Enhancing STEM Academics' Public Engagement Skills – Middlesex University Case Study

Introduction:

The School of Engineering and Information Science (EIS) at Middlesex University has been actively involved in inspiring future prospects and options in STEM subjects in younger audiences. There were and are a range of activities that have been presented on many occasions at schools as well as at open days, exhibitions, fairs and workshops.

The main and most popular activities include:

1) A Lego-education kit containing software and hardware to create small, customisable and programmable robots. (Provides learning solutions for children aged 1 ½ all the way to University level).

2) "*Learning to touch the untouchable*" and "*integrate Kinect with a haptic device to play an instrument*." Both of these explore haptic effects / games where touch can be generated in different sensations to allow the user to feel and understand a virtual environment in a more realistic way.

The EIS department has an excellent record in providing activities, often at short notice, to a variety of audiences, including major national exhibitions and events overseas. The majority of pupils we have addressed to date are children aged 10 and above. The current approach to outreach activities is effective but not very consistent and sustainable. In particular, we are outgrowing the significant demands place upon a small core group of staff.

The STEM seminars offered clear guidelines and a structure for delivering effective STEM public engagement activity. The sessions enhanced understanding of school pedagogies and learning principles. They provided detailed information on what schools are doing and how we can better work with them. What are the differences between key stages? What is the scope of learning and nature of enquiries for age group (year 2, years 2-4, years 4-6)? What is the structure of a 'perfect' learning experience? What kinds of question are expected from

different age groups? What is necessary for effective session structures and what are the important skills to engage with active learning? Additionally, what are the various techniques for gathering evaluations after sessions and what suggestions are there on how to approach schools or academics to engage and participate in workshops? Insights from the teacher's perspective (Nic Garrick) were particularly helpful.

Innovation / Project Highlights:

We are in the process of designing a project that will encourage young pupils to take a look at engineering and technology not simply from the user perspective but from the inventor / designer point-of-view. We would like to concentrate on the interaction between hardware and software by developing games / activities using new technology and high tech equipment typically not available in schools. The intention is to recruit, train and guide student ambassadors to deliver new workshops to local schools so that sessions can be student-led. We will do this via the University Volunteer scheme.

What's changed for the setting back at your institution?

We will create new outreach projects around the theme of communicating Engineering and Technology that will necessitate:

- Recruiting gifted and talented students with exciting ideas (rather than simply asking them to "deliver" activities owned by others)
- Providing volunteers with CRB clearance and safeguarding training (Child Protection and Health & Safety)
- Running a short training session on communications (working with differing audiences – attracting attention, working as a team, what to do when something goes wrong)
- Developing demonstrations that inspire others and allow practical engagements
- Discussion / critical evaluation so that the students take the project forward, adding value to the process

Currently there are two new activities that are being constructed:

(1) A problem-solving activity that involves tangible user interface (TUI) - Sifteo intelligent cubes. 'Siftable' are compact devices with a sensing, graphical display that co-operates with digital information and media to provide enjoyable, educational activity.

(2) Touch screen, interactive table with Scratch - a computer language learning environment enabling beginners to get results without having to learn syntactically correct writing first. Created by the MIT Media Lab, it is intended to motivate further learning through playful experimentation and the creation of projects, such as interactive animations etc. We will be

developing this in collaboration with Technology Volunteers at Warwick University.

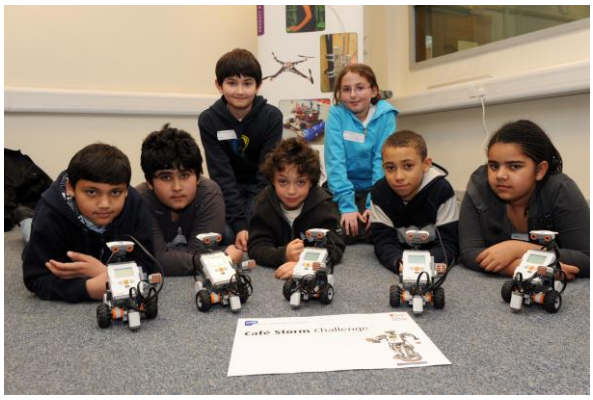
Outcomes:

Due to funding received through the practice transfer adopter scheme, we have:

(a) Created projects that support the development of outreach workshops for delivery by university student volunteers in local schools with the intention of motivating young children to look at technology not only from the consumer point of view but also from the designer and creator point of view.

(b) Built effective communication with local communities by engaging with many of the local primary schools in North London.

(c) Created sustainable programs that will: enhance students' creativity in the ways they engage with the public; boost their self-confidence; improve their communication skills and enhance their employability.



(d) Extended both the range of STEM workshops offered to local schools and the availability of STEM ambassadors capable of delivering effective, STEM-specific public engagement activities.

Ultimately, the funding has helped us in our goal to motivate children to move from the position of passive consumer of Technology & Engineering into designers, owners and creators of it.

This activity was undertaken as a part of the National HE STEM Programme, via the South West Spoke. For more information on South West Spoke projects, please see www.hestem-sw.org.uk. For more information on the overall national programme, please see www.hestem.ac.uk.