13

Imparting basic plant recognition and identification skills - challenges, resources, practicalities

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Introduction

Establishment of comprehensive plant knowledge is identified as one of the major ambitions of the newly established four-year study programme *Have- & Parkingeniør*, Urban Landscape Engineer. From the very start of the programme, the students are supposed to steadily increase their knowledge of and about plants. The course I am teaching (Plants and Climate in Urban Areas, 15 ECTS) is one of the main courses to actively pursue this goal. However, building comprehensive plant knowledge is time consuming and requires substantial independent student activity.

The first challenge in this process is to recognize and identify plants correctly, using and mastering the international botanical nomenclature instead of (or in combination with) Danish common names (Virtanen & Rikkinen 2010). The majority of the students have no previous knowledge of Latin or Greek, therefore the botanical nomenclature is for them a new language to learn. As with all new languages, pronunciation and orthography are challenges for the students, too.

There are different resources for teaching and learning plant identification and recognition, ranging from a broad variety of books, catalogues and other literature to interactive homepages and software.

In addition, plant collections have a long tradition in botanical education at university level, but in recent years have been subjected to severe budget cuts. In 2011, Forest and Landscape Denmark established a new, very practically oriented collection called the Urban Tree Arboretum

(UTA). This arboretum contains many of the relevant species and cultivars and is supposedly a valuable educational tool for our students.

However, it is my impression as a teacher that the students obtain little new knowledge during the traditional excursion to the UTA or other plant collections. Although the students are highly motivated and seem to listen attentively to the guide, the next classroom session reveals that for the majority of the students, no new plants have been learned. Part of the explanation of this experience may already be evident from the description above: the students are merely listening and looking, whereas a deep learning process requires commitment and activity.

Objectives

This project aims to (A) identify challenges and resources regarding teaching and learning plant recognition and identification and (B) evaluate current teaching activities. The knowledge obtained is incorporated into the development of teaching and learning materials in general and into the development of a set of UTA field exercises in particular. Furthermore, the results are supposed to help create a structure for blended learning, where a variety of face-to-face learning situations both in the classroom and in plant collections are blended with independent learning activities designed by the teacher or the students but controlled by the students alone – as described by, among others, (Virtanen & Rikkinen 2010). In the long run this includes the use of electronic resources, both for classroom activities and for independent, self-regulated studies.

Research methodology

All first (HOPI15) and second year students (HOPI14) of the Have- & Parkingeniør study programme were invited to participate in a web-based anonymous questionnaire with nine questions. Of the fourteen available second year students, eight (57 %) answered the questionnaire; of twenty-two available first year students, thirteen (59 %) answered the questionnaire.

The second year students had experienced traditional guided visits of several plant collections during their first year without activating exercises, whereas the first year students were supplied with sets of questions and

tasks or missions during two visits (UTA, the hedge and vine demonstration plantings at SCIENCE Frederiksberg). Plant education was generally provided in a much more structured way for first year students, and plant education is much reduced during the second year of the study program.

Five first year students and two second year students (volunteers) were subsequently interviewed as a group in a semi structured interview in regard to their learning strategies and activities as well as any ideas that might contribute to increase the general learning success. This interview was performed by the author while a second teacher involved in plant teaching took notes.

For the sake of simplicity, answers from first and second year students were pooled (with the exception of the introductory question asking for a self-assessment of own plant identification skills). In the following text, only those results that either had or will have direct consequences for teaching are reported.

In addition, teaching experiences and examples are included where appropriate.

Results and discussion

Challenges and resources – questionnaire, interview and teaching examples

The majority (69 %) of the first year students estimate that they are able recognize many plants by their common names . Only 15 % state that they feel they have obtained sufficient expert knowledge to recognize many plants with the correct botanic nomenclature. None of the first year students admitted they were able to identify only a very few plants.

In contrast, second year students seem to either have lost some of their plant knowledge during their second year of study – or their first year learning outcome was smaller. Here, only 50 % state that they are able to recognize plants by either their common or botanical name, and 25 % stated that they recognize only a very few plants. Various reasons for this difference can be discussed. One obvious reason is that plant identification is not as significant a part of the second year course as it is of the first year. However, another important point is that this cohort of first year students have been subjected to a somewhat restructured plant education.

When asked about the perceived challenges, plant recognition is reported as challenging or very challenging by 54 % of both first and second

year students. Danish names are memorized much easier than botanical names:

No respondents find it very challenging and 23 % find it challenging to remember Danish names, while 48 % find it very challenging and 42 % find it challenging to remember the botanical names.

In addition, 69 % of the students find it challenging or very challenging to pronounce botanical names and 77 % find it challenging or very challenging to write botanical names. This emphasizes the need for working actively with the linguistic aspects, and one approach is to work with translations of the botanic names. This was attempted in 2012 with the first year students in the form of a working document that followed us throughout the course and could be edited by both myself and the students. For every new species we met, we tried to translate its genus or species name from botanical Latin to Danish. During the course, the students became increasingly familiar with botanical names and it was both my clear impression as well as mentioned in the interviews and the course evaluation that it helped greatly to be able to know the meaning of botanical names – one student mentioned specifically that it helped him to remember the plant when he was able to relate its name to a specific feature, a historical person or whatever else might be hidden in a name.

In the questionnaire, 84 % of the students state that a collection of living specimens of relevant species should be in their immediate vicinity (i.e. at Skovskolen, Forest and Landscape College). In the interviews, the students expressed the view that their campus in its current state is too forestry oriented and that it, due to the location of Skovskolen and poor connection to public transport, takes too much effort to visit plant collections in other places (arboreta, Science Campus Frederiksberg). This is emphasized by the fact that many students have the possibility and choose to live on the campus. In my personal opinion this recommendation has to be taken seriously, as it is necessary to make the new students feel at home at the campus at Skovskolen and not just an appendix to the very successful study programme Skov- & Landskabsingeniør, Forest and Landscape Engineering.

76 % express that they depend heavily on repetitions in order to be able to learn to recognize or identify new plant species. This is further elaborated in the free text answers and the interviews, and it not only covers treating the same species repeatedly but also treating it from different angles and in different seasons. Also visits to plant collections should be repeated in order

to be effective: 84 % of the students state that repeated visits are important or very important for their educational effect.

Classroom activities

Surprisingly to me, 61 % of the students stated that they experience classroom activities as efficient in order to learn about plants, and only 8 % stated that they experienced difficulties transferring knowledge obtained in the class to the real world. As a teacher I was under the impression that classroom learning of plant identification was at best second to the real experience and at worst an extremely boring display of vast number of plants. However, it seems that both teacher-based presentations, student-based presentations and exercises with plant material are experienced as rewarding.

This is further supported by free text answers about efficient plant learning methods:

> "Giving and receiving presentations from/to other students."
> "Plant material that has to be identified and added to a scrap book (e.g. as drawing)."
> "Memorizing games with pictures og plants we have to identify."
> "Plants should be a part of every teaching session – short but frequent repetitions."

These findings have contributed to a number of new classroom activities. As an example, the so-called *Plantestafet* has become an inherent part of each course day. For this rather playful approach, one student has to prepare a presentation of a course-relevant species complying with a challenge defined by his predecessor (e.g. the plant should remind you of your mother-in-law or the plant should be beautiful but deadly etc.). This exercise is almost totally self-regulated by the students, i.e. the presenter decides who is to be the next presenter and what challenge he or she has to meet.

In addition, we have designed an exercise with an internet-based application (www.socrative.com), where the students anonymously type the botanical names of plant examples shown simultaneously on a PowerPoint presentation. The typed names can then be displayed as a list, where it is easy sort to out correct and incorrect answers.

This is further supported by a number of small exercises with a duration of between 10 and 30 minutes where the students have to work with plants

via a specific angle, as for example sorting plants according to phenological features (e.g. flowering time) or finding species or cultivars with specific features (e.g. columnar, edible, native). These exercises can, depending on their complexity, be solved individually or in groups, and they are fairly easy to prepare and evaluate. The students state that they experience these exercises as rewarding and enjoyable, and 72 % state that they are efficient plant learning tools.

Visits to plant collections

Plant collections are recognized as efficient resources for plant learning – in earlier studies (Bühler & Kristoffersen 2009, Taraban et al. 2004), but also by the interviewed students. Of the stuents asked, 85 % state that provided they are guided by competent experts, visits to plant collections provide a good or very good basis for learning to identify plants. However, without a guide, only 38 % of the students estimate that visits to plant collections are rewarding in terms of the learning outcome. Another important aspect to the students is the time factor: 62 % state that they need to spend sufficient time in plant collections. In addition to expert guidance, correct labelling of the individual plants is considered an important prerequisite for successful learning.

The most visited plant collection for the students was the UTA (84 %), followed by LIFE's arboretum in Hørsholm (77 %) and LIFE's plant collections at Frederiksberg Campus. Only 23 % stated that they had visited the University Botanical Garden or that they had used the plant collections at Roskilde Teknisk Skole, where parts of their studies are conducted. Whereas the plant collection at Skovskolen (their home campus) has been visited by 92 %, this is by far the poorest and least relevant collection of plants for the *Have- & Parkingeniør* programme – further supporting the need for a relevant plant collection.

The weakness of the traditional guided plant collection tours (similar to what the second year students experienced) might be what could be termed the serial perception of plants, i.e. one plant is viewed after another without establishing any relations between the different observed plants or between the observed plants and other learning activities or the observed plants and real life plant use.

In contrast to this serial perception, a relational approach could trigger deeper learning and increase long term memorization success (Tunnicliff 2001). This relational experience of plant collections could be facilitated

by a set of exercises, by questions, but also, referring to the questionnaire, by giving the students time. A specific example of how to encourage relational perception of a plant collection could be comparing features as for example, leaf morphology or crown habitus between species, or try to elaborate recommendations in regard to plant use. The latter is also mentioned by one of the students in the free text answer to the question about further efficient plant learning methods: "Linking the species with a specific location – e.g. plane trees at Halmtorvet, birch trees at SEB bank. It is easier to remember them and their specific characteristics when I am able to recall them from real situations". The examples of exercises presented in the appendix have been developed focusing on relational perception.

Tunnicliff (2001) points to an aspect often forgotten in factual-based university education. According to her, aesthetic or emotional experiences may contribute significantly to the learning outcome, and it seems that factual memories associated with a state of affection or emotion are much easier to recall. Questionnaire answers also give a hint that aesthetics can trigger learning, as one of the free text answers to the question of efficient learning methods indicates: "Visiting nurseries, in particular when the trees are flowering".

Aesthetic experiences could rather easily be integrated in teaching and learning activities. Examples of how this is encouraged we could mention a photography competition, visits to flowering fruit yards and classroom exercises with flowering species.

Importance of exams

The first students of the described study program were not tested in regard to their skills in plant identification. Instead, each student was assigned to compose four plant descriptions that had to be delivered in print as well as a short PowerPoint presentation. Combined, the plant descriptions would closely match the number of species that we as teachers had defined as the learning goal. It was our assumption that working with plants on this detailed level would trigger deep learning and facilitate learning of the remaining species – helped by the presented work of co-students. However, after completion of the course most students were far from able to recognize and identify any plant species beyond their assignments – and even the assigned species were not thoroughly learnt. In the questionnaire, 38 % of

the students would agree that working in-depth with individual species is a good way to learn plant identification.

Therefore, we redesigned the plant-learning-theme drastically in the following year. Here, the students received a list of 100 plants that we expected them to be able to identify at the end of the course. Shortly before the ordinary exam we scheduled a plant-identification test that had to be passed in order to be allowed to attend the ordinary exam. We provided the students with ideas and examples to design and structure individual learning activities and used classroom time to work on a selection of the 100 species, making it clear that the students were supposed to learn the remaining species on their own. The results were convincing: from day one the students showed great initiative and eagerness and worked individually or in groups with self-developed learning tools such as memory-games, slide shows or index cards.

In order to pass the test, the students were required to correctly identify thirty out of forty randomly chosen plants from the plant list, and out of twenty-four students all but one passed the test with in general good to very good scores.

The students themselves seem to recognize the stimulating effect of the threatening exam – 46 % of the students answered that having to pass an exam increases learning activities. However, 15 % state that an exam obstructs their learning. This was emphasized by some of the students in the interview, who stated that extreme nervousness either prevented them from efficient learning or from recalling information in the exam situation. The interview also suggested that the most nervous students were often students coming from practical careers who had lost familiarity with the exam situation. As this high degree of anxiety was recognized early, we teachers tried our best to create a safe learning environment and to prepare the students for the exam situation, e.g. with mock-exams conducted in a rather playful atmosphere.

Still, the clear impression remains that expecting the students to pass an exam makes them recognize a direct importance or urgency of the respective subject and helps them prioritize their efforts. In the future, plant identification tests will be incorporated in additional courses in order to ensure continuing progression of plant identification skills.

Concluding remarks

This project is by no means concluded. Plant education on the *Have- & Parkingeniør* programme needs to be continuously developed and improved. For this, the questionnaire, the interviews and teaching experiences from the two first years of the study programme provide valuable hints at where to focus.

First of all it is necessary for me as a teacher to continue, increase and develop the use of small (10-30 minutes) classroom exercise units. Those units would serve multiple purposes: The students can work with plants from various angles; they could be opportunities to repeat plants; they can be used to relate to plant visits. All this has been initiated on a small scale but needs to be structured and elaborated. Visits to plant collections are experienced as worthwhile, provided that there is a competent guide, enough time and a set of assignments encouraging the students to actually work with the collection. A focus area for further blending of teaching and learning activities could be promotion of the students self-regulated, individual learning.

The optimal solution would be the establishment of a plant collection on the main campus of the study programme. Due to building activities starting up this scenario is not unrealistic.

Plant identification tests should be incorporated in further relevant courses. The simple version could be a number of online tests that the students have to pass in order to be accepted for the regular course exam.

A Example exercises for visits to plant collections

Træer i vintertilstand Øvelse på bytræarboretet.

1. Beskriv forskelle mellem ***Acer campestre*, *Acer platanoides* og *Acer pseudoplatanus*** i vintertilstand – bemærk især knoppernes udseende:

2. Nævn kendetegn for ***Aesculus hippocastanum***, og giv et bud på om/hvordan *A. hippocastanum* kan skelnes fra *A. carnea* i vintertilstand?

3. ***Fraxinus pennsylvanica*** er et muligt bud på en askeart som er modstandsdygtig overfor asketoptørren. Beskriv ligheder med og forskelle til ***Fraxinus excelsior***. Vurder, om den vil kunne erstatte den almindelige ask i forhold til udtryk og vækstkraft..
    a. Er der forskel mellem *F. excelsior* og *F. ornus*? Beskriv.

4. Beskriv **forskelle mellem lindearterne** – se på habitus (kronearkitektur), vækstkraft og gren- og knopfarve.
   Tilia cordata
   Tilia euchlora
   Tilia platyphyllos

5. Flere arter/kultivarer har noget særligt at byde også i **vintertilstand**. Find arter/kultivarer, som er iøjnefaldende pga:
    a. Grenfarve
    b. Bark (f. eks. struktur eller farve)

6. Find 3 arter/kultivarer du vurderer som specielt egnet til formklipning.
7. Find 3 arter/kultivarer du vurderer som specielt uegnet til formklipning.
8. Find 3 arter/kultivarer, som naturligt danner en smal krone (ikke søjleformer)
9. Find 3 arter/kultivarer, som er særligt vækstkraftige.
10. Find 3 arter/kultivarer, som er mindre vækstkraftige og kunne anvendes i en villahave.

Øvelsesopgave i Bytræarboretet- sommer

Giv forslag til træ (art og klon) for flg. landskabsarkitektoniske situationer:

Lyst og let løvtag over udeservering: ……

Stram allé plantning på kirkegård ……

Løs træræk ke af store træer langs landevej: ……

Højt lægivende træhegn: ……

Løs trægruppe på vejhjørne ……

Stram trægruppe på gadehjørne ……

Stort solitærtræ: ……

Mellem solitærtræ: ……

Lille solitærtræ: ……

Fin stammehæk på gågade: ……

Hver studerende vælger én art/klon for hver situation. Plantevalget diskuteres i studiegrupperne og fremlægges så for de andre.

Hække om vinteren - **Øvelse i hæksystemet, Rolighedsvej 23**

1. Nævn de vintergrønne hækplanter, du kan finde
2. Der demonstreres 3 forskellige arter/kultivarer af *Ligustrum*. Er der forskelle mellem dem? Hvis ja: Giv en kort beskrivelse. Gør det samme for de to arter *Buxus*.
3. Find arter af hækplanter, som er nåletræer, og vurder deres egnethed til formålet.
4. Find 4 arter med torne.
5. Nævn 3 arter, som er velegnet til en meget tæt hæk.
6. Nævn 3 arter, som er bedre egnet til en løst opbygget hæk
7. Blandt de præsenterede planter er der både buske (basitonisk vækst) og træer (akrotonisk vækst). Nævn arter som uden beskæring ville udvikle sig til træer og arter, som ville udvikle sig til buske.
8. Hvilke generelle egenskaber kendetegner en god hækplante?
9. Hæksystemet klippes to gange årligt for at bevare den præcise form. I hvilke tilfælde bør man overveje en uklippet hæk, og hvilke arter egner sig her? Giv nogle forslag.

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