

Educational Research

Young Maltese children's ideas about plants

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Fifty Maltese children, 25 in the second year of pre-school (4 years olds) and 25 in the first year of compulsory education (5 years old), were interviewed about their knowledge of plants. Analysis showed that they had a restricted understanding of the term, meaning something small, with a thin stalk, leaves and a flower. Trees, cacti and nettles were not classified as plants. Children's knowledge was observed to increase with age. Parents were identified as the main source of knowledge; schools were rarely mentioned. Maltese teachers should be made aware of children's limited knowledge about plants and they need to use readily available resources in schools to expose pre-school children to the plants in their immediate surroundings.

Key words: Primary; Plants; Alternative; Frameworks; Children's ideas

Introduction

Research about plants and young children in their early years as well as their understanding of the concept 'plant' is limited (Boulter *et al.*, 2003 Tunnicliffe, 20001). Research has focused more on children's knowledge about plant growth and photosynthesis instead (Russell and Watt, 1990; Osborne *et al.*, 1992).

Children develop scientific ideas from an early age, even though these may seem incoherent to adults (Driver, 1985). They give various, often incorrect, interpretations of scientific phenomena. Children explore their immediate environment, inside and outside their home, so they are likely to have noticed plants. Children explore plants by touching and smelling, feeling their texture, and noticing associated odours, both pleasant and unpleasant (Tunnicliffe, 2001, and personal communication).

Background

Research shows that primary children from different cultural backgrounds hold similar ideas about plants (Bell, 1981; Russell *et al.*, 1991). Children believe that plants are not 'living things' (Stavy and Wax, 1989; Tamer *et al.*, 1981). Research carried out in New Zealand by Bell (2005, 1981) and earlier by Stead (1980) showed how 13-15 year old students often had a much more restricted meaning of the word 'plant' than the one used in science. Tunnicliffe (2001) noted that, when viewing plant specimens at a botanical garden, over half of the groups talked mainly about an anatomical feature, referring in many cases to their dimensions.

Bianchi (2000) also studied children's notions of plants. They mentioned flowers, stems, leaves and roots but not much beyond that. As children grew older their use of scientific vocabulary improved. Nonetheless, children showed great dependence on their past experiences for their explanations.

Rymell's research (1999) on children aged seven, nine and 11 noted that they considered shape as an indicator of plants. Plants were expected to have no trunk and to grow on the ground.

Bruner (1983) observed the specific 'labelling' pattern of conversations. Children learn to identify an organism using the basic, everyday name of the culture in which they are living (Rosch and Mervis, 1975). When they fail to recall or cannot invent a descriptive name, children refer to an unfamiliar specimen as a 'plant', although this term is used most often to refer to flowering plants in a manner similar to the way 'animal' is used for 'mammal' (Bell, 1981).

This research focused on very young children who had not started compulsory schooling. Half the cohort were still in pre-school (aged four) and the other half in their first year of compulsory schooling (aged 5).

Children at pre-school are usually taught basic physical and coordination skills such as holding a pencil, taking care of their belongings and other capabilities that need to be mastered before the start of compulsory education. Rarely do children learn about plants as part of a formal science lesson. Early years guidelines do, however, make reference to science (Attard, 2002).

When children start compulsory schooling in Year 1, learning becomes more subject-based. This is particularly significant in Malta where children learn two languages, English and Maltese, from the first year (Education Division, 2004a, b). A science syllabus (Education Division, 2004) covering the whole of primary education has just been introduced but it was not fully implemented when the present research was carried out. Thus, any science done at this time depended on the teacher's personal interest and enthusiasm (Gatt, 1998).

The research probes children's knowledge and exposure to the different names and range of plants and some parts of fruit, as well as the conceptual framework they use for classifying specimens as plants. The research also investigated the source of children's knowledge. It particularly focused on the role that parents, schools and media have in providing information.

Method and sample

A qualitative approach was adopted. Young children do not

<p>I: What plants can you name? S: Flower, sunflower, a rose, bluebell...I don't know any more. Trees (after looking around). I: Who showed them to you? S: We did a show of Alice in Wonderland on stage. I: Here at school? S: No, my sister and I and some of my friends go to drama lessons. We put on a show of Alice in Wonderland, and I was the rose, and my other friends were sunflowers and bluebells. I: Is that where you saw them? S: Yes</p>	<p><i>Generic group:</i> flower <i>Specimens mentioned:</i> rose, sunflower, bluebell <i>Generic Group:</i> Trees <i>Source of knowledge:</i> extracurricular activities</p>
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Figure 1. Excerpt from an interview.

have mastery of the written language and they can best express their ideas when talking. It was therefore decided to use in-depth interviews.

Children were probed about their ideas on the following:

- knowledge of plant names
- sources of knowledge
- the concept of 'plant'.

The interview

The interviews were semi-structured. Children were asked to name different types of plants that they knew and to say where this information came from (e.g. TV, films, internet, etc).

At the conclusion of the interview each child was shown a number of coloured pictures of plants and asked what they noticed about them. The list comprised: a sunflower plant, a rose, a cactus, an apple tree, a palm tree, a lemon tree, lettuce and grass.

Interviews were carried out with 50 children (25 boys and 25 girls). Half were four year olds at pre-school, the rest were five year olds in the first year of compulsory education (Year 1). The children, from both state and private schools, were selected randomly by the schools.

Each interview took about half an hour. All were audio-taped and later transcribed. The transcriptions were then analysed to identify patterns of reasoning.

The interviewers began by asking the children if they liked plants. This served as an ice-breaker. In all the remaining questions, the children were allowed time to express their ideas freely without being interrupted. If they were reluctant to talk, or at a loss, the researchers used further questions to elicit more information.

Figure 1 shows how the transcript was used to identify the names of plants provided by the children and the source of knowledge. Similar replies were placed in sub-categories so that patterns in responses could be obtained.

Results

Children's knowledge of plant names

Children recalled few names. Sixteen of the 50 children made no reference at all to specific names of plant species. Among the rest, there was a good number who referred to super-ordinate categories. Some 24 replied 'flowers', 20 mentioned 'trees' while another five just repeated 'plants'.

Interviewer: Now can you name some plants for me?

Student (pre-school boy, 4 years old): Flower

I: Flower. Any more?

S: Trees

I: Trees. What else?

S: Plants

I: What?

S: Plants

As this excerpt shows, this child was unable to categorise beyond generic terms and was at a loss for words beyond that. It appeared as if there was no knowledge base other than these everyday super-ordinate categories upon which to draw.

In some cases the super-ordinate categories were mentioned along with the names of specific species. The girl below considered flowers and daisies at the same level. She also included parts of plants in her list of examples.

Interviewer: Can you name some plants?

Student (pre-school girl, aged 4): Flowers, trees, leaves, seeds in flowers, plants, daisies, flowers.

Table 1. Number of times plants were mentioned by the children

Plants	No. of times mentioned
Rose	11
Sunflower	6
Arum Lily	2
Daisy	1
Pansy	1
Bluebell	1
Buttercup	1
Thorns	1
Nettle	1
Cactus	2
Flower	24
Tree	20
Plant	5
TOTAL	76

Only four children could give more than three examples. The plant most frequently mentioned was the rose (see Table 1), the second being the sunflower. Others mentioned included daisies, the arum lily, pansies, bluebell and buttercup. Plants grown in gardens or occurring wild, such as thorns and nettles, were also mentioned.

Interviewer: Can you name some plants?

Student (pre-school boy, four years old): Mmm...those that are prickly...nettles

I: Anything else?

S: No

Children were also asked to name any trees they knew. They had difficulties, a total of 27 examples being given by 20 children. Oranges and apples were the most popular. Orange trees are very common in many Maltese gardens. It is difficult to explain the occurrence of apple trees in the answers as these are not that common in Malta. Other trees identified included lemon, pear, banana, peach, grape, and pomegranate.

The older children had slightly better knowledge of plant names than the pre-school children. More 5-year old children mentioned roses (7) and the sunflower (4) than the 4-year olds (four mentioned roses and two the sunflower). Thorns and nettles were only mentioned by the 5-year olds while only the 4-year olds mentioned the cactus. Five-year olds mentioned slightly more trees (14 instances) than 4-year olds (11 instances).

Table 2. Trees mentioned by the children. (Note that some children mentioned more than one example while others did not mention any.)

Tree	No. of times mentioned
Apple	7
Orange	7
Lemon	3
Banana	2
Grape	2
Peach	1
Pomegranate	1
Pine	1
Olive	1

Girls overall possessed more knowledge of plants than boys. More girls than boys were able to name plants and they were also able to provide a greater variety of examples. Girls mentioned roses (6), sunflower (3), arum lily (1), daisies (1), pansies (1), and bluebells (1), while boys only mentioned roses (5), sunflower (3), arum lily (1), and buttercup (1). However, boys mentioned slightly more examples of trees (14) than girls (11).

Table 3. Trees mentioned by boys and girls

Trees	Mentioned by boys	Mentioned by girls
Orange	5	4
Apple	4	2
Banana	1	1
Grape	1	1
Lemon	1	2
Peach	1	–
Pine	1	–
Olive	–	1
Pomegranate	–	1

Sources of knowledge

Parents were found to be the main source of knowledge about plants for 23 out of the 50 children. This is a similar to results obtained by Tunnicliffe and Reiss (2000).

Many women in Malta stop working, either temporarily or for good, when they have children. They thus spend a lot of time with their children. This could explain why 15 of the 23 children referred to their mothers as their main source of knowledge about plants.

Interviewer: ...Where did you learn about these flowers and plants and trees?

Student (Year 1 boy, aged 5): At my house, 'cause my mummy was a teacher about plants and animals, and she taught

Table 4. Sources of knowledge

Type of source	Number of mentions
Parents	23
Direct observation	9
Media	8
Other family members	6
School/teachers	4
Total	50

me about the animals and plants.

I: So you should know the names of some plants?

S: But she didn't teach us the names.

The father was also mentioned, but to a lesser extent. Men often engage in gardening and so opportunities may arise where the father can share his hobby and knowledge with his children.

Interviewer: Where did you see these plants?

Student (pre-school girl, aged 4): In the garden.

I: Nowhere else?

S: Nowhere else, because I planted them with my daddy.

I: Did anybody else show them to you?

S: Only my daddy.

Children also mentioned direct experience as a source of knowledge. They described how they noticed plants in different places and in different circumstances. Places identified included the garden, school, particular locations in Malta as well as fields.

Only eight children mentioned books, television or pictures as the source of their knowledge. There was no reference to more modern media such as ICT. This may be due to the children's age; the use of computers (which are widespread in Maltese households) and the internet will probably still be restricted to games due to children's limited literacy skills.

Other adults, mainly close family relatives such as uncles and grandparents, were also mentioned (6 times). Malta is a closely-knit society with extended families and is also a small country. Consequently, children often spend time with family members other than their parents. This can lead to informal learning, for example about plants.

Interviewer: Where did you find out about plants?

Student (Year 1 boy, aged 5): ...when I go to see my grandfather, we go to the fields. I go to help him and work in the fields.

School rarely featured: only four children mentioned it. In no instance did they refer to learning within a science context. If they experienced any teaching about plants, it was in an indirect way. The children's comments indicated that teachers did not focus on science and science-related activities with young children and only provided second-hand information, as the following transcript shows.

Interviewer: Where did you see the apple tree?

Student (pre-school boy, aged 4): I've never seen an apple tree.

I: But who taught you about them?

S: Ms A.

I: So your teacher at school showed them to you?

S: Yes.

I: How?

S: On the blackboard.

I: And what did she use?

S: She used chalk. White chalk.

I: And she drew it? Did she draw a tree on the board?

S: Yeah.

Conceptual framework

The main mental model held was that plants were small, with straight stalks and leaves, and green in colour. This mental model was rarely described in a single instance, but different aspects of it were revealed when making statements and observations about the specimens shown in the pictures.

Interviewer: Do you know any other plants?

Student (Year 1 girl, aged 5): Those that have a thin stalk.

I: What are they like?

S: They are...mmm...they have blue flowers and have green leaves.

In many instances, the presence of one characteristic was considered enough to classify the specimen as a plant. For example, in one case, lettuce was considered a plant because of its green colour. In other cases, it was important that the specimen was small in size.

Specimens which varied from this mental model were not classified as plants by many children. This occurred particularly in the case of the cactus: some children said that it was not a plant because it had spines. Since most of the cacti tend to have a wide stem with spines it did not fit into the conceptual framework of a plant.

Children tended to focus on parts of the plant rather than the whole specimen when presented with the pictures. Some noted the colour of the flower of the specimen first and only afterwards gave the name. Only five children gave the name of the flower straight away.

Children also experienced difficulty in distinguishing between the names of parts of plants and the plants themselves. One child confused petals with the name of the plant. In another instance, petals were interchanged with wings. Confusion was evident even when discussing trees, where children did not really distinguish between leaves and trees.

Discussion

Young Maltese children, like those in England and New Zealand, possess limited knowledge about plants. While the word 'plant' elicited few responses, children had more to say with respect to 'flowers' and 'trees'. From the little knowledge they displayed, it appears that young children regard a plant as being something that is small and green with a stalk and leaves. Such a concept limits plants to small herbaceous angiosperms – as was also found by Ryman (1974) in England. Flowers, fruit and trees were considered to be separate groups rather than subgroups of plants. This reflects the everyday botany of the community but does not concur with the concept of the plant kingdom in science.

Children tend to use basic or everyday names to identify categories of vegetation (Tunnicliffe, 2001). Such a situation may reflect children's lack of knowledge both about plants as well as technical or scientific language. The most often cited plant was the rose, frequently grown in local homes and a popular flower, as well as a common name for females. A similar familiarity with the everyday was noted by Boulder *et al.*, (2003).

Some progression in knowledge was observed between the 4 and 5 year olds, with the older children possessing slightly more knowledge than those in pre-school. This may have been due to increased experience of their surroundings, thus increasing their knowledge of the natural world. In both age groups, the rose had the highest percentage of all the flowers mentioned, showing that there was a common pattern. The result was similar in the case of trees: the lemon and orange trees, most often named by children, are commonly seen in Malta, often growing in the garden or courtyard.

Girls demonstrated more knowledge of flowers but less about trees than boys. The girls may have been more observant and interested in flowers than the boys. However, this possibility was not explored in this work.

Children are usually aware of, and interested in, the world around them. However, they do not express the same enthusiasm in talking about plants as they do about animals. They experience what Wandersee and Schussler (2001) call 'plant blindness'. Children adopt the adult attitude that vegetation is not important and consequently worthless (Schneekloth, 1989). Plants, unlike animals, do not move or respond instantly to children's actions in the same way that animals do.

Parents were identified as the main source of knowledge about plants. This is similar to observations by Tunnicliffe and Reiss (2000). Parents spend a lot of time with their young children, reading books to them or involving them in everyday things such as gardening. Only a small number of children mentioned the media, and here books were the most common means of exposure to plants. It may be that children do not watch television programmes that focus on scientific aspects, particularly plants. Children often tend to watch cartoons and it is rare that plants (fictitious or real) feature as main characters in children's programmes. Whether cartoons or real life documentaries, TV programmes are more likely to focus on animate species like animals rather than plants.

As in Tunnicliffe and Reiss's (2000) study, children did not mention the school as a source from which they learnt about plants. This highlights how school activities tend to be perceived as separate from everyday activities.

Implications

It is important for parents, carers and pre-school teachers to expose children to plants at an early age. Plants make up a large and basic group of living things and have a vital role in the ecosystem. However, plants do not move and thus do not naturally attract children's attention in the same way as animals (Tunnicliffe, 2001). The intervention of adults thus becomes more important.

Parents have been identified as the main source of knowledge. They could be encouraged to help their children discover more about the world and nature around them.

This highlights two educational issues: the role of parents as educators, particularly in the early years; and the need to provide parents with information to develop those skills required for their children to enjoy quality experiences of the world around them. It is important to have programmes aimed at parents that make them aware of the educational value their interactions with their children have on the development of scientific skills such as observation and classification. Heritage Malta and environmental organisations could offer information relevant to children's botanical education at local heritage sites which families visit, for example.

Schools need to focus more on scientific aspects, even at such an early age. There should be more opportunities for children to learn about nature and particularly about plants. As Tomkins and Tunnicliffe (2001) lament, children in school are not encouraged to 'stand and stare', look for meaning and make observations. Although the focus in education in the early years is on basic skills, observation and classification should form an integral part of the educational experience. Plants are often readily accessible on school premises and teachers can draw young children's attention to the variety of plants, their specific names, why some plants need to stay in the shade and others can withstand outdoor conditions. Once children become interested in plants, they will come up with many questions that may serve as opportunities for learning.

Unfortunately, too many conversational exchanges become missed learning opportunities (Tunnicliffe *et al.*, 1997). It is necessary to bring to teachers' attention children's limited knowledge about plants and make them aware of how to make better use of opportunities. It is not enough to have plants in the primary syllabus as often the teacher only talks about plants and trees on a general level. Teaching should interest children in individual plants and their characteristics. Teachers can achieve this by organising class activities using books, television and also the internet. The classroom and the school libraries can be supplied with books about plants. One may consider the return of the nature table in the classroom. Children can also be given the opportunity to spend a day in an environment exploring plants and learning about them.

Conclusion

This research highlighted the limited knowledge young children in Malta hold about plants. It showed that knowledge of plants improves, although to a limited extent, with age and that the Maltese children interviewed demonstrated similar ideas to those held by children in England. In order to improve young children's awareness and knowledge of plants it would be worth providing better quality educational experiences. In the same way as early education at pre-school level lays the foundations for the children's educational progress at a later stage, the same argument can be put forward with respect to science.

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