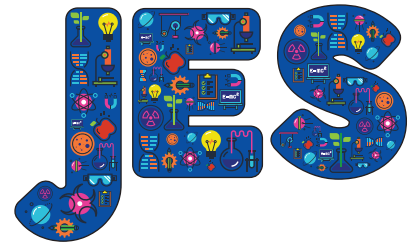


The benefits of outdoor learning on science teaching



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Abstract

A short review of the literature concerning outdoor learning relevant to primary school is provided, followed by some short case studies of work generated by primary school teachers. The aim of this article is to start to marry practice-based work in schools with the wider research base. Here, we look at the impact of outdoor learning on children where English is their second language (EAL); the impact on the curriculum, teachers and children; and how a science trail can support multi-sensory learning.

Introduction

In this new style of paper for the *Journal of Emergent Science*, we are seeking to take teachers' experiences in school, through case studies, action research, etc. and set them in the context of the wider research literature. There is no attempt to make the teachers' contributions definitive (i.e. these are teachers' reflections), but to link themes that emerge from their experiences with known research in the field. In this article, we will focus on the use of the outdoor classroom. There are many benefits of using the outdoor classroom, especially for science lessons, and these have been shown in a range of studies.

Some benefits of outdoor learning that are of importance in the primary school setting include:

1. Making learning a multi-sensory experience (e.g. Gray & Birrell, 2015; Mann & Taylor, 1973; Phillips, 2015);
2. Lending itself to inter-disciplinary studies (e.g. Dillon *et al*, 2005);
3. Recognising and celebrating differing learning styles (e.g. Gardner, 1993);
4. Engaging boys: 'Some boys who are at risk of becoming disaffected at a very young age have shown significant improvements if their learning takes place outside' (Bilton, 2005);
5. Connecting the school to the neighbourhood and the world at large, e.g. citizenship (e.g. Dillon *et al*, 2005);
6. Blurring the boundaries between academic learning and creative play (e.g. Phillips, 2015);
7. The outdoor classroom fosters active, hands-on, inquiry-based learning in a real world setting. Through group problem-solving activities, students embrace the learning *process* as well as seeking final outcomes (e.g. Morgan *et al*, 2016; DeWitt & Hohenstein, 2010);
8. Connections are made experientially with the real world outside the classroom, helping to develop skills, knowledge and understanding in a meaningful context (e.g. Phillips, 2015; Morgan *et al*, 2017);
9. Outdoor environments and surroundings act as a rich stimulus for creative thinking and learning. This affords opportunities for challenge, inquiry, critical thinking and reflection (e.g. Gray & Burrell, 2015);
10. Children and young people are able to understand the relevance of a subject taught in school to everyday life (e.g. Gehris *et al*, 2015);
11. Children and young people can sometimes behave differently outdoors. Quiet pupils may speak more, others become calmer and more focused when outside, especially in a natural space (e.g. Smith, 2015);
12. The multi-sensory experience outdoors helps children and young people to retain knowledge more effectively. There are opportunities for pupils to learn with their whole bodies on a large scale (e.g. Malone & Tranter, 2010);
13. Learning in a less structured environment can provide a different learning experience from that of the classroom (e.g. Dillon *et al*, 2005); &



14. Opportunities to play outside are often particularly beneficial, as most children tend to be less inhibited in their language use in an outdoor environment. Practitioner observations have shown that children commonly make at least five times as many utterances outdoors as they do inside. This has clear implications for ensuring that the potential for outdoor spaces as learning environments is maximised (Dowdell *et al*, 2011).

Case studies

Three Fellows of the PSTT College (Shallcross *et al*, 2015) were asked to reflect on their experiences using the outdoor classroom.

Case Study 1: Reflections on the impact of outdoor learning on EAL students

Our community school has around 420 children on roll and 95% of these have English as an additional language, with the majority being from an Asian

background. 11.5% are SEND (Special Educational Needs and Disabilities) children. Few children have access to gardens or a green space outside of school. There are high levels of social deprivation and a rising number of individuals and families with mental health issues. Our pupils generally have limited life experiences and rarely experience nature and the outdoor world.

When our school roll dropped and we moved from being a 3-form entry to 2, the decision was made to demolish the infant building and build a sports hall. This would provide income for the school, as it could be hired by groups in the community. After its construction, we were left with an L-shaped piece of land approximately 8 feet wide and 100 feet long.

I applied for a grant from Awards for All to construct a wildlife garden. The bid was successful (see Figure 1), and a local Environmental Action Group, including some young offenders, began



Figure 1: Case study 1: part of the outdoor space.



work. The children and staff were consulted about what features the garden should have and submitted drawings and plans. A competition was held for the whole school and wider community and we incorporated some of the features into the completed garden (this approach is noted by Wake, 2015).

Developing spoken language was an area for which I believed the garden would be highly beneficial. Many parents and grandparents spoke little English and so many children entering the school did not have high English language skills.

One of the main aims of the garden was to encourage more parents, particularly mums, to become more involved in school life. Part of the garden included a community herb garden where people could come and pick herbs for cooking. We concentrated on plants that are particularly used in Asian recipes. This helped to create a dialogue between parents (usually mums) and staff and also between parent and child.

The garden has: compost bins, a pond, bird viewing area, bug hotels, a willow dome with seating, and raised beds. Different functional parts of the garden were developed. One part was dedicated to plants that could be used as dyes, such as onion, rhubarb, St John's Wort and camomile. One area focused on bio-mimicry, e.g. burrs (which provided inspiration for Velcro). Slugs were encouraged here, so we could look at the properties of slug slime and compare it with commercial glue. Another area was a medicinal garden, with a range of plants and herbs used historically to treat illness. We grew a range of vegetables and fruit and these were used by the cooking club. We planned for crops that would come to fruition before the end of term.

The garden provided the opportunity to deal with wider issues faced by the school. Children who were experiencing mental health problems found the garden a place where they could be peaceful. This worked too for pupils with behaviour issues, where, for example, digging was a useful task for alleviating frustration. Just being outdoors has an amazing effect on the body. We held a soup competition in January. We first made a batch of soup with children from all year groups using in-season vegetables. Then the recipe was sent home with the challenge to adapt it any way they liked,

but the additions had to be grown in this country (apart from spices). This was a way of introducing economic education to children and their families and also an introduction to monitoring our carbon footprint. We also held a cake competition later in the year. The cakes had to have a vegetable ingredient included in the recipe.

We made a book of the recipes and asked the dental health service to give a talk to parents about reducing sugar. We have one of the highest incidences of tooth decay and childhood diabetes in the country and showing that cakes could be made with reduced sugar was a small step in trying to address these problems.

We ran an after-school gardening club, which was staffed by behaviour support workers and we also held Saturday morning gardening sessions (an hour before the football team met for training, so they could come and 'warm up!'). Parents and ex-pupils also attended these sessions.

Every year in the summer we have a science week. This has had various themes over the years, but we always have a celebration day where parents are invited into school to see what their children have been learning. We always run 'Garden Tours' as part of this day. The pupils who attend gardening club take groups of parents on guided tours explaining about the different areas and plants.

The written work that evolved from this activity was, for the majority of children, of a much higher standard than that previously produced. Children who found speaking in class difficult discovered their voices outdoors. Natural links between subjects were spontaneous and child-led. We ended up having a bird and plant identification session as well as the planned lesson. Wherever possible, we would make sure that my class had some time outdoors each day. Even a 10-minute break in the middle of winter would invigorate the class and staff. Despite many barriers and difficulties, we have seen real progress in children's learning (especially in science) and a greater connection with the community.

Case Study 2: Reflections on the impact on the school curriculum, children and teachers

The development of a 'Secret Garden' (see Figure 2) has been fundamental in the development of an

exciting and innovative curriculum throughout the school. In Figure 2, a before-and-after picture of part of the space is shown. We use the 'Cornerstones' curriculum, developed by the Learning Partnership in Wales. The learning is through 'Contexts for Learning' and many of the projects require the use of an outdoor space, which of course the secret garden provides. For example, the nursery class does 'Wellie Wednesday' every week; whatever the weather, they are in the garden exploring, looking at minibeasts, digging, planting, etc.

The older children have been using the garden to study life cycles and minibeasts, using identification keys and collecting data to take back to the classroom to be able to construct pictograms and bar graphs. The insect habitats have proven very exciting to watch, and we have had a range of birds nesting in our bird box. We have also used the gardening equipment to plant fruit trees and develop the planting area.



Figure 2: Part of the 'Secret Garden' in Case study 2 – before and after.

The pond dipping station allows the children to investigate what is in the pond and they have been able to use the pond camera to see what lies beneath. The children in Years 3 and 4 (ages 8 and 9) have been engaged in a project called 'The Big Dip', which concentrates on comparing and contrasting freshwater ponds and rock pool habitats. It has been so exciting for the children to be able to pond dip in our own school grounds and the creatures that they have found have been extremely interesting and diverse. Apart from any impact on science, there is an impact on language skills; children express ideas outdoors that they do not in the indoor environment, stimulated by what they observe. The change in seasons, and week-to-week changes, are noted and remembered by the children, some of whom have seen dramatic changes as the garden has developed since they started in reception class. Multi-disciplinary studies are natural to plan; we use data gathered to support numeracy, derive inspiration for elements of literacy, and both geography and design and technology projects have used the 'Secret Garden'. For children with special educational needs, this space is most welcome, allowing them to explore the world around them in a relatively safe environment, and both children and teachers look forward to their sessions in the garden. The only element of the 14 benefits listed above that is missing is no. 5, but greater engagement by parents, relatives and friends in the upkeep of the 'Secret Garden' has developed a greater connection with the neighbourhood.

Case study 3: Reflections on a sound trail and its impact on sensory learning

The idea behind science trails has been discussed in a previous article in the *Journal of Emergent Science* (Morgan *et al*, 2017) and will only be briefly recapped here. Teachers develop (with children where possible) a trail either within the school grounds or in the local environment, which may be urban as well as green spaces, with a particular theme. This case study reports on a sound trail outside the school grounds. The trail takes the children on a circular route through an urban area, through a park, over a bridge and back to the school. In the park, children close their eyes and identify sounds; they may record the loudness of these using a decibel meter, or record the sound to

play back at school. They record where the sounds were heard on the walk and if it was specific to a location. They have taken musical instruments out to test them in these environments: how far away can you be and still hear the instrument?

For children where English is the second language (EAL), the use of picture cards and/or cards with words both in English and their first language, with a variety of sources of sound, was helpful. Cards showing various animals, vehicle types and elements such as the wind engage these children well. We challenge children with questions like 'Can it ever be absolutely quiet?', 'Why is the sound being made?', 'How is the sound being made?' In this environment, it is easier to differentiate learning. Back in the classroom, the children have made a sound drama, using the sounds they have heard as stimulus for a story. They discuss where the sounds were heard and whether that was a unique location and why. They have played back the sounds weeks, and even months, later to see whether they still recognise them and where they heard them, and they are able to do so. Younger children may make a story stick sequence for the sound journey using different materials to generate the different sounds. Some common comments include:

'We found closing our eyes really helped us to concentrate.'

'We never realised how many animals we can hear when we listen quietly.'

'We knew it was going to be noisy by the railway bridge so we waited for a train, it was noisy and we could use our sound meters to see how noisy it was.'

'When we spotted some sounds, like the dog, we pointed our log boxes at them and noticed that the numbers were changing lots and the numbers were much higher.'

Sounds heard in the urban environment include: traffic, people talking, traffic lights, buses, ambulance, banging on glass, (it is very noisy). Sounds heard in the park include: water flowing, birds, people talking, cars, someone playing tennis, train, splashing fountain, street cleaning, motorbike, wind, grass swaying, footsteps on leaves, laughing, hoot from a truck.

These outdoor experiences are memorable for the children and they do retain science concepts over a

long period of time because of this. Here, all 14 potential benefits listed above have been realised.

Summary

In this paper, we have highlighted some of the benefits of outdoor learning, as evidenced through research. We have then asked three teachers to reflect on their experiences of outdoor learning and see that the majority of benefits are observed in each case. Although these are reflections and no attempt has been made to obtain quantitative data, this supports the use of the outdoor classroom.

We would welcome your comments on this paper. If you are a primary school teacher and have outdoor classroom experiences that you would like to share, we plan to write a follow-up paper in a future edition, which collates these reflections and comments. If you disagree with elements of the paper, we would also like to hear from you. Please e-mail PSTT at info@pstt.org.uk

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