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Using ICT to Teach Science

Torun, Poland, December 2012

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What ICT can we use in school?

- Projectors
- Interactive whiteboards
- Data-logging equipment
- Laptops
- Desktops in the lab
- Desktops in a dedicated room
- Tablets and smart phones?

Why use ICT?

- Motivating – children automatically interested
- Can add value – explain things in new ways
- Learn new skills – datalogging, graphing
- Source of knowledge and information
- Links with the ‘everyday’. A home they use the internet – we need to help them use it intelligently
- Helps cater for different needs within the class

How do we use ICT in school?

Projectors

- Video clips
- Websites
- Powerpoint

Interactive whiteboards

- Brainstorming/discussion
- Interactivity
- Simulations

How do we use ICT in school?

Data logging

- Range of sensors – light, temperature, mass
- Processing results

Laptops/desktops

- Making presentations
- Simulations
- Extended writing
- Guided research

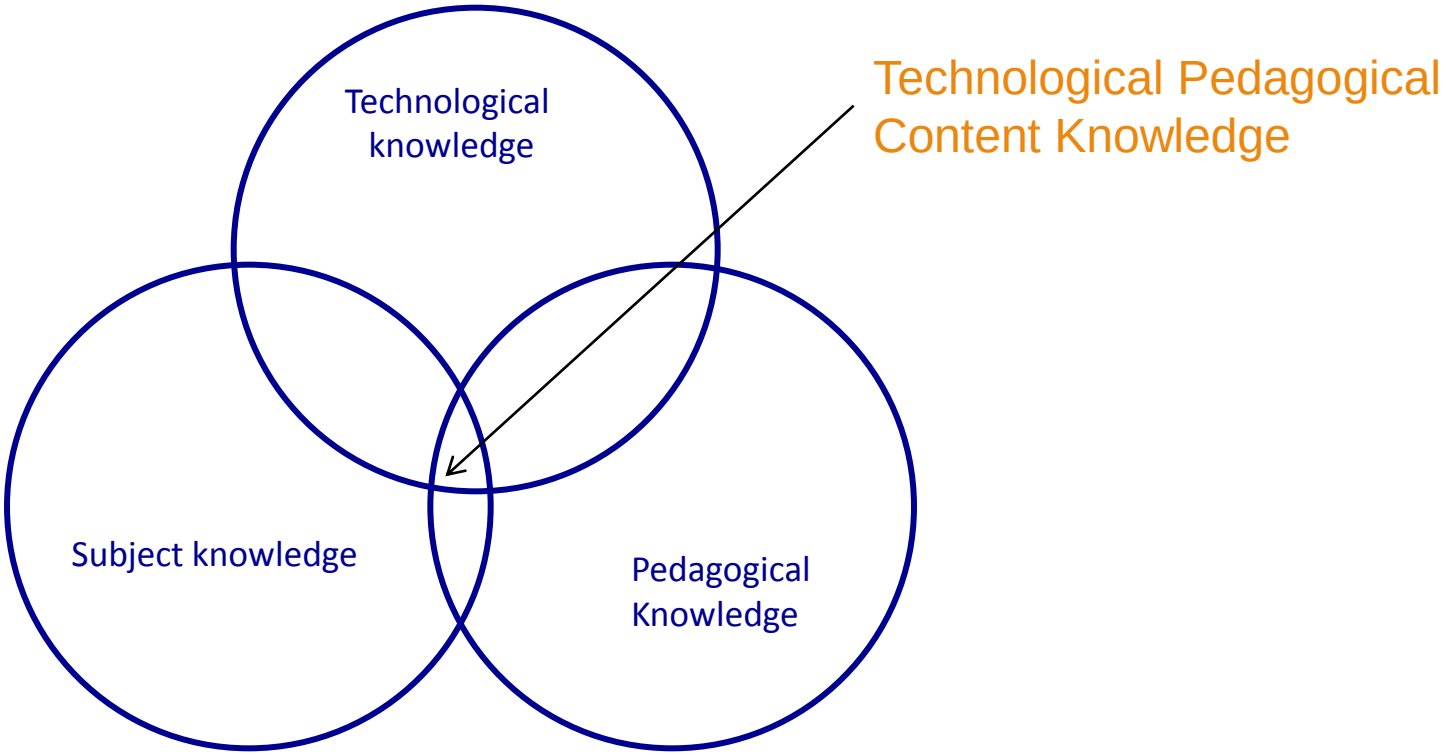
Guided research

Scientist	What did they say about atoms?	What was 'correct' about this idea	What happened next?	Scientist
Dalton				
Thomson				
Rutherford				
Bohr				

The practicalities

- Move to a dedicated room
- Rotation within a lab
- Laptop trolley
- Set for homework
- Internet access
- Access to applications
- How to ensure equality?

The challenge



What is Technological Pedagogical Content Knowledge?

- An understanding of the representation of concepts using technologies
- Pedagogical techniques that use technology in constructive ways to teach content
- Knowledge of what makes concepts difficult or easy to learn and how technology can tackle some of the problems students face
- Knowledge of students' prior knowledge and understanding
- Knowledge of how technologies can be used to build on existing knowledge and develop new understandings

Ref: Koehler, M. J., & Mishra, P. (2009). What is technological pedagogical content knowledge? Contemporary Issues in Technology and Teacher Education, 9(1), 60–70.

Questions for Teachers…..

- What is difficult about this concept?
- How does this piece of software support the learning of this topic?
- How can I use ICT to help children learn about this concept?
- Does using ICT help me to teach the concept better?

Challenges

Developing a knowledge of technology – traditional methods not helpful

- Rapid changes in technology
- Inappropriate software design
- Infrequent use
- Technology use is context dependent – depends on the class, grade level, equipment available, student background

Subject Knowledge

- ‘School’ subject knowledge has to be very good – teacher has to be very well-prepared.

Learning by design

- Making movies- teachers or students working in groups
- Designing resources – presentations, podcasts
- Designing educational websites

So what?

The framework provides a way of thinking about the issue and highlighting the fact that you still have to focus on the pedagogy and not the technology.

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How Science Works

Bringing science to life in the classroom

Developing Pedagogy: problem solving and creativity

Generating electricity.

You live in a remote village in Africa, with no electricity supply. Should you buy a small diesel generator or install solar panels?

- How long would it take to recover the cost of the solar panels?
- What other things might you want to consider.

The nature of science

- Thinking scientifically
- Understanding the applications implications of science
- Communicating and collaborating in science
- Using investigative approaches
- Working critically with evidence

Learning about the nature of evidence

- In this activity, children are presented with some adverts for shampoo. They are asked to think about how the claims might be tested scientifically and to evaluate the evidence. Does the evidence support the claim?

Learning about the nature of Science

- In a move to cut greenhouse gas emissions, Australia is banning incandescent light bulbs. In so doing, it follows the lead of Cuba, Venezuela and Belize. Since 2010 Australian shops have sold only energy saving fluorescent light bulbs. In this activity, students look at the differences between traditional light bulbs and energy saving bulbs, calculate the cost savings for an average house, and work out the pay-back time for bulbs of different wattages.

Challenges and opportunities

- Takes time from traditional content
- Implications for teacher knowledge

- Highly motivating
- Promotes thinking skills
- Introduces students to the complexity of issues
- Critical consumers