*Figure 1* Bubbles offer many opportunities for investigation in maths and science

Pattern Seeking

Science & mathematics

*Tanya Shields investigates turf for Scunthorpe United and the art of bubble blowing to show how important maths is to science*

# REAL-LIFE MATHS AND SCIENCE

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Cross curricular
Types of activities

As a primary teacher in a large junior school I would spend many Sunday afternoons planning exciting science lessons only to find they did not include sufficient mathematical knowledge and skills. At the time, the Numeracy Strategy was spreading through classrooms in English schools like wildfire. Children would start the week calculating the fraction of red Smarties in a tube and end the week calculating the area of a fictitious field. Meanwhile, science lessons were progressing under the QCA scheme of work headings (see *Websites*), but taking on a more practical pupil-led approach. I recall one particular lesson where pupils were investigating ways to keep 'The Lighthouse Keeper's Lunch' warm.

The scene was set. The children were motivated. The investigations began and, shortly afterwards, so did the questions!

*Which end of the thermometer do I put in the container?*

*How do you know what the temperature is?*

*Mine's between 30 and 40!*

Fortunately, after a quick crash course, the class picked up the skills needed to read the scales and take accurate readings. It was some time later that I discovered these children's only prior experience of using thermometers was via an interactive whiteboard

program. At the time, I did not give this a great deal of thought. The lesson had not been a total disaster. I had to rush the 'review' part of the lesson but the children seemed to enjoy it. How things have changed!

## Language of science

It is only now, working as an advisory teacher, that I wonder how much learning is lost because of the impromptu 'crash courses' designed to fill unforeseen gaps in education. Maths is the language of science. As teachers we should provide children with opportunities to explore this fundamental relationship. Without maths, science becomes subjective:

- **Would boiling water be perceived as being the same temperature as boiling custard?**
- **Would a chemist be able to replicate medicines with the same quantity of active ingredients?**
- **Would you be able to spot patterns such as height being equal to arm span?**

Whether maths and science are taught separately or through an integrated approach, it is impossible to ignore the fundamental relationship between these subjects. It is essential that children have the opportunity to gain contextualised hands-on experience that is purposeful and engaging.

## Real contexts for maths and science

I believe that using a constructivist, pupil-led, approach to teaching maths and science provides children with the opportunity to develop skills within real-life contexts. However, in many primary classrooms, where teachers may not be subject specialists, the confidence and willingness to take this risk is not always forthcoming. Both maths and science have come to be widely perceived as 'hard' subjects. To attempt to counter this, CIEC Promoting Science has produced materials that offer a wealth of support for teachers who are looking for ideas to deliver these 'hard' subjects in real-life contexts. Some examples are given below.

## Supporting Scunthorpe United

The *Turf troubles* resource (see *Websites*) is full of investigations and ideas to promote observations and interpretation of data (Figure 2). While working with a year 3 class (ages 7–8), I used this project to enhance a topic entitled 'Helping plants grow well'. The work began with a trip to our local football ground where the children not only saw the pitch midway through the resurfacing process, but also learnt about the techniques used to maintain a professional football field. Throughout the day the children learnt about the cost of purchasing the raw materials, the weight of each material needed to cover a given surface area and the time taken to grow and treat the turf in order to obtain the perfect pitch (Figure 3).

When we returned to school the classroom became a hive of research activity. Children were focused on finding the best growing medium to help grow turf for the local stadium. What was once the standard '*Let's grow plants in sand, compost and in the dark*' became a meaningful and real experience.

Meanwhile, in maths, the class had been learning to measure length accurately using rulers, tape measures and trundle wheels. The class now had the skills to select appropriate pieces of equipment and take accurate measurements.

From beginning to end the children carried out every step of this pattern-seeking investigation with precision. The same depth of soil was used in each container, the water was measured to the exact millimetre using measuring cylinders and the observations were made at the same time every day for two weeks.

On this occasion, I made sure we had time to review our findings! We had a job to do – we were carrying out research for Scunthorpe United! The class had recorded the data in a number of ways. The less able children used strips of paper cut to the height of the turf. Over time, these strips were used to form a simple bar chart. The more able children plotted their data in a line graph and were beginning to make predictions about the expected growth over the coming days.

Reviewing the data brought about a heated discussion:

*What is the perfect way to grow turf?*

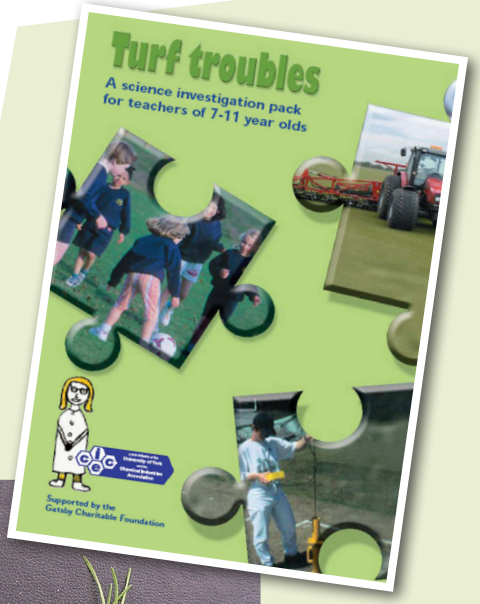


*Figure 2* Turf troubles resource, downloadable from www.cciproject.org/topicBank/turf_troubles.htm

*Figure 3* Fibre sand. The turf around areas of high usage such as the goal mouth and the sidelines has strong fibres mixed in with the soil to make it more durable

*Figure 4* Careful addition of colouring and perfume to make soap during work on *Kitchen concoctions*

## I'm forever blowing bubbles

The turf project paved the way to a context-led approach to science within the school. Using CIEC Promoting Science resources, teachers were able to identify projects to enhance their units of work. One class carried out a problem-solving investigation from *Kitchen concoctions* to find the best bubble mixture at the cheapest cost. Following a brief exploration of bubbles the questions began:

*Do we need a bubble mixture that will make big bubbles? If so, how will we measure them?*

*Should we make a bubble mixture that makes lots of small bubbles?*

*Do we want bubbles that last a long time or even bounce?*

Children devised different ways to measure, count and time the size, number and durability of the bubbles. Some children used bubble shadows to help measure the diameter, while others popped the bubbles on black sugar paper and measured the 'pop' mark left behind. As with all problem-solving investigations the solutions were many and varied. The discussion and evaluation of the investigation was outstanding.

*Figure 5* Children examine a fairing on a real truck before making their own


## Faster trucks

An older group of group of children investigated the effect of wind resistance on the transport industry. The resource *Feel the force* was written before the retailer Marks & Spencer launched its uniquely shaped 'teardrop' trailer, but the idea of shaping trucks and trailers to reduce air resistance and fuel costs has been around for many years. Many trucks use fairings, structures that reduce wind resistance by creating a more aerodynamic shape between the cab and the trailer. Armed with forcemeters, elastic bands, toy trucks and a selection of cardboard fairings, children soon discovered the beneficial effect of reducing air resistance on the distance travelled by an object. After applying the same amount of force, they observed the fairing-adorned trucks travelling up to twice as far as those without. The real-life scenario produced a high level of ingenuity and a vast array of designs. Some children worked on nets to create strong durable fairings, while others constructed calibrated catapults to launch the test trucks with the same amount of force each time.

## Use your curriculum time wisely

The success of each of these projects had one common factor: the children wanted to find out more. The contexts were meaningful to them. If they had been asked to find out what conditions would be best for growing turf on a farm the response may not have been so positive. Using the transport industry as a context appealed to a large number of children whose parents drove trucks for a living. And the bubbles? Well who doesn't like bubbles?!

Whether you decide to teach 'mathematical skills' in a science context or take the integrated approach, it is import to ensure that the science skills receive equal attention. Use your curriculum time wisely. Why not learn how to use a thermometer in a maths lesson while exploring which materials keep hot drinks hot? Or develop measuring skills while finding out whether people with the longest legs can jump the furthest. Your science lesson then becomes the learning ground to master the skills needed to engage in real-life science.

### Websites and useful information

All of the resources mentioned in this article are available for free download via the CIEC Promoting Science website:
**www.cciproject.org/topicBank/topicBank.htm**

QCA Scheme of work produced by the Qualifications and Curriculum Authority now available at:
**webarchive.nationalarchives.gov.uk/20090608182316/http://standards.dfes.gov.uk/schemes2/science/?view=get**

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