Children are born science learners and often possess a particular interest in the part of the natural world that is the focus of biology. They learn much about biology long before they encounter formal educators or the requirements of the curriculum and the knowledge assessed by school tests. Children are surrounded by the life sciences, so biology might be considered the most accessible of the science disciplines (Lindemann-Mathies, 2005, 2006, Patrick et al., 2013).

Interviews with 4-year-old children who had just begun formal schooling revealed that these young “scientists” already possessed an understanding that there were organs, bones, heart, and a brain inside a body (Reiss & Tunnicliffe, 2001). Somehow these children learned these things just by paying attention to their environments and listening to everyday comments. Schreck Reis et al. (2014) point out that young children (5–10 years of age) are both sensitive to and interested in living organisms and possess inquiring minds. Often the first word that a young child gives to a new phenomenon, such as something moving in the sky, may then be ascribed by them to anything they see in the sky, until they start learning to differentiate. For instance, one little girl called all birds a “plane” until she began to recognize that birds are different from aircraft. Young children intuitively explore through their senses and notice phenomena – many of which are biological – because of their interest in, and exposure to, animal representations, in particular as portrayed in various forms such as soft toys, books, and perhaps through preschool media on television (Gatt et al., 2007; Tunnicliffe et al., 2008).

This is not to suggest that everything children learn on their own is accurate. For instance, some 4-year-old English-speaking children, when asked to talk about plants, revealed that the word “plant” meant to them only a flower in a garden – not a weed, which was different. Trees and other members of the plant kingdom were referred to with their everyday name, such as “tree” or “bush.” “Grass,” according to these and many other older children interviewed in other projects, is a word synonymous with “lawn” – that is, grass is not a plant. Likewise, it is usual for children in English-speaking countries to equate the word “animal” to mammals and not to all members of the animal kingdom (Bell, 1981; Villabi & Lucas, 1991).

Such depictions may provide only basic views that could be considered scientific and, at the same time, offer biologically inaccurate portrayals due to anthropomorphic features and habits that may, for example, include cupcake-eating caterpillars (Carle, 1970) and talking plants (Tavares, 2013). However, all is not lost. Prokop et al. (2008) discovered that if children looked after pets of any type, they had a better understanding of these animals; and young children in some countries do notice the plants and animals of their surroundings and have reasonably accurate notions about the natural world. In any case, teachers must realize and build upon prior biology knowledge – accurate or not – that children possess.

Given this reality, we should begin our teaching plans for young biology learners with the topics they already know in everyday environments. We should begin instruction with what children know and what interests them. The starting point for science is observation, and that occurs during play, a crucial element in child development. Play is essential for intellectual achievement and emotional well-being. Moreover, play is one of creative thinking (Robson, 2014). Ogborn et al. (1996) argued that science knowledge can be reworked into story-like forms. This is what preschool children do as they investigate and observe biological phenomena and apply their existing understanding in new situations. Consider Josh, who noticed some young frogs with tails in the long grass near a pond. He was concerned because he had watched the tadpoles develop in their pond into these young frogs but associated them solely with living in water. An adult explained that they had left the water but still had to live in moist surroundings. So, applying what he knew, Josh decided to build them a home at the edge of the long grass and made up a story about the frog’s house, which he amply watered once it was constructed from grass and twigs.

Thus, I suggest that we need a paradigm shift in thinking about the curriculum of early biology. Instead of providing a simplified version of advanced knowledge, we need to analyze the big ideas of biology and match these ideas with the observations and interests of these young emergent biologists. This builds on their prior notions and impressions. Adults find it difficult to limit the story in this fashion because we know what comes next. However, we must curb our enthusiasm and even restrict the information we want to convey. We must listen instead to the learners and assist them in incrementally constructing further understanding without overpowering them with information that does not yet fit their conceptual model.

References


Patrick, P., Byrne, J., Tunnicliffe, S.D., Asunta, T., Carvalho, G. S., Havu-Nuutinen, S. et al. (2013). Students (ages 6, 10, and 15 years) in six countries knowledge of animals. *NorDiNa, 9*, 18–32.


SUE DALE TUNNICLIFFE is a Reader in Science Education at University College London, Institute of Education, and an Associate Editor of the *Journal of Biological Education*. She is also the only member of NABT from the UK!

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