Tinker Tailor Robot Pi: embracing engineering in the school curriculum

This project explores how through a partnership approach between primary and secondary teachers, and University engineers we can respond to the project question:

How do we embrace engineering education and an ethos of tinkering using computer science, design & technology and the science curriculum?

Project Description
September 2014 has seen schools responding to the requirements of the new curriculum. Primary schools have noticed increased emphasis on the aspect of working scientifically in the science curriculum, design technology on iterative design and make processes and understanding the concept of mechanical and electrical systems and computer science has had a significant facelift embracing computational thinking and programming. In essence all such aspects move us towards making our learning useful – showing children how their learning relates to the real world and how they can use their learning to influence the world around them.

The Science Education Research & Innovation designs, undertakes and evaluates innovative projects that involve researchers and academics from the University working with and alongside in-service primary school teachers. The focus of these projects is to enliven and enrich the school science curriculum and to provide a mechanism through which expertise and research from the University can be shared within the community and potentially influence the life choices of children.

TTRP aims to work with a cluster of primary and secondary schools, together with academics/students from the Faculty of Engineering & Physical Sciences to:
- share professional practice and knowledge to provide greater insight into the school science, DT and computer science curriculum, and the related teaching and learning opportunities schools exploit in their delivery (What is currently happening in school?)
- explore how engineers ‘work’ by deconstructing how engineers practice their profession (What it currently means to ‘be’ an engineer?)
- identify areas within the curriculum (science, DT and computer science) that would allow for a stronger ethos engineering to be embraced (Where are the opportunities?)
- use coteaching to develop, deliver and reflect on learning opportunities for pupils which are infused with the skills, habits of minds and processes of engineering within the context of the science, D&T and/or computer science (What can we achieve together?)
So far...
There have been a range of stimuli that have brought this project to the table this year, mainly:
- the new computer science curriculum: in which we have been inspired by being able to really show how the control elements of the curriculum can be strengthened so that children can see the applications and creative uses of their learning (control)
- interest in the developing world of robotics, programming and technologies that can potentially enhance the learning process (Scratch, Pi’s, LegoMindstorms, MyDaq boards etc.)
- the launch of the Engineering Habits of Mind (RAEng)

To some extent the following also provide stimulus:
- the new science curriculum: in which working scientifically to develop subject knowledge is a much stronger feature, yet few links are made to how technology can support this
- the design technology curriculum: in which there is much greater emphasis on applying understanding of computing to program, monitor and control products (KS2)
- the profiling of engineering and tinkering within this year’s RI Xmas lecture series (D George)

Are there specific problems this project is trying to solve?
Teachers identify a few key problems:

1. there are missed opportunities within the primary and secondary curriculum to genuinely exploit the links between science, computer science and design technology,
2. there are aspects of learning that are desirable yet pose significant challenges to teachers, in particular: the aspects of control within the computer science curriculum and how to make this link to the things children design and make in DT (making programming really ‘work’ for us in classroom settings);
3. there are few opportunities to apply scientific learning in a creative and productive pursuit (to solve problems to make a difference).

The proposition is that by working together we develop, trial and refine learning approaches/experiences that can work to address the problems identified above. We believe that there are curriculum experiences that we can refine that will ‘plug’ the gaps in practice. We feel that this can be achieved in ways that contextualises and makes real ‘what it means to be an engineer’.

What will TTRP do?
The project will provide time and support over the academic year of 2014-15 for the development of a series of testbeds, which will respond to the problems outlined above. They may do one or more of the following:
- explore whether we can create a more progressive approach to control within the computer science curriculum, with the purpose of using such control systems within our design technology products or to enhance our science learning
- explore how technology and programming can enhance the science curriculum and the rigour with which children can conduct science investigations/enquiries
- or...

Each school-university partnership will undertake collaborative planning and delivery of experiences and reflect on them together and with the larger project group. Focus will be paid to track or log the progress of activity within the testbed groups and to inform the wider project group on happenings, findings and areas for further development.

Dr Lynne Bianchi
Head of the Science Education Research & Innovation Hub
University of Manchester