Promoting questions and dialogue in school science

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Getting teenagers to ask good questions in science is not as easy as one would think. Many able pupils seem happy to passively absorb information without asking many questions, and to some extent the teacher might be forgiven for making the best of it by skipping through the syllabus, merrily ticking off learning objectives without losing too much sleep. While most teachers would agree that this way of learning science is not exactly ideal, questions concerning how to get pupils to become more inquisitive about science and how to foster a climate of questioning in lessons have been stagnating in the ether of secondary schools’ prep rooms across the land for some time.

Most scientists would consider questions and the search for their answers to be fundamental to the study of science, but while educationalists feel we should acknowledge this in school, they are also mindful that learners’ questions are often unpredictable, not always easy to answer and can result in feelings of failure in our teachers. It is easy to see why some teachers close down opportunities for pupils to ask questions.

Indeed, teachers are commonly criticized by Ofsted for “neglecting to take up issues that pupils raise” and for engaging too frequently in closed questioning and thereby “limiting their pupils’ responses”. Researchers are concerned that this could have detrimental effects for pupils’ conceptual understanding in science. Alsop, Gould and Watts conclude that “questions should be fundamental to good classroom practice” and that teachers should nurture a spirit of enquiry by “encouraging questions even if we do not know or cannot hope to find all of the answers”. This conclusion is encouraging in that it takes the onus away from the science teacher as being the ‘font of all knowledge’ and may even help to provide a more realistic representation of the uncertain nature of science (although some learners may prefer to see it as the uncertain knowledge of the science teacher!).

Having said all this, even if teachers are convinced of the benefits of providing more pupil opportunities for dialogue and questions about aspects of science, these sorts of activities are often very time-consuming to prepare and pupil engagement can, at times, be unpredictable. With this in mind, the education team at the Biochemical Society decided it would be useful to devise a professional development course to help teachers get their pupils to generate some questions on a variety of developments in science that provide good opportunities for discussion. We felt that by providing a structured format, some science presentations and a collection of dialogue stimuli, we could take some of the elbow work out of dialogue activity preparation.

To inform this project, we looked to the field of philosophy (who are generally felt to have a better track record for this...
sort of thing) and found a group specializing in getting children to engage in dialogue or ‘philosophical enquiries’ by using a structured framework typically including the following elements:

- The presentation of a stimulus (e.g. a reading, an activity or a multimedia presentation) to illustrate an open-ended issue, concept or situation
- Structured student collaborations to formulate specific questions arising from these issues
- Democratic selection of a single question for the whole group to explore through structured dialogue aided by the facilitator

This framework was originally devised by US philosophy professor Matthew Lipman and it has been gaining in popularity in the UK over the last 10 years under the name ‘Philosophy for Children’ (or P4C) where dialogue facilitators are encouraged to ‘guide from the side’ rather than attempt to be the ‘sage on the stage’!

In consultation with P4C facilitators, we delivered a pilot teacher workshop at the Institute of Education in London which modelled some of the activities and techniques the teachers could find useful in the classroom. We also undertook some pupil sessions for 14-year-olds at the 2009 British Festival of Science in Surrey to see how the process worked in ‘real life’! The feedback from both these events was very encouraging.

Dr Sheila Dargan, Professional Tutor in Physiology at Cardiff University attended our 2-day pilot teacher workshop at the Institute of Education and said: “Embarking on my new career as a Professional Tutor (lecturing and conducting pedagogic research), I have become acutely aware of the difficulties associated with trying to engage students in sustained insightful scientific discussions in small group settings. I decided to attend the pilot teachers’ workshop in the hope that it would provide me with some novel ideas – and indeed it did. P4C is targeted at younger age groups, but the methodology for developing skills in open questioning and dialogue are easily adapted for use in higher education. I am currently working with the Biochemical Society to encourage more scientists and students to go into schools and/or work with teachers, and we will undoubtedly be incorporating some P4C methodology to facilitate open discussions between scientists and school pupils.”

“We really enjoyed your session,” said Christine Williams, Head of Physics at Portsmouth High School, who brought two classes of year 10s (14-year-olds) to our sessions on embryonic stem cell research at the festival. “As teachers, we appreciated the skill in drawing out the different opinions and delighted in seeing the girls in a different environment. The girls appreciated that it was not just science that will matter in the future, but how the information will be used.

“We hope to include some of the material in future as it has real potential for development, particularly, we feel, with our gifted and talented scientists of the future. Thank you again for thinking of the poor teachers dealing with the scientists of the future.”

Following an analysis of our feedback, the Society has developed a new improved version of the Dialogue in Science CPD (continuing professional development) course which we intend to roll out throughout 2010 initially with the help of our friends at Surrey SATRO (Science and Technology Regional Organisation) and hopefully other Education Business Partnerships across the UK. Grants from the Monsanto Fund will be available to cover the full cost to teachers and schools outreach workers on a first-come, first-served basis. Please see www.sciberbrain.org/events for more details.

References