talking science

Children taking part in a guided science activity

GUIDED SCIENCE ACTIVITIES MAKE A BIG IMPACT

Nicola Beverley introduces guided science activities, developed to help schools assess children's progress, and Craig Early describes how these have been successfully implemented in his school

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Many teachers and subject leaders in primary schools across England are currently struggling to get their heads around the challenges – and opportunities – of an education world 'beyond levels'.

Central to making judgements about children's progress is a notion of security of understanding or 'mastery' of the curriculum. Have children 'got it' or not at any given point and in response to a planned learning sequence? As teachers, we need to be confident that the ongoing assessment picture we are building of children and their progress is as accurate as possible, soundly based and underpinned by a wide range of evidence of learning – way beyond tests or formally recorded work in books. Using 'guided science' activities with children can help, by providing a context within which teachers question, probe and dig deeper, examine children's understandings and ultimately confirm – or deny – their initial judgements about children and their progress towards security of understanding.

Guided science activities are a useful monitoring tool for subject leaders too, providing insight into progress across the school.

What is 'guided science'?

Most English primary schools have had some experience of guided learning, whether in the context of writing, reading or mathematics. Guided science has many similar features and has been developed with and by schools, as a tool to support teacher assessment. Guided science activities can be used to:

- develop or check children's use of scientific vocabulary;
- explore children's understanding of enquiry process skills;
- model scientific thinking and support children in developing their own;
- evaluate their responses;
- provide teaching that supports the next steps for learners;
- encourage children to use and apply subject knowledge in real-world contexts.

Guided science activities should be short(ish) and snappy and be used to explore children's understanding of, for example, a concept or skill (Box 1). They work best when used with a small group of up to eight children. Children frequently use elements of their prior and wider learning, demonstrating their capacity to use and apply their knowledge and understanding in a different way.

Developing a guided science question sequence

The quality and variety of questions included in a guided science activity question sequence is critical. These should be planned in advance, but used selectively by the teacher as they explore children's understanding, rather than being treated as a list to be worked through. An adapted version of Bloom's taxonomy has proved useful to teachers as they consider – and plan for – questions they might ask to prompt, probe and encourage children's responses (Box 2).

Box 1 Guided science checklist

- Useful resources might include: card sort, science game, ranking activity, practical task, vocabulary game, *Primary UPD8*, concept cartoon, newspaper report.
- Focus on promoting discussion and oral response.
- Create a question sequence to explore, extend and challenge children.
- Build the activities into science sessions from time to time – in the classroom, or outside.
- Plan to spend a limited amount of time, between 10 and 20 minutes, with a focus group of children.
- Select children for a focus group for a guided activity who you think are not making sufficient progress, 'borderline' children or 'the quiet ones', for example.
- It is not necessary to work through all children in your science class (as you may do in a guided reading session, for example) – cut your cloth according to the time available.

Box 2 Using an adapted version of Bloom's Taxonomy to help plan questions

Knowledge and comprehension (low)	Application and analysis	Synthesis and evaluation (high)
Recalls or describes simple factual information as required. Makes straightforward observations of features or objects. Reads or extracts information from simple data sources or text or diagrams.	Applies knowledge to given contexts. Gives simple explanations. Identifies patterns in data and makes comparisons. Makes predictions based on data given. Analyses data sources.	Makes links between different sources of evidence. Makes inferences and deductions from information given and own knowledge. Draws conclusions from evidence and relates to scientific understanding.
What? Which? How? Does? Are? etc. Describe Name Label, list Recall, select Remember Sort, group, classify Match, sequence	What would happen if …? How could you find out/test your idea …? What do you know already that might help? What evidence do you have? Give reasons for … Why do you think …? What conclusions can you draw? What evidence can you find? Justify your decision. Analyse, order. Connect, link.	What would happen if …? Suggest an alternative. Think of a new way to … Use your knowledge to predict, create, develop. What else could you …? Assess, test, judge, rank, select. Which is the best …? Which information is the most important? Do you agree with … and why? What do you think about … and why? What would you recommend … and why? What would you suggest … and why?

Box 3 Bumblebee Bonanza: example of an activity used in guided science (developed by Nicola Beverley)

Children are given a set of cards and asked to identify whether statements are 'Bee-good' or 'Bee not-so-good' and justify the choices that they make. Discuss any cards that they were unsure about and encourage them to explain why. Ask a variety of questions to explore their understanding. For example:

- What kinds of plants do bumblebees visit?
- When are most flying insects, including bumblebees, likely to be seen?
- What if the weather is cold and dull?
- What if it is sunny and warm?
- Would you ever see bumblebees in winter? Why?
- Where do bumblebees live?
- Do all bees live in similar places?
- If you had to recommend a location for the queen bumblebee to build a nest, where would you suggest? Why?
- What are the most important things to help them survive and thrive?

Some statements are relatively clear-cut; others do not have a right answer. Children need to justify their thinking, using their growing subject knowledge to reason and shape their ideas.

Levels of understanding

Developing understanding

Children have some awareness of where bumblebees are most likely to be found and when, stating that '*it needs to be a sunny day*' for example. They may recall where bees make their nests, but might confuse honeybees with bumblebees or mention bee hives.

Secure understanding

Children suggest when and where they think they will be more (or less) likely to see bumblebees and other flying insects in the garden, recognising how weather conditions and the season of the year might affect this. They identify some locations, such as on the beach or on the playing field, where bumblebees might not be safe to nest or that might not provide them with a good source of food.

Exceeding understanding

Children recall details about bumblebees and their requirements gleaned from research and suggest a number of different places in the school grounds where a bumblebee queen might choose to make a nest. They explain why various sites would be best and suggest alternatives beyond the school site that might be appropriate. They consider where a bumblebee sits in a garden food chain and who its natural predators might be.

Guided science activity: Bumblebee card sort

Age group: Year 4

It's spring; early flowers are blooming and our queen bumblebee has woken up from her winter hibernation. She is busily looking for somewhere to live. Can you help her to decide where to choose? Think about what she needs – somewhere to lay her eggs, food for her and her young and the right kind of conditions to thrive. Organise the cards into two columns under the headings:

BEE GOOD and **BEE NOT-SO-GOOD**

Meadow with plenty of wild flowers	Warm sunny weather with some rain	No rain for weeks	Wet and windy weather
Compost heap	Leaf or grass cuttings pile	Bee hive	Shady corner
Bird box	In the ground	School playing field (grass just cut)	Herb garden
Under a shed	Hole in a wall	Feld of wheat	Bee-friendly garden
Hot sunny wall	On the beach	Window box	Hot, sunny garden with lots of pansies and begonias

Cards for the bumblebee card sort activity (© Nicola Beverley, 2014)

Considering likely responses in advance helps to determine what children might say and do that might indicate their understanding is secure – have they got it or not?

Developing teacher assessment in your school using guided science

Guided science activities can prove a useful addition to science assessment practice in any school – but what is learnt from them is only part of the assessment picture. At Tower Road Academy, Boston, Lincolnshire, teachers chose to use two or three targeted guided sessions per half term across the school year. Evidence from the activities supported teachers as they made assessment judgements, adding to (and confirming) quality ongoing assessments of children and their progress. By doing this, they created a purposeful model and avoided the assessment process becoming too onerous or paper-driven, with the added benefits of building teacher confidence and ensuring accurate assessment and next steps for the children – something we are probably all aiming for!

One school's story: Tower Road Academy

***Craig Early**, science subject leader*

Guided science became a priority at Tower Road Academy, Boston, Lincolnshire, when teachers were struggling to assess children's progress in science accurately. Too often children were penalised for poor writing ability or a failure to answer test-style questions correctly, when it came to teachers judging their scientific ability. As a school, we needed a better assessment system, which could allow all children to display their potential in science, regardless of writing or reading ability, while providing teachers with evidence to help inform their judgements and identify next steps.

Right from the beginning we could see the sense of working with guided groups in science, much as we would in literacy or maths, focusing on a small group of children, and having a scenario or small experiment/problem for the children to discuss. Careful choice and sequencing of questions would allow teachers to assess children's scientific progress based on their responses and ideas – relying on the verbal response rather than a written one.

Getting started

A small selection of activities were developed and given to teachers to try out before feeding back and discussing outcomes, successes and difficulties at a later staff meeting. Teachers were reminded that guided sessions should last no longer than 20 minutes, and that they did not have to take place within science lessons. During subsequent staff meetings, and with support, year groups started to develop their own activities.

We started by looking at planning and encouraged teachers to think about what outcomes they were looking for from their lessons. Guided activities were developed and matched to these. In this way, children would 'pop out', as 'exceeding understanding', 'secure understanding' or 'developing understanding' and clear evidence would be provided for where they were as scientists (Box 3).

Finally, we developed the use of assessing science during guided reading sessions. Specific science books were provided for each year group, and staff planned a guided reading session around the use of these books, which meant that not only could reading comprehension be assessed, but it allowed the staff to again see the thinking of the children with regards to science in a different context, providing more evidence to back up their judgements. Using this assessment model allowed teachers to identify children who they were 'unsure' about and to plan specific guided science sessions to target these children and find out more about them.

What have we gained from this approach?

Introducing guided science has had a big impact at Tower Road Academy. Staff confidence when making judgements about children has risen, because they have been able to hone their questioning skills during the guided sessions and have become more familiar with what to look out for when a child is working at a particular level. These skills have been transferable to whole-class situations, meaning teachers are much more adept at identifying children's next steps to progress further. The realisation that a child's scientific ability should not depend on their reading or writing skills was a huge step forward for us. The use of guided science as a way for these children to showcase what they could actually do, by verbal response and discussion, was an eye-opener for staff, and again impacted on how we approach science teaching in our school, by making sure children can all show their understanding in a variety of ways, not just by writing things down. With guided science embedded into our assessment approach, staff are confident in their judgements of children, but also in identifying next steps and ways to push children on in their learning.

Moving forward, the school is currently developing a bank of guided science activities to place on the school network. We will continue to look at our questioning skills with the children, as a way of teasing out higher-order understanding and intend to share our expertise with other schools in the local area.

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