Teaching science down on the farm

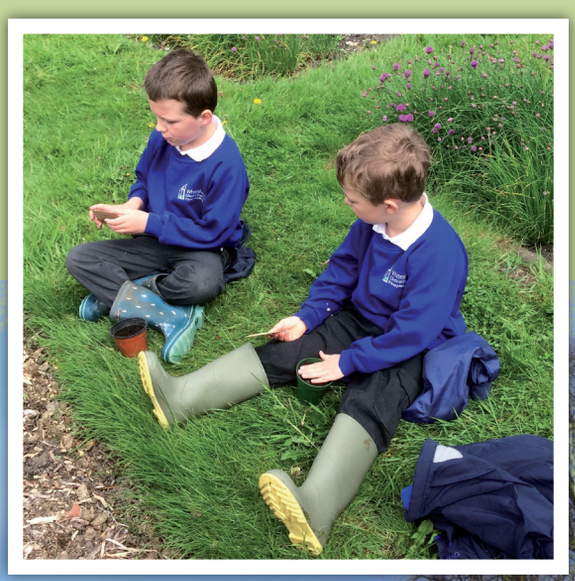

Figure 2 (inset) Sowing seeds on the farm

Debbie Hicks

explores the key role of the farm in teaching science as well as wider educational benefits and suggests activities to engage and excite

Figure 1 Stokehill Farm, a learning resource for science

- **Do you know what proportion of UK land is used for agriculture?**
- **Are you aware that farmers grow crops for medicine, cosmetics, rope and paper?**
- **Do you know that farming makes a really effective and engaging context for science learning?**

Congratulations if you answered '75%' to question 1 and 'yes' to questions 2 and 3! According to research carried out in advance of this year's annual 'Open Farm Sunday' event, which showcases the industry to the public, around two-thirds of consumers are unaware how much land is used for agriculture and 90% of consumers are unaware of the non-food crop plants that are farmed in the UK. And yes, the third question was intended to be rhetorical, but although farming often makes an appearance in lessons about food, it is less commonly used as a focus for other practical science activities.

My teaching background is in secondary biology but in my work as an educational consultant for Farming and Countryside Education (FACE) and with school groups on my farm, science learning forms an implicit or explicit element of almost every engagement with children. From popular children's characters such as Tractor Ted and Shaun the Sheep to television series such as *Lambing Live* and *Countryfile*, generations of children grow up enjoying stories from the farm, whether they live in rural or urban areas. One of the many reasons to consider using science from the farm in your lessons is that you will have a background level of interest and curiosity from these children, including those who do not always engage confidently in science lessons.

Throughout the UK's primary science curriculum, there are numerous opportunities for us to use the farming industry as a rich and engaging real-world context for science learning. We can focus on the animals and plants on the farm as subjects for children to learn about life processes. We can turn our attention anywhere along the production chain and we will see examples of the application of accessible biology, chemistry and physics. We can use the farmed environment as a context to explore habitats, biodiversity and human impact.

Whichever farming sector we choose, there are direct, natural links to the science curriculum that can be incorporated into lessons in a meaningful way at different levels, with little need to oversimplify or to contrive. Effective farming-themed

Key words: Farming ■ LoTC ■ Life processes

science learning can take place in school and, most rewarding of all, by visiting a farm.

Carry out farm science at school

Farm animals and crops make great subjects for studying life processes and, although seeing them *in situ* on a farm will, for many children, be the most enjoyable place to learn about them, good classroom science can underpin or even replace this. There are so many ways to use science from the farm in lessons that it is difficult to narrow it down to a few examples; the following are just a few of the possibilities that spring to mind.

In addition to their place in the curriculum as part of our diet, eggs make good subjects for practical work on forces and reversible and irreversible changes. Dairy-themed practical work might include making butter, cheese and yoghurt. Work on crops might include designing a reliable experiment to compare the growth of plants with and without nitrates, which can then be linked to the use of fertilisers by farmers.

Many farmers have diversified their activities to include production of non-food crops alongside or instead of more traditional crops such as wheat, maize and barley. Children may already have encountered lavender oil and various stages of the growing and processing processes lend themselves to practical work. They can sow lavender seeds and, although you can't expect to be harvesting flowers any time soon, the seeds will germinate and develop into aromatic seedlings that the children can smell.

Rather than waiting for the germinated plants to reach a useful size, adult lavender plants can be bought quite cheaply and used for children to describe the functions of different parts of plants and to explore pollination.

As the logical conclusion to the farming process and an extension activity for studying separation of mixtures, a simple version of steam distillation can be used to show children how the lavender oil is collected. If fresh lavender flowers and leaves in water are heated to boiling point and the steam collected and condensed, a layer of oil will be seen floating on the water. The oil can be removed using a pipette or, more simply, by dipping a tissue on the surface to absorb the oil and create scented tissues!

Invite a farmer to school

To breathe even more life into the science, why not invite a farmer into your lessons? A visiting farmer not only brings a fresh, informed voice to the subject, but they will probably also introduce the children to live animals or plants brought from their farm. In one session organised by FACE, children at Castle Cary School in Somerset enjoyed a visit from local poultry farmers. During the session, children met ducks, chickens and quail and learned about egg production and the lives of laying birds (Figure 3).

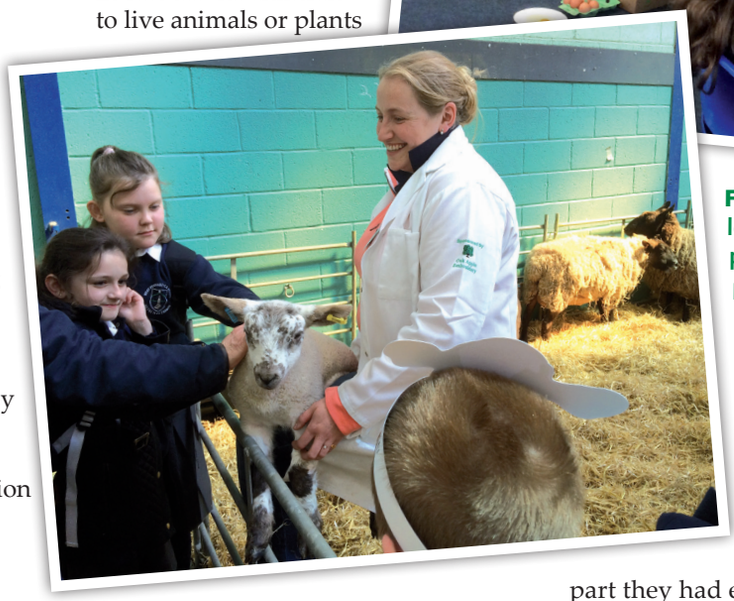

Figure 3 The children learning directly from a poultry farmer

Figure 4 Getting to know sheep at a 'Field to Food Day'

Participate in an Education Day

Agricultural societies increasingly organise large-scale Education Days, which enable hundreds of children to meet farmers and learn about many different aspects of farming, all in one place. The focus is very much on linking the producer with the consumer. Children might, for example, be able to speak to a dairy farmer and then taste the milk that has been produced by that very farmer. Invitations are usually sent to schools in the local area well in advance and sometimes there is even support for transport costs.

At a Bath and West 'Field to Food Day' nearly one thousand children from 19 local schools met with arable and livestock farmers, watched milking demonstrations, tasted cheese, met pigs and sheep and participated in a wide variety of other activities (Figure 4). When asked which part they had enjoyed most, the answer 'everything' was heard more than once.

Visit a farm

In addition to the well-documented benefits of outdoor education helping to maximise the impact of the science learning being carried out on the farm, there are so many ways that we can use the farm environment to embed, enrich or extend science skills and knowledge.

For example, a key stage 1 group (ages 5–7) visiting my farm, Stokehill, might focus on the needs of plants and animals. We will discuss the basic requirements of the sheep, consider how their lambs grow and look closely at their fleece (Figure 5).

For another group, as we walk around the farm, we might observe and record key features of the season and discuss how and why the farm would look different at other times of the year. We might sow seeds for the children to take away and monitor their growth, or we might carry out an experiment on fruit in the orchards.

Some sheep breeds come in different

colours and patterns. On a visit about variation, a group might choose a variable to measure, record the data and present it appropriately, some even using washed fleece to make the bars on the chart!

A key stage 2 group (ages 7–11) learning about human nutrition might extend their work to learn about nutrition in sheep. We watch sheep grazing, look close up at their teeth and learn how they obtain a balanced diet at different stages of their lives. A different group might spend time in the poultry area, considering the different stages of the chicken life cycle and carrying out activities on the properties of eggs.

In addition to producing our food, farms are vital habitats for much of our wildlife, but many children are unaware of the role that farmers play in supporting biodiversity. At Stokehill, we use the wildflower meadows and hedgerows to identify and classify different plants and animals, investigate variation in flower colours and stem heights and to discuss human influences on the environment (Figure 6).

Figure 5 Finding out about fleece on the farm

Figure 6 Wildlife in the farm hedgerows

Find out more

There are numerous resources available to help with finding and planning a farm visit (Box 1). Countryside Classroom has a section on farms to visit, searchable by postcode, while local education authorities often have lists of approved providers. LEAF's Open Farm Sunday initiative has an 'Open Farm School Days' section, where certain farms open up their gates to schools throughout June. Again, these are searchable by area.

In conclusion

In addition to providing a robust context for learning, farming–themed science can enable children to become more aware of the central role that farming plays in all of our daily lives. We are also able to reduce the chances of children acquiring some of the common misconceptions associated with farming.

Ask a child to draw or describe a farmer and it is quite likely that the figure will be male, dishevelled, with straw in his teeth and mud on his boots. Meanwhile, the agricultural industry requires a steady influx of well-qualified, ambitious entrants. To support the agri-tech revolution that is well underway, the industry is reliant on those of us who teach science to build solid foundations, not only in the relevant skills and knowledge, but to help children gain awareness of the huge range of possibilities open to them in the field of agriculture.

Box 1 Resources and support

- **Countryside Classroom (www.countrysideclassroom.org.uk)** – a consortium of organisations providing teaching resources, practical experiences and networks with local services
- **FACE (www.face-online.org.uk)** – website includes guidance for planning farm visits, teaching resources including a STEM-linked activities booklet, and details of nationwide teacher CPD.
- **Why farming matters (www.whyfarmingmatters.co.uk/why-farming-matters)** – a resource resulting from a collaborative project between FACE and the National Farmers' Union. It contains images, weblinks, questions and answers and short videos about different farming sectors. The videos also make useful stimulus material for discussion about other science topics, including nutrition, skeletons and life cycles. The previous edition of *Why farming matters* was 5–star recommended by the TES Resource Team for the 2014 National Curriculum, and has now been revised and updated with new food and farming content for 2015.
- **Career options (www.brightcrop.org.uk/explore–your–career.aspx)** – one way to highlight the role of the farmer behind the science, and perhaps even ignite the spark of future career ideas, is to incorporate into the lesson the careers information and/or short videos from this website. Bright Crop has been developed to help older pupils and teachers to explore career options in the farming and food supply industry, but it can help to show the human element in the industry to a much younger audience.
- **LEAF Open Farm Sunday (https://farmsunday.org)** – has section on 'Open Farm School Days', where certain farms open up their gates to schools throughout June, searchable by area.

Debbie Hicks is the founder of Stokehill Education and Training Limited (www.stokehill.com), using her farm as a learning resource, primarily for science, at key stages 1 to 5 (ages 5–18). She teaches biology part time and has a CPD leadership role at her school. Debbie is also the south-west regional educational consultant for Farming and Countryside Education (FACE). Email: debbiehicks@stokehill.com