



# Teaching about the Nature of Science: Impact of a CPD programme on primary schools participating in the Fibonacci Project

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[www.fibonacci-project.ie](http://www.fibonacci-project.ie)

# Fibonacci - Dublin



## What?

- Develop primary teachers' conceptual and pedagogical content knowledge of Nature of Science (NoS)

## How?

- Inquiry-based approaches to teaching about NoS
- Linked to the Irish Primary Science Curriculum
- Professional Development Model



# Fibonacci: Dublin



- 10 primary schools from North and South Dublin
- Different school types
  - Mixed and single sex
  - Some with disadvantaged status
- 22 primary school teachers
  - Range of experience
  - All non-science experts
- Over 800 pupils from senior primary classes (8 – 12 years)

# Aspects of Nature of Science addressed

- Body of Knowledge (BoK)
- Scientific Inquiry
- Human Activity
- Science and society
- History of science

*(Akerson et al., 2009, 2010; Lederman, 1998; Murphy et al 2005, 2011, Peters, 2008, 2009)*

# Why NoS?

- More frequent use of **inquiry-based** science
- Teachers more confident & enthusiastic about teaching science
- More reflection
- More dialogue
- Greater interest in science (*teachers and pupils!*)

*(Akerson et al., 2009, 2010; Driver et al., 1996, Lederman, 1998, 2000; Murphy, 2008; Murphy et al., 2007, 2011; Peters, 2009, 2010)*

# Fibonacci CPD Methodology

	<b>Traditional CPD</b>	<b>Fibonacci</b>
<b>Time</b>	<b>One-off or short modular courses</b>	<b>Extended professional engagement; continuity</b>
<b>Priorities</b>	<b>Needs of the system</b>	<b>Needs of the schools and individual teachers</b>
<b>Participation</b>	<b>Passive</b>	<b>Active; feedback</b>
<b>Collaboration</b>	<b>Little or No Expectation</b>	<b>Meaningful Collaboration</b>

# Implicit Vs Explicit *teaching about NoS*

## ‘Implicit’ methods

- Will learn about NoS while doing science, don’t need to teach specifically about NoS

## ‘Explicit’ methods

- Have to *teach* about NoS
- **NOT** didactic ‘chalk & talk’
- **Is** reflection, discussion, hands-on activities, reviewing literature & existing resources, developing resources

# Explicitly teaching about NoS

- De-contextualised activities



- Contextualised activities





# Bayside Senior School, Dublin, Ireland



# The Cube & NoS ...

- Black box activity
- Tentative NoS
- Objective & subjective NoS
- Search for patterns
  - Partly based on evidence
  - Partly on scientists' imagination & creativity



# Many sides to the Cube ...

- Group work
- Scientific Inquiry:
  - Questioning
  - Observations and inferences
  - Making Predictions
  - Searching for patterns
- Discard suggestions if not consistent with evidence
- Different answers are plausible



# Children's reactions

- *“I really enjoyed trying to figure out what the pattern was ... We really wanted to lift up the cube to see what word was at the bottom, but our teacher wouldn't let us... some of us tried to cheat but we couldn't ... I suppose now I know how scientists must feel...”*
- *“Most groups thought the word at the bottom was ‘pat’, but we came up with different patterns and reasons for why we thought it was ‘pat’ ... We never found out what the word at the bottom was, but I think it was ‘pat’ because most of the groups thought it was, and they gave good reasons why....”*
- *“Does this mean that scientists aren't always right?”*



# The Great Bone Hunt



Children worked  
like  
Palaeontologists



# Children's reactions

- *“Going on the bone hunt was so much fun ... but I really wished we had got all the bones then we would have known for sure what animal it was ”*
- *“At first we thought it was a dinosaur, like a T-Rex, but then we changed our minds ... in the end when we put our bones together and looked in the resource book we thought it was probably some kind of cat ... but we weren't absolutely sure ... but I think our answer was right because the teeth were sharp and pointy .... Kind of like a tiger's ...”*
- *“No! You did not **observe** that it was the skeleton of a sabre-tooth tiger you **inferred** it”.*



# Other skills acquired

- Language development
- Reflection
- Creative thinking
- Numerical sequencing
- Problem Solving

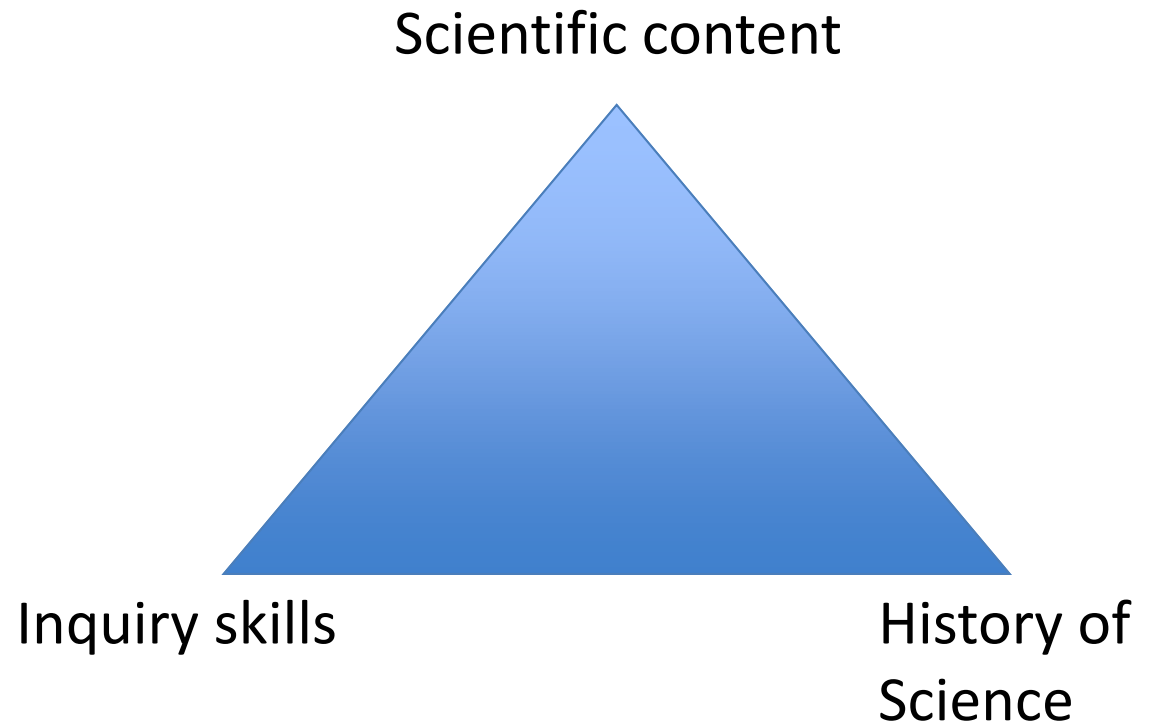


# St Martin de Porres NS, Dublin





# da Vinci's Parachute



# Inspiration and Challenge



“We think measuring the materials will be important.”

“It might be helpful to make a template so all the sides are even.”

“Teacher, this looks easy but it’s not!” Help....!



# Learning from the NoS - HoS Experience

- Science is a human endeavour
- Science is an attempt to explain phenomena
- Scientists use creativity
- Influence of HoS today



# Moving Forward ....

- Postgraduate In-service Certificate in NoS
  - 13 of the Fibonacci teachers
  - Certified by Dublin City University (DCU)
  - Completion October 2012 or continue into Diploma / M.Teach
- CPD
  - Fibonacci teachers already disseminating to own staff
  - DVD Funded by Irish National Teachers' Organisation
  - DVD will support further CPD courses all over Ireland