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Title	Learning beyond the classroom - Importance of residential fieldcourses in teaching plant biology
Authors	Doyle Prestwich, Barbara
Publication date	2019
Original Citation	Doyle Prestwich, B. (2019) 'Learning beyond the classroom - Importance of residential fieldcourses in teaching plant biology', Learning Connections 2019: Spaces, People, Practice, University College Cork, Cork, Ireland, 5-6 December, pp. 141-148. doi: 10.33178/LC.2019.28
Type of publication	Conference item
Link to publisher's version	10.33178/LC.2019.28
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Download date	2026-11-15 04:36:31
Item downloaded from	https://hdl.handle.net/10468/10707

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Learning Beyond the Classroom - Importance of Residential Fieldcourses in Teaching Plant Biology

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Introduction

The establishment of physic gardens (gardens particularly focused on plants with medicinal properties) dates back to the middle of the 16th century and generally had strong links with university medical schools (Bennett, 2014). Wyse Jackson in 1999 described botanic gardens as 'institutions holding documented collections of living plants for the purposes of scientific research, conservation, display and education'. In 2014, Bennet described the role of botanic gardens in university education as akin to learning in Paradise. By 2050 it is predicted that almost two thirds of the world's population will live in an urban enviroment. This may have a huge impact on our ability to both experience and understand the natural world. Plants have a massive impact on the earth's environment. This paper focuses on learning beyond the classroom in botanic & physic gardens and in industry settings using the annual Applied Plant Biology fieldcourse as a case study. The Applied Plant Biology residential fieldcourse has been running for the past five years and takes place around Easter each year. I am the coordinator. It is a 5 day residential course for 3rd year Plant Science students. The learning outcomes of the fieldtrip state that; students should be able to discuss recent developments in industrial plant science research (facilitated in part by visits to a multinational (Syngenta) and samller family owed companies (Tozers)); be able to explain worldwide plant conservation approaches and plant biodiversity in the context of different plant ecosystems and anthropogenic environmental impacts through engagement with such centers of excellence as Kew Botanic Gardens in London, Kew's Millenium Seedbank Wakehurst in Sussex and the Chelsea Physic Garden in central London.

Method

A few weeks prior to the Easter fieldcourse, the students attend 6 hours of preparatory lectures in UCC. In addition to relevant scientific information, the students are given key logistical and safety information. The group (staff and students) reside in University accommodation (Royal Holloway in Egham London) for the duration of the trip as this offers a convenient loation to access all sites. From here the group can use public transport or private coach as needed. The working day begins no later than 9 am and finishes on average around 5pm. The students are given the option of a rest period and time for dinner, then the group (staff and students) work for another 1-1.5 hours discussing the

scientific highlights of the day and how the work can be written up for submission (see fig 1). The students have to keep a daily diary of events and they also have to prepare two 1500 word essays on topics directly related to the fieldtrip. The work is submitted on-line at the end of each day (part of the essay topics are prepared in advance of the fieldtrip). As the fieldcourse is close the summer exam period, we insist that all of the work is submitted during the week of the fieldtrip in order to give the students sufficient study time once back in Cork . At each site, students get access to behind the scenes and actively engage with external staff . The preparatory sessions in UCC prior to the trip give the students an excellent insight into each facility/location and allows for the students to fully participate and engage with the staff they meet on site. The feedback from the staff in Kew, Millenium Seedbank, Syngenta, Tozers and Chelsea Physic Garden has been very positive and external staff have been impressed with the level of engagment they experience with many of our students.



Figure 1. Evening discussion of highlights (scientific and other) of the day



Figure 2: Learning beyond the classroom at (a) Kew Botanic Gardens (b) the herbarium



Figure 3. A tour of the Syngenta facilities and a chance to engage with Syngenta staff



Figure 4. Dr Frances Gawlthrop showing the students some of the new varieties produced on site in Tozers

Findings

We have made several key findings in relation to running residential fieldcourses – learning beyond the classroom, many of which incorporate Bloom's taxonomy of learning domains to include knowledge and comprehension from the classroom setting to application, analysis, synthesis and evaluation of the knowledge in a fieldbased learning environment . Amongst the findings I highlight four main ones below:

1. The residential fieldcourse offers a great opportunity for staff and students to interact beyond the formal setting of the classroom and allows for a deeper engagment between all parties on the subject matter. Students and staff have an opportunity to develop a good working relationship and share ideas on wide-ranging topics. Many of the students will take the opportunity to discuss potential final year projects whilst on the trip.
2. By accessing such centers of excellence as Kew Gardens and the Millenium Seedbank, the students gain a deeper understanding of the importance of botanic gardens and seedbanks in conservation, biodiversity and in understanding the environmental impacts of anthropogenic activity. In these settings the students get to think critically about plant biology and its place on a global stage. The site visits give the necessary context to classroom-based learning.
3. By engaging with companies (multinatinational like Syngenta and family owned international companies like Tozers) the students get to experience the commerical side of plant biology and gain an awareness of constraints associated with applied research (Fig 3 and 4). During the course of the company visits, the students gain an understanding of large production facilities and what is involved in quality control and meeting industry standards (fig 3). They also get an insight into the economics of such markets both in and oustide of the EU. Over the past number of years a few of our students have been able to secure summer and longer-term internships with these companies.
4. Over the past number of years of running this fieldcourse, the feedback to us directly and via our external exmainer (who meets the students in 4th year) has been excellent with a huge level of camraderie evidenced within the student group during and after the trip (Fig 5 and 6). This is something that should be encouraged particularly from the student perspective of being able to develop a supportive peer network from both a personal and professional viewpoint.



Figure 5 The students on-site at Kew Gardens (a tour of the Herbarium)

Conclusions

How essential is learning beyond the classroom? Learning beyond the classroom is critical **(fig 6)**. It allows the students to apply the learning from the classroom in a real-world setting. It gives the student learning a context and allows the students to critically evaluate the topic in an applied setting. It gives the students access to other professionals working in their discipline and opens up many possibilitites for them in how they could potentially apply their qualification in Applied Plant Biology. The final critical component of a residential fieldcourse is that it gives the students the time to 'cement' friendships and to develop a network of peers who may offer personal and professional support in future endeavours.



Figure 6. The 2018 3rd year Applied Plant Biology class from UCC

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Acknowledgements: I would like to sincerely thank my colleagues in Plant Science in the School of Biological Earth and Environmental Sciences who teach on this course with me.