REAL TREES IN THE CLASS-ROOM

FRANCISCA MARIA FERNANDES, MENDONÇA DE CARVALHO AND MARGARIDA SILVEIRA DESCRIBE A PROJECT IN PORTUGAL AIMED AT IMPROVING CHILDREN'S PLANT KNOWLEDGE BY GIVING THEM THE OPPORTUNITY TO OWN AND CARE FOR A 'PET TREE'

At home, children often have pets that they take care of and play with; even in the classroom it is not uncommon to find a wormery, an aquarium or an ant farm. However, children rarely have the opportunity to own and care for a plant over a lengthy period of time, let alone a tree. This project, which took place in Beja city in the Alentejo region of Portugal, aimed to find out whether we could improve children's knowledge of plants by giving each of the children involved their own tree to keep in the classroom for six months. Each child knew from the beginning that the tree belonged to him or her alone, and was their responsibility.

We chose the cork oak (*Quercus suber* L.) species to work with because it is a common native tree in the area, and one of economic importance. We hoped that experimental activities involving a very common tree, in a constructivist environment, would increase children's interest in plant science; we also wanted to promote learning of several key concepts related to the influence of environmental factors on how plants grow, which are part of our national curriculum for primary grade 5 (age 8–10 years).

How we went about it

Two primary schools were selected. In each school, one class of 8–10 year-olds had the 'experimental lessons' and another had 'traditional lessons'. In total, 39 children had 'experimental lessons' and 42 other children traditional lessons. Teachers of the experimental lessons were provided with materials to support all the activities, including: plant pots, loamy soil, sandy soil, tape measures, measuring jugs, one-year-old cork oak trees and worksheets. They were also provided with the protocol of the experimental activities (Box 1) and pre- and post-tests for the children, consisting of multiple-choice questions.

Box 1 Guidelines for the experimental activities

Tree transplanting

- All plant pots have a hole in the base where a perforated plastic disc should be placed in order to allow water but not soil to pass through.
- All pots must be stood on base dishes to collect excess water.
- Half of the pots should have loamy soil and half sandy soil.
- One cork oak tree will be planted in each pot.
- As the cork oak trees used in the experiments have already grown for one year in loamy soil, the roots should be gently washed to remove the soil before placing them in the sandy soil.
- After the trees have been planted, each pot must receive 200 ml of water.
- All pots must be numbered.
- Each group of two or three children will be responsible for two trees, one planted in loamy soil and the other in sandy soil.
- Each group will write the date of the transplant and their observations on the worksheets.
- All pots must be placed on a table by the window in order to expose the trees to the sunlight.

Managing and observing growth

- Every Monday, each pot must receive 200 ml of water.
- Every Monday, the children will measure the height of each tree using the tape measures.
- Once a month, children will draw their trees using a proper scale.
- Children should observe the trees throughout the week in order to report any change in the numbers of leaves and branches.

Data presentation

Groups report:

- how many centimetres each tree grows on a weekly basis;
- the most likely relationship between the numbers of leaves and branches of each tree;
- the growth rates of trees growing in sandy soil and in loamy soil;
- the experimental results in graphic form.

Data analysis

- Groups will formulate hypotheses about their results.
- Teachers and children will discuss which hypotheses and explanations are most likely to explain the results.
- Children will report the main conclusions.

Fate of the young trees

- Children will be invited to adopt the trees.
- The remaining trees will be planted in the school grounds or adopted by other members of the school community.

The activities continued for six months in the experimental classes. Teaching followed a constructivist approach, with children working collaboratively in small groups of two to three using the worksheets and materials provided. During the activities, children expressed their own ideas about the subject under study, and results were collected and analysed within each group. Later, all groups presented their conclusions and discussion followed.

Figure 1 **In their picture of trees on a table by the window. Alice holding a tape measure is saying '*I am going to measure the tree*' while Peter says '*I will count the leaves*'**

In the control classes, teachers taught the same ideas but in the traditional way, which did not include experimental activities.

What we observed

Children who followed the 'experimental' lessons made drawings showing the cork oak activities, such as watering the plants, measuring the trees and counting the leaves (Figures 1–3) and the results of using different soils (Figure 4).

Children made very interesting comments, such as:

My tree grows better on loamy soil than sandy soil because sandy soil does not retain the water.

Loamy soil is better for my tree because it has more salt minerals to reach tree roots.

Your tree is taller than mine, but mine has more branches.

My tree is ill because small animals are sucking its energy.

They also asked questions, such as:

Have the trees fever when they are bitten by aphids?

How can we send the aphids away?

My dad told me that ladybirds eat aphids. Can we bring them to the classroom?

The ladybirds are giving precious help to my tree.

I love my tree!

The pre- and post-test results showed there was an improvement in both the experimental and control classes. However, significant increases were obtained only in the experimental classes (Table 1).

The averages of children's correct answers in the pre-test were not significantly different across classes (A, B, C and D). However, in the post-test, the experimental class had 36 per cent more correct answers, while in the traditional classes the increase was only 15 per cent. The results obtained in the post-test were similar in both experimental

Figure 2 **John pictures himself watering the trees**

Figure 3 (right) **William has drawn himself measuring the height of his tree**

classes (A and B); importantly, the increase in correct answers was linked to questions requiring close observation of the shape of the growing tree and its leaves.

What we have learned

We recognise that question 6 about where the cork oak comes from (seed, fruit, flower or stem) was not easy. To answer this, children must understand that the acorn is the cork oak fruit which contains the seed, and that it is from the latter that a new tree will arise. In order for the children to understand these concepts better, seed germination should have been studied before the experimental activities. Children's understanding of seeds is one area that needs more attention, as children have a restricted concept of the term 'seed', as well as a number of misconceptions about the internal structure of seeds and germination (Jewell, 2002).

Question 7, about which soil is best (sand, loam, rock or clay), was also difficult. Children found that the cork oak trees planted in loamy soil suffered a stronger aphid attack than those planted in sandy soil. As a result, several cork oak trees growing on sandy soil were healthier than the trees planted in the loamy soil. This fact might explain their problems with question number 7 in the post-test.

In spite of the strong presence of the cork oak tree in the local landscape, and all the benefits that come from its cultivation, some of the children did not recognise it. This lack of knowledge may reflect people's lack of recognition of the environmental importance of trees to their lives, and the common belief that plants are inferior to animals (Wandersee and Schussler, 2001). Children also do not recognise school as a source of plant knowledge (Tunnicliffe and Reiss, 2000).

These experimental activities involving an important native tree increased the children's interest in plant science, and convinced us that having a 'pet tree' is an effective way of motivating children to observe, take care of and love plants.

References

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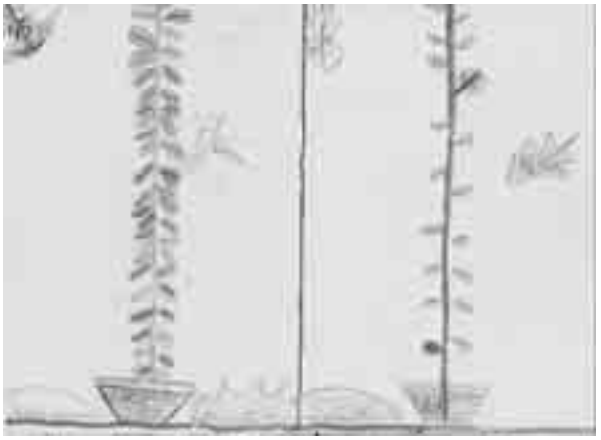

Figure 4 **This drawing shows the difference between a tree growing in loamy soil (left) and one in sandy soil**

Francisca Maria Fernandes is head of the education service, Botanical Museum of Beja, Portugal.
Email: franc579@yahoo.com
Luís Mendonça de Carvalho is director of the Botanical Museum of Beja, and professor of botany, Escola Superior Agrária, Instituto Politécnico de Beja.
Email: lmmc@esab.ipbeja.pt
Margarida Silveira is professor of geology, Escola Superior Educação, Instituto Politécnico de Beja.
Email: msilveira@esab.ipbeja.pt

Table 1 **Percentages of correct answers in the pre- and post-tests for the experimental and control groups**

	Experimental classes				Traditional classes			
	Class A (n = 20)		Class B (n = 19)		Class C (n = 20)		Class D (n = 22)	
Questions	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**
1	95	100	79	100	83	100	96	100
2	70	100	42	100	50	95	77	90
3	10	100	26	100	6	5	36	65
4	50	100	84	95	100	85	86	90
5	10	95	0	100	78	50	41	95
6	95	90	84	100	50	85	68	10
7	90	79	84	100	61	80	9	90
8	85	100	84	100	28	65	86	80
Average	63	96	60	99	57	71	62	78