Challenges and opportunities in primary science initial teacher training in England

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In considering the challenges ahead for teacher education in primary science Tina Jarvis, like Roger Lock, finds that things are changing for the better. The revised requirements for programmes leading to Qualified Teacher Status, alongside possible changes in the balance of the curriculum away from literacy and numeracy and towards other subjects, give grounds for optimism.

Recent changes in primary schools and initial teacher training requirements provide the opportunity to give new primary trainees a more effective science training than has been possible in the recent past.

In the last few years, primary trainees have been faced with a reduction in time spent on science in schools following the introduction of the Literacy and Numeracy Strategies in 1998 and 1999. In addition, primary teachers have participated in less science-based INSET (ASE, 1999). This has resulted in trainees having fewer opportunities to teach science under the guidance of scientifically knowledgeable teachers-mentors. The widespread use of unadapted units from the QCA science schemes of work, while providing a good basic structure for teachers and trainees, has made it difficult for trainees to understand and practise medium term planning, assessment for individual needs and differentiation. Publication of league tables has encouraged excessive revision for SATs promoting almost rote learning in science during year 6 and minimal science teaching in year 2 with the effect that years 2 and 6 classes often do not provide good environments for trainee placements.

More recently, however, there are grounds for at least cautious optimism that things are going to change. The dominance of pure literacy and numeracy appears to be declining with more encouragement being given to making links across the curriculum by the National Literacy Strategy (2002). Additionally, as explained by Rebecca Edwards at the ATSE (Association of Tutors in Science Education) conference in Bristol (2002), new materials from QCA will give examples to show how the science units can be adapted to cater for local needs, mixed ages, wide ability ranges and cultural diversity. Similarly new SATs, from 2003, are expected to emphasise investigative skills which may reduce the rote learning revision in year 6. If teacher-mentors have the appropriate supportive training, trainees are likely to have improved experiences in their placements. We have to hope that teacher-mentors have not been overwhelmed by the many recent initiatives in primary schools and continue to be prepared to adapt their practice.

During this period of limited science teaching in primary schools, the science standards required for qualified teacher status have been very detailed and prescriptive. These standards radically changed in September 2002 with implementation of new standards (Teacher Training Agency, 2002). Between 1998 and 2002 Circular 4/98 entitled *Teaching: High Status, High Standards* specified the core knowledge, understanding and skills which all primary trainees must have been taught and able to use in relation to English, mathematics, science and ICT. The science standards alone included nearly 100 standards covering science pedagogical knowledge, teaching and assessment methods, with an additional 100 or so standards requiring specific knowledge such as:

- *'the nature of variables including: identification of categoric, independent and dependent variables, and the recognition of discrete and continuous variables;*
- *the types of particles that make up all materials including atoms, protons, neutrons and electrons; and*
- *the colour of an object depends on the wave lengths of light that it scatters'.*

Teacher training institutions were expected to audit trainees' knowledge and understanding to *'ensure ... that by the end of the course, trainees (were) confident and competent in using the science specified'*. (DfEE, 1998). This expectation was reinforced by OfSTED visits. However, science tutors considered that it was impossible to meet all these standards within a initial teacher training course and

that attempts to meet requirements would force models of poor practice, such as an excessive didactic lecturing style (SCIcentre, 1999).

In September 2002 this Circular, covering approximately 700 generic, English, mathematics, science and ICT standards, was replaced by 42 new generic standards. There are now no specific subject standards. These new standards emphasise good professional behaviour and inclusion as exemplified by the requirements that trainees:

- *'have high expectations of all pupils; respect their social, cultural, linguistic, religious and ethnic backgrounds; and are committed to raising their educational achievement; and*
- *can communicate sensitively and effectively with parents and carers, recognising their roles in pupils' learning, and their rights, responsibilities and interests in this'* (TTA, 2002).

Requirements relating to subject knowledge and understanding are now covered by a few very broad standards, such as trainees should *'have a secure knowledge and understanding of the subject(s) they are trained to teach'*.

This change has many advantages. It will be far easier for trainees and teacher-mentors to understand the requirements in order to monitor progress. The lack of many specific science standards provides the opportunity for teacher-trainers to focus on effective understanding. For example, instead of touching briefly on many topics, there is the possibility of concentrating on a few 'big explanatory stories', such as particle model of matter, energy, the gene model of inheritance and evolution, as suggested by Millar and Osborne (1998) and Harlen (1997). It should then be possible to adapt the trainees' audit process to focus on detailed learning in the science topics they are going to teach. This models good professional behaviour and is more motivating for the trainees. As one of the new standards requires trainees to develop the ability *'to plan opportunities for pupils to learn in out-of-school contexts, such as school visits, museums, theatres, fieldwork and employment-based settings'*, there is also more motivation to make science relevant and linked to real social situations.

While all these changes are potentially good for science teaching in primary schools, there are real risks that teacher-mentors will lose sight of the need to support and assess trainees' science development in schools still dominated by literacy and numeracy. This may be a particular risk in the increasing number of solely school-based training routes. In contrast, the traditional initial teacher training institutions may not be prepared to reduce the excessive detail of science subject teaching because of concerns about future OfSTED inspections which have yet to indicate their expectations. Consequently, it is important that trainees, teacher-mentors and science teacher-trainers continue to support each other and share practice through organisations like the ASE, ATSE and SCIcentre, to help maximise good opportunities and minimise the risks.

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