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UCC Open Arboretum Project: Trees as a Teaching and Outreach Tool for Environmental and Plant Education

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Introduction

The University College Cork (UCC) Open Arboretum Project aims to re-imagine the original purpose of the University's tree collection – as a teaching tool. The arboretum represents a unique on-campus learning space which has been under-utilised for teaching in recent times. The arboretum has the capacity to engage students, staff and visitors in a tangible way with important global issues (e.g. the climate emergency and biodiversity loss). It is also an opportunity to combat 'plant blindness', i.e. the ambivalence shown to plants in our environment compared to often charismatic animal species.

Wandersee and Schussler (1999) coined the term "plant blindness" to describe the preference for animals rather than plants that they saw in their own biology students. Knapp (2019) has argued that, in fact, humans are less 'plant blind' and more 'everything-but-vertebrates-blind' with school curricula and television programming over-emphasising the role of vertebrates at the expense of other groups of organisms.

Botanic gardens and arboreta have long been used for educational purposes. Sellman and Bogner (2012) have shown that learning about climate change in a botanic garden led to a significant short-term and long-term knowledge gain for high-school students compared to students who learned in a classroom setting. There is also evidence that learning outside as part of a science curriculum results in higher levels of overall motivation in the students and a greater feeling of competency (Dettweiler *et al.*, 2017).

The trees in the UCC collection, like other urban trees also provide a range of benefits outside of the educational sphere. Large, mature trees, with well-developed crowns and large leaf surface area have the capacity to store more carbon than smaller trees. They provide shade as well as food and habitats for animal species as well providing 'symbolic, religious and historic' value in public common spaces. Such benefits have recently been summarised by Cavender and Donnolly (2019) and aligned with Sustainable Development Goal 11, Sustainable Cities and Communities by Turner-Skoff and Cavender (2019).

A stakeholder survey has been conducted to evaluate how the tree collection is currently used and a tour of the most significant trees in the collection has been developed. The tour encourages participants to explore the benefits of plants through many lenses including recreation, medicine and commemoration. The open arboretum project brings learning beyond the classroom and acts as an entry point for learning in a variety of disciplines, not least plant science and environmental education generally.

Method

History of the Arboretum Site

The UCC tree collection has its origins in the Queen's College Cork (QCC) botanic garden which was established by Prof. William Hincks, the first professor of Natural History at Cork, in 1849 (Figure 1). A major extension to the botanic garden was laid out in around 1880-1881 by Prof. Andrew Adams and it was at this point that many of the most important tree specimens were first planted. At that time, the President was Dr W.K. Sullivan who used his friendship with William H. Crawford (of the well-known Cork brewing family) to fund this extension, and the construction of glasshouses on the site. Crawford, himself a keen amateur plantsman, donated numerous specimens to the collection. Cullinane (1988) has extensively reviewed the history of the botanic gardens at UCC.

As early as 1856, the then President of QCC, Robert Kane noted that the gardens, then numbering 1,640 plants, were '*accessible to the students at all College hours and free access was given to the public generally at hours not devoted to class instruction*' (QCC President's Report, 1855-56). Therefore, from its earliest inception the plant collection was in use as a teaching and a public engagement tool.



Figure 1: Quadrangle Building and some of the QCC Botanic Garden (c. 1880). Image: French (c.1880); Colourised by the authors using Colourise.sg

Current Collection

Over time, the systematic botanic garden has been removed due to changing teaching methods in the field of botany and plant science and to facilitate the development of new buildings on the historic campus. Many of the tree specimens have survived in various locations around the old botanic garden site and these are supplemented by specimen trees which were planted in the President's Garden, Lower Grounds and other parts of the campus. The arboretum has been supplemented by regular new

planting over the intervening years under the careful stewardship of the Grounds Staff and Buildings & Estates Office at UCC. The total collection is now distributed over 42 acres with 2,500 trees representing more than 120 different species.

Literature and archival search

A full search of the literature, UCC Archives and UCC curatorial collection is ongoing along with a search of external databases and collections.

Tour Development and Delivery

As part of the Open Arboretum Project, c. 36 species of tree (Table 1) were selected from the collection to form the basis of a UCC Tree Tour. These species were selected based on their scientific, historical and/or cultural importance as well as their geographic location on the ‘main’ campus. The inaugural tour took place on 8th October 2019, during UCC ‘Community Week’ and attracted a capacity audience of 33 participants. These participants signed-up online and were therefore self-selecting. The tour lasted just 60 minutes and was led by two of the three authors.

Table 1 Tree species selected to form the UCC Tree Tour	
COMMON NAME	SCIENTIFIC NAME
Wollemia Pine	<i>Wollemia nobilis</i>
Copper Beech	<i>Fagus sylvatica purpurea</i>
Weeping Willow	<i>Salix babylonica</i>
Monteray Pine	<i>Pinus radiata</i>
Giant Redwood	<i>Sequoia sempervirens giganteum</i>
Horse Chestnut	<i>Aesculus hippocastanum</i>
Lucombe Oak	<i>Quercus lucombeana</i>
London Plane	<i>Platanus x acerifolia</i>
Wing Nut	<i>Pterocarya fraxinifolia</i>
English Oak	<i>Quercus robur</i>
Ceder of Lebanon	<i>Cedrus libani</i>
Strawberry Tree	<i>Arbutus unedo</i>
Sweet Chestnut	<i>Castanea sativa</i>
Bhutan Pine	<i>Pinus wallichiana</i>
Scots Pine	<i>Pinus sylvestrus</i>
Irish Yew	<i>Taxus baccata 'fastigiata'</i>
Black Pine	<i>Pinus nigra</i>
Flowering Cherry	<i>Prunus avium</i>
Katsura Tree of Japan	<i>Cercidiphyllum japonicum</i>
Norway Maple	<i>Acer platanoides</i>
Swamp Cypress	<i>Taxodium distichum</i>
Western Red Cedar	<i>Thuja plicata</i>
Lime	<i>Tilia cordata</i>
Maidenhair tree	<i>Ginkgo biloba</i>
Portugal Laurel	<i>Prunus lusitanica</i>

Sycamore	<i>Acer pseudoplatanus</i>
Tulip Tree	<i>Liriodendron tulipifera</i>
Paper Bark Maple	<i>Acer griseum</i>
Blue Cedar	<i>Cedrus Atlantica glauca</i>
Atlas Cedar	<i>Cedrus atlantica</i>
Monterey Cypress	<i>Cupressus macrocarpa</i>
Common Yew	<i>Taxus Baccata fastigiata</i>
Firethorn	<i>Pyracantha coccinea</i>
Common Beech	<i>Fagus sylvatica</i>
Silver Birch	<i>Betula pendula</i>
Gum Tree	<i>Eucalyptus gunii</i>

Participant and Stakeholder Surveys

Participants on the UCC tree tour were asked to complete a short questionnaire before and after the tour. In addition, a stakeholder survey was distributed electronically to UCC staff, students and interested parties to establish the current use of green space both on and off campus as well as stakeholder's general perception of plants and green space.

Preliminary Findings

The archival and literature search is ongoing and helping to add important context to the historic use of the arboretum as a teaching, outreach and research tool. A search of the library at the Royal Botanic Gardens, Kew located 15 images of the UCC botanic garden and arboretum dating from c. 1914. These images were deposited in the library by Prof. Henry Cummins, Chair of Botany, UCC from 1908 to 1932 (Cummins, 1914). The images represent a window into the tree collection's development at a time period when the collection was not previously thought to have been illustrated by purposely-produced photographs.

Responses from the participants in the UCC Tree Tour indicated that many already had a keen interest in plants and the collection itself. This is to be expected, given the self-selecting nature of the participants but does indicate a challenge of attracting a wider audience to such events. Participants indicated that more such tours should take place in the future and could be even longer in duration to highlight more of the tree species.

The stakeholder survey has just recently been completed but early indications are that respondents are very positive about the tree collection and the value of green spaces, in general, on the UCC campus. Respondents also felt that being 'in nature' had a positive effect on their mental health and overall happiness.

Conclusions

It has been argued that many academics "*know very little of the environments in which they and their students, spend so much time*" (Speake et al., 2013). Thankfully, there is a growing respect and awareness with regard to the value of green spaces as learning environments in themselves rather than just the aesthetically-pleasing backdrop in front of which learning takes place.

As part of the UCC Open Arboretum Project, the use of the tree collection and associated spaces as a living classroom is being assessed and encouraged. Already, there has been a positive response to initiatives run as part of the project (e.g. tree tour, urban tree workshop). There are opportunities to engage primary-level students and other groups with the tree collection and to raise awareness about major challenges such as biodiversity loss, climate change, etc. and to combat plant blindness (Speake et al., 2013). These opportunities will be explored during the lifetime of the project.

The capacity of trees to increase a student's ability to succeed in education (at all levels) has been summarised by Turner-Skoff and Cavender (2019) and include:

- Improved student performance
- Reduced levels of stress
- Increased concentration
- Reduced symptoms of ADD/ADHD
- Increased attention
- Increased self-discipline

This current project will build upon these known benefits of learning in the presence of trees to demonstrate the importance of tree planting not just in UCC but in other educational institutions at primary, secondary and third-level, as well as in other urban settings.

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