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‘DESIGN FOR NOTICING’ WITH BIODIVERSITY LOGBOOKS

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ABSTRACT

This paper introduces the use of design to improve noticing skills in order to address environmental issues at a variety of physical and temporal scales. We illustrate the application of ‘design for noticing’ through Biodiversity Logbooks – a pilot project intended to reduce ‘plant blindness’ amongst primary school children. Plant blindness is the inability to recognise, appreciate and value plants and it has far reaching social, environmental and economic implications. In this project, we designed pedagogical tools and processes to foster the skills of noticing plants in their environments, and connecting the small-scale of their individual features to large-scale systems.

Biodiversity Logbooks was designed in collaboration with primary school staff. We present initial lessons learnt from our work to support the delivery of specialist content and to create activities that can be embedded in the curriculum for the long term.

INTRODUCTION

Many current ecological threats have been accelerated anthropogenically. Any attempt to overcome or counter these threats requires a transformation in human behaviour and increased appreciation of the interconnectedness between human lives and more than human worlds.

Design activities can play an important role in reframing these relationships. For this project, we developed an approach that we call ‘design for noticing’ for education to support environmental care and pro-environmental action. Biodiversity Logbooks is an exemplar of an ongoing collaboration which uses this ‘design for noticing’ approach to challenge ‘plant blindness’ amongst primary school children, as a step towards greater environmental care. Through this approach, we design tools and processes to notice elements and interconnections within systems (Meadows, 2008, p.16).

This project does so through a set of interdisciplinary educational activities that focus on learning to see and noticing at the small scale of plants and, by looking at differences and similarities in plants and habitats, connecting these observations to the large-scale complexity of the botanical world and its relations to the environment.

Design for noticing is a response to theories about development of attention, interest, nature connection and ethic of care applied in an environmental context. Noticing is a point of intersection in these theories and our ongoing work explores how design can be used to encourage noticing at different scales, to support cross-curricular education about biodiversity.Through the

design of the Biodiversity Logbooks, we sought to explored how 'design for noticing' can contribute to countering plant blindness.

WHAT IS PLANT BLINDNESS?

Plant blindness describes the tendency to overlook plants in everyday life (Balick & Cox, 1996), perceiving them as of lower value than animals (Wandersee and Schussler, 1999) and hence "unworthy of consideration" (1999). It manifests in people's inability to appreciate plant needs or recognise unique plant features, a consequence of which is people's blindness to the importance of plants to human life and the biosphere.

Different causes for plant blindness have been proposed, from a combination of perceptual, cognitive and evolutionary factors that mean plants do not capture human attention as readily as animals (Wandersee and Schussler, 1999; Balas & Momsen, 2014), to a variety of social and cultural reasons. This includes a tendency within research, teacher training, education, publishing and media to give pre-eminence to content about animals over plants (Hershey, 2002).

Plant blindness has far reaching implications across different sectors including environmental sustainability, health and the economy (Krosnick, 2018). This is because the inability to notice, appreciate and value individual plant species has an impact on priorities, decision-making and future planning. Where the importance of varied plant functions is not recognised, biodiversity is undervalued and environmental resilience is lost (Fančovičová and Prokop, 2011; Balding and Williams, 2016; Comeau et al. 2019).

ADDRESSING PLANT BLINDNESS

Education has been recognised as an important means of addressing plant blindness. Various approaches have been proposed, including developing specific courses and materials about plants (Hemmingway et al. 2011) and involving plant mentors (Hemmingway et al. 2011) and experts from botanical gardens (Amprazis & Papadopoulou, 2020).

Many researchers point to the benefits of outdoor education and experiences in combating plant blindness (Fančovičová & Prokop, 2011; Lindemann-Matthies, 2002; Nyberg and Sanders 2014). There are manifold reasons given for endorsing direct engagement with plants including nurturing empathy, emotional connection and skill acquisition (Amprazis & Papadopoulou, 2020; Balding & Williams, 2016; Hershey, 2002)

Place making, and community connection can be key because they give prominence to people's home area which can make the learning more meaningful (Amprazis & Papadopoulou, 2020) and anchor ecological awareness (Frisch at al., 2019).

Several active learning approaches have been advanced for addressing plant blindness such as drawing natural objects, keeping observation diaries, plant-focussed supermarket trips, gardening and nurturing plants (Lindemann-Matthies, 2002; Smith and Avery, 1999).

A multidisciplinary approach incorporating creative dimensions is often favoured because this can reinforce learning and grow empathy for plants. For example, Hecht's work with naturalists shows how their long-term interest in nature grew in tandem with other interests such as photography and drawing (Hecht et al. 2019). The strength and persistence of an interest is often attributed to such "interwoven experiences" (Hecht et al. 2019).

Care, attentiveness and skill nourish one another. Increasing care is associated with increasing perceptual competence and attunement to materials and place (Krzywoszynska, 2016), in other words the skills to care. Skills are a catalyst for interest, and this in turn ignites both attentiveness and skill acquisition.

Accordingly, educational approaches that enable acquisition of skills needed for plant care will help promote attention to plants and potentially interest in plants, especially if tied experientially to other pre-existing interests.

Direct experiences of nature can feed interest and seed connection to nature (Chalwa, 1999; Hecht et al. 2019), especially habitual experiences in local environments. Knowledge that situational interest and nature connection linked to positive environmental behaviour are generally established before twelve years of age has informed the design of the Biodiversity Logbooks project, described below.

DESIGNING PEDAGOGICAL TOOLS FOR NOTICING

The Biodiversity Logbooks project sought to investigate how to design pedagogical tools and processes that could help children notice features in the environment that would otherwise go unseen.

Most of the studies on plant blindness that we reviewed as part of this project identified the lack of meaningful engagement with the environment and of time spent in and with nature as some of the key issues. For this reason, rather than designing a tool for quick and efficient plant identification, we chose to design a toolkit that encouraged slowness and intentionality instead, the centrepiece of which was a kit for making cyanotype impressions from plant samples collected during fieldwork.

One of the oldest photographic techniques adopted by artists and naturalists alike, making a cyanotype involves exposing paper that is treated with a photosensitive chemical solution to the sun. Areas of the paper that are hit by sunlight turn blue, while those that are in the shade remain white. Plant samples placed on photosensitive paper appear as white silhouette on the cyanotype. Exposure times vary greatly, and on cloudy winter days in the North of England (where the team is based) may require up to an hour or so. In addition, in order to clearly display the key features of the plant in the impression it is necessary to observe it closely, understand its structure and arrange it accordingly.

The Biodiversity Logbooks toolkit (Figure 1) includes photosensitive paper to produce cyanotype impressions, a logbook with plant and leaf study sheets to collect and describe the cyanotypes, as well as transparent acrylic to keep the plant samples in place when exposing them to sunlight. As a tool for slow visualisation, it requires time and care spent with samples to produce the cyanotypes, and it supports the development of knowledge of plant features by asking key questions through the plant and leaf study sheets. We expanded the initial logbook design into a set of multidisciplinary activities aimed at yielding perspectives on the scale of an individual plant and wider environment. The activities, which included drawing, mapping, physical computing and picture matching as well as making cyanotypes, were designed to introduce the basic knowledge of plant structures and key vocabulary needed for observing and describing plants, ahead of venturing out in the field. In this paper we reflect on a subset of the activities and their relevance to design for noticing.

Figure 1 The Biodiversity Logbook toolkit

In the autumn of 2020, design researchers working on the Biodiversity Logbooks project were joined by the Headteacher at Ryelands primary school in Lancaster (UK) to discuss and refine the programme, with particular attention to progression of activities. Together, and in collaboration with the team of teachers at the school, we delivered activities to two Year 3 classes involving 44 children aged 7 and 8 years-old.

Because of the restrictions on indoor contact and access to school that were imposed during the covid-19 pandemic, all of the activities except for the fieldtrip were designed for remote delivery to students in their classrooms.

Preliminary activities included learning to look for key plant features and learning the scientific vocabulary to describe common leaf arrangement patterns and leaf structures. We did this through an activity in which students were asked to match botanical illustrations of various plants to the corresponding categories of leaf arrangement and structure. The teachers devised hand gestures to reinforce leaf arrangement patterns. Picture matching was repeated to identify plant family characteristics.

We explained the importance of being able to notice these features (as well as fruits and flowers when present) in order to connect individual plants to the families to which they belong. This allowed us to discuss how individual organisms are part of systems that are characterised by interactions at different scales, and how plants that look very different from each other might share key characteristics and benefit from similar habitats.

The knowledge built through the remote workshops proved valuable when out in the field. During the fieldtrip we visited two areas: a section of a large park and an unmanaged plot wedged between a busy road and railway tracks (Figure 2). The two areas represented two very different environments for plant life. The open ground of the park allowed for plenty of sunlight, but also strong winds and the regular presence of humans and dogs. Tall, woody plants and grasses thriving in exposed areas were prevalent here. By contrast, the roadside area was much more protected from winds and shaded by large trees as well as the nearby railway bridge. Smaller, more fragile plants thrived in this area, alongside shrubs, brambles, nettles, and saplings. Students used the notepads in their kit and the digital

Figure 2 The two locations of the fieldtrip: the park (A) and the roadside area (B)

compasses that we programmed in one of the introductory lessons to map and describe the two habitats.

During the field exploration students were encouraged to collect plant samples, which were brought back to the school. Here, we sat outside and positioned the samples on photosensitive paper to create the cyanotypes and then waited patiently for the sun to create an impression (Figure 3). With the samples kept securely in place by two acrylic boards clipped together, students used the

Figure 3 Exposing the cyanotypes and studying the plants

plant and leaf study boards in their logbook kits to describe their plants and habitats, using the vocabulary and methods learnt during the remote workshops. At the end of the process the research team collected and washed the cyanotypes, while students returned to their classrooms where they were asked to produce a drawing of the plant they have been studying, in as much detail as possible.

As part of the coding and evaluation part of the research process, we collected these drawings and compared them to the base-line drawings made by students at the outset, to see if we could identify any evidence of improved plant noticing skills (Figure 4).

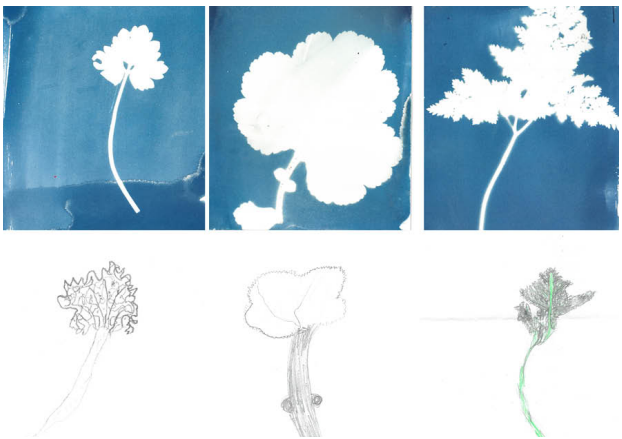

Figure 4 Some of the cyanotypes made by the students and the corresponding drawings

DISCUSSION/REFLECTIONS

These reflections are co-authored by researchers and a headteacher who participated in development and evaluation of this project. It also draws on interview data from four educators involved in delivery of the activities. Although the project comprised multiple activities the reflections will predominantly address cyanotypes, leaf arrangements, drawing and fieldwork in respect of design for noticing and additional insights regarding project delivery and embedding the project into a local, place-based curriculum.

The skill of noticing was recognised by staff to be one of the most important aspects of the project because it is essential for studying nature as well as active, independent learning. Teachers noted that children were using the word ‘notice’ more and were applying it in other parts of the curriculum.

Making cyanotypes proved one of the most popular activities because of the combination of science, beauty, magical sensation and detail. The cyanotypes work with scale in different ways; harnessing different temporalities to encourage careful observation, and directing visual attention toward the precise size of a plant and it outline features, portrayed in silhouette.

Anna Atkins' botanical records collected in the 19th Century illustrate the noticing skills and value inherent in well made cyanotypes. Positioning the sample on the photosensitive paper requires speed and care but observation over an extended period is needed to judge the best moment to fix the exposure. The children loved being able to see detail and used it to reinforce learning about leaf arrangement and structure.

We compared base-line drawings made by children before the activities with those produced after the workshop (see Figure 4). We noticed that some drawings done after the cyanotype activity were less ‘pretty’ but were also less idealised and displayed more detailed representations of plants. The different dimensions of scale involved differentiate this approach from ‘slow design’ (Strauss & Fuad-Luke, 2008).

The illustrations used to teach plant features and families were presented as black and white line drawings at an enlarged scale. Every time they were shown, teachers reinforced the names of plant features using hand shapes to show how a leaf joined a stem. The simplicity helped children to see plant features and details that were hard to see with the naked eye but the fieldwork introduced the nuances and uncertainty of ‘real’ three dimensional plants that don’t necessarily conform to a simplified archetype. The activities were staged to progress from images that isolate the plant from context to ones that situate it in its locale and introduce new learning about aspect, landuse and microclimate. A similar approach was used to start to

introduce the concept of plant families and this has the potential to introduce global connections.

The importance of looking at actual plants was noted by the headteacher who commented that traditional teaching about plants, that relies solely on worksheets, dismisses ambiguity and complexity, and glosses over inconsistencies between the stereotype and the actual plant. It isn't easy to identify plants in the field. It is a skill learnt over time and it is challenging for children to persevere with this unfamiliar and uncelebrated skill. However, research shows that skill, interest and care are interlinked and we saw children's palpable excitement and attention as they began to recognise and name plant features on their fieldtrip. The children were proud of their ability to use technical language that went beyond the requirements of the National Curriculum and teachers reported children teaching their parents.

It is also challenging for teachers to teach in the field if they lack confidence or specialist knowledge. Hence the value of collaborations which introduce these experiences practically, so that teachers learn the detail of the project and gain the confidence to make them their own. Once specialist content feels more familiar staff can bring their own expertise to change the pace of delivery and find ways to embed the activities more comprehensively into the curriculum.

This is an ongoing endeavour. The next steps involve reinforcing current learning and introducing activities that contextualise plant ecology in relation to seasons, climate and human activity. The work to date has shown that design approaches that harness different temporal and physical scales can tune humans into scales at which they can more readily notice more than animal worlds, sewing the seeds for plant care and appreciation. We are now working with Eden Project North which is developing the Morecambe Bay Curriculum, aimed at enriching the UK National Curriculum with a place-based programme of interdisciplinary activities aimed at fostering a stronger connection with the local environment through experiential learning. Our objective is now to work more closely with schools and Eden Project North to design an open, adaptable, long-lasting set of resources based on the original toolkit.

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