

# Primary Science & Technology *Bulletin*



Ideas and inspiration for teachers in Primary Schools and S1/S2

- > Keeping tadpoles in the classroom
- > Beyond the visible
- > Sow safely with seeds...



# Keeping tadpoles in the classroom

Observing the lifecycles of animals in the natural world is sometimes seen as something best left to the likes of David Attenborough *et al*, but with a little simple planning and preparation learners can experience the delight of raising a native species, namely the Common Frog (Figure 1), in the classroom.

With many of our native amphibians in decline due to a number of factors, often due to human influence, this activity could actually help boost the numbers of these engaging and often overlooked native species in the wild. The activity described here could help to support the following *Curriculum for Excellence* Experiences and Outcomes [1]:

I have observed living things in the environment over time and am becoming aware of how they depend upon each other - SCN 0-01a.

I can distinguish between living and non-living things. I can sort living things into groups and explain my decisions - SCN 1-01a.

I can explore examples of food chains and show how animals and plants depend upon each other for food - SCN 1-02a.

I can use my knowledge of the interactions and energy flow between plants and animals in ecosystems, food chains and webs. I have contributed to the design or conservation of a wildlife area - SCN 2-02a.

By investigating the lifecycles of plants and animals, I can recognise the different stages of their development - SCN 2-14a.



Figure 1 - Common Frog (*Rana temporaria*).

The opportunity to observe the development of living things over time is a fundamental feature of science enquiry and the chance to do this in the classroom, on a manageable scale, is well worth the effort involved. The activity lends itself to a number of areas of research - learners may wish to find out more about other native amphibians, including their geographical spread and current ecological status. Indeed many learners may not be aware of the group of animals known as amphibians and this could lead into an introduction into classification. There are a number of websites that provide information about native amphibians, including ideas for encouraging them into a wildlife garden [2, 3]. The activity could form part of a study into lifecycles and learners could compare and contrast a variety of species. The

concept of metamorphosis can be introduced as part of the life cycle of some species. Butterfly and Ladybird eggs and larvae are available from a number of reputable suppliers [4] and these can also be raised in the classroom. The RSPCA [5] and BBC websites [6] have a number of games and resources to support the study of lifecycles.



Figure 2 - Male claspng female leading up to spawning.

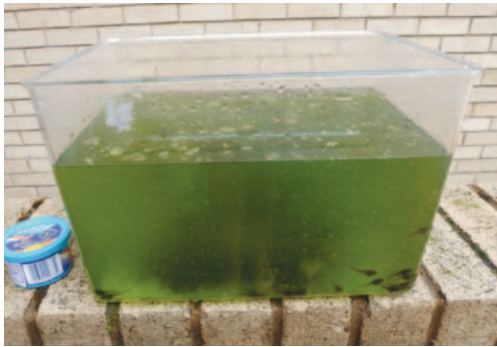


Figure 3 - Plastic tank with lid removed.

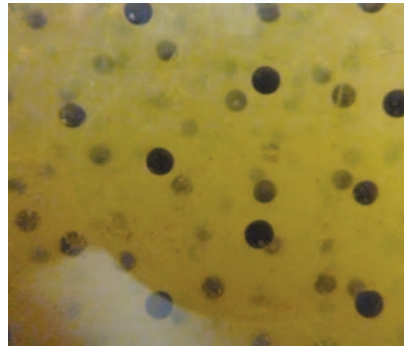


Figure 4 - Freshly laid frog spawn.

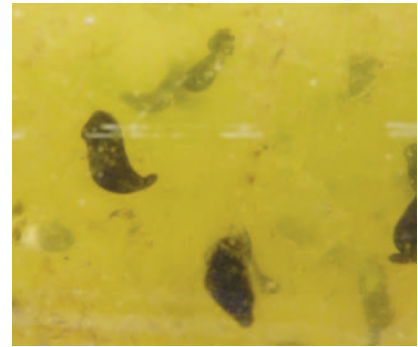


Figure 5 - Fertilized eggs at four days.

### Preparations

In the UK the Common Frog tends to spawn between late January and March, males and females pairing up for several days (Figure 2) prior to making their way to water. As the eggs are laid the male releases sperm over them, fertilising them externally. Many frogs spawn in the same location and the eggs tend to clump together in the shallows where it is warmest. As many as 2000 eggs can be laid by each female, but very few of these will reach maturity. Many eggs remain unfertilised and there are many predators waiting to eat spawn, tadpoles, froglets and frogs along the way. Hence the need for so many eggs!

If you intend to raise froglets in the classroom it is worth keeping up a regular observation on any likely ponds in your area from the end of January. Even the most urban area is likely to have either a wild or garden pond where frogs are known to spawn. Some of our native amphibian species are protected and so their spawn must not be collected [2, 3, 10]. For safety reasons it is not advisable to encourage learners to bring frog-spawn into school, rather it should always be collected by an adult. Good hygiene should always be observed whenever coming into contact with pond water, any cuts covered and hands washed thoroughly. For further advice contact SSERC [7] or read the 4<sup>th</sup> edition of ASE publication *Be Safe* [8]. It is important to note the location of the pond as, once developed,

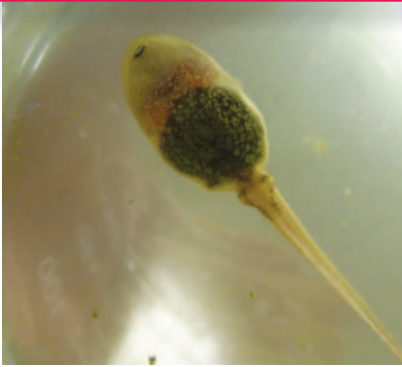
the froglets must be released near their pond of origin. Returning the froglets to their original location will help to minimise the spread of disease between populations - this is especially important if the spawn was collected from a garden pond, introducing these froglets into a wild pond should be avoided. Metamorphosis can take between 12 and 16 weeks depending on temperature and other factors, so arrangements should be made for the care of the tadpoles and froglets during any holiday periods.

There is no need to buy any expensive equipment - a simple plastic tank with a perforated lid is all that is needed (Figure 3). Most pet shops and even some supermarkets stock these, look for one that holds around 9 litres of water. Glass tanks are not

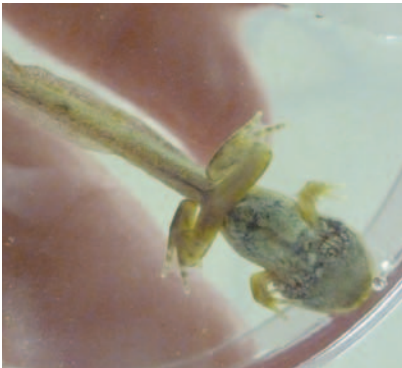
recommended for obvious reasons! Start to collect rainwater, keeping it outside in buckets, ready for setting up your tank. If you need to use tap water remember that the chlorine can harm the tadpoles, so allow it to stand for a few days before using it. Place your tank in position, choose a strong, stable surface, and locate it away from direct sunlight. Ensure that learners can observe the tank easily. Collect and wash some pebbles, stones and gravel and place these on the bottom of your tank. Carefully pour in the water and leave it to settle. You should obtain some native pond weed to both oxygenate the water and provide a base for algal growth on which the tadpoles will initially feed. Avoid non-native weed as you may inadvertently introduce it to the pond when you release the froglets. ▶



Figure 6 - Tadpole with internal gills and gold spots.



**Figure 7** - Hind legs just visible.



**Figure 8** - Front limbs are now fully formed, note the feet are now webbed.

### Collecting the frog spawn

Half a cupful of frog spawn will be sufficient for your tank, an old sieve or net can be used to collect it. Don't be tempted to bring back too much spawn as overcrowding can lead to problems - including the spread of disease, and even cannibalism, amongst the tadpoles. Bring back a bucketful of the water in which the spawn was laid. Place the spawn and enough water to cover the spawn in a strong plastic bag and suspend this in the tank surrounded by the rest of the water. This allows the temperature difference to equalise. After around an hour the contents

can be very carefully tipped into the tank. Each ovum or egg can be seen surrounded by a sphere of transparent jelly (Figure 4). Encourage learners to observe the eggs; there is an upper dark surface and grey lower half. The grey half is the yolk reserve, providing nourishment for the growing tadpole (or larvae). Always ensure strict hand washing after coming into contact with pond water and the tanks contents. The Code of Practice, *Materials of Living Origin* [9], which can be accessed from the SSERC website, has recently been reviewed and updated and provides useful advice for keeping animals in the classroom.

After a few days each fertilised egg starts to change shape and looks a bit like a comma. It is now an embryo, and will begin to move within the jelly casing (Figure 5).

When the tadpoles first leave the jelly they still have not developed mouths and rely on the yolk for nourishment. Once this food source is depleted the mouths open and they begin to feed on algae growing on the sides of the tank. Feathery external gills, which absorb oxygen directly from the water, are present for a few days and can be observed. The gills are soon covered with a layer of skin but the tadpoles continue to absorb oxygen from the water. Any undeveloped eggs will appear cloudy and should be carefully removed with a sieve or net and



**Figure 9** - Froglet now has wider mouth and eyelids.

be double bagged and disposed with household waste. Change around half the water every week using a jug to pour the discarded water through a net or sieve, thus catching any tadpoles caught in the jug by accident. Replace with rain water at room temperature and keep the tank clean. At this stage the tadpoles are herbivorous, so after a week or so try placing a piece of boiled cabbage leaf in the tank, regularly removing any uneaten plant material. The tadpoles will also graze on any pond weed and algal growth present around the tank.



**Figure 10** - Plastic box divided into two sections.



**Figure 11** - Waterproof divider keeps sand in one section.



**Figure 12** - Water now fills one section of the enclosure, providing a "beach" area. Note the froglet climbing up on the right.



**Figure 13** - Young frog climbing.

The tadpoles grow quickly in the warmth of the classroom and will soon start to develop the gold speckles characteristic of frog larvae (Figure 6). If time and resources allow a tank could also be kept outside and rate of development compared.

Hind legs develop first (Figure 7) and at this point the need for protein is increased. Start to feed dried flaked fish food, adding a few flakes at a time. Take care not to over-feed the tadpoles, as water quality will suffer.

Lungs begin to develop and the tadpoles will start to come to the surface to breathe. The water level should be reduced to 10 cm and some large stones provided as platforms as the air-breathing froglets could now drown.

At this point the front limbs start to develop (Figure 8), the mouth widens, tongue grows and eyelids develop (Figure 9). Ensure that there is an accessible, shallow beach area and stones to enable the froglets to leave the water when necessary.

Learners could be asked to design and build a new enclosure. A large plastic box could be divided into two sections using thick plastic and waterproof tape. One side could

be filled with sand or soil and the other filled with water from the original tank. Stones and pebbles to make a shelving beach ensure that undeveloped tadpoles and froglets can live in the same tank as they continue to develop at different rates (Figures 10-12).

As part of the continuing metamorphosis the tail starts to be reabsorbed. The froglets will now spend more time exploring their surroundings. Make sure you keep a perforated lid on the enclosure as froglets are able to climb a variety of surfaces (Figure 13). Just how much variation occurs within the species is evident once you start looking closely at the different markings and patterns on the froglets (Figures 14 and 15).

The young frogs now need to find a good supply of live food, making them unsuitable to keep in the classroom past the froglet stage. Release them as and when their tails are reabsorbed and they spend the majority of their time on the land. Place them in the damp grass near the pond they came from during dusk or early morning.

Learners will be fascinated with the temporary classroom visitors. Good books to share with learners at early and first levels are *Growing Frogs* by Vivien French and *The Tiny, Tiny Tadpole* by H.E. Todd.

Further information on keeping common frog tadpoles is presented in the Field Studies Council guide to keeping common frog tadpoles [10].



**Figure 14** - Young frog resting.



**Figure 15** - Young frog ready for release.

#### References

- [1] [www.educationscotland.gov.uk/thecurriculum/howisthecurriculumorganised/experiencesandoutcomes/index.asp](http://www.educationscotland.gov.uk/thecurriculum/howisthecurriculumorganised/experiencesandoutcomes/index.asp)
- [2] [www.scottishfrogs.co.uk](http://www.scottishfrogs.co.uk)
- [3] [www.arguk.org/useful-links/](http://www.arguk.org/useful-links/)
- [4] [www.insectlore.co.uk](http://www.insectlore.co.uk)
- [5] [www.rspca.org.uk/education](http://www.rspca.org.uk/education) (search tadpoles).
- [6] [www.bbc.co.uk/learningzone](http://www.bbc.co.uk/learningzone) (search tadpoles).
- [7] [sts@sserc.org.uk](mailto:sts@sserc.org.uk)
- [8] [www.ase.org.uk/bookshop](http://www.ase.org.uk/bookshop)
- [9] Third editions of Codes of Practice published (2012). Copies of the Code of Practice are available via the Biology Health & Safety pages on the SSERC website - [www.sserc.org.uk](http://www.sserc.org.uk)
- [10] [www.field-studies-council.org/](http://www.field-studies-council.org/)

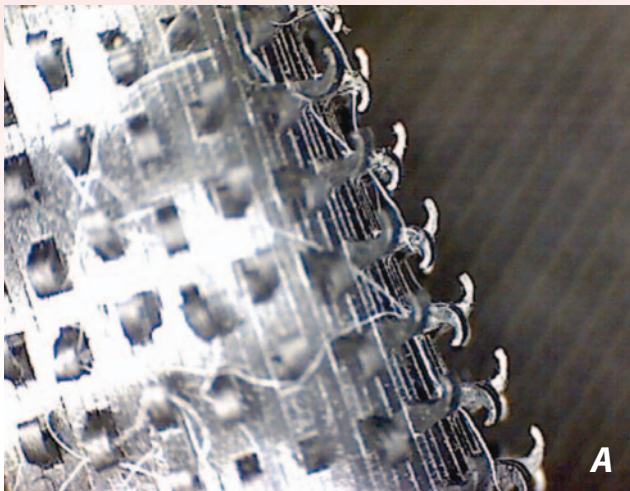
# Beyond the visible - an introduction to

**Can you identify the 4 images in Figure 1? The answers are at the end of the article. All were taken with the Veho VMS-001 (Figure 2) microscope which retails for around £35 from a range of outlets including Misco [1] and Amazon [2].**

The microscope comes with software that allows still images to be viewed, saved and manipulated on-screen and also the ability to record video.

The use of the microscope can enhance science in the primary classroom. Children can explore

a world that is otherwise too small to be seen. A look at everyday materials offers an insight into the differences between man-made and natural fibres. Does the structure of a fabric, as viewed under the microscope, give clues to its insulating properties? Viewing salt and sugar crystals reveals

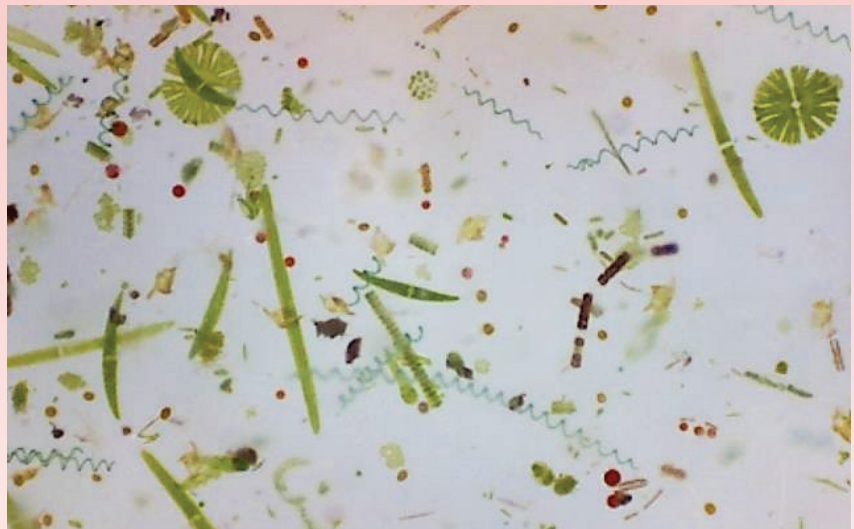


**Figure 1 - Four images.**

# the Veho VMS-001 USB microscope



**Figure 2** - Veho VMS-001 - 200x USB Digital Microscope.



**Figure 3** - Image of microscopic algae x220.

an ordered structure that is not apparent to the naked eye. And who could fail to be amazed when green sludge turns out to contain a wonderful variety of microscopic algae? (Figure 3) Even looking at the cursor on the computer produces a surprise.

Initially, it may be enough just to allow pupils to view a wide variety of objects using the microscope but in the upper primary they could be encouraged to use more of the microscope's features. The photographs in Figures 1, 3 and 4 have been taken with the microscope and it is possible to label the photographs - time and date can be added and it is good practice to add the magnification as well.

Another useful feature allows measurements to be made. An image has been taken of a sugar crystal (Figure 4) and a measurement made of the length of one of the sides. The accuracy achieved by the software is limited by the accuracy of determining

the magnification but should be sufficient for use within the primary classroom. The microscope can also record video. A manual which provides comprehensive, easy-to-use instructions for each of the microscope's facilities is included on the software.

The microscope's use in science activities can also help to address a variety of Experiences and Outcomes in the areas of mathematics and technology and a full list of the ones that we have identified can be found on [www.sserc.org.uk](http://www.sserc.org.uk).



**Figure 4** - Image of sugar crystal x26.

## Answers to quiz:

- A: Velcro x25
- B: Dandelion seed x20
- C: Cone from Scots Pine Tree x17
- D: Mosquito wing x195

## References

- [1] [www.misco.co.uk/](http://www.misco.co.uk/) (accessed 10<sup>th</sup> December 2012).
- [2] [www.amazon.co.uk](http://www.amazon.co.uk) (accessed 10<sup>th</sup> December 2012).

# Sow safely with seeds...

We have recently received quite a few enquiries asking about the safe use of seeds in the primary classroom.

A number of activities linked to CFE experiences and outcomes [1] are made all the more engaging, and indeed are underpinned, by studies of the germination and growth of plants.

## Planet Earth: Biodiversity and interdependence

I have helped to grow plants and can name their basic parts. I can talk about how they grow and what I need to do to look after them - SCN 0-03a.

I can help to design experiments to find out what plants need in order to grow and develop. I can observe and record my findings and from what I have learned I can grow healthy plants in school - SCN 1-03a.

I have collaborated in the design of an investigation into the effects of fertilisers on the growth of plants. I can express an informed view of the risks and benefits of their use - SCN2-03a.

By carrying out practical activities and investigations, I can show how plants have benefitted society - SCN 2-02b.



Figure 1 - Typical warning statement found on some seed packets.

Many practitioners will regularly use seeds in (and out of) the classroom and will be aware of good practice in terms of hand hygiene and avoiding seeds which may pose choking hazards. They will also be aware that some plants are unsuitable for use in school due to their toxicity e.g. red kidney beans or because they risk causing an allergic reaction or irritation e.g. chilli plants. Information on experiments involving plants in the classroom can be found on the SAPS website [2].

The bulk of the recent enquiries have concerned the treatment of commercially available seeds with

fungicides and pesticides. Warnings are appearing on seed packets with increasing regularity (Figure 1) so we recommend that you check carefully before purchase. Seeds that are not treated with these potentially harmful chemicals are available from health food shops and other retailers. If treated seeds are used they should be scattered directly from the packet, planted using tweezers and/or gloved hands. As with any planned activity the age, maturity and level of supervision of the learners are important factors in the decision making process. If there is any doubt contact SSERC [3] for further advice. ◀

## References

- [1] *Curriculum for Excellence* Experiences and Outcomes. Available at: [www.educationscotland.gov.uk/thecurriculum/howisthecurriculumorganised/experiencesandoutcomes/index.asp](http://www.educationscotland.gov.uk/thecurriculum/howisthecurriculumorganised/experiencesandoutcomes/index.asp) (accessed February 1<sup>st</sup> 2013).
- [2] *Plants for Primary Pupils* - a series of 6 booklets published by Science and Plants for Schools and the Field Studies Council. Booklets can be downloaded at [www.saps.org.uk/primary/teaching-resources/539-plants-for-primary-pupils-booklets-overview](http://www.saps.org.uk/primary/teaching-resources/539-plants-for-primary-pupils-booklets-overview) (accessed February 1<sup>st</sup> 2013).
- [3] In the first instance contact us via email at [sts@sserc.org.uk](mailto:sts@sserc.org.uk).