Teach teachers to teach about Nature of Science (NoS)

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Two Teacher Education Initiatives in Ireland

- 50 Student & 50 practising primary school teachers
- NoS pedagogy
- 15 hours CPD
- Coteaching

NoS Continuing Professional Development (CPD) Programme (2010 - 2013) (Fibonacci Project)
- 20 Primary school teachers
- NoS pedagogy
- 80 hours CPD (2 yrs)
- Framework for effective CPD
What is Nature of Science (NoS)?

A knowledge about

- What science is and how it works
- How scientists work as a social group
- How science and society are affected by one another
- The history of ideas in science and their impact on society today

The way one understands science

Science as a way of knowing (epistemology)
NoS in Primary School Context

No one definition – embraces many characteristics

- Science is a **reliable body of knowledge** that provides information and explanations about the world.

- There is **no one universal scientific method** to which all scientists rigidly adhere.

- Science is a **human activity** encompassing subjectivity, creativity and imagination.

- **Science and society** have impacted scientific development in the past and science and society are influenced and affected by one another in contemporary society
  
  *(Abd-El-Khalick & Lederman, 1998; Akerson & Hanuscin, 2003; Murphy et al., 2015)*
Why teach about NoS?

- Makes science relevant and interesting
- More opportunities for active engagement in genuine scientific inquiry
- Creativity and innovation in science
- Children more opportunities for reflection
- Links everyday science with school science making science more relevant to children
- Teachers more confident & enthusiastic about teaching science
- Teachers use more IBSE approaches to science (which is good!!)

(Akerson & Haunuscin, 2003; Driver et al., 1996; Murphy et al. 2011; 2015; Lederman & Lederman, 2014)
NoS Pedagogy

Activities ABOUT Science

Activities IN Science
Aims: To provide student and practising teachers with opportunities to:

- Develop their **PCK of NoS**
- Develop expertise in teaching science
- Use **co-teaching** to teach about NoS

**Murphy and Beggs (2008) Model of Coteaching**
Overview of BEST Project

• NoS Elective course

• 2 professional development (PD) days
  – University (DCU)
  – Student and practising teachers

• 4 week co-teaching period
  – 4 science lessons in schools

• Review day (DCU)
Findings

Student and practising teachers:
• Enjoyable and worthwhile
• More confident teaching science
• Sharing ideas / expertise
• Employed wider range of methodologies
• Providing children more opportunities for
  – Skill development
  – Inquiry
  – Questioning
  – Collaborating
  – Problem solving
  – Reflection
  – Discussion
Fibonacci Project in Ireland

- **What:** 2 year CPD programme (80 hrs)

- **Aim:** Develop Irish primary teachers’ PCK in NoS & IBSE

- **How?**
  Inquiry-based approaches to teaching about NoS
  Innovative Professional Development Model (Desimone, 2009)

- **Who?**
  20 teachers (10 Dublin schools)
  - Range of experience
  - All non-science experts

  450 pupils from 20 primary classes (8 – 12 years)
Overview of the CPD

**Workshops**
After school (6pm – 9m)
Introduction to IBSE & NoS pedagogy
Relevant to Irish Primary Science Curriculum

**Virtual learning environment**
Teachers adapting and developing resources

**School Visits**
- Observing pupils
- Teaching
- Coteaching

**Teacher led workshops**
- Whole school CPD
## Evaluation

### Sample
- 20 teachers
- 442 children (8 - 12 years)

### Data Collection

#### Surveys
- 20 initial and exit teachers’ questionnaires
- 438 initial and 442 exit children’s questionnaires

#### Interviews
- 10 teachers (post CPD)
- 10 focus group interviews (1 class from each school) prior to and after CPD

#### Teachers’ reflective diaries
- 11 of the 20 teachers completed diaries for the full 2 years

### Data Analysis
- Questionnaire data SPSS
- Interview & reflective journals data coded and categorised – inter-rater reliability established
FINDINGS

**Teachers**
- Positive reaction to PD
- Evidence of learning
- Increased competence and confidence in teaching science
- Organisational support critical
- Change in Practice

**Children**
- Positive impact on children’s experiences and learning of science in school
- More frequent engagement with IBSE
- Developed conceptual understanding of NoS
What have we learned?

• **NoS pedagogy in primary classroom**
  – Numerous positive impacts on teaching and learning in primary science
  – NoS should be taught in primary schools

• **CPD Essential**
  – Move away from ‘one size fits’ all model
  – Framework for effective CPD

• **Coteaching**
  – Positive impacts on teaching of and learning in primary science
  – Useful pedagogy for teaching science
References


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