CHAPTER EIGHT

A thematic approach to humans and animals in Early Years education

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Purpose of this chapter

After reading this chapter you should have:

- an understanding of the key ideas about animals including humans that children in the Early Years context should develop and why these ideas are important;
- ideas about thematic contexts for children's learning about animals;
- an insight into how practitioners can support children's learning about animals through enquiries in science and D&T.

Introduction

Children are interested in animals and curious about their own bodies. Many children will have first-hand experience of animals as pets or through hobbies, or through playing outdoors. They are very likely to have learned a great deal about a wide range of animals and their habitats through media such as books and television. They will share common experiences of how their bodies work and grow as well as having physical and sensory differences as unique individuals. Social concerns about healthy lifestyles draw on scientific ideas about what humans need to stay alive and well and so it is important to begin to develop these ideas with young children. There are two values underlying this topic: that we should learn to live in a way that respects and protects living things, including ourselves, and that we need to understand and look after our environment.

For teachers, this means that children will have a rich bank of ideas to draw on in discussions and knowledge to share with others. The challenge for work in this area of science is not finding meaningful contexts; the challenge is about finding ways of learning more about living animals and humans that are hands-on, ethical and accessible. Observing animals in their natural

habitats takes time and patience. Some children may be frightened about handling real animals and they don't always keep still to be sketched or photographed! Unlike learning about a torch, you can't take a human apart to see what is inside, but we can explore our senses, and compare and measure what our bodies can do. Learning from secondary sources is also important, but should be part of a broader enquiry that includes learning at first hand.

The ideas that we develop about ourselves and other animals can have important social consequences. For example, people may claim that certain gender roles or sexual behaviour is natural or unnatural and draw on examples from nature to 'prove' it. Nature is remarkably diverse and fluid and our science teaching in the early years can contribute to a rich picture of the variation in reproduction that exists in nature. Science is seen as an authoritative source of knowledge so we need to be careful not to set up ideas about what is normal that lead to rigid notions of gender identity in humans. Also, our views of other animals affect how we treat them; do we eat them? do we farm them in a humane way? do we protect their habitats? Science can't answer moral questions, but it can and does provide information that informs those decisions. Posthumanist and new materialist theories suggest that we need to think critically about the mutual entanglement of humans and other animals (Lindgren and Ohman 2017).

This chapter will start by outlining relevant concepts in relation to living processes, classification, human and animal biology, habitats and sustainability at both practitioner (adult) and appropriate child levels. It will consider the scientific process skills needed to classify animals, undertake fieldwork and appropriate attitudes to be developed towards living things. The chapter will go on to suggest learning activities within broad Early Years themes such as 'ourselves', 'underground' and 'water', illustrated with case studies, children's story books, curriculum and ICT links. Related D&T activities such as designing a home for an animal will also be included.

Conceptual understanding of humans and other animals

This chapter encompasses a very broad range of concepts. Some concepts are about the characteristics of a range of animals: what are they like, what do they do and what are they called? One scientific approach to managing learning about the huge diversity of living things is to look for commonalities: what are the similarities and differences between animals; how can we classify them? We can think about the general characteristics of living things (the mnemonic MRS GREN helps children to remember these) with a particular focus on animals helps us to identify themes such as feeding and growth and to look for the ways in which different animals meet the challenges of staying alive and reproducing. Taking a broader view of the relationship between animals and their environment leads us to think about habitats and the relationships between different groups of animals, such as in food chains. Another useful biological strategy for learning about animals is to look for links between the 'structure and function' of a particular body part to help explain how it works. This helps us to make connections between the needs of living things in general, such as for excretion and respiration, and how an animal is adapted to do this in a particular environment. This helps us to ask relevant questions. Why is a worm the shape it is? How does it feed and breathe? Does it have

babies? Do worms need to sleep like humans do? Charles Darwin's last book was on his careful study of worms and their role in breaking down vegetation!

Teachers can help children to pay attention to features of animals they may not have noticed. Cognitive psychology tells us that our attention is a limited resource (Hattie and Yates, 2014; 48) and what we give attention to depend on what our brain has decided is important or relevant in that moment so we don't take in other information. There is a now famous research project in which people were asked to watch a video clip and count the number of time certain players passed a basketball, and were so focused on this that they didn't notice a gorilla running on! (Chabris and Simons 2011). Table 8.1 below summarises the key concepts children should learn and provides a synopsis of the subject knowledge a practitioner would need to support this.

TABLE 8.1 Conceptual understanding: animals

Key concepts in the Early Years curriculum	**Subject knowledge for practitioners in the Early Years curriculum**
Distinguish between living, dead and non-living	In comparison with plants, children find it relatively easy to see animals as alive because they more obviously carry out the seven processes that characterise life. Most obviously they move (often very actively, in search of food or away from danger). They also obtain food (by feeding on plants or other animals), respire (usually the way a complex animal exchanges gases as part of the process of respiration is observable), sense, excrete and reproduce. Animals do also grow, which in an adult is the process of replacing worn out cells with new ones rather than actually increasing an animal's size, but, as is the case with plants, this is really only measurable rather than visible as it happens gradually over time (see Table 7.1 for further details).
There is a major division of living things into plants and animals	In the early years children will learn that there are two large groups that can be used to classify living things: plants and animals. These are in fact only two of the five kingdoms that many biologists use to classify all living things; the others are fungi, monera (e.g. bacteria) and protoctista (e.g. algae and seaweed).
Feeding relationships are shown as food (energy) transfers	Although children will learn later that plants and animals differ at a cellular level (plant cells are made of a rigid material called cellulose), at a young age it is differences in the way they feed that help children distinguish between the two kingdoms. Plants are able to make their own food; animals either eat plants (herbivores), animals (carnivores) or both (omnivores). Animals can also move to change location, whereas plant movement might involve opening and closing flowers or growth in a particular direction. The feeding relationship between plants and animals can be represented as a food chain or food web that shows the direction of energy transfer from plant to animal. An arrow shows the movement of chemical energy from plant (producer) to animal (primary consumer), and from animal to animal (secondary consumer), e.g. grass → rabbit → fox.

	Simple food chains such as this can be part of a larger food-web which depicts a set of feeding relationships.
Animals can be classified into different groups by their similarities	Animals are divided into two main groups: vertebrates, which have a backbone, and invertebrates, which don't. Vertebrates include: **Fish** – live in water, have gills for gas exchange ('breathing'), have scales, lay eggs.
Living things are found in certain environments because they have features that enable them to survive (adaptation)	**Amphibians** – newts, frogs and toads; adults live on land in damp places and breathe with lungs or though their moist skin; at an earlier stage in their lifecycle tadpoles live in water and have gills; eggs are laid in water. **Reptiles** – lizards, snakes, tortoises; dry, scaly skin, lay eggs in soft shells; dinosaurs are extinct reptiles. **Birds** – lay eggs, have feathers and wings. **Mammals** – humans, bats, whales, dolphins; feed their young milk that is secreted from the mammary gland; most give birth to live young. Animals and plants are adapted to survive and thrive in specific conditions. Adaptation to a particular environment is the result of small differences that occur between individuals. In competition with other individuals of the same species, the one which is best adapted to its environment is more likely to survive and pass on its features to its offspring. An example of animal adaptation is the difference in dentition between carnivores and herbivores. Meat eaters have prominent incisors and canine teeth for killing and tearing apart prey; plant eaters have lots of grinding molars for chewing plants which are hard to digest.
Different parts of animals have different functions	Younger children will become familiar with the names of external body parts. Later they will learn that the bodies of complex animals are organised into systems made up of specialised tissues and organs. In humans there are seven main systems: **Digestive system**: mouth, teeth, tongue, oesophagus, stomach, intestine, liver, anus. The function of the digestive system is to break food down into smaller and smaller pieces until it is possible for food to pass into the body. Young children will be most aware of the start of this process in the mouth where food is broken down mechanically by teeth and chemically by saliva. They will also be aware of undigested food being expelled from the anus as poo (faeces). **Excretory system**: kidneys, bladder, liver, urethra, skin. Its function is to remove the waste products of metabolism from the body, so poo is not included. However with primary-age children this distinction is not usually made so is included in the study of excretion along with urine (wee). **Circulation system**: blood, heart, blood vessels (veins and arteries). Blood is the main means of transport for materials (oxygen and carbon dioxide, food, waste products) around the body. It is pumped around

the body in vessels by the heart which produces a surge of blood in the arteries each time it beats. Children can feel this as their pulse. Arteries take blood away from the heart, veins takes blood back to it.

Respiratory system: lungs, nose, mouth, trachea (wind pipe). Breathing is only part of the respiration process, but it is the part that children will be aware of. Oxygen is absorbed into the blood stream in the lungs as a result of breathing. The oxygen is involved in the chemical process known as respiration that releases chemical energy from food for movement and other life processes. It can be represented by the equation:

glucose + oxygen → carbon dioxide + water + energy

Carbon dioxide is a waste product of this process, and is expelled by the lungs.

Nervous system: nerves, sense organs (eye, ear, tongue, nose, skin), brain. This is the system that enables different parts of the body to communicate with each other. Information from sense organs is received by the brain. It controls the body's response to this information, maybe sending nerve impulses to muscles to control their movement. We are able to consciously control some responses (e.g. running) but some actions are involuntary (e.g. pumping of the heart, or reflex actions).

Skeletal system: bones, muscles, tendons. Our skeleton protects vital organs (e.g. the rib cage protects the heart and lungs) and enables us to move (muscles pull on bones which move about joints). Muscles are only able to contract, not lengthen, so operate in pairs pulling in opposite directions (e.g. biceps and triceps in the upper arm).

Reproductive system: testes and penis (males), ovaries, uterus and vagina (females). Younger children will learn the biological name for external reproductive organs and be aware that humans along with other animals reproduce – that is form new individuals. Later they will learn about the process of reproduction in humans – that it is sexual, that it involves the female egg being fertilised by the male sperm and that bringing the two together is achieved by sexual intercourse.

Some animals reproduce asexually so that offspring arise from a single parent. Asexual reproduction of animals does (rarely) occur in nature. Examples include starfish and sea anemones. In the laboratory there is the famous example of Dolly the sheep who was cloned artificially from and was genetically identical to the adult sheep whose DNA was used in the process.

There are examples from nature of animals that are capable of changing sex - for example clownfish are born with an ability to do this in certain circumstances. If the female dies in a group of clownfish consisting of her and several males one of the males will change sex and become a female because the clownfish has both ovarian and testicular tissue.

Staying healthy involves eating a balanced diet, exercise and sleep	A balanced diet includes: **Carbohydrates** (bread, rice, pasta, potatoes, sugar) for energy. **Proteins** (beans, meat, fish, milk) for growth and repair. **Fats** (oils, butter), small amounts are required for correct functioning of nerves. **Vitamins and minerals** for specific functions, e.g. vitamin C for preventing scurvy, a skin disease. **Water**, required for all chemical processes that take place in the body. **Exercise** improves the strength of muscles, including the heart muscle and muscles associated with breathing. It can contribute to reducing obesity.
Medicines are drugs we take to help our body work	The focus in Early Years is on drugs that are helpful to the body (medicines). Later children will learn that some drugs can be harmful, and that some of these are illegal. Different drugs act at different sites in the body. For example, asthma medicines reduce inflammation in the airways of the respiratory system enabling sufferers to breathe more easily.

Early Years activities that develop children's understanding of animals support their development towards the big ideas in science that *organisms are made up of cells, organisms require a supply of energy and other materials and that organisms are in competition for them, genetic information is passed from one generation to the next.*

Sources to develop background subject knowledge further:

Collier, C., Davies, D., Howe, A. and McMahon, K. (2011) *The Primary Science and Technology Encyclopedia*. London: David Fulton.

Harlen, W. (ed) (2010) *Principles and Big Ideas of Science Education*. Hatfield: ASE.

Howe, A., Collier, C., McMahon, Earle, S. and Davies D. (2017) *Science 5–11: A Guide for Teachers*, 3rd edn. London: David Fulton (Chapters 2.1 and 2.3).

Peacock, G., Sharp, J., Johnsey, R. and Wright, D. (2012) *Primary Science: Knowledge and Understanding (Achieving QTS Series)*, 6th edn. Exeter: Learning Matters (Chapter 3).

Wenham, M. and Ovens, P. (2010) *Understanding Primary Science*, 3rd edn. London: Sage (Chapters 2, 3 and 5).

Early Years themes and contexts for learning

There are many opportunities for outdoor learning about animals; different habitats can be visited and explored. Many teachers begin the year with a theme that focuses on 'ourselves' as part of getting to know children and helping them feel that they themselves are at the centre of their learning. Themes of growth and change are often linked with transitions between stages of education to help support children with the emotional and cognitive challenges this can present. A place or theme that is revisited at different times during the year would offer new possibilities depending on the season.

Learning science can, and perhaps should, be about taking action and participating in making changes for the better. Projects could focus on ways to protect or improve the environment in the local community or to help children look after their own health. School grounds can be developed to offer a range of habitats and micro-habitats by making smaller scales changes such as a 'minibeast hotel', or a larger project such as a pond. Children might think about how they could use a local play area differently to help them stay fit and healthy. The broad Early Years themes explored below – ourselves, minibeasts, water and Spring – have been chosen to cover a range of concepts and approaches to learning.

Ourselves

Young children enjoy exploring their senses – what they can see, smell, taste, hear and touch – and this offers rich opportunities to develop descriptive language as they find out what their bodies can do. Taking part in cutting up fruit and vegetables for snacks can also be a regular part of the daily routine in food preparation; the range of fruit and vegetables offered could be varied and extended. What do children like and dislike about the flavours and textures of the food? There are clear links here with the food strand of design and technology as well as the science of senses. The exploration can begin in an informal way, such as playing with a range of musical instruments with practitioner interventions to suggest how children could make comparisons. Which sound is louder? Which sound is softer? How could you change the sound? What else might make a similar sound? Providing mirrors can help children to look at their eyes, ears, noses and tongues more closely, notice different parts and wonder what they are for.

Games and songs such as 'Heads, Shoulders, Knees and Toes', and 'Put Your Finger on Your Nose' can help children name the different external body parts. Still focusing on visible, external features, children could compare handprints and footprints with each other, or perhaps measure their height and find out how that compares with some other animals. How many 'Tobys' long is a crocodile? To develop comparison and measurement children could try picking things up with their feet or hands. Which hand is best? How can you prove it? Why might fingers be better than toes at picking up Lego bricks?

Invite children to draw around themselves (each other) and label the body parts they can see. Will you expect children to include genitals and breasts or will everyone pretend these don't exist? The naming of parts of our bodies can contribute to health and well-being. The non-statutory guidance for Year 1 recommends that: 'Pupils should have plenty of opportunities to learn the names of the main body parts (including head, neck, arms, elbows, legs, knees, face, ears, eyes, hair, mouth, teeth)' (DfE 2013: 149). Does this mean the reproductive organs should not be named? How do we relate this to safeguarding children, which is strengthened if children can use words that everyone understands? Schools and settings will develop their own policies on this issue.

Ask children to think and talk about what is inside their bodies too. Research (Osborne et al. 1992) has shown that young children are aware of their bones, stomach, heart and brain, probably because these are referred to in everyday language and also because they have some sensation of what they do. However, they may be less clear about what these organs look like and where in the body they are. When asked to draw their ideas about where food goes when

we eat it, very few young children have a clear idea about how intestines are tubes from mouth to anus. There are two common ideas: sometimes food goes all over the body, just as it is, so a whole fish finger could end up in their forearm, sometimes food just sits in a bag (the stomach). Without an understanding that food is broken down into smaller bits and used as building blocks, rather like Lego, it is hard for children to move beyond these ideas and some will not be ready for these more abstract ideas until later.

Considering our bodies and what they do also means thinking about how we look after them. A visit from a doctor, nurse or dentist would provide stimulation for a role play in an area of the room set up as a clinic. Although children may be able to talk about the importance of exercise for good health, they often do so in adult terms – exercise means being on an exercise bike, or lifting weights. Asking them to notice what happens in their bodies when they are skipping or playing chase might help extend their ideas. Concerns about the rise in childhood obesity in the UK mean that it is important to help children choose to eat an appropriate, balanced diet, but practitioners need to be sensitive; food choices go beyond scientific knowledge, and young children do not control the food that is provided in their homes and may have limited choice about the food offered. Culture and identity play a role in the diets people have as do the wealth and income of families. What we can do is offer children experiences of a wide range of foods and flavours and encourage them to enjoy good food.

Minibeasts

Children find animals very interesting. Early Years practitioners would not be surprised by the outcome of an investigation that showed toddlers were more engaged by living animals than attractive toy equivalents; they spent significantly more time playing with them (Lobue et al. 2013). This was even true when the animal included a snake and a spider.

The most available wild animals children can study are ‘minibeasts’. This is the name often given to *invertebrates* (animals without backbones) and avoids the less positive sounding term ‘creepy crawlies’ or ‘bugs’. The group ‘minibeasts’ or invertebrates, includes commonly found animals: insects (adults have six legs), worms, slugs, snails, woodlice (14 legs) and spiders (eight legs).

Children can collect and observe, then photograph and draw a wider range of minibeasts in the garden, school grounds or nearby space such as a park. The Woodland Trust has downloadable guides with colour photos to help identify a range of common minibeasts (www.woodlandtrust.org.uk). They also have ‘trump cards’ to help children become more familiar with a range of different animals as they play the game. The Field Studies Council produce cheap, splash-proof identification guides (www.field-studies-council.org). An alternative is to take a camera out to the location the children will be studying and create your own identification guide to match the area. Through drama or dance children could draw on their observations to move like different minibeasts – a grasshopper, an ant or a woodlouse curling into a ball.

The children might think about animals they are not seeing, as well as those they are. For example, there is a concern about the decline in bee populations. An active project might survey minibeasts in a specific area before and after an intervention such as planting flowers that will attract pollinators such as butterflies or bees. This could involve the local community, with

children talking to experts to plan what to plant and asking parents and others what they think of the outcome. A popular project is building a bug hotel. This involves filling a space, which could be as small as a shoe box or a large as a stack of wooden pallets, with sticks, hollow bamboo, bricks with holes in, pieces of bark and anything else the children think that minibeasts might like to live in.

Water

The theme could be as broad as water, or refer to a more specific place: 'the seaside' or 'our pond'. Looking at animals living in water, or nearby, offers a contrasting habitat to compare with minibeasts on land. This may mean planning a visit. Perhaps this would be a good opportunity to ask children what they need in a place to keep them alive and well – food, drink, shelter or warm clothes, and somewhere to go to the loo! The discussion could be developed later to consider what the water animals need to stay alive and where they might find what they need.

An alternative to a wild location might be a zoo or aquarium visit. Garden centres can be a surprisingly good and free source of cold water and tropical fish to look at. Children could imagine themselves living underwater; many will be familiar with the well-researched television programme 'Octonauts' (BBC CBeebies) in which cartoon characters encounter a range of sea creatures and learn about them. Encourage children to contrast animals in different habitats: how do they move, feed and breathe? How do they reproduce? This may not always be as we might expect: male seahorses have babies and Clownfish (like Nemo!) are hermaphrodites.

Most children think of animals as being large, furry, four-legged land mammals (Bell 1981). How do children see animals such as fish, crabs, sea anemones or corals? The research suggests they tend to see them as separate groups rather than subsets of animals. It is worth mentioning at this point that children often do not see humans as animals and this is reinforced by everyday uses of the word such as: 'No animals allowed except guide dogs'.

Is an empty shell found on the beach a living thing? (In case you weren't sure: it isn't.) Research into children's ideas about what makes something 'living' goes back to work by Piaget in the 1920s. Characteristics such as movement, growth, not being 'man-made' or having a face may be used by children as criteria to decide whether something is alive or not (Piaget 1929; Osborne et al. 1992). Instead of rote learning of the list of characteristics of living things (see Tables 7.1 and 8.1) it may be more productive to explore with children what different body parts different animals have and how they contribute to keeping them alive to gradually build a rich body of knowledge about the variety of life in a range of habitats.

Spring!

A good start point for this theme might be to ask: what season is it: Winter or Spring? How do we know? What is changing? Go beyond the usual clichés of chicks and daffodils to what the children can actually observe in the local area. Alternative titles for similar themes might be 'Changes' or 'Growing up'.

To explore lifecycles at first-hand it is possible to keep chickens, though many settings and schools opt to incubate eggs until they hatch and then return the chicks when they are older. This can be made particularly exciting if, like Fen Marshall (formerly head teacher at Hawkesbury Upton Primary School), you take the trouble to source a range of eggs of different sizes and colours. Small amounts of frogspawn can be kept and when the tadpoles emerge they can be fed on blanched lettuce until they have grown into froglets, when they will need to be released, preferably to the place the frogspawn came from. (Look at back at chapter 3 to read about children's talk about the life cycles of the frog.) Visiting a farm to look at and bottle-feed newborn lambs or kids is very popular. Other opportunities for learning about the lives of animals might be learning about how some animals wake from hibernation or looking out for migratory birds (such as swallows, swifts and house martins) when they return from warmer climates where they have spent the Winter. Links can be made with Spring festivals such as Easter with themes of growth and renewal. It is possible to buy cocoons and pupae to hatch out a moth or a butterfly and see the astonishing process of metamorphosis at first-hand.

Research into children's ideas about what happens inside a chicken egg before it hatches reveals a variety of ideas (Russell and Watt 1990). An unusual but intriguing idea a few children have is that there is an 'assembly of compete body parts' – legs, head, body and beak – waiting to be put together. A more common idea is of a complete animal in limbo and waiting to hatch, and the most common was of miniature, but complete animal, gradually increasing in size. It is rare for children under the age of seven to present the idea that the material inside the egg transforms into a structurally refined animal. Perhaps this shouldn't be surprising as to really understand this we need an advanced concept about matter as tiny particles that can be formed into different materials. Consistent with this, children will predict that an egg gets heavier as the animal inside 'grows' rather than understanding that the material is reorganised but not added to. They could be challenged to think about where the new material would come from – how would it get in?

FIGURE 8.1 Bottle-feeding a lamb

Inviting a parent to bring a baby into the room would stimulate children to think about how they have changed since they were babies. Another way of making a link with home is asking them to bring in photographs of themselves as babies or toddlers. Among other changes such as from crawling to walking, babbling to talking, they might talk about changes to what they can eat as they grow teeth. Children's first baby teeth are lost at about the age of six, usually the lower incisors. Different cultures have different stories about what you should do with your baby teeth when they come out and children could share and find out about these. Instead of a tooth fairy many cultures have a 'tooth mouse' and in some Asian countries the custom is to throw the tooth and shout a request for it to be replaced by the tooth of a mouse – a tradition probably based on the fact that, unlike humans, rodents have teeth that continue to grow throughout their lives.

Scientific and technological process skills

Learning about animals will draw on a wide range of process skills: questioning, recording, measuring and drawing conclusions and presenting findings. In this chapter the focus is on the scientific process skills needed to identify and classify animals, undertake fieldwork and develop appropriate attitudes towards living things.

How to catch an animal: techniques and ethical issues

Often the best way to study animals is by observing them as they go about their normal behaviour in their natural habitat, but sometimes it is good to carefully catch them for a closer

look (see Chapter 7 for more on using magnification techniques and close up photos). Children need to be shown how to collect animals carefully and have respect for them and then afterwards return them to where they were found.

Some minibeasts can simply be caught by gently using your hands, or scooping them into a collecting pot. Very small minibeasts, such as ants or flies that could be damaged by fingers, can be picked up using a paintbrush, or a 'pooter' – a small collecting pot with a clever system so the child sucks on one tube and the minibeast is sucked into the pot through a second tube. One way of collecting a range of minibeasts is to place a sheet or upturned light coloured umbrella under a bush and then tap or gently shake the bush so that flies and beetles tumble down where they can be collected. Adults should be a positive role model for the careful handling of minibeasts. One author of this chapter has been practising handling large spiders (as large as Incy Wincy) and not responding like Little Miss Muffet. It gets easier! Animals living in ponds can be caught by sweeping a net through the water; practitioners could suggest skimming the top or taking a deeper sweep, or even scraping some of the muddy bottom to see what different things can be found. Empty ice cream tubs make good containers for children to see what they have found with the white plastic providing enough contrast to see more clearly.

Unless the school keeps animals, perhaps chickens, larger animals will probably be viewed at a distance or on a farm or zoo trip. The ethical issues of keeping animals out of the wild can be debated. Do children think it is okay to keep pets such as hamsters or rabbits? What about a snake, a bird or a lion cub? Invite children to offer their opinion and justify it: 'I think . . . because . . .'. This is also an opportunity to talk about what animals need to keep them alive and well. In the theme of this chapter, as in this area of science, curiosity needs to be balanced with care and respect for living creatures.

Identifying and classifying animals

Having caught an animal, children may want to name it. The National Curriculum for Key Stage 1 (DfE 2013) emphasises that children should know the names of a variety of plants and animal and be able to classify them correctly, that is, according to the current scientific view. If interpreted narrowly, this could become rote learning and limit children's own observations and the connections they make as they make sense of the variety of life around them. But there are reasons for naming and classifying. As they acquire language, young children are very good at learning the names of objects and then applying this label to similar objects. It is a common belief that the child first develops the concept – say of 'butterfly' – then names it, but linguistic research suggests that encoding a concept with a word contributes to its construction. Concept development is promoted by language acquisition (as explored in Chapter 3). Naming an animal as a frog, toad, newt or amphibian is a way of assigning it to a group that has certain common features. Young children tend to focus on obvious observable features of objects to distinguish them and there is a role for adults in helping to draw attention to other significant features to make them 'salient'. In Learning story 8.1 Year 1 teacher Julia Holder helps children refine their criterion for something being alive 'it moves' to something that moves by itself.

As critical practitioners we should also pay attention to what is not named. Children may be able to name different kinds of dogs, or perhaps dinosaurs, but can they name, and therefore distinguish between, different types of butterflies, or perhaps spiders?

Learning story 8.1

Is it alive?

In this short transcript teacher Julia Holder at St Philip's Primary School works with a group of children who have been sorting objects/photos according to whether they are alive or not.

Teacher: Could you tell us, how did you sort yours? How did you sort it?
Child 1: Umm . . . all of these are alive and all of those are not.
Teacher: And all of those . . . including that one there?
Child 1: Yes.
Teacher: Okay. What do you think?
Child 2: They move.
Child 3: So that means it is alive.
Child 2: It being moved. It only has a helped being moved because it's got that tree.
Teacher: You're quite right. But would it move by itself? No. We said, if you listen, we said . . . umm . . . Thomas and Ashley said that we know that these things . . . umm . . . are alive because they move and then we looked at this watch here and we said but hang on, that one moves along, but what did you just say Allie?
Allie: They need batteries to move.
Teacher: They need help to move don't they. Okay. Umm . . . and then, what else did you say Thomas, how do we know that these things are alive? How do we know that they're alive?

Commentary

Here the teacher is eliciting the children's ideas by inviting them to sort a collection in their own way. She explores their understanding by using open-ended and person-centered questions: 'What do you think?', showing that it is the child's idea she want to know. She is not closing down the conversation by moving to the scientific view straightaway, instead she does this by challenging them to think about what makes it move. The idea that something is alive because it moves is a classic alternative idea often held by young children and was evident in the influential Science Processes and Concept Exploration (SPACE) project (Osborne, Wadsworth and Black 1992).

One of the issues in learning about classification is young children's lack of understanding of how groups can be subsets of bigger groups, so the idea that an ant is an insect and an animal is difficult for many to grasp (Bell and Barker 1982). A study (Leach et al. 1992) found that even seven-year-old children, when asked to classify a selection of items (e.g. photos of animals) can do so by finding common features between items in the collection, but the groups may have different status and not be hierarchical. For example, children might group a selection of pictures of animals into these groups: colourful birds, brown birds, things that live in a pond, animals I like and creepy crawlies. The children could be encouraged to use one criterion at a time: first sorting all the animals according to whether they like them or not, then sorting all of them by where they move (land, air, or water). Understanding of classification can be gradually built during children's education through discussion of different examples in different contexts.

UK Curriculum Links

In the Early Years Foundation Stage (EYFS) (DfE 2017: 11) there is an emphasis on health and self-care in the prime area of physical development that relates to science. Children are expected to 'know the importance for good health of physical exercise, and a healthy diet, and talk about ways to keep healthy and safe'.

As part of 'Understanding the world' children should know about similarities and differences between themselves and others, and different places and living things. The document emphasises the role of talk: 'They talk about the features of their own immediate environment and how environments might vary from one another. They make observations of animals and plants and explain why some things occur, and talk about changes' (DfE 2017: 12).

As in all themes, opportunities for playing and exploring in this context are important. There are perhaps particular opportunities for 'creating and thinking critically' as children make their own links between different animals and their habitats to form a broader picture of how living things are similar and different and how they relate to each other.

At Key Stage 1 the English National Curriculum (DfE 2013) requires that children identify and name a variety of common animals across the whole range of groups: birds, fish, amphibians, reptiles, mammals and invertebrates. They should be able to compare them, thinking about the different structures of different animals, although it is not until Key Stage 2 that the formal distinctions between the different groups of animals are required. They should learn about common animals that are carnivores, herbivores and omnivores. This is expected to take place in Year 1, along with naming the parts of the human body and associating them with the different senses.

In Year 2 children are expected to explore and compare the differences between things that are living, dead, and things that have never been alive. Building on their previous studies of particular animals, the focus extends to learning about a range of different the habitats in which different animals live and how the habitats provide for the basic needs of different kinds of animals. The curriculum distinguishes between the major 'habitats', which could be a pond, grassland, ocean, or rainforest and or 'micro-habitats'. The non-statutory guidance describes a micro-habitat as 'a very small habitat, for example for woodlice under stones, logs or leaf litter' (DfE 2013: 151). When studying habitats, the concepts of interdependence of living things (e.g. how a butterfly depends on flowering plants) and simple food chains can be introduced.

Children should be taught that animals, including humans, have offspring that grow into adults. The non-statutory guidance makes it clear that in the science curriculum there is no expectation that children should be learning about sexual reproduction in Key Stage 1:

> The focus at this stage should be on questions that help pupils to recognise growth; they should not be expected to understand how reproduction occurs. The following examples might be used: egg, chick, chicken; egg, caterpillar, pupa, butterfly; spawn, tadpole, frog; lamb, sheep. Growing into adults can include reference to baby, toddler, child, teenager, adult.
>
> (DfE 2013: 153)

Children are expected to find out about what animals, including humans, need in order to survive; the basic physical requirements for water, food and air. This link with health education is further strengthened by the expectation that children learn about the importance of diet, exercise, and hygiene.

In Wales there are a number of key areas and experiences that could be planned for in the area of 'Myself and other living things', part of the Knowledge and Understanding of the World strand of the curriculum (DES, 2015). These include pupils: comparing and talking about the visible similarities between themselves and other children; observing and making comparisons between humans and other animals; discovering that animals, including humans, move, need food and water, as well as grow and reproduce, and; using their senses to discriminate between different sounds, tastes, smells, textures, as well as recognizing visual differences.

The Northern Irish Curriculum (CCEA, 2007) emphasizes the interdependence of all living things and 'the need to respect and care for themselves, other people, plants, animals and the environment;' (Foundation Stage) and this includes making links with geography: 'how people's actions can affect plants, animals and places (Key Stage 1, Geography)'. The theme of movement of humans and other animals is important, offering opportunities to compare how different animals, walk, crawl, slither, swim and fly! Teachers might ask children about why they might need to move, and so further develop children's understanding of 'the basic needs of animals and plants for survival (Key Stage 1, Science & Technology).

In Scotland, the curriculum benchmarks (Education Scotland, 2017) also emphasise interdependence and care for the environment: 'Describes characteristics of livings things and how they depend on each other, for example, animals which depend on plants for food' (Education Scotland 2017: 8). Children are encouraged to use their senses to describe the world around them and to identify specific parts of the body related to each of the senses (p10).

Story books

In Table 8.2 there are some suggestions for story books and how they could be used as start points for children's learning about animals and human health.

It is worth noting that non-fiction texts can also play an important role in children's learning about animals. Ganea et al. (2011) demonstrated that young children were able to apply information about camouflage that they had read in information picture books to a new context that was presented and, importantly, also to real animals they encountered.

ICT links

By looking at photographs of different animals children can compare their features. Video offers the possibility of recording animals in action: moving and feeding and often provide more information about the habitat than a still photograph. Children can do their own Internet

research using images alone to answer intriguing questions that adults may not be able to answer. Do crabs lay eggs or just have baby crabs? How does a spider make its web? The organisation 'Arkive' (www.arkive.org) has collected a wide range of photographs and video clips of animals with further text providing more information about each animal so it can be used at many levels. But children can also take their own photographs and make their own movies. This could capture unexpected animal events. Alternatively children could be given a camera to record a systematic survey: Where can we find spiders' webs? What do the habitats have in common? What is different about them?

Still photographs of animals taken by children could become characters in animation packages such as Puppet Pals HD, an easy to use 'app' in which children can move, grow, shrink and flip images to bring them to life against a background while adding sound. Possibilities might include turning a food chain or lifecycle into a story, or perhaps showing an animal checking out different habitats until it find the one that suits it best.

The Internet could be used as a source of information about the human body, but practitioners need to make sure children are not accessing age inappropriate or unsafe websites. We also all need to be wary of using websites with misleading or unsubstantiated information, particularly about health as many, many people and organisations claim health benefits for products or foods for which there is no good evidence. More reliable sites are those that offer government-backed health advice, or the websites of publicly accountable organisations such as the BBC.

TABLE 8.2 Story books as starting points for children's learning about animals and human health

Book and author	How it could be used
'Sharing a Shell' (Julia Donaldson)	This book about the symbiotic relationship between a hermit crab, anemone and bristle worm could be a start point for creating a 'rock pool' for small world play in nursery settings.
Tadpole's Promise (Jeanne Willis, Tony Ross)	Tadpole's promise to his caterpillar love is that he will never change. Be prepared for what happens when both do indeed transform.
'Once There Were Giants' (Martin Waddell)	This is a warm, poignant book about changes for different generations of a family as a child and those around her grow older.
'Run Little Mouse Run' (Shirley Isherwood)	This picture book with plenty of tension (and a happy ending) would be a good way of introducing ideas about predators and prey and which habitats might be safest for the prey.
'The Very Hungry Caterpillar' (Eric Carle)	This popular book is often used to introduce the topic of life cycles. But help the children to check the information against other sources. Beyond the more obvious questions: Do caterpillars really eat pickles and wear boots, they might

	find out: Which pair of butterflies wings is the larger – the top or the bottom? Or, what is the difference between a cocoon and a pupa?
'Dr Dog' (Babette Cole)	As Dr Dog warns: 'Never scratch your bum and suck your thumb'. This funny book would be a great introduction to a discussion about what we can do to keep healthy.
'One World' (Michael Foreman)	This story of two children exploring a rock pool could be used before or after a visit to a real rock pool. The children think about how they can protect habitats of the world as they have looked after their rock pool and this could provoke thinking together about how wild animals should be treated and natural environments protected.
'One Tiny Turtle' (Nicola Davies)	This book, which is part narrative, part information text, introduces the lifecycle of the endangered loggerhead turtle. It explores what we don't know as well as what we do know, offering possibilities for imagining what is happening to the turtles in the time they are out at sea and not seen by humans.
'Whale' (Nicola Davies)	In this book Nicola Davies explores how everything about a blue whale comes back to just how very big it is!
My First Book of Garden Birds - Identifying and naming animals (RSPB)	This isn't actually a storybook, but it is an innovative form of non-fiction that could be read with a class instead of a story. Children are enticed in with part of a drawing of bird and some clues that help to focus attention on features of the bird. The bird's identity and more information is then revealed.

Learning story 8.2

Animals inside and outside the classroom

Many of the children in the Reception class of teacher John Paul Sharman had very little direct experience of animals. With the support of his teacher-mentor, John Paul planned a range of activities to introduce children to a range of animals. He was careful to check school policies, LEA guidance and legal issues before beginning. He sent a letter to all parents asking for information regarding children's known allergies. He was also careful to find out whether animal bedding or feed (for example, that containing nuts) might cause allergic reaction. At the same time he asked parents if they could help in any way with the topic of 'animals'.

The topic began gently with James bringing in his rabbit from home. James was able to talk to the class about how he cared for the pet, its need for exercise, handling (to keep it good natured) and feeding. In this way the class began to think about the needs of living things. When another pet made a visit to school, four-and-a-half-year-old Kim astounded the class and the teacher by demonstrating her expertise in the care of poodles, since her mother was a dog breeder. She explained to her peers how she 'groomed' the poodles by shampooing, 'clipping around the muzzle' and brushing their coats.

For two weeks the class hosted a colony of African land snails. The children were taught how to care for these amazing molluscs – they need regular spraying with water mist and enjoy a diet of fresh cucumber. Because the snails are very large, the children could clearly see the way they 'rasped' their way through the cucumber and how they moved on ripples of their 'foot' as they travelled up the glass side of their tank. The children made links to other experiences with snails and slugs, realising why their parents needed to keep them away from their precious garden plants.

The death of animals was a significant part of the project. One child was hoping to bring his pet dog in to share with the class, but it fell ill and died during the term. Children discussed such losses openly; they shared experiences about burying dead pets and where they had 'gone', although John Paul noticed children often talked about dead pets in the present tense and seemed to think a replacement pet was the original pet in a new guise. He felt that the discussions helped children begin to understand death and bereavement.

The next visitor to school was a horse although John Paul kept clear due to an allergy. Discussions about the care for this animal provided a good opportunity for the children to think about similarities and differences; both the horse and the snails enjoyed apples, while the differences were easier to identify. An education officer, Vicki Thomas, from the Royal Society for the Prevention of Cruelty to Animals (RSPCA), was the next visitor to the class. She did not bring any animals with her, as the RSPCA have a policy of advising teachers not to keep animals in school. During the workshop she encouraged them to think about the needs that all pets have: food, clean water, exercise, a safe and comfortable place to live and sleep, grooming to keep them healthy and 'love' (i.e. freedom from injury, fear and stress, and the opportunity to behave naturally) for all their lives. The teacher used this framework of six needs in future weeks when the children encountered other more unusual creatures. Having a visitor in class also gave the children opportunity to practise listening, raising questions and responding to a different adult in a change of routine – all aspects of 'stepping stones' to Early Learning Goals in this area.

Social development also featured in a trip to Bristol Zoo; again children were having to adapt to a new situation in a different environment. At the zoo the education officer was rather taken aback by the level of knowledge the children already had about the care of animals. For example, the children were shown a cage with a rat inside but otherwise empty. They were able quickly to identify what the zoo should provide in order to care for it properly. The children were then introduced to a python and some hissing cockroaches. They heard about the need for animals to have appropriate and varied diets and careful handling (e.g. always to stroke a python with the back of the hand to avoid transferring sweat and salts to its skin) before seeing the rest of the zoo.

John Paul concluded the topic with an 'empathy session'. Children took it in turns to be an animal. The others then asked the child how they would feel if they were hit, or mistreated, or not fed. This helped the children think back to all they had learned about caring for animals and apply it to this situation.

Commentary

This delightful learning story shows how, with a considerable amount of planning and thought, children's scientific experiences of living things can be enriched enormously during the Foundation Stage. The work described above addressed many aspects of personal, social and emotional development, including those related to dispositions and attitudes, behaviour, self-control and self-care. It also shows that the local community and children themselves can contribute towards this learning. John Paul acknowledges that the topic would not have been half as successful without the parents' support.

Learning story 8.3

Mole holes

Making models of animals and animal homes helps children to draw on and develop their knowledge of animal structure, their usual habitat and even their diet.

As part of their topic 'Under the ground', children at Westleigh Infants School made model animals and habitats for them. In Figure 8.3 you can see a mole made out of air-drying clay with the key features of the animal – it is blind, but has a long nose for smelling, it has big feet, claws for digging and a short tail. An empty box has been painted to represent the underground tunnel and a model stag beetle and other small insects that the mole will eat are there too. The information used came from books that were available in the classroom and from verbal support by the teacher as the children worked.

The child who made this model took her research on moles into the field – or rather her granny's garden, where she took a long stick and poked it systematically into each of the many mole hills, moving the stick around to find the direction the tunnel went off in and then pushing it in as far as it would go. Each time she looked carefully at the stick to see how far it went in (about 50cm on most occasions), once noticing that she was moving the grass a short distance away as that tunnel was very shallow. Finally she concluded: 'That means they don't go as far down as the lava'.

FIGURE 8.2 Home for a mole

Learning story 8.4 *Fantastic Plastics?*

EYFS children took part in a whole school project on the impact of plastic on the natural environment at Beacon Rise Primary School in Bristol. EYFS leader Cat Powell collaborated with the school science subject leader Garreth Rhodes and academics at Bath Spa University to develop activities that would explore and develop children's understanding of the impact of plastics on the natural world. For the

youngest children in the school this began by asking the children what they already knew about plastics in the sea. The children's spoken ideas were written on sticky notes and these ideas formed the first pages of a floor book that was continued throughout the project (see chapter 5 for more on floor books). It was striking that most of the children already had ideas about the dangers of plastics to animals. Some talked about fish eating the plastic and getting sick, some talked about turtles getting stuck in it so they can't swim.

The problems caused by single use plastics were explained and the children were shown video clips of what happens if they aren't recycled; the plastic ends up accumulating in the oceans where they the impact on the lives of a diverse range of animals including fish, seahorses and turtles. The children were asked to think about how animals in the ocean might eat the plastic and then themselves get eaten by other animals and ultimately eaten by humans. To help bring the issue closer to the children's first-hand experience they were asked to collect plastic drinking straws that they had used. After 5 weeks of the whole school keeping the straws from break and lunchtime drinks a huge pile had been collected! Cat put these in the waterplay tray where the children could feel at first-hand how they moved and could role play animals moving through the mass of plastic straws.

The project elicited strong emotions: sadness, anger, disgust. Cat and Garreth decided that it was important that the children shouldn't be left feeling powerless to help the animals they had become so concerned about. As well as learning about the environment, the project was designed to help the children take action in their own lives and in their immediate community. The children talked with the adults about what could be done. Most children had clear ideas about the need to put plastics in a recycling bin, to help stop them getting into the oceans, but the school wanted to go beyond the familiar 3 Rs: Reduce, Reuse, Recycle, with a fourth R too - Refuse!

These ideas were reflected in the children's ideas captured on sticky notes after the interventions; as well as comments about not throwing rubbish in the sea, some of the children were saying we should tell shops to stop making plastics and tell adults to stop buying it. Posters designed by the children to share their learning and messages with others were displayed as part of a fabulous whole school event for parents. The project is being taken forward and in the next term the children will go to beach to see for themselves what plastics they can find there. Cat has plans for an art work made from all the straws.

FIGURE 8.3 'We can clean up plastic all over the world'

Learning story 8.5 What do Tadpoles like to eat?

Although much work on animals is observational sometimes there are opportunities for experimental work too. In this learning story we revisit the teacher, children and tadpoles in the Early years classroom that were introduced in chapter 3. At Dulwich Prep teacher Ruth Burtonshaw set up an experiment with the children to find out which food the tadpoles most enjoyed eating. Together they decided to give the tadpoles, steak, ham and lettuce. The three pieces of food were suspended into the tank with string and the children watched and then recorded the results. (The children have been given pseudonyms.)

Teacher: So you've all made a prediction, can you explain what that is?
Michael: Guessing, but it's not just guess it's better guess
Teacher: Ok let's put the food in the tank
Sean: I hope they like the ham
Teacher: Or the lettuce, if you eat lettuce what type of animal are you
Sean: A vegetarian
T: Why is the lettuce floating?
Harry: it's light
Rory: It has lots of float stuff
Tim: It's got lots of gas
Teacher: Let's watch, we need to be quiet
Teacher: Why aren't they eating?
Elliot: Maybe they don't like it, or can't see it
Harry: They liked ham before
Sean: They've eaten too much ham
Tim: oh… look that tadpole is eating the steak
Jordan: They think it's yummy
Elliot: I thought the lettuce would be good because it's like the weed
Sean: That was the other stage when the don't have any legs

The teacher then drew the children's attention back to what was happening in the tank:

FIGURE 8.5 Tadpoles like steak!

Teacher: Look (pointing to food), they're eating it, which is the most popular?
Sean: The ham and the steak
Teacher: Are they carnivores or herbivores?
Elliot: Herbivores
Sean: Its vegetarian, meat and vegetarian
Teacher: That's a thought

The teacher went on to suggest that they count the tadpoles. The children counted the number of tadpoles at the steak, ham and lettuce at 2 or 3 minute intervals and made a table of results.

Harry: We need an answer
Teacher: What sum do you need?
Harry: Find the biggest number (he meant in the table)
Elliott: Steak has a 6, ham a 4 and lettuce a zero
Harry: We could add them up
Elliott: 19 and 6 that's 25, and 12 for ham 4 3 3 2 is 12

The children found out that on this occasion the tadpoles liked steak best!

Commentary

What is most striking here is how little this wise teacher says! She has provided a provocation for the children and gives them space to observe and discuss what they have seen. The children are building on their previous experience with the tadpoles and making connections to what they have already learned. Sometime the teacher intervenes to draw their attention back to what is happening in the tank and what they are trying to find out. Later on she moves the enquiry on by suggesting that the children count the tadpoles and helps them to record this.

Summary

Children are fascinated by the other life forms with which humans share this planet. Knowledge of our own bodies is essential for us to make health choices during our lives. In this chapter we explored concepts of what it means to be alive, about different animals, their behaviour and lifecycles and how they are interconnected through food chains and their habitats.

We provided an overview of the curriculum requirements in England and made suggestions for meaningful contexts through which these ideas could be brought to life: ourselves, minibeasts, water and Spring. Research offers insights into some ideas about humans and other animals that children may bring to their learning and we presented case studies of real learning in action that provided further insights into what practitioners can do to support children's learning.

Discussion points

- The ancient Greek philosopher Thales defined living things as anything that can 'move by itself' and later another Greek philosopher Aristotle suggested the definition should be 'can nourish itself'. Are these good definitions of living things?
- What television programmes are children currently watching that involve animals in some way (documentary, cartoons, etc.)? What ideas are they learning from these?
- Is knowing the science of how our bodies work enough to make us have healthy lifestyles? What other factors might be involved?
- How has studying the structure of animals influenced designers and technologists to solve problems and make new products?

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