All the themed articles in this issue are based on sessions held at this year’s ASE Annual Conference at the University of Nottingham in January.

Fox Hill Primary School is part of a family of schools in Sheffield that is piloting the Specialist Schools and Academies Trust Primary Specialism for Science. In parallel to this work, Fox Hill participated in the Smarter Schools project from September 2008-9. This project, funded by the AstraZeneca Science Teaching Trust, was set up by the Centre for Science Education at Sheffield Hallam University, in collaboration with five schools from the family cluster. The group of schools was looking to underpin all the science developments by adopting a coaching approach to reflection on key areas of curriculum development, namely improving scientific enquiry and learning skills.

As a family, we had already identified six Skills for Learning, which lie at the heart of our curriculum and through which we are trying to provide our children with a rich, relevant and engaging experience. A framework for these skills has also been defined by the schools and each school has actively explored methods to incorporate them into teaching. The skills are:

- Communication
- Creativity
- Collaboration
- Self esteem
- Independence
- Reflection

We feel that it is particularly timely to be exploring these skills, given those identified in the New Curriculum for England.

One of the challenges for Fox Hill is that children come in with low levels of language and there is little parental engagement with learning. Finding ways to tackle these issues has been one of the school priorities. We have found that using question stems support children in formulating their own questions and helps them to access language in the context of primary science.

**Inspiration from Rosemary Feasey**

A notable source of inspiration came from Rosemary Feasey, who led a thought-provoking workshop on how to encourage scientific questioning, using a simple starter activity or storybooks. As adults, we made a simple paper spinner fish, which we then played with. This activity immediately provoked curiosity and lively discussion. We found ourselves keen to play and explore like children. The idea of using question stems was introduced, which prompted us to come up with spontaneous and instinctive questions. Using a sorting grid, we then categorised these questions, identifying those that could be scientifically investigated.

**Using exploratory play to stimulate children’s questions**

For the first lesson with my Year 6 (age 11) class, I replicated this paper fish spinner activity. The focus of the session was to encourage the children to play, explore and talk in pairs. The simplicity of the task gave them the freedom to do this without feeling constrained by the content. Working in pairs helped them to later work in groups.

As the children had had time to talk spontaneously about their findings, I then introduced the question stems, to give them a structure for formulating scientific questions from their talk. I deliberately introduced one question stem at a time, starting with ‘What if?’, so that the children did not feel overwhelmed or confused.

After about ten minutes, we shared our questions as a whole class. These included:

- What if we used different paper?
- What if we made the tail shorter?
- What if we added weight?
- What if we joined two spinners together?
- What if we made the world’s smallest spinner?

To help the children understand the variety of scientific questions, and how some questions can be investigated and some cannot, I introduced a sorting grid (see Table 1). We then agreed on one question that could be investigated:

- What if we add weight (paperclips)?

I gave the children time to try out their ideas. This activity really helped my class become familiar with the question stems and see how this could support their independent science enquiries.

**Stories as a starting point for science investigations**

In the second session, my starting point was the picture book *Egg Drop*, by Mini Grey. This was the first time I had tried using a picture book with a Year 6 class. The story, which is witty and has a slight edge to it, immediately engaged the children.
The story is about an unfortunate egg, who desperately tries to fly but comes to a sticky end. We then discussed in groups of four how we might be able to help the egg to fly and land safely. Children recorded their ideas informally and, at this stage, I chose not to link the activity to a particular area of science, in order to free up their thinking. I encouraged them to come up with their wildest, wackiest ideas. The children suggested amazingly creative ideas, ranging from firework rocket launches to bungee jumps and cable cars.

As they were talking, I started to re-introduce the question stems. Since the children were already familiar with these, they were able to use them in the context of this problem-solving activity. This process helped them to develop their ideas into identifiable questions:

- What if we attach the egg to elastic and bubble wrap?
- What if we wrap it in cotton wool and bubble wrap?

Through the now familiar process of sorting questions, the children reached a consensus to try parachuting eggs.

The final session was planning, trying and testing out their ideas of protecting an egg so that it could be parachuted.

**Sam’s story – What if… I freeze it?**

Sam, a child who is not normally a student who engages with learning outside the classroom, was so enthused that he came up with his own original suggestion, ‘What if I freeze the egg?’ and, without being prompted, froze an egg in a container of water at home, which he brought back to school to test. Because his ideas captured the interest of the whole class, I made the time for Sam to share his ideas and we carried out the investigation as a class. The whole class was involved in making predictions and observing, while Sam led the investigation. It proved quite a dramatic lesson with unexpected results. I took photographs of the session, which were displayed in the classroom along with the questions the children, including Sam, had asked.

**The impact of using question stems and stories on learning in science**

For Sam, this proved to be a very valuable experience, boosting his self-esteem and giving him the confidence to share his ideas with other children. He later told me that he was ‘happy and proud because I was the only one to think of it!’ Because of this success, Sam is now better motivated to engage with learning and contribute more willingly in lessons. The children were engaged straight away, curiosity was stimulated and the children had a genuine desire to come up with their own questions and actively wanted to investigate these.

It is important that the children see how learning outside the classroom and their own individual ideas are valued and celebrated. This exercise has motivated other children to ask their own questions and seek solutions for themselves. Another child was fascinated by our AlkaSeltzer rocket investigation and asked ‘what if I use a different liquid?’ or ‘what if I use a different tablet?’. She conducted the investigation at home and brought her video account of it into school.

Through the coaching process, I had time to reflect on my science teaching and share my experiences with colleagues. As I considered what had happened in the classroom in more detail, the real impact of learning beyond the classroom became more apparent and the value of pursuing the children’s ideas more powerful. Coaching gave me an invaluable opportunity to focus on something that I might otherwise have briefly acknowledged, but not acted upon. As a result, I feel more confident to let children go with their own ideas and have realised how important it is to make time to follow up ideas and to recognise the impact this has on learning. It was also an interesting reflection on which areas of learning had really engaged the children and captured their interest.

**Next steps**

In order to disseminate practice across the school, staff training was carried out. This involved me leading a session in which staff participated in the spinner activity and used question stems to generate scientific questions, which were then sorted into categories. The activity was particularly effective because it was practical, simple and not exclusive to any Key Stage and there was a real buzz of excitement.

The staff engaged with the activity because they could identify it as one that could be transferred to many areas of the curriculum. The teachers were motivated to try out the activities with their own classes and were given sets of ready-to-use question stems. The use of question stems is now becoming embedded into classroom practice. Staff are also more willing to try out new ideas and use stories to capture children’s interest and imagination and to stimulate scientific questioning. I bought a whole range of picture books that might lend themselves to science investigations (as recommended by Rosemary Feasey), so that teachers had an accessible starting point. Our school and classroom displays are full of photographs and speech bubbles, reflecting the children’s ideas and practical engagement with the science stimuli with which the teachers have presented them. In order to develop this further, we aim to create science kits for children to take home. These would consist of simple resources, with instructions, which parents and children could investigate together. This would help to engage parents with children’s learning in a practical, fun and non-threatening way, as well as supporting children’s language development. This has already been piloted in our nursery, where some parents have returned written accounts of what they and their children have done, as well as action photographs. Our positive experience was also celebrated in a science week and a whole school display.

For further information about the Smarter Schools project, please visit www.personalcapabilities.co.uk/smarterschools

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**How could we answer some of our questions?**

<table>
<thead>
<tr>
<th>Investigate</th>
<th>Think</th>
<th>Research</th>
<th>Observe</th>
</tr>
</thead>
<tbody>
<tr>
<td>We could carry out an investigation</td>
<td>We could think about what we know to help us answer the question</td>
<td>We could find out from other sources</td>
<td>We could observe to find out our answer</td>
</tr>
</tbody>
</table>

**Table 1: Questions sorting grid**