Exploring Engineering with Emulsions & Energy

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Summary

The School of Chemical Engineering has been carrying out an increasing amount of outreach work in secondary schools and is now developing workshops aimed at Key Stage 2. Three different workshops were developed and piloted following on from the National HE STEM Programme's Practice Transfer Adopters' project. Three PhD students were involved as well as one member of staff. The workshops were very successful and will be offered to other primary schools next academic year. More volunteers from within the department have come forward and will be trained up over the summer, ready for the next term.

Background

The School of Chemical Engineering at the University of Birmingham has recently begun to do more schools outreach work, mainly amongst secondary schools in the Birmingham area either at the school or on campus. They have a dedicated member of staff for 2 ½ days a week to: develop engineering-related workshops; train PhD students and post-docs in outreach; and to co-ordinate visits to schools and events on-campus on behalf of Chemical Engineering, working in co-operation with the University's central outreach department. The National HE STEM Programme's Practice Transfer Adopters' project has provided some excellent training and support, particularly with regards to primary school outreach.

The resulting workshops developed through this project were piloted in a local primary school during their Science Week at the end of May. The energy workshop was delivered to both Years 5 and 6, the emulsion workshop to year 5 and the flight workshop to year 6:

(a) Renewable energy workshop:

After some initial training and some brief discussions, two PhD students from the Hydrogen Fuel Cell research group developed a great 45 minute

workshop for Years 5 and 6 on energy which involved lots of participation including a role play explaining how a fuel cell works.

Comments from Year 5 pupils included:

"The best energy thing I did was ordering energy bit at the beginning"
"I found out about different types of energy"

(b) Engineering emulsions workshop:

This workshop was originally developed for Year 9 and Year 10 groups, explaining the principle of emulsions and their applications in engineering, from low-fat food to lipstick. A brief demonstration and poster presentation version is also available for science fairs and open days (first used at the Big Bang Fair, NEC, this year).

After the practice transfer adopter training, the workshop was adapted for Key Stage 2, with a costume game involving 15 volunteers to explain the mechanism of an emulsifier and some hands-on experiments to teach the difference between hydrophobic and hydrophilic materials.

Comments from Year 5 pupils included:

"I've learnt that hydrophobic means hates water and hydrophilic means loves water"
"The best thing I did today was the soap and oil game"

(c) The Physics of Flight workshop

Although based in Chemical Engineering, the outreach officer is a Mechanical Engineer and developed a 1-hour workshop for Year 6 explaining the scientific principles behind flight and the engineering considerations in aircraft design, ending with a team competition constructing paper airplanes which were then tested in the school hall.

Project Highlights:

1. Meeting people from other universities and hearing how they are doing outreach
2. Receiving very useful training in effective science communication for primary school age children
3. Working with PhD students in the department to develop workshops
4. Piloting the workshops in a very enthusiastic and positive primary school

Outcomes:

1. Dedicated member of staff now up-skilled in primary school STEM outreach (in science communication, learning models and marketing to schools)
2. Three distinct workshops have now been successfully developed and piloted and are well suited to both Years 5 and 6
3. Three PhD students have had a positive experience developing and delivering workshops to primary schools around their area of research
4. Plans for marketing the workshops to other schools next year
5. Plans to train up more volunteers over the summer