



**CONFERENCE ON  
DISASTER PREPAREDNESS - THE PLACE OF  
EARTHQUAKE EDUCATION IN OUR SCHOOLS**

Preliminary Proceedings

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NATIONAL CENTER FOR EARTHQUAKE ENGINEERING RESEARCH  
State University of New York at Buffalo  
Red Jacket Quadrangle, Buffalo, NY 14261

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## TABLE OF CONTENTS

SECTION	TITLE	PAGE
1	INTRODUCTION .....	1-1
	Speakers List .....	1-3
	Conference Planning Committee .....	1-5
2	CONFERENCE PROGRAM .....	2-1
	Program and Schedule .....	2-1
	Conference Workshops .....	2-7
3	ABSTRACTS .....	3-1



## SECTION 1 INTRODUCTION

May, 1988, the National Center for Earthquake Engineering Research initiated an earthquake education project whose focus was on earthquake awareness and safety education in school programs for grades K-12, with a special emphasis on grades K-6. The initial goals of this program were to determine what has been done elsewhere in the field, develop a package of materials with an appropriate amount of detail for students at varying intellectual and interest levels, and test those materials in an elementary level program.

Pursuit of the first objective resulted in the identification of a multiplicity of issues involved in earthquake education that need to be addressed; the identification of the need for coordinated dissemination of information to minimize duplication of effort and maximum distribution of useable information; recognition of the need to share available information that is specifically tailored to various audiences; and the need for a forum to discuss pertinent issues.

These identified issues have been addressed by a group of people active in earthquake education from both the United States and Canada. As a result of these discussions, NCEER and co-sponsors, Federal Emergency Management Agency and Emergency Preparedness Canada, have chosen to sponsor a two-day closed meeting to address outstanding issues in this area.

This inaugural conference is designed to provide an overview of pertinent issues in earthquake education and act as a springboard for regional follow-up workshops. This meeting will also provide an excellent opportunity for those spearheading the efforts of the science, earthquake education, and preparedness communities to join together to address the issues which challenge us today.

The endeavors of the world's educators become even more significant as we approach the 90's - the U.N. International Decade for Natural Disaster Reduction - which emphasizes the role of the teaching community in improving public understanding of natural disasters and what can be done to protect against them.



**SPEAKERS LIST**  
**Disaster Preparedness - The Place of Earthquake Education in Our Schools**  
**July 9-11, 1988**

Ms. Joyce Bagwell  
Director, Earthquake Education Center  
Baptist College at Charleston  
P.O. Box 10087  
Charleston, SC 29411

Dr. Joyce Blueford  
Math/Sciences Nucleus  
3710 Yale Way  
Fremont, CA 94538

Dr. Ian Buckle  
Deputy Director  
National Center for Earthquake  
Engineering Research  
105 Red Jacket Quad  
SUNY at Buffalo  
Buffalo, NY 14261

Mr. Jeffrey Callister  
Earth Science Teacher  
Newburgh Free Academy  
Newburgh, NY 12550

Mr. Daniel Cicirello  
Arkansas Earthquake Preparedness  
Program Supervisor  
Arkansas Office of Emergency Services  
P.O. Box 758  
Conway, Arkansas 72032

Dr. Thomas Frantz  
SUNY at Buffalo  
Counseling and Educational Psychology  
426 Baldy Hall  
Buffalo, NY 14260

Dr. John Gill  
Education Administration Supervisor  
Arkansas Department of Education  
Rm. 305-B Education Building  
Capitol Mall  
Little Rock, AR 72201

Ms. Ferne Halgren  
Director, Earthquake Project  
UCLA Education Extension  
10995 Le Cont Ave. #514  
Los Angeles, CA 90024

Mr. Neil Jackson  
Architect of School Facilities Research  
Ministry of Education  
620 Superior St.  
Victoria, BC, Canada V8V 2M4

Dr. David Kennedy  
Program Administrator for Curriculum  
Office of Superintendent of Public Instruction  
Old Capitol Building, F-G11  
Division of Instructional Programs and Services  
Olympia, WA 98504-3211

Ms. Phyllis Marcuccio  
National Science Teachers Association  
1742 Connecticut Ave. NW  
Washington, DC 20009

Mr. Karl Naugle  
District Computer Coordinator  
Dorchester School District Two  
805 South Main Street  
Summerville, SC 29483

Mr. Eldon Nelson  
Supervisor of Support Services  
Idaho State Department of Education  
Len B. Jordan Office Building  
Boise, ID 83720

Ms. Linda Noson  
Natural Hazards Specialist  
FEMA Region 10  
130 228th St. SW  
Bothell, WA 98021-9796

Mr. Kurt Othberg  
Research Geologist and Director  
Earth Science Education Programs  
Idaho Geological Survey  
Morrill Hall  
University of Idaho  
Moscow, ID 83843

Mr. Lawrence D. Pearce  
Assistant Regional Director  
Emergency Preparedness Canada  
Box 10,000  
Victoria, BC V8W 3A5

Ms. Katharyn E.K. Ross  
Education Specialist  
National Center for Earthquake  
Engineering Research  
116 Red Jacket Quad  
SUNY at Buffalo  
Buffalo, NY 14261

Mr. Thomas P. Sachse, Manager  
Math/Science Education Unit  
California State Department of Education  
721 Capitol Mall  
P.O. Box 944272  
Sacramento, CA 94244-2720

Mr. James Tingey  
Earthquake Preparedness Coordinator  
Comprehensive Emergency Management  
1534 Sunnyside Ave.  
Salt Lake City, UT 84105



**CONFERENCE PLANNING COMMITTEE**  
**Disaster Preparedness - The Place of Earthquake Education in Our Schools**

Ms. Joyce Bagwell  
Earthquake Education Center  
Baptist College at Charleston  
P.O. Box 10087  
Charleston, SC 29411

Dr. Joyce Blueford  
Math/Science Nucleus  
3710 Yale Way  
Fremont, CA 94538

Mr. Daniel Cicirello  
State of Arkansas  
Office of Emergency Services  
P.O. Box 758  
Conway, AR 72032

Mr. Fred Cooper  
Emergency Preparedness Canada  
Box 10,000  
Victoria, BC  
Canada V8T 4Z8

Ms. Andrea Dargush  
National Center for Earthquake  
Engineering Research  
106 Red Jacket Quad  
Buffalo, NY 14261

Ms. Marjorie Greene  
BAREPP  
Metro Center, #152  
101 8th Street  
Oakland, CA 94607

Ms. Marilyn MacCabe  
FEMA  
228th St. SW  
Bothell, WA 98021-9796

Ms. Linda Noson  
FEMA Region 10  
130 228th St., SW  
Bothell, WA 98021-9796

Ms. Deedee O'Brien  
Utah Museum of Natural History  
University of Utah  
Salt Lake City, UT 84117

Mr. Lawrence Pearce  
Emergency Preparedness Canada  
Box 10,000  
Victoria, BC  
Canada V8T 4Z8

Ms. Katharyn Ross  
National Center for Earthquake  
Engineering Research  
116 Red Jacket Quad  
Amherst, NY 14261

Dr. Herbert Thier  
CALEEP  
Lawrence Hall of Science  
University of California at Berkeley  
Berkeley, CA 94720

**ADVISORS**

Dr. Rodney Doran  
SUNY at Buffalo  
Learning and Instruction  
563 Baldy Hall  
Buffalo, NY 14260

Dr. Richard Foster  
State University College at Buffalo  
Room 131  
Science Building  
Buffalo, NY 14222

Dr. Thomas Frantz  
SUNY at Buffalo  
Counseling and Educational Psychology  
426 Baldy Hall  
Buffalo, NY 14260



## SECTION 2

### Disaster Preparedness - The Place of Earthquake Education in Our Schools July 9-11, 1989

#### Program and Schedule

- Sunday, July 9:** 3:30-4:30 pm Conference Registration  
**Hilton Lobby**
- 4:45 pm Bus leaves Hilton for Amherst Campus
- 5:30-7:00 pm Tour of NCEER Seismic Simulator Laboratory  
Demonstration of NCEER Quakeline  
Poster and Exhibit Displays  
**Room 140 and Computer Lab, Ketter Hall,  
UB Amherst Campus**
- 7:00-9:30 pm Dinner Meeting - The Earthquake Risk in the Pacific Northwest  
Ms. Linda Noson, FEMA, Region 10  
Mr. Lawrence Pearce, Emergency Preparedness Canada, British  
Columbia and Yukon  
**Center for Tomorrow, UB Amherst Campus**
- Monday, July 10:** 7:30-8:30 am Conference Registration  
Continental Breakfast  
**Outside of Newport Room, Hilton**
- 8:30-9:00 am Welcome: Ms. Katharyn E.K. Ross  
NCEER Education Specialist  
The Need for Earthquake Education  
Dr. Ian Buckle, NCEER Deputy Director  
**Newport Room, Hilton**
- 9:00-9:20 am Seismic Safety of Idaho Schools  
Mr. Kurt Othberg, Idaho Geological Survey  
**Newport Room, Hilton**
- 9:20-9:40 am The Benefits of Earthquake Education to the Schools  
Mr. James L. Tingey, Utah Comprehensive Emergency  
Management  
**Newport Room, Hilton**
- 9:40-10:00 am Internalizing Mitigation Education in the Schools  
Mr. Daniel Cicirello, Arkansas State Office of  
Emergency Services  
**Newport Room, Hilton**

### Program and Schedule (Cont'd)

- 10:00-10:15 am Break  
**Outside of Newport Room, Hilton**
- 10:15-10:35 am What Currently Exists in Earthquake Education: An Overview  
Ms. Katharyn E.K. Ross, NCEER Education Specialist  
**Newport Room, Hilton**
- 10:35-11:00 am Plate Tectonics - Learning the Science to Understand the Hazard  
Dr. Joyce R. Blueford, Math/Science Nucleus,  
Fremont, California  
**Newport Room, Hilton**
- 11:00-11:25 am Earthquake Preparedness From a School's Perspective  
Mr. Karl Naugle, Dorchester Two School  
District, Summerville, South Carolina  
**Newport Room, Hilton**
- 11:25-11:50 am Teacher Participation in Earthquake Curricula  
Mr. Jeffrey Callister, Newburgh Free Academy, Newburgh,  
New York  
**Newport Room, Hilton**
- 11:50-Noon Questions and Answers
- Noon-1:30 pm Lunch Presentation - It's Not My Fault: The Role of  
Denial in School Earthquake Preparedness  
Ms. Ferne Halgren, Education Extension, UCLA  
**Palo Alto Room, Hilton**
- 1:30-2:00 pm The Process of Dissemination  
Ms. Phyllis Marcuccio, Editor, Science and Children, National  
Science Teachers Association  
**Newport Room, Hilton**
- 2:00-2:15 pm Implementation of Earthquake Education in the United States:  
An Overview  
Ms. Katharyn E.K. Ross, NCEER Education Specialist  
**Newport Room, Hilton**
- 2:15-2:35 pm Crisis Management and Earthquake Preparedness - A Regional  
Perspective  
Mr. Lawrence Pearce, Emergency Preparedness Canada,  
British Columbia and Yukon  
**Newport Room, Hilton**

### Program and Schedule (Cont'd)

- 2:35-2:45 pm Policies and Projects in the British Columbia  
Ministry of Education  
Mr. Neil Jackson, Senior Architect, Schools Facilities Branch,  
Ministry of Education, British Columbia  
**Newport Room, Hilton**
- 2:45-3:00 pm Break  
**Outside Newport Room, Hilton**
- 3:00-3:10 pm Strategies for the Implementation of Earthquake Preparedness in  
the Arkansas Schools  
Dr. John Gill, Educational Administrative Supervisor,  
Arkansas Department of Education  
**Newport Room, Hilton**
- 3:10-3:20 pm Implementation of Earthquake Education in California  
Public Schools  
Mr. Thomas Sachse, Manager, Math/Science Education Unit,  
California State Department of Education  
**Newport Room, Hilton**
- 3:20-3:30 pm Seismic Safety Standards for Idaho Schools  
Mr. Eldon Nelson, Supervisor, Support Services, Idaho State  
Department of Education  
**Newport Room, Hilton**
- 3:30-3:40 pm Slow Scholars Consider the Realities of Significant Seismicity  
Dr. David Kennedy, Program Administrator for Curriculum,  
Washington State Department of Education  
**Newport Room, Hilton**
- 3:40-4:30 pm Implementation Panel Discussion  
Dr. John Gill, Mr. Neil Jackson, Dr. David Kennedy, Mr.  
Eldon Nelson, Mr. Larry Pearce, Mr. Thomas Sachse,  
Ms. Katharyn Ross  
This time is provided to allow for optimal exchange between  
speakers and participants  
**Newport Room, Hilton**
- 4:30-5:00 pm Summary of the Day; Identification of Key Issues  
and Workshops, July 11  
Ms. Katharyn E.K. Ross, NCEER Education Specialist  
**Newport Room, Hilton**

### Program and Schedule (Cont'd)

- 5:00-6:00 pm      Poster and Exhibit Session  
Participants are encouraged to display materials and descriptions of their programs  
Cash Bar  
**Palo Alto Room, Hilton**
- 7:30-8:30 pm      Optional Curricular Discussion  
This is designed for those who would like to further discuss available curricula and the future directions of earthquake education materials  
**Palo Alto Room, Hilton**
- Tuesday, July 11:** 7:30-8:30 am      Continental Breakfast  
**Outside Newport Room, Hilton**
- 8:30-9:45 am      Workshop 1: Avenues of Dissemination  
Group A: Point of View of Administrators  
Ms. Marjorie Greene, Project Planner, BAREPP  
**Palo Alto Room, Hilton**  
Group B: Point of View of Educators  
Ms. Deedee O'Brien, Utah Museum of Natural History  
**Newport Room, Hilton**  
Group C: Point of View of Material and Curriculum Developers  
Ms. Marilyn MacCabe, Earthquake Education Program Manager, FEMA  
**San Carlos Room, Hilton**
- 9:45-10:00 am      Break  
**Outside Newport Room, Hilton**
- 10:00-11:00 am      Psychological Aftermath of School Tragedy: Planning and Coping  
Dr. Thomas Frantz, Department of Counseling and Educational Psychology, State University of New York at Buffalo  
**Newport Room, Hilton**
- 11:00-11:15 am      Break  
**Outside Newport Room, Hilton**
- 11:15-12:30 pm      Workshop 2: Barriers to Implementation  
Group A: Point of View of Administrators  
Group B: Point of View of Educators  
Group C: Point of View of Material and Curriculum Developers
- 12:30-1:30 pm      Lunch  
**Justine's, Hilton**

### Program and Schedule (Cont'd)

- 1:30-2:45 pm     Workshop 3: Strategies: Getting Earthquake Education into the Schools  
Group A: Point of View of Administrators  
Group B: Point of View of Educators  
Group C: Point of View of Material and Curriculum Developers
- 2:45-3:00 pm     Break  
**Outside Newport Room, Hilton**
- 3:00-3:45 pm     What Do We Do Next? The Next Step in Earthquake Education  
Ms. Joyce Bagwell, Earthquake Education Center Director,  
Baptist College at Charleston  
**Newport Room, Hilton**
- 3:45-4:15 pm     Conclusions and Recommendations From Workshops; Reports  
From Workshop Leaders  
**Newport Room, Hilton**
- 4:15-4:45 pm     Closure  
Ms. Katharyn E.K. Ross, NCEER Education Specialist





## **CONFERENCE WORKSHOPS**

The Conference Workshops are designed as working sessions in which conference products will be developed. These include goal statements, lists of recommendations, limitations for achieving listed goals, factors that will encourage the successful attainment of the goals and general position statements. Products from these workshops will be included in the formal proceedings.

To avoid duplication and maximize discussion, each workshop will have three sessions occurring simultaneously. One workshop session will discuss the listed topic from the point of view of an administrator, another from the point of view of an educator, and the third from the point of view of a developer of science and/or safety curricula, inservice, and other related materials. These are not assigned groups. Attendees are encouraged to join the group with which they feel most comfortable and would best be able to contribute.

### **Workshop 1: Avenues of Dissemination**

This workshop will focus on available avenues for dissemination of materials and how they can be utilized more fully, and even expanded.

- Who should be responsible for dissemination?
- How do we get existing materials to students and teachers? What local, state and professional organization mechanisms are there?

### **Workshop 2: Barriers to Implementation**

This workshop will focus on regional, national, and political factors that are interfering with the full implementation of earthquake education in the schools.

- Where does natural hazard education fit into the existing curriculum?
- Should existing materials be regionalized to meet the needs of particular areas of the country?

### **Workshop 3: Strategies - Getting Earthquake Education into Our Schools**

This workshop will focus on ways that earthquake education can be fully incorporated into the existing school curriculum at a variety of levels and across age groupings.

- How can parents and teachers be motivated to ask for the inclusion of earthquake education in the schools?
- In what ways can earthquake education in the schools be designed so that students internalize the concept of hazard mitigation and grow to become informed adults?



**SECTION 3**  
**THE EARTHQUAKE RISK IN THE PACIFIC NORTHWEST**

Linda Noson\*  
Natural Hazard Specialist, Federal Emergency Management Agency

Larry D. Pearce\*  
Assistant Regional Director, Emergency Preparedness Canada,  
British Columbia and Yukon

British Columbia and Washington are in earthquake country. Thousands of earthquakes are recorded each year by instruments sensitive to even small motions of the earth. A number of earthquakes have shaken the region hard enough to cause wide-spread damage and alarm. Early explanations through Indian legend tell of this terrifying phenomena, including the stumbling of individuals with a mysterious disease called "Earthquake Foot" and punishment of local inhabitants by an angry God. Information now available provides a clearer understanding of why earthquakes occur in the region. This information has been gathered and studied by scientists in both Canada and the United States. Earthquakes ignore economical, political, and social boundaries.

Scientists from both countries must work together to better understand where, when, and how big earthquakes will impact British Columbia and Washington. These joint attempts to define the regional earthquake hazards have led to cooperative efforts to find ways to reduce further earthquake damage and injury.

The U.S. and Canadian governments, in response to the threat, are developing in concert with the states and the Province of British Columbia, their National Earthquake Response Plans. The U.S. and Canadian plans identify those government departments and agencies, private industry and other non-government groups who would be called upon to provide support to the state or province in the event of a catastrophic earthquake. They detail the type of resources required and which agencies provide these resources. They outline the concept of operations and the organization necessary to initiate the process and procedures of the plan and they detail the command and control structures necessary to execute and prosecute their aims and objectives. The strategy is clearly to provide support to the states and province while insuring that state and provincial authorities are in charge of operations.

This paper reviews the integration of information as well as the planning process from both sides of the border to improve the understanding of the earthquake hazards and to reduce further losses.

\*Ms. Linda Noson  
Natural Hazard Specialist  
FEMA Region 10  
130 228th St. S.W.  
Bothell, WA 98021-9796

\*Mr. Larry Pearce  
Asst. Regional Director  
Emergency Preparedness Canada  
P.O. Box 10,000  
Victoria, BC, Canada V8T 4Z8

\*Indicates Speaker

## THE NEED FOR EARTHQUAKE EDUCATION

Dr. Ian Buckle\*  
Deputy Director, NCEER  
State University of New York at Buffalo

In 1977 the United States Congress found that 1) all 50 States are vulnerable to the hazards of earthquakes, and at least 39 of them are subject to major or moderate seismic risk, including Alaska, California, Hawaii, Illinois, Massachusetts, Missouri, Montana, Nevada, New Jersey, New York, South Carolina, Utah, and Washington. A large portion of the population of the United States lives in areas vulnerable to earthquake hazards; and 2) earthquakes have caused, and can cause in the future, enormous loss of life, injury, destruction of property, and economic and social disruption. With respect to future earthquakes, such loss, destruction, and disruption can be substantially reduced through the development and implementation of earthquake hazards reduction measures, including (A) improved design and construction methods and practices, (B) land-use controls and redevelopment, (C) prediction techniques and early-warning systems, (D) coordinated emergency preparedness plans, and (E) public education and involvement programs. Education is seen in this extract from the Earthquake Hazards Reduction Act of 1977 to be one of five reduction measures to be undertaken under Public Law 95-124.

More than 10 years later, this need is even more urgent. A destructive earthquake is expected to occur, with almost 100 percent certainty, somewhere in the Eastern or Central United States before the year 2010. This means that every child in grade school today will most probably experience this most catastrophic of all natural disasters.

Knowing what to expect, how to prepare and how to respond to an earthquake is a proven method of mitigating the loss of life and property. Teaching this knowledge is the ultimate responsibility of today's educators.

\*Dr. Ian Buckle  
Deputy Director  
National Center for Earthquake Engineering Research  
State University of New York at Buffalo  
Red Jacket Quadrangle  
Amherst, NY 14261

## SEISMIC SAFETY OF IDAHO SCHOOLS

Roy M. Breckenridge  
Kurt L. Othberg\*  
Idaho Geological Survey

Kenneth F. Sprenke  
Department of Geology and Geological Engineering, University of Idaho

Idaho is an earthquake state. It ranks fifth highest in the nation in overall seismic zoning. The two largest earthquakes in the contiguous United States since 1952 occurred in Idaho or within a few miles of the Idaho border. The seismic threat to the public schools in Idaho is critical. Many of our school buildings were built long before acceptable codes for earthquake-resistant buildings were enacted. The Idaho Bureau of Disaster Services together with the State Department of Education received funding from the Federal Emergency Management Agency for an Earthquake Hazard Mitigation Assistance project. This project developed seismic safety standards to be submitted to the State Board of Education. The project was directed by the Idaho Geological Survey at the University of Idaho and included experts from the disciplines of geology, geophysics, structural engineering, and education.

Our study had three components. First, the geotechnical group characterized the earthquake threat in the state based on the record of historical seismicity and interpretations of the geologic setting. Second, the structural engineering group mailed questionnaires to all the schools in the state and analyzed the seismic vulnerability of approximately 670 school buildings in 109 of the 115 school districts in Idaho. Finally, the education group studied nonstructural mitigation measures necessary to minimize the threat of injury to school occupants and investigated establishing a school-based disaster preparedness program.

We completed the project in December 1988 and presented the results and recommendations to the Department of Education. There are three recommendations as a result of this study:

1. Future school building construction and renovation should comply with the current Uniform Building Code (1988 UBC).
2. All school buildings in the state must be able to withstand seismic shaking of Intensity VII (Modified Mercalli Scale) with priority given to the high risk buildings in the most hazardous parts of the state.
3. Every school building in Idaho is at some risk. Therefore, a program of planning for earthquake preparedness should be implemented on a statewide basis.

Standards based on the recommendations of our study will be presented to the State Board of Education June, 1989. Mr. Eldon Nelson of the Idaho Department of Education will present details of the standards recommended and discuss implementation. At this point the project has met with strong support from all parties involved and we anticipate substantive standards will be adopted.

\*Mr. Kurt Othberg  
Idaho Geological Survey  
Morrill Hall  
University of Idaho  
Moscow, ID 83843

## THE BENEFITS OF EARTHQUAKE EDUCATION TO THE SCHOOLS

James L. Tingey\*  
Earthquake Preparedness Coordinator  
Utah Comprehensive Emergency Management, Salt Lake City, Utah

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.

\*James L. Tingey  
Earthquake Preparedness Coordinator  
Comprehensive Emergency Management  
1534 Sunnyside Ave.  
Salt Lake City, UT 84105

## INTERNALIZING MITIGATION EDUCATION IN THE SCHOOLS

Daniel J. Cicirello\*  
Earthquake Preparedness Supervisor  
Arkansas State Office of Emergency Services

Life sustaining information has been provided to students in United States schools over past decades in one form or another. It is the purpose of this presentation to point out the need to provide earthquake preparedness and mitigation information through the education curriculum that will cause those that receive it to be a major influence as an adult in developing, sponsoring, supporting and voting for those building codes, and the enforcement thereof, that will afford reasonable protection to those occupants of schools, hospitals, nursing homes, municipal buildings, etc. located in earthquake damage prone areas. The concept considered is "INTERNALIZATION."

\*Mr. Daniel Cicirello  
Earthquake Preparedness Supervisor  
State of Arkansas  
Office of Emergency Services  
P.O. Box 758  
Conway, AR 72032

## WHAT CURRENTLY EXISTS IN EARTHQUAKE EDUCATION

Katharyn E.K. Ross\*

Education Specialist, National Center for Earthquake Engineering Research

In May, 1988, a survey of state education departments was initiated to see who was offering earthquake education. In addition to discerning whether a state or particular school was offering earthquake education, surveyed programs were also asked the following: whether FEMA's Guidebook for Developing a School Earthquake Safety Program (December, 1985) was being used, what natural hazards curricula was being implemented, and if there was a school or classroom with a model natural hazards program. Throughout the time of the survey, copies of and information about earthquake education curricula, related software, and supplemental informational materials and books were collected and compiled. The result of this was a bibliography of earthquake education materials. This presentation will provide a general overview of earthquake education curricula, highlighting differences in curricular emphases.

\*Katharyn E.K. Ross

Education Specialist

National Center for Earthquake Engineering Research

State University of New York at Buffalo

Red Jacket Quadrangle

Buffalo, NY 14261



## PLATE TECTONICS--LEARNING THE SCIENCE TO UNDERSTAND THE HAZARDS

Dr. Joyce Blueford\*  
Math/Science Nucleus, Fremont, California

The science of Plate Tectonics can help students understand earthquake hazards. Overcoming fear and anxiety of any hazard starts in the elementary grades. Activities and lesson plans that emphasize critical thinking skills and content about a particular type of hazard gives students confidence to deal with problems if the student should experience that hazard. An elementary science program, Integrating Science, Math, and Technology (I. Science MATE) has students develop the skills within a year long science program. Learning about earthquake hazards requires a coherent, grade leveled, and scientifically rigorous look at volcanoes, earthquakes, and plate tectonics (Plate Tectonic Cycle). The hands-on materials were designed to highlight the evidence that geologists and seismologists use to "prove" plate tectonics as a working model. These lines of evidence include data from the structure of the surface of the earth, geophysical data from earthquakes, and paleontological clues. This scientific rationale has guided the development of activities so students learn sequential concepts that provides insight on prevention of hazards.

\*Dr. Joyce Blueford  
Math/Science Nucleus  
3710 Yale Way  
Fremont, CA 94538

## EARTHQUAKE PREPAREDNESS FROM A SCHOOL'S PERSPECTIVE

Karl E. Naugle,\*

Dorchester Two School District Computer Coordinator, Summerville, South Carolina

Why teach earthquake safety in schools? What better place to start than the place where statistics show that children spend the majority of their waking hours? Many advocate that we should build our hotels, shopping malls, and resorts more earthquake resistant; what about the buildings that house the future of America--our children? On a recent episode of the television show, "Our House," they showed a family that exercised a great deal of common sense action in dealing with a potentially devastating earthquake. The truths that came from this 2-part episode are frightening. First is the social apathy that allows a square box in our houses to teach us what our parents don't have time to teach. The second truth is the already bulging curricula of our schools which do not allow them the opportunity to incorporate earthquake safety education. We have been piloting earthquake safety curricula for many years and are still debating what should be incorporated. Meanwhile, earthquakes continue and many die.

What did our pilot study in Summerville bring to light? It showed that there are similarities between earthquakes, tornadoes, and fire drills. All deserve equal time and planning. The problem is exemplified by Xenia, Ohio which was leveled by a tornado while children were in school. The devastation caused massive drilling and planning for the next few years. But as reality fades, the awareness wanes.

Our safety search revealed that there were many hazardous conditions in classrooms and buildings. There were many objects in classrooms that were not bolted down and could fall on children during a quake: book cases, cabinets, shelves, cubby holes, light fixtures, and wall partitions. The air conditioners are located on the roof and could potentially crash through and block all exits. There were no battery-powered safety lights in the hallways or the bathrooms.

The water cut-offs were outside the building and were stripped to the point that few could turn them. The safety assembly areas outside the building were located directly over 440-volt power lines which could be brought out of the ground during afterquakes.

Separated families and their attempts to communicate presents another kind of problem. Attempts by hundreds of students to contact their parents and attempts by those parents to reach their children or even to learn of their welfare could result in panic. Panic increases the intensity of an already catastrophic event.

The real question yet to be answered by all of those in attendance at this conference is, "What is our plan of action?" Who will be in charge? What can we do in advance in terms of preparedness for any, if not all emergencies? From my perspective as a parent of three children, I would like to know the answer to one question: are my children going to be safe? If I can say "yes" by our protective planning, then the parents of the other 13,000 students in Summerville can rest easier. You don't have time not to plan.

\*Mr. Karl Naugle  
Special Services  
805 So. Main St.  
Summerville, SC 29483

## TEACHER PARTICIPATION IN EARTHQUAKE CURRICULA

Jeffrey C. Callister\*

Earth Science Teacher, Newburgh Free Academy, Newburgh, New York

In the development of curricula to educate the K-6 children of the United States in Earthquake Awareness, a series of alternative projects has been developed by various federal, national, state, and local organizations. These projects/curricula should, at least in part, be designed and written by the teacher-practitioners who have, and will be, using these materials in the classrooms. The National Science Teacher Association-Federal Emergency Management Agency 1988 K-6 Curriculum Project is an example of such a program involving numerous teacher-participants. Selected characteristics and aspects of the development of this curriculum are contained herein.

\*Mr. Jeffrey Callister  
13 Linda Drive  
Newburgh, NY 12550

## **IT'S NOT MY FAULT: THE ROLE OF DENIAL IN SCHOOL EARTHQUAKE PREPAREDNESS**

Ferne Halgren\*

Coordinator, School Earthquake Management Program, Education Extension, UCLA

A damaging earthquake, which strikes without warning and seemingly at random and reduces thriving entities to rubble, is a terrifying metaphor for death. Individuals normally employ a variety of defense mechanisms to alleviate the stress of coping with negative emotional states. It is argued that these defense mechanisms, often appropriate when employed on a personal level, can and do adversely impact decisions regarding policy and planning for school earthquake preparedness. This theme is discussed with reference to parents, teachers and principals at the site level and superintendents and school boards at the district level. Suggestions are made for dealing with these powerful defense mechanisms so that the serious work of upgrading schools' earthquake management plans can begin.

\*Ms. Ferne Halgren  
University of California, Los Angeles  
University Extension  
Education Extension  
10995 Le Conte Avenue  
Los Angeles, CA 90024-2883

## THE PROCESS OF DISSEMINATION

Phyllis Marcuccio\*  
Director, Publications and Editor, Science and Children,  
National Science Teachers Association

Reaching an audience in the teaching community with information about earthquake preparedness can be a frustrating task. How can you increase the chances that your materials and message are seen and heard by the classroom teacher? What channels are best to use for communication directly to the teacher? Which ones work best for dissemination? for communication with administrators? for response? for support? How can and will the teacher fit your materials into the existing curriculum?

What options exist for materials distribution and communication through the science education professions beyond the direct routes within a school or school system, e.g., mailing lists, meetings, conventions, conferences, workshops, organizations, newsletters? What computer bulletin board systems and networks exist that science teachers frequent for information?

There are practical dos and don'ts for many of these questions. Several suggestions and techniques will be mentioned that may stimulate ideas and channels for you to try as you strive to encourage the implementation and use of classroom materials you prepare.

\*Ms. Phyllis Marcuccio  
Director, Publications  
Editor, Science and Children  
National Science Teachers Association  
1742 Connecticut Avenue, NW  
Washington, DC 20009

**IMPLEMENTATION OF EARTHQUAKE EDUCATION  
IN THE UNITED STATES: AN OVERVIEW**

Katharyn E.K. Ross\*

Education Specialist, National Center for Earthquake Engineering Research

May 26, 1988, the National Center for Earthquake Engineering Research initiated an earthquake education project whose focus was on earthquake awareness and safety education in school programs for grades K-12. A primary focus of this program was to survey state education departments, individual school districts, and schools in the United States and the Territories to see who was offering earthquake education. A survey of the state education departments has been completed with fifty states and two Territories responding. Results of this survey will be presented and difficulties with general implementation of earthquake and other hazard awareness curricula at the state education level will be highlighted. Especially in those states where the state education department cannot mandate any curriculum, there is a need to find other dissemination and implementation mechanisms.

\*Katharyn E.K. Ross

Education Specialist

National Center for Earthquake Engineering Research

State University of New York at Buffalo

Red Jacket Quadrangle

Buffalo, NY 14261

## **CRISIS MANAGEMENT AND EARTHQUAKE PREPAREDNESS--A REGIONAL PERSPECTIVE**

Lawrence D. Pearce\*

Assistant Regional Director, Emergency Preparedness Canada, British Columbia & Yukon

It's a natural human reaction that when disaster strikes somewhere in the world, we suddenly scramble to see what the chances are of the same type of disaster happening in our own locale.

The vast variety of potential disasters creates a nightmare for our leaders and planners. How do we make the public aware of the problems? How do we analyze the hazards and risks and take steps to mitigate effects? How do you overcome the "Oh, it can't happen here" syndrome? How can you plan unless you know what hazards exist and who and what is a risk?

The public in Canada has become more and more concerned with man-made hazards but in the past three and one half years British Columbians have become more concerned with the earthquake hazard. This is largely as a result of major earthquakes around the world. The probabilities for disasters such as earthquakes are high and the risks are great. There are environmental, political and social impacts following any major incident. If you believe these risks exist, then what do you do about it?

This paper will outline for you some of the initiatives taken in Canada and in particular British Columbia to make the public aware of the risks and to educate planners, politicians and responders as to what can be done to mitigate the effects of disasters.

\*Mr. Lawrence D. Pearce  
Assistant Regional Director  
Emergency Preparedness Canada  
P.O. Box 10,000  
Victoria, BC, Canada V8T 4Z8

**POLICIES AND PROJECTS IN THE  
BRITISH COLUMBIA MINISTRY OF EDUCATION**

Neil Jackson\*

Senior Architect, Ministry of Education, British Columbia, Canada

The entire 900 km. long western seaboard of British Columbia plus large areas in the north-east are defined as zones of high seismic risk. The development of earthquake-preparedness programs however was not begun until 1986. This paper describes the difficulties experienced in starting such programs, the developments to date and plans for the future. The intention of this paper is to share experiences with other education authorities and perhaps initiate future dialogue to mutual benefit.

\*Mr. Neil Jackson  
Architect of School Facilities Branch  
Ministry of Education  
620 Superior St.  
Victoria, BC, Canada V8V 2M4



**STRATEGIES FOR THE IMPLEMENTATION OF  
EARTHQUAKE PREPAREDNESS IN THE ARKANSAS SCHOOLS**

Dr. John C. Gill\*

Educational Administrative Supervisor, Arkansas Department of Education

In an effort to coordinate the activities of the Office of Emergency Services and the Department of Education in earthquake preparedness for schools within the twenty-four counties on or in close proximity to the New Madrid Fault. The following responsibilities and duties will be discussed: The science section, Instructional Services, may function as the contact for communications. To effectively utilize the extensive earthquake educational materials available from the Office of Emergency Services, the Division of Instructional Services may facilitate the dissemination of materials and monitor their use during annual visits. Other divisions and agencies may assist in the implementation of this program.

\*Dr. John Gill  
Education Administration Supervisor  
Arkansas Department of Education  
Rm. 305-B Education Building  
Capitol Mall  
Little Rock, AR 72201

**IMPLEMENTING EARTHQUAKE EDUCATION  
IN CALIFORNIA PUBLIC SCHOOLS**

Thomas P. Sachse,\* Manager  
William A. Andrews, Consultant  
Math/Science, Environmental Education Unit  
California State Department of Education

This presentation will focus on the needs, mandates and expectations for Earthquake Education in California Public Schools and show how state, regional and local education agencies are responding to this critical area. The paper opens with brief treatment of the legislative and geological history supporting the need for earthquake education. It then describes state level agencies and their roles and responsibilities for earthquake education leadership. The paper also demonstrates how university and regional support mechanisms provide assistance to local education agencies. Finally, the paper provides a status report on earthquake awareness and preparedness in local California schools. The status report draws on the science (seismology) curricula available to schools as well as facilities design issues, inherent in earthquake prone areas like California.

\*Mr. Thomas P. Sachse  
Manager  
Math/Science Education Unit  
California State Department of Education  
721 Capitol Mall  
P.O. Box 944272  
Sacramento, CA 94244-2720

## SEISMIC SAFETY STANDARDS FOR IDAHO SCHOOLS

Eldon L. Nelson\*

Supervisor, Support Services, Idaho State Department of Education

A project to develop seismic safety standards for Idaho schools has been completed and submitted to the Idaho State Board of Education. The study has three components: evaluation of the seismic hazard in the state from the geological point of view; seismic vulnerability for approximately 670 public school buildings in the state; and, the establishment of a school-based disaster preparedness program. Findings and recommendations from the report cluster around four general areas: construction standards for new school buildings, retrofitting of existing school buildings, non-structural mitigation, and emergency preparedness training.

\*Mr. Eldon Nelson  
Supervisor of Support Services  
Len B. Jordan Office Building  
Boise, ID 83720

## **SLOW SCHOLARS CONSIDER THE REALITIES OF SIGNIFICANT SEISMICITY**

**Dr. David Kennedy\***

Office of Superintendent of Public Instruction, Olympia, Washington

Washington is a state that has a significant history of and potential for violent natural disaster from such events as fires, winds, volcanic eruptions, tsunamis, and earthquakes. The Kindergarten through Grade Twelve education system has not made this reality a component of their everyday educational practice. The system currently has other priorities that line up well ahead of earthquakes such as reading, mathematics, writing, HIV-AIDS, drugs, alcohol, violence, driver training, dropouts, school lunches, and money.

A recent significant national conference and subsequent report indicate that "large subduction earthquakes on the Cascadia subduction zone pose a potential seismic hazard, and the potential exists for a great earthquake being of magnitude 8 or 9." A growing effort among the scientific community to inform us about this probable seismicity and a resulting awareness on the part of a few educators is beginning to bring the reality of the earthquake problem to the attention of educational decision-makers.

The structure of the education system and characteristics of the education community will play a large role in how well a significant percentage of our population prepares for such an eventuality as significant seismic shock.

**\*Dr. David Kennedy**  
Program Administrator for Curriculum  
Office of Superintendent of Public Instruction  
Old Capitol Building, F-G11  
Olympia, WA 98504-3211

## **PSYCHOLOGICAL AFTERMATH OF SCHOOL TRAGEDY: PLANNING AND COPING**

Dr. Thomas Frantz\*

State University of New York at Buffalo

This presentation will focus on a step by step plan for reacting to a tragedy in a school in accordance with the main goals of reducing fear, restoring security, and appropriate grieving. Types of student responses school staff should anticipate and ways of helping students cope with their feelings about the tragedy will be discussed. The importance of staff members own reactions and ways of coping will be emphasized.

\*Dr. Thomas Frantz

SUNY at Buffalo

Dept. of Counseling and Educational Psychology

426 Baldy Hall

Buffalo, NY 14260

## WHAT DO WE DO NEXT? THE NEXT STEP IN EARTHQUAKE EDUCATION

Joyce B. Bagwell\*  
Director, Earthquake Education Center,  
Baptist College at Charleston, Charleston, South Carolina

"Do I have to teach this earthquake drill to my students? I simply do not have the time!" said the frustrated first-year fourth grade teacher to the assistant principal of the Newington Elementary School in Summerville, South Carolina. Her pleading eyes begged the assistant principal to say, "No." The assistant principal firmly, yet kindly, replied to the teacher, "Mrs. Brown, you do not have the time not to teach the earthquake drill."

The purpose of this paper is to bring you five steps for implementing an earthquake education program to the school population. The steps which I call the five C's are (a) commit, (b) consult, (c) channel, (d) communicate, and (e) charge. Each step works together to provide a simple, flexible approach for implementing earthquake education within the educational structure of your state.

\*Ms. Joyce Bagwell,  
Director  
Earthquake Education Center  
Baptist College at Charleston  
P.O. Box 10087  
Charleston, SC 29411

## THE NATIONAL CENTER FOR EARTHQUAKE ENGINEERING RESEARCH

The National Center for Earthquake Engineering Research was established in September 1986 at the State University of New York at Buffalo, the first such national center sponsored by the National Science Foundation (NSF). It joins more than 80 researchers from the University at Buffalo, City University of New York, Columbia University, Cornell University, Lamont-Doherty Geological Observatory of Columbia University, Lehigh University, Princeton University, Rensselaer Polytechnic Institute, and other institutions throughout the United States and the World.

Funded by a five-year \$25 million grant from the NSF with matching funds from New York State and other sources, NCEER is part of the National Earthquake Hazards Reduction Program established by Congress in 1977. The National Center's focus is to minimize damage caused by earthquakes through directed research, implementation of findings, public education and transfer of technology. NCEER also examines socio-economic issues of earthquakes such as emergency preparedness, response and recovery.

NCEER is a collaborative team effort of academics, practicing professionals, government officials and other experts. Their mutual objective is to enhance basic knowledge of earthquakes, perfect engineering practices and implement earthquake hazards mitigation procedures. Studies include investigation of earthquake ground motion, soil behavior, structural performance and design principles, education, response and recovery programs. NCEER is equally interested in the broad-based dissemination of information and technology, sponsoring national and international conferences, meetings with private and public sector leaders, public seminars on earthquakes and offering a computer-based information service as a reference source on engineering, geological, political and socio-economic aspects of earthquakes.





**NATIONAL CENTER FOR EARTHQUAKE ENGINEERING RESEARCH  
LIST OF PUBLISHED TECHNICAL REPORTS**

The National Center for Earthquake Engineering Research (NCEER) publishes technical reports on a variety of subjects related to earthquake engineering written by authors funded through NCEER. These reports are available from both NCEER's Publications Department and the National Technical Information Service (NTIS). Requests for reports should be directed to the Publications Department, National Center for Earthquake Engineering Research, State University of New York at Buffalo, Red Jacket Quadrangle, Buffalo, New York 14261. Reports can also be requested through NTIS, 5285 Port Royal Road, Springfield, Virginia 22161. NTIS accession numbers are shown in parenthesis, if available.

- NCEER-87-0001 "First-Year Program in Research, Education and Technology Transfer," 3/5/87, (PB88-134275/AS).
- NCEER-87-0002 "Experimental Evaluation of Instantaneous Optimal Algorithms for Structural Control," by R.C. Lin, T.T. Soong and A.M. Reinhorn, 4/20/87, (PB88-134341/AS).
- NCEER-87-0003 "Experimentation Using the Earthquake Simulation Facilities at University at Buffalo," by A.M. Reinhorn and R.L. Ketter, to be published.
- NCEER-87-0004 "The System Characteristics and Performance of a Shaking Table," by J.S. Hwang, K.C. Chang and G.C. Lee, 6/1/87, (PB88-134259/AS).
- NCEER-87-0005 "A Finite Element Formulation for Nonlinear Viscoplastic Material Using a Q Model," by O. Gyebi and G. Dasgupta, 11/2/87, (PB88-213764/AS).
- NCEER-87-0006 "Symbolic Manipulation Program (SMP) - Algebraic Codes for Two and Three Dimensional Finite Element Formulations," by X. Lee and G. Dasgupta, 11/9/87, (PB88-219522/AS).
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- NCEER-87-0008 "IDARC: Inelastic Damage Analysis of Reinforced Concrete Frame - Shear-Wall Structures," by Y.J. Park, A.M. Reinhorn and S.K. Kunnath, 7/20/87, (PB88-134325/AS).
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- NCEER-87-0013 "Frequency Response of Secondary Systems Under Seismic Excitation," by J.A. HoLung, J. Cai and Y.K. Lin, 7/31/87, (PB88-134317/AS).
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- NCEER-87-0017 "Digital Simulation of Seismic Ground Motion," by M. Shinozuka, G. Deodatis and T. Harada, 8/31/87, (PB88-155197/AS). This report is available only through NTIS (see address given above).
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- NCEER-87-0024 "Vertical and Torsional Impedances for Radially Inhomogeneous Viscoelastic Soil Layers," by K.W. Dotson and A.S. Veletsos, 12/87, (PB88-187786/AS).
- NCEER-87-0025 "Proceedings from the Symposium on Seismic Hazards, Ground Motions, Soil-Liquefaction and Engineering Practice in Eastern North America," October 20-22, 1987, edited by K.H. Jacob, 12/87, (PB88-188115/AS).
- NCEER-87-0026 "Report on the Whittier-Narrows, California, Earthquake of October 1, 1987," by J. Pantelic and A. Reinhorn, 11/87, (PB88-187752/AS). This report is available only through NTIS (see address given above).
- NCEER-87-0027 "Design of a Modular Program for Transient Nonlinear Analysis of Large 3-D Building Structures," by S. Srivastav and J.F. Abel, 12/30/87, (PB88-187950/AS).
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- NCEER-88-0043 "Nonstationary Models of Seismic Ground Acceleration," by M. Grigoriu, S.E. Ruiz and E. Rosenblueth, 7/15/88, (PB89-189617/AS).
- NCEER-88-0044 "SARCF User's Guide: Seismic Analysis of Reinforced Concrete Frames," by Y.S. Chung, C. Meyer and M. Shinozuka, 11/9/88, (PB89-174452/AS).
- NCEER-88-0045 "First Expert Panel Meeting on Disaster Research and Planning," edited by J. Pantelic and J. Stoyke, 9/15/88, (PB89-174460/AS).
- NCEER-88-0046 "Preliminary Studies of the Effect of Degrading Infill Walls on the Nonlinear Seismic Response of Steel Frames," by C.Z. Chrysostomou, P. Gergely and J.F. Abel, 12/19/88.
- NCEER-88-0047 "Reinforced Concrete Frame Component Testing Facility - Design, Construction, Instrumentation and Operation," by S.P. Pessiki, C. Conley, T. Bond, P. Gergely and R.N. White, 12/16/88, (PB89-174478/AS).

- NCEER-89-0001 "Effects of Protective Cushion and Soil Compliancy on the Response of Equipment Within a Seismically Excited Building," by J.A. HoLung, 2/16/89.
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B159  
10