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Trainee Teachers' perceptions of the Nature of Science and implications for teaching 'How Science Works'

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Background

In this longitudinal study of Secondary pre-service trainee teachers we are exploring the interplay between trainees' perceptions of the Nature of Science and their training needs in respect of teaching 'How Science Works' in the Key Stage 3 and 4 Science National Curriculum for England and Wales (QCA 2008). The study probes secondary trainee teachers' perceptions of the Nature of Science and explores links between these perceptions, the school and University based training experienced by the trainees, and the new Science National Curriculum for Schools.

Research Questions

The main research questions we consider are:

- What is the pre-service trainee teachers' understanding of the Nature of Science?
- How does the understanding of the Nature of Science compare between Primary and Secondary trainee teachers?
- Are there particular areas of the Nature of Science that evoke different responses from different groups of trainees (primary, secondary, male, female)
- What is the role of the new Key Stage 3 and 4 curriculum developments in science trainees' understanding of the Nature of Science?
- Which aspects of our training programmes can be identified and further developed to facilitate trainee teachers' understanding of the Nature of Science and in particular the context of the 'How Science Works' in the new National Curriculum for science

Methods

We are not alone in considering it vital that trainees have a sound understanding of the Nature of Science in order to facilitate learning in 'How Science Works' and will present our conclusions in terms of the implications for the type and depth of training required in both University taught- and practice-based elements of a one-year teaching training programme (Clough 2007, Lock 2008, Mathews 2007, Monk 2006, Millar 2006).

The baseline study draws on an American survey on the Nature of Science developed by Liang, L. et al. (2006), which has been adapted to the UK context. Clough (2008) cautions that assessing perceptions about the Nature of Science is no easy task, however the survey used here does allow us to access what are now considered to be broadly agreed terms of reference (see for example Abd-El-Khalick 2001). Previous studies (Tairab 2001, Bartholomew 2004) have explored pre-service trainee teachers' perceptions of science and we will consider our findings within this context.

In their 2004 paper Bartholomew et al identified five dimensions of affective practice when teaching ideas about science and this informs our analysis (Bartholomew 2004). Our conclusions inform planning for delivery of science sessions in this one year PGCE programme. Additionally, findings and implications for school based mentors who work closely with our trainee teachers are considered, as are implications for CPD for current Science teachers.

The survey was undertaken by trainees at the start of their training and at the end of their one year initial teacher training programme. Further questions allowed us to probe the impact of the training experience, in particular, teaching of "How Science Works", in developing their understanding of the Nature of Science. The survey results were shared with the trainees to help them track their own changing perceptions about the Nature of Science. Follow-up focus group interviews probed the role of the school experience and University taught sessions in more detail. In the second year of the study we have revised the training programme to include further specialist input on the Nature of Science and How Science Works and will aim to measure the impact of this intervention programme through our study.

Frame

This is a socially based project using an inductive-interpretive approach mixed methods study that will draw on the use of survey tools and focus group interviews. We have had the opportunity to collect data from both pre-service Secondary trainees in two cohorts (n = 70) and Primary trainee teachers (n = 40) on their one-year Initial Teacher Training programme.

Research findings

Baseline results showed broad agreement on topics such as observation and inferences, Nature of Scientific Theories and Scientific Thinking, but a much wider range of perceptions on Social and Cultural influences, Creativity and Investigations. The post training survey indicated a narrowing in the range of responses for the first set of topics which suggests that students' perceptions had been brought into a finer focus. The range of responses for the second group of topics remained wide, but showed a strong polarization to either agree or disagree with the statements. Interviews revealed that the University input was generally focused and stimulating, but that only some schools were able to provide the depth and breadth of exposure that trainees needed.

Our presentation at BERA will include findings from across the two training years so far in the study. We will explore trainees' differential perceptions of the Nature of Science; trainees' developing understanding informed by their training experiences; implications for our training programmes in schools and at the University.