

Undergraduate education at the University of Oxford Botanic Garden

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Whenever conservation workers meet to discuss progress towards the targets of the Global Strategy for Plant Conservation (GSPC) someone is bound to say that no one is teaching plant identification and classification any longer. I would challenge this on two grounds. Firstly, many UK universities, including Oxford, are teaching systematics and field botany including the use of keys to identify plants. Secondly, I do not believe that more than a handful of people ever get into plant identification at school. Like it or not, most normal people develop their interest in plants after their adolescent hormones have finished looping the loop. Certainly most of us in professional horticulture learnt our first gardening with a parent or grandparent but they taught us how to grow vegetables, not how to distinguish *Euphorbia villosa* from *Euphorbia palustris* (like anyone cared).

However, this does not mean that all is well in the teaching of botany in universities. The thoughts & suggestions detailed in this paper have been accumulated during the past 30 years as both an undergraduate and lecturer.

The first problem is the word “botany”. It is just not a word that most people use; zoology is one thing but botany is quite another. This means that if you want to sell the product you don’t call it botany; Biological Science, Environmental Biology, Conservation Biology, even Geography but not botany. The problem is exacerbated by the fact that botany is not a word used in schools. In fact, plant is not a word used in most secondary schools. Most biology teachers now in UK schools are zoologists or molecular biologists. They are not comfortable teaching any plant science except for photosynthesis. While the antics of ribulose-biphosphate carboxylase are rather important, it is more chemistry than biology. It is now possible for “A” level (pre-university) pupils to avoid plants totally. Even the teaching of genetics avoids mention of Mendel and his peas. There are more references to plants in General Studies where the Convention on Biological Diversity is mentioned.

There are number of things that botanic gardens can do to mitigate the avoidance of plants at schools; either you go into schools or you invite the schools to visit you and in reality you do both. At the Garden we employ a secondary schools education officer in a joint appointment between us and the University Museum of Natural History. The advantage of this is that the teachers see Museum of Natural History and think animals and are therefore not put off from coming. You can offer programmes on conservation, genetics, ecology, evolution or whatever and they come; offer botany & no-one comes. Once the pupils are on the programme then for the first time they are exposed to plants by people who are passionate about plants. Going into schools is also a very easy way to reach a lot of pupils. Many schools teach general studies to all of their 17 & 18 year olds. The advantage of this is that you get to all the pupils including those who are not scientists. Even non-scientists need to know about plants.

The next important stage is to encourage the pupils to apply to study at your university. This takes a lot of time but there is a great deal of competition between universities and no university can assume that they will receive applicants. Open-days are the standard ways of recruiting potential students. University botanic gardens must be involved at this stage with displays and preferably with garden staff. Mock tutorials or classes are a very easy way of engaging with those attending open-days. If at all possible garden staff should be involved in the selection process and interviews.

It is essential that garden staff are involved in the teaching of biology at universities and therefore are on the teaching committee for the course. Garden staff should be involved not only as lecturers and practical demonstrators but also as module coordinators and option organisers. If at all possible the undergraduates should visit the garden in their first week at university. Again this may be the first time that they have been shown how truly wonderful plants are. This is not the time for an explanation of the basis of the Angiosperm Phylogeny Group's Ordinal Classification of the Angiosperms. Instead this is where you show them that plants underpin everything that we do. Show them medical plants, crop plants and any other plants of which they may have heard and lead from this into conservation. This story telling is an extended version of what we do with primary & secondary school groups.

When the undergraduate start their lectures that is the time to start teaching them hard-core plant science like the major groups of land plants, plant reproduction, pollination, seed biology and plant propagation but at every stage you must relate this to a practical issue. The easiest and the best practical issue to choose is plant conservation and especially habitat management. If there are others teaching whole plant biology then encourage them to use the garden and its plants as demonstration material; the zoologists can only show pictures but we can use the real thing.

In the second year our undergraduates can choose three of five options in addition to compulsory modules in Statistics and Evolution & Systematics. The Garden can obviously contribute to the environment/conservation option and the plants option and in some cases to the other options in developmental biology, disease and even the animals course. In the conservation option the Garden runs one of the eight lecture modules and so has total freedom on the content. The syllabus for this is essentially the targets of the GSPC. In addition, the Harcourt Arboretum is used as the venue for a practical demonstration of both *in situ* and *ex situ* conservation techniques and programmes. The beauty of the Garden organising this module is that the conservation work of botanic gardens worldwide can be used as a very positive and productive example of work in progress. We must bang our drum because no one else will. The Garden can also contribute to the teaching of contemporary issues in plant biology such as biodiversity assessments and plant classifications.

By the third and final year we will have lost some of the undergraduates because they only need to do two options. However, they all have to complete a small research project and this has been a very useful way of carrying out research into the conservation biology of our English bluebells at the Arboretum, a species recovery programme for *Euphorbia stygiana* and plant diversity assessments of our woodlands and meadows at the Arboretum. Student projects are a very good source of bright, motivated researchers who are free.

For those continuing with plants into the third year, the first module is a two week field trip to the western end of the Algarve. This is the most wonderful place to teach field biology and we have always been made to feel very welcome by the Portuguese authorities. In the first week the undergraduates learn how to identify plants in the field, to build keys and how to classify plants at species level. In the second week they look at how the plant communities function, particularly

in terms of their reproductive biology. Each evening there is a lecture that either compliments the day's field exercises or previews the following day. The undergraduates always work very hard during this intensive fortnight and the course questionnaires are always very positive. One undergraduate reported that he "had not learnt so much, so quickly & so pleasurably since his first serious girl friend."

Later in the third year the plants undergraduates can take modules in angiosperm systematics and in the morphology of phylogeny of seed plants. These two modules call extensively on the Garden & Arboretum. The latter module consists of eight one-day sessions that builds on and reinforces the skills learnt on the field trip. Meanwhile, the undergraduates who have kept up the environment/conservation option look in more detail at topics such as conservation genetics and the ethics & politics of conservation.

The final chapter in this story concerns the fate of the undergraduates; do they go on to pursue a career in conservation? A significant number do. Both the UK and Irish GSPC co-ordinators went through this University. The three previous directors of Kew were also Oxford graduates. Other undergraduates have recently gone on to work in taxonomy and conservation projects abroad. In my experience there is not a lack of appropriately trained graduates if, and only if, you accept that education is now a market place and that we have to work hard to attract students to our courses.

Ten points for including botanic gardens in the education of undergraduates - T15 of the GSPC:

1. Get out into schools to evangelise about plant conservation.
2. Always get involved in open days for sixth-formers.
3. Accept that sixth-formers & teachers can avoid plant biology at school.
4. Get the botanic garden on the course teaching committee.
5. Get the students into the Garden in week 1.
6. In Year 1 open their eyes to the practical use of plant biology.
7. In Year 2 teach them the basic of plant conservation including GSPC focusing on what BGs do worldwide.
8. In Year 3 take them into the field, then bring them into the Garden & Arboretum.
9. Use the garden's work as an example of what individuals can do – don't be modest.
10. It doesn't matter what the course is called so long as it is not botany.