

Biology education – progress or retreat?

The RSB is just finishing a year of celebrations, commemorating ten years since its inception. I have been a Fellow of the RSB and its antecedent organisations, the Institute of Biology and the Society of Biology, since 1990 and a biology educator for almost a decade longer, having trained to be a school teacher in 1982-83.

In that time, I have seen biology grow in importance as a discipline and I am proud to be associated with the RSB. Yet I am now less optimistic than I once was about the future of biology and biology education, both in the UK and internationally. There are a number of reasons for this – let me mention four: the biodiversity crisis, climate change, changes in human health and school biology curricula.

As biologists we all know the awful statistics about the current biodiversity crisis (e.g. WWF 2000). Extinction rates are running somewhere between 100 and 1000 times their normal levels. Over the last six hundred million years (since the evolution of multicellular life) there have been five previous mass extinction events: the Ordovician-Silurian extinction, the Late Devonian extinction, the Permian-Triassic extinction, the Triassic-Jurassic extinction and the best known of all, the Cretaceous-Paleogene extinction. We are now in the early stages of what seems likely to be a comparable extinction event, driven entirely by humanity's effects on the environment – particularly, habitat alteration and loss.

As each year succeeds another, the extent of anthropogenic climate change becomes clearer. The real worry is not so much the changes to date – harmful as they are – but the fact that as we increasingly learn of the various positive feedback loops, it becomes clearer and clearer how difficult it will be to keep global warming, sea level rises and ocean acidification within any sort of tolerable limits.

In terms of human health, a growing number of countries have already seen major slow-downs in increases in average life expectancy. Now, not everyone wants to live longer and longer but this crude measure of human health serves as a canary in a coal mine. There are other worrying indicators of poor health, such as the rising levels in many countries of mental illness, and threats to future health, such as the increasing prevalence of microbial antibiotic resistance. And I haven't even mentioned COVID-19 and the long-publicised (though largely ignored) risks of pandemics.

Given all this, how are biology curricula responding? The first thing I note is that there don't seem to have been any recent comparative analyses of school or higher education biology curricula. Such studies would be valuable. In their absence, I'll restrict myself to saying that when I think of the school biology curriculum in my own country, England, it doesn't do an especially good job of addressing the above points. In particular, the state of ecology education for 5-19 year-olds in England is woeful and yet at least two of the three contemporary biological issues identified above – the biodiversity crisis, climate change and changes in human health – require a good grounding in ecology if one is to understand them.

Back in 1996, I remember giving a talk at an enthusiastic celebration of whole organism biology education in the UK entitled 'Lifscience 2000' (Reiss 1998). In my talk I mentioned that I had recently bought a second-hand edition of *The Ladybird Book of the Seashore and Seashore Life* authored by Nancy Scott. This is an excellent book, stuffed full of the best type of natural history. For example, it has an entire double page spread on periwinkles (small marine snails in the family Littorinidae). This not only tells the reader how to distinguish small, rough, common and flat periwinkles, but gives a certain amount of detail about their feeding ecology and reproductive biology and provides an excellent colour drawing which indicates the intraspecific variation in colour and shape one finds in most periwinkle species. Nancy Scott's book was published in 1964 and written for children, probably in the 10-14 year-old range. Nowadays, I suspect most teachers would expect only post-16 students who were specialising in biology to be tackling this level of detail.

But biology courses need to be about more than curriculum content. They need to help learners develop appropriate skills. Traditionally, biology curricula have concentrated on the skills of practical work and have sometimes included a small amount to do with ethical reasoning. I think that nowadays we may need to help students to read and listen more critically. They should not only be able to judge the scientific accuracy of a piece of writing or a speech but also reflect on who is producing the arguments and why. To give some topical examples, we want students to be able to examine media claims about global climate change and vaccine safety and we want them to be able to assess arguments about whether clinical trials should be shortened in the face of a pandemic.

Finally, some questions. Do we want biology courses, in addition to the content they include and the skills they develop, also to shape students' attitudes and behaviours? Do we want student not only to be able to write about the causes of biodiversity loss but also, passionately, to care about this? Do we want them, if they choose to, to support Extinction Rebellion and the actions of campaigners such as Greta Thunberg? I know what my answers are.

References

- Reiss, M. J. 1998. "The Future of Lifscience Education." *School Science Review* 79 (289): 19–24.
- WWF (2020) *Living Planet Report 2020 – Bending the Curve of Biodiversity Loss*. Almond, R. E. A., Grooten M., and Petersen, T. (Eds). Gland, Switzerland: WWF.

Michael J. Reiss

ORCID: 0000-0003-1207-4229