The Growth of Seismology Education and Public Outreach

Advancing awareness & understanding of seismology and geophysics while inspiring careers in Earth Sciences

John Taber, Tammy Bravo, Perle Dorr, Michael Hubenthal, Jenda Johnson, Patrick McQuillan, Russ Welti
Overview

• Why E&O in a science facility?
• History
• Activities arranged by audience
  • Undergraduate students and faculty
  • Middle school/high school
  • General public
Why E&O in a science facility?

• Incorporated Research Institutions for Seismology (IRIS) formed in 1984
  – Global Seismic Network (with USGS), portable seismographs, data management center
  – IRIS community wasn’t initially in favor of including E&O
• Strong NSF encouragement to add E&O
  – Initiation of NSF Broader Impacts criteria (1997)
  – First staff member in 1998
• Value of a facility E&O program
  – National consortium with local university connections
  – Strong community involvement
  – Unique data and scientific resources
  – Stable consortium structure for long-term programs
  – Considerable emphasis on outreach
Progression

• Then
  – Started as largely volunteer community efforts
  – K-12 and informal education focus
    • Seen as greatest need
  – Mainly paper-based and in-person professional development

• Now
  – Led by professional staff with community oversight
  – Providing undergraduate resources as well as training for the community
    • Serving Consortium members as well as broader community
  – Online professional development via videos, animations and data access tools
  – EPO is an integral part of the facility
  – EarthScope/USArray outreach is significant component
IRIS EPO Guiding Principles

• Provide targeted products and services for a range of audiences
  – grades 6-12 students and teachers, college students and faculty, researchers, and the public.

• Emphasize seismology and the use of seismic data
  – Maintain scientific accuracy while employing best educational practices

• Strive for continuous improvement
  – Ongoing internal and external evaluation

• Integrate diversity into all activities
Undergraduate education

• Research Experiences for Undergraduates
  – 144 undergraduates since 1998
  – Over 40 Consortium member institutions as hosts
  – 85% of alumni go on to grad school
  – Past interns are now mentoring their own interns
  – Virtual REU
    • Student community established through 1-week orientation
    • Connection through rest of summer via online communication

• Creating labs and exercises for intro and upper level earth science courses
Teacher and College Faculty Professional Development

• Improve instructor knowledge and confidence
• In person workshops – 1 hour to 3 days
• Leverage via interactions with other groups
• Can’t reach enough instructors with existing methods
  – Focus on online resources
    • Webinars
    • Creating a virtual professional environment
Web Resources

• Activities developed for school and college classroom
• Interactive software
  – Simplified use of data available through IRIS
• Materials and interactions promoted via Facebook, Youtube, Twitter
Animations and videos

- Over 100 animations, visualizations and videos for use in teaching
  - Over 1.5 million visitors to YouTube+TeacherTube
- Designed to simplify and demonstrate concepts
IRIS Earthquake Browser

- Student exploration of plate boundaries
  - 3.3 million earthquakes spanning 50 years

- New 3D interactive browser
  - Rotate and zoom through hypocenters
  - Up to 5000 events

- Can share links for social networking or giving assignments to students
Teachable Moment slide sets

- Newsworthy earthquakes motivate students
- Slide sets produced within 1 day
  - Jointly produced with Univ. of Portland, collaborative content from USGS, UNAVCO, ESNO and others
  - Tell a story
  - In English and Spanish
Seismographs in Schools

- IRIS provides training and specialized software
- Web environment to improve connections between schools
  - Over 150 US schools
  - 250 international schools
- Student introduced to school seismograph in 8th grade became IRIS intern
  - Now a grad student in geophysics
- USB accelerometers and smart phones for engagement
EarthScope/USArray

- How to engage the public in
  The #1 most awesome experiment in the Universe
  (According to Popular Science)
USArray Student Siting

Student Siting Program:

- 8 summers
- 9 workshops
- ~135 students
- More than 50 institutions
- ~1375 sites identified
USArray Ground Motion Visualizations

- Automatically produced at the IRIS Data Management Center
- Teaching sequence tutorial on web
USArray Ground Motion Visualizations

- Combined Ground Motion Visualization

**IRIS DMS Combined Ground Motion Visualization**
**GULF OF CALIFORNIA 2007 - 2013**
Public Displays

- Started with IRIS/USGS displays in major museums
- Now focused on Active Earth Monitor
  - Designed for visitor centers, small museums, universities, schools, highway rest area
  - Regional content sets and customizable selection of pages to display
    - Content development with UNAVCO, ESNO, CERI, SCEC
Public Outreach

- **IRIS/SSA Distinguished Lecture Series**
  - Convey the excitement of seismology to a general audience
  - 19 Lecturers have given over 110 presentations to up to 400 people

- Temporary exhibits for the public

- National and international filming and broadcasting of EarthScope and USArray
Publications

- Provide fundamentals of seismology and broaden awareness
- Many EarthScope-related publications are collaborative with UNAVCO and ESNO
- Printed material is less common, but still has value
Evaluating our progress

- How well do the individual activities support the mission and goals of IRIS and the EPO program?
- Does the balance of activities adequately address the needs of the target audiences?
- Is the quality of services and products appropriate?
- Importance of evaluation continues to increase
  - Primarily internal formative assessment
  - Occasional external assessment of individual elements or entire program
  - IRIS EPO Standing Committee provides ongoing oversight of the program
Summary

• Stability of a facility-based program allows for long term growth and improvement of products and services
• Elements are designed for specific audiences and desired depth of involvement
• Increased emphasis on virtual delivery and interactions, but some face-to-face interaction still needed
• Impact is leveraged through collaborations