

# Evolving 5-19 Biology

## **Improving Teacher and Student Perceptions of Ecology**



# Importance of ecology in the curriculum

Ecology is the study of organisms, the interactions they have with each other and the environment they live in. Engaging pupils in ecology has never been more important, with a deepening climate crisis and climate anxiety<sup>1</sup> amongst young people. If we want to know how we directly and indirectly affect other living things and the environment they live in, we must first be aware of the organisms that are there and the environment in which they live; only then can we understand how our own interactions can have a detrimental or indeed positive effect. Engaging students in ecology in the curriculum has therefore never been more critical<sup>2</sup>. Ecology provides learners with an opportunity to consider how some of their theoretical biology study relates to the real world and enables them to consider the interplay between many areas of biology.

# Implications for teaching and learning in the sciences

The Royal Society of Biology recommends:

- Curriculum designers: Curricula should provide ample opportunities to engage in ecology, including work undertaken in the field that is beyond Exam requirements.
- Government: increase funding to more deprived areas.
- Schools: Practical work should be purposeful and be used to aid the understanding of the biological world, drawing on RSB's *Evolving 5-19 Biology*<sup>3</sup> and Gatsby's *Good Practical Science*<sup>4</sup>.
- Awarding organisations: Curricula should be constructed to allow students to develop a deep understanding of scientific principles alongside developing ecological skills that will serve them no matter their career path.



# Teaching ecology with conviction and purpose

Ecology brings together many biological concepts and offers a holistic perspective on the environment and the human impact upon it, both positive and negative. Ecology is a fundamental aspect of environmental science and sustainability education, and can open doors to further study and a wide range of careers, including green jobs.

Understanding ecological concepts and having ecological skills can empower young people to understand the impact that humans have on local and global scales and find solutions to reduce damage to ecological systems.

The practical techniques of ecology are integral to learning of ecological concepts rather than stand alone. The Science Education Tracker 2023<sup>5</sup> found that two thirds of students in years 7-13 were interested in issues related to climate change, and one in three were interested in a career that will help to tackle climate change. To inspire the next generation of ecologists, teachers must provide, where possible, immersive and authentic experiences of practical ecology in their local environment.

# Barriers and solutions to teaching ecology

The perception is that teaching ecology, and particularly teaching ecology outside the classroom, is challenging. Teachers may think that they need to know how to identify all the organisms in a habitat, or have a high level of knowledge about many different habitats in order to teach the topic successfully. However, there are many useful resources, tools and apps available that enable teachers to demonstrate to their pupils how they would identify an organism they were unfamiliar with. Many organisations have expert volunteers who are able to visit schools, or accompany school trips to assist with specific subject knowledge.

One important element of an ecology curriculum is fieldwork, giving students the opportunity to observe interactions and measure populations and changes in populations. This presents several barriers, including cost of off-site transport, permission for off-site activities and the risks associated with providing these experiences. Many organisations provide a site risk assessment. It may be a perception that there are no suitable areas on the school site to study ecology practically, or that there are no suitable sites nearby.



## Consider

- when is best to teach ecology topics within the phase of science teaching, including the weather and season for availability of living organisms in their environment for practical work.
- your school area local ecology and finding opportunities to link this to global ecological issues and climate change.
- terrestrial (park land, verges, grassland, meadows, woodland and forests), freshwater (river, lake, ponds) and marine (rocky shores, sandy beaches), urban and rural ecosystems, including those at microscopic levels (moss, leaf litter).

If it is possible, combine field trips with the geography department to make the most of an off-site trip.

## Practical experiences include

- investigating the school/college site e.g. light and shade, trampled and non-trampled to discuss habitat and species differences.
- plan and organise a trip to a local natural site: terrestrial, freshwater or marine.



## Experiences beyond the quadrat and transect

Although quadrats and transects are important tools in ecology, there are many other ecological techniques (often overlapping with Natural History) that provide valuable experiences.

For example, field techniques contrasting two habitats opportunities include:

Quadrat sampling, transects, kick sampling in a stream, pond dipping, tree beating and pooter sampling, sweep net, leaf litter, pitfall traps (capture-mark-release), sampling microorganisms in water, moth trapping, placing camera traps around school grounds, mammal trapping (with supervision), observing lichen and moss, bird watching and recording (visual and song), following fungi trails, and owl pellet dissection (food chains). These experiences can be accompanied with the collection, analysis and presentation of data to aid students in making connections between what they experience and the scientific importance behind it.

## Opportunities to modernise ecology in schools

Advances in technology have generated several helpful digital assistants for school ecology, which also support scientific biological recording programs. Technology should not be used to replace identification skills, but as an avenue to gain the enthusiasm of students. These include apps that support identification of plants and animals.

# About the **Royal Society of Biology**

The Royal Society of Biology (RSB) is a single unified voice for biology: advising government and influencing policy; advancing education and professional development; supporting its members, and engaging and encouraging public interest in the life sciences. The RSB represents a diverse membership of individuals, learned societies and other organisations. Individual members include practising scientists, pupils at all levels, professionals in academia, industry and education, and non-professionals with an interest in biology.

The RSB seeks to support biology education at all levels, and actively engages with education policy through formal consultation responses, convening special interest groups and collaborating and coordinating with other science organisations.

As part of our next steps following publication of *Evolving 5-19 Biology: recommendations and framework for 5-19 biology curricula*, this document forms part of a suite of summaries and further consideration into aspects of the framework, with a view to signposting resources to, and disseminating best practice for teachers who are developing school, curriculum and qualifications policy, evidence-based teaching orders and interdisciplinary areas of study.

[www.rsb.org.uk/curriculum](http://www.rsb.org.uk/curriculum)

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# References

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2. Cooke, J., Araya, Y., Bacon, K.L., Bagniewska, J.M., Batty, L.C., Bishop, T.R., Burns, M., Charalambous, M., Daversa, D.R., Dougherty, L.R. and Dyson, M., (2021). Teaching and learning in ecology: A horizon scan of emerging challenges and solutions. *Oikos*, 130(1), pp.15-28.
3. Evolving 5-19 Biology, Royal Society of Biology (November 2021). Available at [www.rsb.org.uk/images/Evolving\\_5-19\\_Biology.pdf](http://www.rsb.org.uk/images/Evolving_5-19_Biology.pdf)
4. Good Practical Science, The Gatsby Charitable Foundation (September 2017). Available at [www.gatsby.org.uk/education/programmes/support-for-practical-science-in-schools](http://www.gatsby.org.uk/education/programmes/support-for-practical-science-in-schools)
5. Royal Society, Science Education Tracker, 2023 (2024). Available at [royalsociety.org/news-resources/projects/science-education-tracker](http://royalsociety.org/news-resources/projects/science-education-tracker)

## Further reading:

[British Ecological Society](#) offers a teacher summer programme to help teachers improve their ecology teaching, alongside offering fieldwork guides and lesson resources to help planning.

Butterfly Conservation Trust runs the [Big Butterfly Count](#) as a UK-wide survey to count the variety of butterflies and some day-flying moths.

[Field Studies Council](#) provides free resources to implement new ecology teaching ideas for science lessons as well as geography, from primary to post 16. It also offers residential courses and trips for fieldwork opportunities.

The Natural History Museum runs the [Urban Nature Project](#), looking at conserving nature in urban areas, as well as leading the [National Education Nature Park](#)

[Seek](#) is a school friendly version of an amateur and professional identification app called [iNaturalist](#). [Merlin](#) identifies birdsong.

[UK Centre for Ecology and Hydrology](#) regularly updates current citizen science projects, alongside information for free citizen science apps and programmes

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