The Royal Observatory Edinburgh Visitor Centre has led a national project to provide Continuing Professional Development for teachers of science in Scotland. We have trained over 400 teachers, of whom we trained 50 to train their colleagues.

The project has two valuable lessons for astronomy outreach:

1. In promoting pupils’ interest in and learning in relation to astronomy, how you teach astronomy is as important as what you teach or even the materials you use.
2. High quality training is a powerful way of disseminating ideas and materials widely among the teaching profession.

Since 2001, the Scottish Science Strategy has invested over £10 million to improve science education in schools. We received a grant to second four teachers over two years to develop workshops that demonstrate ways of teaching three parts of the Earth & Space curriculum:

- Sun, Moon and stars (for 5-7 year olds)
- The Earth and its resources (for 8-10 year olds)
- The model of matter (for 11-14 year olds)

The team then ran five residential training programmes based around the workshops:

- An Easter and a Summer School. These lasted three days and were the first residential science schools for primary teachers in Scotland.
- Three “Train the Trainer” programmes. Again, these were residential and based on the core workshops. They had additional sessions on how to plan, organise and deliver CPD workshops for teachers.

All the events were based at informal science education centres—the Observatory’s Visitor Centre and outdoor education centres—which were stimulating venues for the teachers.
The workshops demonstrate teaching activities that incorporate key approaches to promoting learning, including:

- Setting the right environment and establishing pupils’ readiness to learn.
- Helping pupils to articulate their prior conceptions about the topic at the start of the lesson.
- Giving pupils the chance to use a range of media in their learning eg group work, graphics, music, movement. This allows them to use different skills and intelligences in their learning.
- Using questions effectively during a lesson—for example—the average wait-time after a question is less than one second, whereas waiting ten seconds encourages all pupils to think about the question.

These and other techniques in the workshops are not unique to astronomy education, nor even science education. But they can radically influence the way pupils engage with and learn about astronomical concepts. They are being widely adopted in science education throughout the United Kingdom, especially by primary teachers.

There are many astronomy materials for teachers but teachers are short of time to find and appraise them. A good CPD workshop will help them with this process and will embed ideas about how the materials can be used effectively.

However, many teacher workshops are poorly run—teachers find the transition from teaching children to training their peers difficult. We worked with a professional train-
The project partners are:

- The Royal Observatory Edinburgh
- Moray House (teacher training college)
- Scottish Earth Science Education Forum
- Our Dynamic Earth (visitor attraction)
- Five local authorities

Figure 2. Practical training can influence teaching practice. Spot the ESA education pack!