THE BENEFITS OF EARTHQUAKE EDUCATION TO THE SCHOOLS

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ABSTRACT

As earthquake awareness in the seismically active areas of the United States has increased, so have many of the myths and misconceptions which have been with us for decades. This intuitive observation underscores the necessity to have awareness put in a structured form and taught in schools - beginning in the elementary grades. Besides the obvious benefit of increased safety and preparedness for students, many other short and long-term advantages can be postulated from such institutional programs. A few of the most important of these advantages are: increased social responsibility, especially for the local area; increased acceptance of earthquake mitigation programs which have an economic impact such as seismic building codes; a broader view of the role of the environment and man's interaction with it; building confidence of the student to adapt and modify risk situations; the proper perception of what a progressive, responsible society is; and the application of scientific information.

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INTRODUCTION

A recent survey by researchers at Utah State University under a USGS grant, showed that the degree of earthquake awareness in metropolitan Utah, as gauged by the perceived importance of undertaking earthquake mitigation, is over 70%. That is, over 70% of the respondents believed this was an issue of high importance (Madsen, 1989).

This awareness and concern level was achieved in large measure by very non-specific educational methods. Ad hoc earthquake presentations to civic groups, schools, religious organizations, and businesses are given two or three times a week by any one of three groups active in earthquake education activities in Utah. Special programs on television and actual earthquakes with the attending news follow-up contribute to the overall earthquake awareness level.

In contrast to the relatively high level of awareness and concern, is the apparent low level of actual understanding, even at a very simple level, of what living in a seismically active area means and what would be the most effective actions to take. I don't mean a perfect understanding of what a "hanging wall" is or the difference in motion between a Rayleigh and Love wave, but just the basic facts of cause and effect.

The primary way to avoid the tedious process of trying to educate an adult population with preconceived and in many cases inaccurate ideas about earthquakes, is to institute earthquake education in the curriculum of schools - especially in areas of high risk. The fallout from such a program can be postulated based on the attitudes which have developed in the current adult population as a result of other organized educational efforts.

LOCAL AND REGIONAL INTEGRATION AND ACCEPTANCE

Integrating earthquake concepts into the local cultural atmosphere can be a critical aspect leading to acceptance of an active program of earthquake or other natural hazard education. A more homogenous community probably requires less effort in terms of fitting the information to the audience, ascertaining the present level of understanding, and the area of earthquake education which should or can be addressed, e.g. science or safety. The concept of knowing the audience can be applied at any level, but the acceptance and implementation in a formal teaching arena requires a larger amount of research showing that the concepts taught are correct and can be understood by the students.

EARTHQUAKE EDUCATION BENEFITS

The "assumed" most obvious benefit resulting from earthquake education is the increased level of safety to students and faculty achieved in the school building. The safety aspect will probably be the easiest point to sell, especially in areas with frequent earthquakes. However, when event probabilities are taken into account, the long term benefits, which will only be measurable as the students begin to affect local and regional decisions, will have the greatest beneficial results. For this reason, the concept of earthquake education should not be perceived or promoted on a single

platform. Initially, earthquake education may have to be integrated with other safety or science programs in a diluted form. But I believe it can stand on its own as a significant issue of earth and social science.

The first step in achieving preparedness and loss reduction in the schools is the performance of a hazard analysis. This process and the resulting conclusions are a benefit to the school for several reasons. First of all it exposes the level of risk at the site or to the school population. This then becomes a motivator for planning and provides a basis for the amount of planning needed. Actual building site mitigation needs are also identified and a long term retrofitting/retirement plan can be established. In regions with a large number of schools needing modernization, the degree of seismic retrofitting needed can serve as a prioritization method.

A recent study of this sort for a school district in Utah (Reaveley, 1987), has attracted much attention and will probably result in some structural mitigation to a few structures. The reaction of the local district board and some concerned parents to this same study illustrates the nature of misconceptions about earthquakes. The school board was ridiculed by some for not taking immediate action on the studies results. In truth, the general seismic condition of these buildings has been known for many years. This report only quantified it so the buildings could be dealt with in an engineering format. The school district should have been praised for undertaking the study at all, then encouraged to take the next step of addressing the results in a rational manner. On the other hand, the school district board is wondering if retrofitting buildings will have any effect in reducing losses to their old buildings and its occupants.

How would earthquake education in the schools improve this real situation? The basic problem rests in the school board and parents misunderstanding of fundamental earthquake facts - in spite of the high level of awareness and concern. An earthquake education program in the schools could possibly have averted the problem by making the board aware of why they were having the study done, the likely conclusions of the hazard analysis and how to address the concerns of the parents. The parents attitude would probably be moderated by an understanding of the earthquake planning process and a recognition that the school board is on the right track.

Anyone conducting a hazard analysis will realize before or during the process that certain risk levels will be clearly identified. If the entities commissioning the study are not prepared to accept and take some positive action based on the results, then the analysis becomes a dark cloud - possibly increasing liability after the earthquake event.

At the present time, I believe the schools have the opportunity to take the lead in promoting earthquake resistant building practices. Schools should be our safest structures, models of a progressive society which recognizes its vulnerabilities and acts to reduce them. However, without a program to educate the students about the hazard the school is trying to mitigate, the base of support is never created to accomplish real mitigation.

PAST ANALOGS

Earthquake education can easily be put into the category of environmental science or human ecology. These two topics should be of great interest to those attempting to promote seismic education. Over the past two decades, environmentalism and ecology have gone from fairly obscure subspecialties of biology to major disciplines which now shape many attitudes and attendant policies affecting all our lives. While Rachel Carson's Silent Spring, combined with environmental disasters around the world, may have been the springboard for this "new age awareness," it wasn't long before textbooks began carrying the message and soon after that, that it became the major subject which introduces biology to students.

Earthquakes or earthquake science and safety may be integrated into this same realm to form a bridge between the natural and physical sciences. The boundary between the two is becoming increasingly difficult to distinguish, and some scientists/educators have suggested that no such differentiation should be characterized (Lovelock, 1987).

SHORT AND LONG-TERM BENEFITS

The safety aspect of earthquake education should first be taught as personal safety measures during and after the shaking and preparedness based on the expected intensity. Postulated benefits from teaching these ideas are: students, faculty and administration which accept and promote earthquake planning, drills and cooperation with local emergency preparedness and response agencies. This same audience will also gain a broader understanding of the role of fire departments, police and other local and state agencies.

In the five years I have been talking to students and teachers, there has never been a group unimpressed by the list of responsibilities these agencies have in an emergency situation. In nearly all instances, the introduction of these concepts in the school has overflowed into homes with resulting opportunities for additional awareness campaigns and Parent-Teacher organization activity to address the issue.

At a more advanced level, the concepts of structural mitigation should be introduced. Seismic design and retrofitting are fundamental topics in peoples' relationship with their environment when they live in an earthquake prone area. What could be more basic than recognition of unalterable environmental conditions and processes as development takes place? The economics of such issues can also be a way of bringing this new topic into an established discipline. The real benefits to the school from these earthquake subjects will probably be realized as the students are integrated into the adult society. Short of an actual damaging earthquake, which can cause large change in the short-term, the attitude of increased social responsibility leading to a forward-looking perception of what a progressive, responsible society should be, may be the greatest overall benefit. This learned attitude, if based on scientific and empirical facts can lead to the types of life and property saving actions which can make the prospect of a moderate or large seismic event less disconcerting. The school should be the first to receive mitigatory action

and receive the most benefit from a sense of real safety in their building, because the occupants may be, in reality, the most at risk and the most distressed by the prospect of a disaster in our society.

SUMMARY AND CONCLUSIONS

The benefits of earthquake education to schools will probably not be measurable from a hit-and-miss program of lectures given by outside experts. The most effective results may be achieved by an organized program of earthquake education which is initially integrated into existing programs with the prospect of it standing on its own. The school should not expect to gain benefits outside of the opportunity to expose the students, faculty and community to a broader scientific and social perspective. Long-term advantages may look less attractive but account for significant safety improvements to the facilities and a higher level of understanding and awareness for people.

A subtle approach to any issue which may seem sensitive always appears to be the best route to take. However, in my work I have found that a slightly more aggressive posture - one that is based on the "Principle of Saturation" has met with some (not measured) success.

The "Principle of Saturation" is based on the following "Murphyistic" observation: I, like many others who work in offices and seem to always be filling out forms and writing reports, bring a good many pencils and pens into the small confines of my working space. These pencils and pens are actually absorbed into some fifth-dimensional labyrinth where they apparently begin to fill this unseen volume. About the time I have lost my one hundredth pencil, one of the earlier lost graphite sticks appears on the floor, on the desk or even miraculously in my hand! The pencil saturation factor for my office is then calculated to be about 100. The factor is larger for small objects such as paperclips, and smaller for larger things like out-of-print publications. Saturation appears to be directly proportional to the importance of the object.

The point of this observation is that with enough earthquake education, over some period of time, the concepts being taught will begin to surface in important places. I don't know what the saturation point and its corresponding benefit output is for earthquake education - it is bound to be quite high. This would indicate a high level of effort, especially in regions that do not have a history of damaging events.

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