and effects of a hazard.** Any scenario of a future event is a best guess. Overstating

the risk or inflating the probability of a quake or a flood inoculates people against belief just as surely as inconsistency. Predictions of catastrophe strike some people as too extreme to be credible; they terrify others. Neither group will be likely to accept the information as deserving of further questioning or attention. More than one public education project has painted too dire a picture and compromised its credibility.

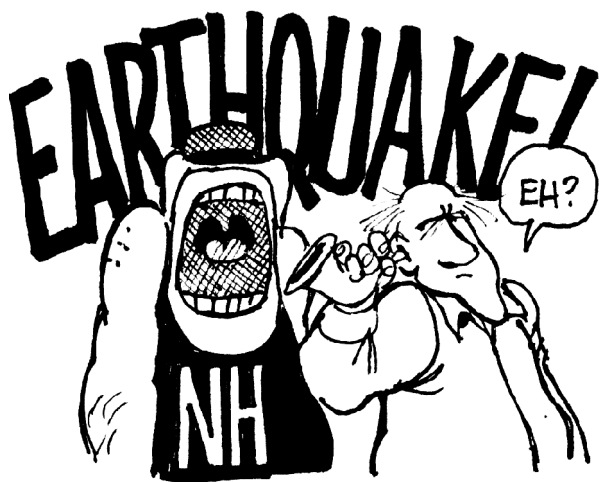


The Process

Public education is a complicated process—on both the delivery end and receiving end. Campaigns must be coherent and collaborative, their information must be credible and understandable, and the information must reach its intended audience. In that statement is a prescription for close cooperation among technical specialists and educators, constant communication among educational organizations, and sophistication and creativity in the message translators and communicators.

- **Line up multiple credible resources of information.** People attend to information only if it comes from a group or a person they trust. Depending on age, education, class, and ethnicity, different people trust different sources. Some people want to hear about earthquakes from seismologists at the U.S. Geological Survey; others believe only what the Red Cross tells them; still others search for data sources online. It's important to use various sources to reach all groups in the community.

- **Assume that your public is diverse; tailor information to the needs of each group.** For example, the elderly have special needs, so create materials for them that speak to those needs. Don't ignore non-English speakers; write information in their languages or get your materials translated by knowledgeable local speakers of those languages. Some cultural groups choose not to read for information for reasons unrelated to literacy; to reach them, use radio and TV, word-of-mouth, or pictographic images. Use the media that serve multilingual populations.



- **Use multiple media.** Now that we've had the information technology revolution, the sky's the limit. You can bounce a fact about hazard risk off satellites, insinuate it into electronic data networks, feature it on interactive computer games, add it to distance learning curricula, and project it onto the screen of the nearby theater. Vary your spokespersons as well: today, the Red Cross spokesperson on radio; tomorrow, cartoon characters on TV; next week, a USGS seismologist on the Internet. Effective public education programs should have the staff to constantly work the media angles and maintain contact with media personalities.
- **Use media appropriate to the audience you're trying to reach.** The Internet is indeed a marvelous tool, but it isn't used by everyone. For example, text that can be downloaded from your web page is not the way to reach a non-English-speaking or low-income audience. Information for those groups can be disseminated through the community organizations and social service agencies that regularly work with that audience. Conversely, technologically sophisticated packaging gets middle-class, computer-using audiences where they live.

- **Make the information easy to get.** On an ongoing basis, successful public education works to motivate a few people to do something to reduce risk. Their activities contribute to the slow, incremental process of reaching others as well. You must not frustrate your public! Have information ready and accessible at the time someone is motivated to ask for it. There isn't space in this *Informer* to list all the seismic safety hints, retrofit directions, guidelines, model ordinances, neighborhood response plans, exemplary policies, and case studies that have been developed in nearly every seismic risk zone by innumerable agencies and organizations. In many cases, the wheel has already been invented. Share materials. Revise them. Adapt them. Translate them.

- **Because learning is incremental, information dissemination should be, too.** Organize the information you present to highlight related themes successively. For example, some education organizations or emergency services agencies distribute to participating communities monthly newsletters with reproducible masters on different aspects of earthquake preparedness. In January, the spotlight is on fastening bookcases and file cabinets; in February, it moves to stocking water supplies.

- **Make your approach interactive and experiential.** We know that adults learn by comparing new information to what they already know, by thinking through and discussing the new concept or practice, and by doing. They don't sit passively and digest everything they hear or read. They do not enjoy lectures. Use models, visual aids, fancy media, and peer group discussions. Engage your audience; don't preach.

- **Use earthquakes as important learning opportunities.** Send elected officials, government functionaries, corporate officials, school superintendents, various professionals, and community organizers to view earthquake damage and organizational response. Have them report the lessons they derive for their community, business, school district, or practice. Such people typically return from their reconnaissance with better vision and a more active imagination than they had before they left. They have seen the truth and can communicate it to many others. They are motivated to do something, and can frequently infect others with their commitment.

- **Never overlook the role of an individual in sparking behavior change.** There are many examples of earthquake champions who singlehandedly prod and cajole their organizations, schools, neighborhoods, or governments into taking action. These individuals

are both tenacious in their efforts to stimulate change and passionate in their belief that change is necessary. Finding and motivating such an individual can sometimes be the key to a successful public education campaign.

- **Build some sort of evaluation component into your campaigns, for yourself and for others.** When you assess the efficacy of your materials and approaches, you can revise what doesn't work. Share that knowledge with other educators, so campaigns across the country can benefit from your experiences. Last, but

not least, use your data to justify continued or increased financial support.

- **Finally, if your organization funds a public education program, continue that support over many years.** If you run a public education program, keep it highly visible and recognizable in the community. Programs that deliver helpful information over the years see their credibility and effectiveness grow. Don't decrease it by altering missions, or by changing logos or names. Be patient, and understand that good public education is a long haul.

*"If it be not to come, it will be now;
if it be not now, yet it will come:
the readiness is all."*

Hamlet, Act V, Scene 2



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Dennis Mileti is professor of sociology and director of the Natural Hazards Research and Applications Information Center at the University of Colorado in Boulder.

Where to Get More Help and Information

Studies Mentioned

- Bolton, Patricia A. and Carlyn E. Orians
1992 *Earthquake Mitigation in the Bay Area: Lessons from the Loma Prieta Earthquake*. Seattle, Washington: Battelle Human Affairs Research Centers. To order, call *Battelle*, (206) 528-3310.
- Farley, John E.
1998 *Earthquake Fears, Predictions, and Preparations in Mid-America*. Carbondale and Edwardsville, Illinois: Southern Illinois University Press. Ordering information can be found on-line at <http://www.siu.edu/~siupress>.
- Lopes, Rocky
1992 *Public Perception of Disaster Preparedness Presentations Using Disaster Damage Images*. Working Paper #79. Boulder, Colorado: Natural Hazards Research and Applications Information Center, University of Colorado. To order, contact the center: (303) 492-6819; e-mail: hazctr@spot.colorado.edu; WWW: <http://www.colorado.edu/hazards>.
- Mileti, Dennis S., JoAnne D. Darlington, Collen Fitzpatrick, and Paul W. O'Brien
1993 *Communicating Earthquake Risk: Societal Response to Revised Probabilities in the Bay Area*. Fort Collins, Colorado: Hazards Assessment Laboratory, Colorado State University. For availability, contact the laboratory: (970) 491-6493; fax: (970); 491-2925; e-mail: hcochrane@vines.colostate.edu.
- Mileti, Dennis S., Colleen Fitzpatrick, and Barbara Farhar
1990 *Risk Communication and Public Response to the Parkfield Earthquake Prediction Experiment*. Fort Collins, Colorado: Colorado State University, Hazards Assessment Laboratory. See the entry above for contact information.
- Showalter, Pamela S.
1998 "Responding to Unconventional Millennial Predictions," *Disaster Prevention and Management: An International Journal* 7 (4), pp. 273-280. Call (512) 245-7980 to obtain a copy.
- Turner, Ralph, Joanne Nigg, and Denise H. Paz
1986 *Waiting for Disaster: Earthquake Watch in Southern California*. Berkeley, California: University of California Press. For availability, access <http://www.ucpress.edu>.

Useful Organizations

The following national organizations have public education departments that conduct campaigns, provide information on a regular basis, and develop multi-media materials that are available from them. They can recommend content and strategies for initiatives in particular places directed at specific audiences.

American Red Cross, National Headquarters, Disaster Services Department, 8111 Gatehouse Road, Second Floor, Falls Church, VA 22042; e-mail: info@usa.redcross.org; WWW: <http://www.redcross.org>.

Also, your local Red Cross chapter is a great source for information and brochures on various disaster topics.

Federal Emergency Management Agency, 500 C Street, S.W., Washington, DC 20472; e-mail: eipa@fema.gov; WWW: <http://www.fema.gov>.

U.S. Geological Survey (USGS), National Center, Reston, VA 20192.

USGS Products and Services: (888) ASK-USGS.
Earthfax-on-demand system: (703) 648-4888.

WWW: <http://www.usgs.gov>.

National Earthquake Information Center: WWW: <http://wwwneic.cr.usgs.gov>.

State or Regional Organizations

The following state or regional organizations have experience in designing and conducting public information initiatives. Their materials are tailored to their areas and their audiences, but they make them available for use or adaptation. Some have extensive information posted on their Web pages.

Association of Bay Area Governments (ABAG), P.O. Box 2050, Oakland, CA 94604-2050.; For general earthquake information: (510) 464-7900; fax: (510) 464-7970; e-mail: shaky@abag.ca.gov; WWW: <http://www.abag.ca.gov/bayarea/eqmaps> or <http://quake.abag.ca.gov>; for erosion, flooding, and landslide information: <http://www.abag.ca.gov/bayarea/eqmaps/onaturalh.html>.

California Office of Emergency Services Earthquake Program, Coastal Region, 1400 Clay Street, Suite 400, Oakland, CA 94612; Publications: (510) 286-0895; WWW: <http://www.oes.ca.gov>.

Center for Earthquake Research and Information, University of Memphis, Seismic Resource Center (CERI), Campus Box 526590, Memphis, TN 38152; (901) 678-2007; fax: (901) 678-4734; WWW: <http://www.ceri.memphis.edu/>.

Central United States Earthquake Consortium (CUSEC), 2630 East Holmes Road, Memphis, TN 38118-8001; (901) 544-3570; fax: (901) 544-0544; e-mail: cusec@ceri.memphis.edu; WWW: <http://www.cusec.org>.

Earthquake Education Center, Charleston Southern University, P.O. Box 118087, Charleston, SC 29423-8087; (843) 863-8088; fax: (843) 863-7924; e-mail: jbagwell@dycon.com; WWW: <http://www.csuniv.edu/Academics/Quake/quake.html>.

Southern California Earthquake Center, University of Southern California, Department of Earth Sciences, University Park, Los Angeles, CA 90089-0742; (213) 740-5843; fax: (213) 740-0011; e-mail: scecinfo@usc.edu; WWW: <http://www.scec.org>.

Utah Geological Survey, 1594 West North Temple, P.O. Box 146100; Salt Lake City, UT 84114-6100; (801) 537-3300; fax: (801) 537-3400; Bookstore: (801) 537-3320; WWW: <http://www.ugs.state.ut.us>.

Western States Seismic Policy Council (WSSPC), 121 Second Street, 4th Floor, San Francisco, CA 94105; (415) 974-6435; fax: (415) 974-1747; e-mail: wsspc@wsspc.org; WWW: <http://www.wsspc.org>.

Research Organizations

To learn more about the latest research on earthquake education, contact the following:

Disaster Research Center, University of Delaware, Newark, DE 19716; (302) 831-6618; fax: (302) 831-2091; e-mail: castelli@udel.edu; WWW: <http://www.udel.edu/DRC>.

Natural Hazards Research and Applications Information Center, University of Colorado, Campus Box 482, Boulder, CO 80309-0482; (303) 492-6818; fax: (303) 492-2151; e-mail: hazctr@spot.colorado.edu; WWW: <http://www.colorado.edu/hazards>.

Engineering Organizations

The organizations listed below engage in a combination of public and professional education. Contact them to learn about their specialties and materials.

Earthquake Engineering Research Institute (EERI), 499 14th Street, Suite 320, Oakland, CA 94612-1934; (510) 451-0905; fax: (510) 451-5411; e-mail: eeri@eeri.org; WWW: <http://www.eeri.org>.

Mid-America Earthquake (MAE) Center, 241 Newmark Laboratory, 205 North Mathews, University of Illinois–Urbana-Champaign, Urbana, IL 61801; (217) 244-6302; fax: (217) 333-3821; e-mail: d-abrams@staff.uiuc.edu; WWW: <http://mae.ce.uiuc.edu>.

Multidisciplinary Center For Earthquake Engineering Research (MCEER), University at Buffalo, State University of New York, Red Jacket Quadrangle, Buffalo, NY 14261-0025; (716) 645-3391; fax: (716) 645-3399; e-mail: mceer@acsu.buffalo.edu; WWW: <http://mceer.buffalo.edu>.

Information Service, c/o Science and Engineering Library, 304 Capen Hall, Buffalo, NY 14260-2200; (716) 645-3377; fax: (716) 645-3379; e-mail: mceeris@acsu.buffalo.edu; WWW: <http://mceer.buffalo.edu/infoService/default.html>.

Pacific Earthquake Engineering Research (PEER) Center and National Information Service for Earthquake Engineering (NISEE), University of California, 1301 South 46th Street, Richmond, CA 94804; (510) 231-9401; fax: (510) 231-9461; e-mail: cjames@eerc.berkeley.edu; WWW: <http://nisee.ce.berkeley.edu>.

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