

# **UK School Seismology Project**

Project host:

***British Geological Survey (BGS)***

Project partners in the UK:

***Science Enhancement Programme (SEP)***

***Science Learning Centre East Midlands (SLCEM)***

***British Association for the Advancement of Science (BA)***

***National Endowment for Science Technology and the Arts  
(NESTA)***

International assistance provided by:

***United States Geological Survey (USGS)***

***Incorporated Research Institutes in Seismology (IRIS)***

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## **Summary**

The sheer destructive power of earthquakes has always held a fascination for children. This project capitalises on this natural interest by making use of earthquakes and seismology as a unifying theme in a set of simple classroom activities that teach a range of basic science concepts. The project also creates a ‘wow’ moment in the classroom by enabling schools to operate their own seismic recording station that is sensitive enough to record signals from large earthquakes that have happened on the other side of the world. After a large earthquake schools anywhere in the world will then be able to exchange and compare the signals that their own seismometers have recorded. Actually detecting signals from events of global significance has dramatic effect on school children, making them realise that science is not a set of abstract ideas but rather a way of understanding how the real world actually works.

The project will complete its development phase by May 2007 will roll out across schools in the UK during 2007–2008.

## **Background**

Practical school seismology has evolved out of amateur seismology, where keen amateurs have designed and built their own seismometers just for the fun of it. Initially they recorded their data on modified paper chart recorders, nowadays digitally on computers. In the US this led to the support of regional school seismology networks by several universities with IRIS and USGS providing some unifying support and latterly the development of a standardised schools seismometer design (the AS-1).

In the UK the school seismology project started with a handful of keen amateurs, some building their own systems, some acquiring commercial or US developed systems. The project really took off in 2005 with the winning of a NESTA grant to fund the development of a set of UK specific classroom activities and the development of a dedicated school seismometer system in collaboration with SEP.

This project has ambitious aims and is one of a number of national projects to improve science education in the UK. It is a long-term project whose success will be judged in 5–10 years time when students who are now aged 11 and 12 make decisions about what subjects to study at A-level and university.

## **Aims**

1. To make science more interesting for students aged 11–16
2. To improve the participation rates in physical sciences for students aged 16+
3. To influence curriculum development in the UK and promote the inclusion of seismology and earth science topics into the science (and physics) syllabus.  
The best way of doing this is to develop and support high quality and exciting classroom resources for teachers.
4. To raise awareness of geoscience as a scientific discipline for pre-university students.

## **Objectives**

1. Develop a set of hands-on classroom activities that support the teaching of basic physical science concepts using earthquakes and seismology as a unifying theme.
2. Develop a simple school seismometer system that can be used by schools to detect and record signals from distant large earthquakes.
3. Set up a website where schools are able to access teaching resources and exchange and compare data from recent earthquakes that they recorded.
4. Promote and facilitate links between UK schools and schools in other countries that are also recording signals from large earthquakes (or even experiencing the actual earthquakes).

## **Project timeline**

2005 2x Royal Society Partnership Grants for instrument development  
2005 July ... School Seismology workshop at the University of Leicester  
2006 Feb ... Award of NESTA grant for development of classroom resources  
2006 collaboration with SEP on development of simple school seismometer  
2006 July ... BGS start as host for the project  
2006 Oct , Dec ... Teachers attend resource development workshops

2007 May ... Press launch of project at the Institute of Physics  
2007 June ... Publication of SEP innovations in practical work booklet  
2007 June ... First production batch of seismometer systems  
2007–2008 Project roll-out

## **Project development**

The project has two components, a set of classroom activities (with supporting equipment) which will be distributed widely to thousands of teachers through the SEP associates scheme, and secondly a practical school seismometer system which will be made available to schools through linked training courses.

## **The classroom activities**

The project is developing (in collaboration with SEP) a set of classroom activities and associated teachers notes to cover the whole narrative of earthquake science. Some of these activities have small amounts of equipment associated with them, some are stand-alone or paper-based exercises

Activity	Resources required	Learning outcomes
What is an earthquake?	Brick, bungee and sandpaper	The role of models in science, elastic rebound theory
Seismic waves	Slinkies	Wave propagation, P, S and surface waves
Building a simple seismometer	Springs, magnets, coils	Inertia Simple harmonic motion Electromagnetic induction
Locating earthquakes	Compass, paper (microphones and PC)	Velocity and displacement
The effects of earthquakes	Shake table and models	Resonance

## ***The Seismometer***

The UK school seismometer is a modification of a traditional Shaw-Milne or Lehman design for a horizontal motion seismometer combined with a modern amplifier/digitiser system. The system is designed to be compatible with the US school seismometer AS-1 system (which is a vertical motion Lacoste type design). The UK seismometer is designed to have an adjustable natural period of 10–20 seconds, adjustable eddy current damping provided by rare-earth magnets and an electromagnetic velocity transducer. The electronics package is of modern surface mount construction and uses a 16-bit digitiser chip which can feed data directly into the freely available Amaseis recording and analysis software (initially developed for use with the AS-1 instrument). The sensor is sensitive enough to detect signals from earthquakes larger than magnitude 6.5 anywhere in the world. The long natural period also allows it to clearly record the arrival of P waves, S waves and Surface waves from distant events.

Comprehensive notes detailing the set up and use of this seismometer are being produced and it is anticipated that seismometers will be made available to schools through linked training courses.

## ***School Seismology website***

Integral to this project is a mechanism for schools to exchange and compare data that they have recorded from the same event. Schools in the US are already able to do this through the Spinet network. For this project BGS are developing a website for schools exchange data on and which will host materials and resources relevant to the project. The BGS website will be linked to the US schools seismology websites so that schools in the UK are able to exchange data with schools in the US.

## ***UK dissemination plan***

A booklet of classroom activities will be distributed free of charge teachers in the UK through the SEP associates scheme (currently this has 5000 members). A set of very inexpensive simple practical equipment items to support these activities will be marketed through Middlesex University Teaching Resources (MUTR). In addition support materials and resources will be made freely available to teachers through the SEP and BGS websites.

Experience from the US school seismology project has shown that school seismometer systems are only really used when their distribution is accompanied by a training session in how to set-up and use them, and when continued support in how to interpret the resulting data is provided. It is planned that school seismometer systems will be distributed in the UK in association with CPD training courses run at regional science learning centres and other established training routes. (e.g. sessions organised by the Institute of Physics).

Publicity for the project will be sought for the project in local, specialist and national press outlets. A formal press launch for the project is scheduled for 30 May 2007 at the Institute of Physics in central London.