Article 3

Centre for STEM Education

Sharing ideas, joining up good practice and celebrating teaching and learning in primary computing.

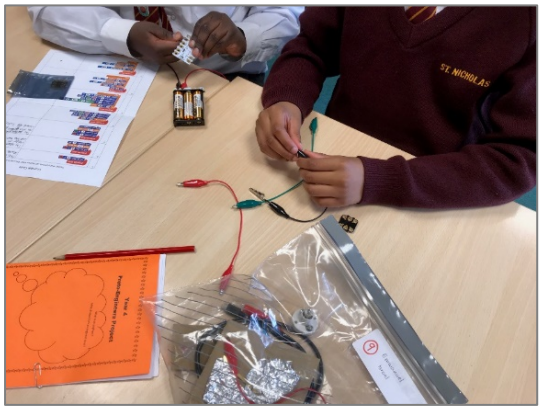
Article by Rachael Coultart, computing subject leader and nursery teacher at St Nicholas C of E Primary School, Stevenage

St Nicholas C of E Primary is a one form entry school located in the centre of Stevenage; it is a diverse, multicultural community driven to ensure every child achieves. With Stevenage building nearly a quarter of the satellites orbiting the Earth, the children at St Nicholas are growing up in a town that serves engineering aspirations very well.

A couple of years ago, in a bid to develop my own subject knowledge and to help me support staff in delivering our computing curriculum, I took part in an engineering project with the Centre for STEM Education. With a cross-curricular focus, I wondered whether it was really going to be possible to deliver physical computing, science and design technology through one engineering project? Well, I discovered it certainly was and the legacy of this project has stood the test of time.

I undertook this project with our Year 4 class and began by exploring children's ideas about engineers. These were somewhat limited to *'someone who works on engines'* and *'my uncle is an engineer'*. By the end of the project the children were far more conversant about what being an engineer meant, for example: *'…engineering is mainly about problem solving'* and *'I'd recommend engineering to people who like challenges.'*

The project comprised of a series of carefully planned lessons that I team taught with the Year 4 class teacher over a term and we watched children's perseverance, resilience and problem-solving skills flourish as they took on the challenge of building and coding an artefact with moving parts and flashing lights. We decided to link the project with the class history topic on the Vikings and this set the context for fighting Viking boat designs. The children were imaginative in their approach and I was particularly impressed with one girl's idea for having a moving sword that made a red sparkle switch on (to represent blood) when it touched a person. While observing her develop coding skills, I wondered if she would use the if/then (selection) statement appropriately in her code; it was very exciting when she finally succeeded!



Children using the components in their bag to build the Crumble into their circuit.

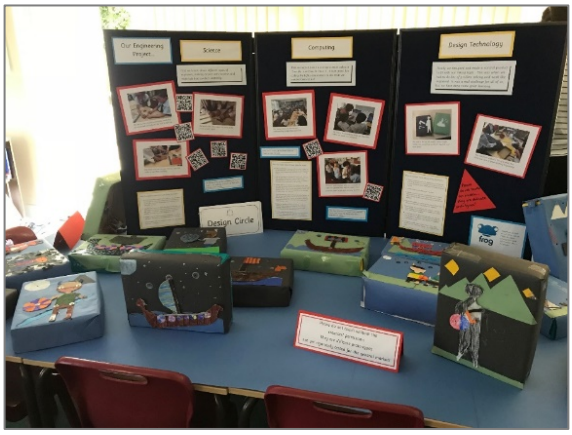
During the project, the children learnt to build electrical circuits, code a micro-processor (Crumble) and construct a model with moving parts. This type of cross-curricular approach to physical computing helped make learning meaningful, exciting, more relevant to their everyday lives, and perhaps more useful for future career aspirations too.

Explaining to children how they could write their algorithm in such a way that they could code it line at a time and test each line before moving on.

Children collaborating to slow their motor down so it didn't destroy their model.

As teachers we not only improved our own subject knowledge, but we found this approach really helped reduce timetabling pressures. We also learnt that computational thinking skills cannot be developed quickly: they need to be embedded into the curriculum from an early age and fostered in all curriculum areas.

Perhaps this is one of the biggest problems with our time-pressured curriculum: we don't have the time to let children fail, so we scaffold their learning too much for too long. Subsequently, we now plan in 'time to fail' on these projects and when we hear pupils talking enthusiastically about all the things they found difficult, we know what a real sense of satisfaction they have felt and how proud they are of what they have accomplished.



Display of work in year 4 classroom for Open Evening

As a staff, we now understand that coding is just like learning another language, so we no longer feel guilty about not being able to do everything right away. It takes time to build up the necessary vocabulary to talk about and explain what to do. Teachers, like children, need a simple starting point to secure the basics and gradually build up to more complex code. I use the analogy about children needing to speak before they can read and read before they can write because I think the same is true of coding. You need to be able to articulate what the code might be doing (for example, explain how automatic doors might work) before you can read it and you have to be able to read it before you can write it. If we remember this, we might not try to run before we can walk.

Our thanks to Rachael Coultart and all the staff at St Nicholas Church of England Primary School and Nursery for telling us about their experience of this project.

If you would be willing to share some of the work you have been doing in your school to support science, computing or wider STEM subjects, please get in touch with us at stem@herts.ac.uk