

Education for Sustainable Development



THE BIRMINGHAM
BOTANICAL
GARDENS
AN EDUCATIONAL CHARITY

Education for Sustainable Development

Botanic Gardens, as centres for the conservation of endangered species, are an ideal location for exploring some of the issues relating to sustainable development, by highlighting the interaction between plants, people and places.

Seven Key Concepts of Sustainability

The following key concepts provide a way of looking at how work carried out illustrates the meaning of sustainable development:

1. **Interdependence:** Understanding how people, the environment and the economy are inextricably linked to all levels from local to global.
2. **Citizenship and Stewardship:** Recognising the importance of taking individual responsibility and action to ensure the world is a better place.
3. **Needs and rights of future generations:** Understanding our own basic needs and the implications for the needs of future generations of actions taken today.
4. **Diversity:** Respecting and valuing both human diversity – cultural, social and economic – and biodiversity.
5. **Quality of Life:** Acknowledging that global equity and justice are essential elements of sustainability and that basic needs must be met universally.
6. **Sustainable Change:** Understanding that resources are finite and that this has implications for people's lifestyles, and for commerce and industry.
7. **Uncertainty and Precaution:** Acknowledging that there are a range of possible approaches to sustainability and that situations are constantly changing, indicating a need for flexibility and lifelong learning.

PAST

GLOBAL

Celebrating:

our close links with the wide diversity of plants: economically, culturally, aesthetically.

our cultural diversity in the Midlands and promoting cross-cultural understanding.

Illustrating:

erosion of people's relationship with plants.

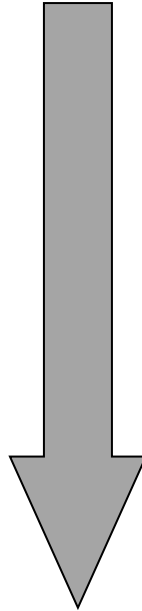
LOCAL

Celebrating:

the traditional relationship of rural people with plants.

Illustrating:

how our local communities have responded to urban development.



PRESENT

Awareness and understanding:

of the complex issues relating to the use of finite resources.

Offering:

inspiration and courage to ensure the world survives through sustainable plant resource management.

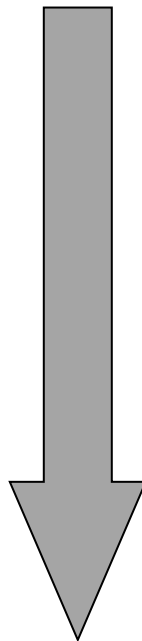
Awareness and understanding:

of the way green spaces and our links with the land have eroded within the cities.

Offering:

the means for positive action to improve our urban neighbourhoods.

the horticultural skills required to move towards a self-sustainable future.



FUTURE

Activities to Support Education for Sustainable Development

Making the links

A good starting point is to raise questions about plants and consider not only environmental issues but also take into account the implications of social, economic and political factors.

- ‘The Development Compass Rose’ (page 6) is a stimulus for pupils to pose questions about the various aspects of sustainable development.

The value of plants

The importance of plants in our daily lives is a good starting point for raising issues related to global citizenship and sustainability.

- The sheet ‘The Value of Plants’ (page 7) gives a useful introduction into the various values of plants to humans, animals and the planet. It can be used to stimulate discussion about the importance of plants and to find examples of plants for each ‘value’.
- The activity ‘Starting the Day’ (page 8) explores plant-based products used when we get up, wash, dress and have breakfast.
- ‘The Family Medicine Chest’ (page 10) provides a list of commonly used medicines from plants. Pupils could search for these medicinal plants in the glasshouses and grounds.

The Wotangu - where next? (pages 11 – 13)

- In Western Africa, particularly Cameroon, Western pharmaceutical companies have discovered that a traditionally used tree has medicinal properties which help prevent prostate problems. At present, the tree is

being used and not replaced – a situation from which nobody gains in years to come. This role-play encourages groups to discuss various viewpoints and hopefully reach a solution which benefits all parties. The Development Compass Rose can be used to explore the social, political and economic aspects of each viewpoint and generate questions/discussion.

Biodiversity

- The four glasshouse climates (Tropical, Subtropical, Mediterranean, Arid (desert)) and outdoor areas such as the Alpine Garden offer opportunities to explore the diversity and interrelationships of components making up an ecosystem along with their adaptations. This can be followed up by considering the implications on the whole ecosystem of removing certain components.

Variation

- The plant collections contain many examples of variation between members of the same species and their value as a gene pool. This can be investigated by observing differences or by counting/measuring particular characteristics such as prickles on holly leaves. Suggestions are given on the 'Variation' sheets (pages 14 & 15).

The Development Compass Rose

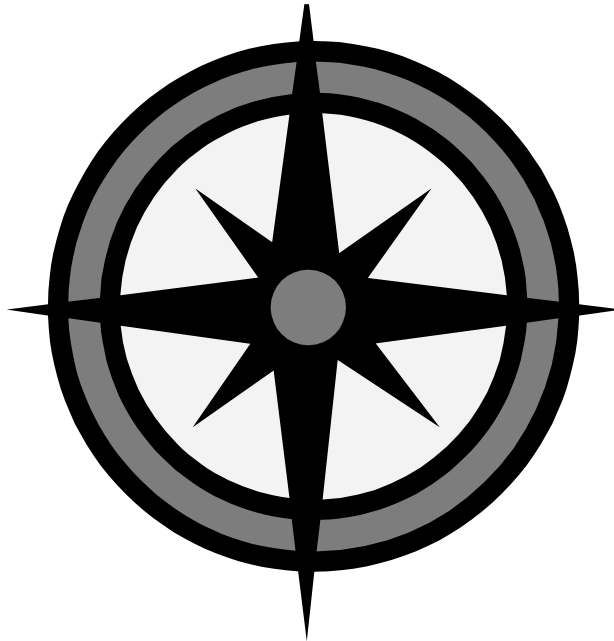
Can you think of questions for each point on the compass rose?

Natural

These are questions about the environment — the land, the sea, living things, and their relationship to each other. These questions are about the **built** as well as the **natural** environment.

Who decides? (Political)

These are questions about power, who make choices and decide what is to happen; who benefits and loses as a result of these decisions and at what cost.



Economic

These are questions about money, trading, aid, ownership, buying and selling.

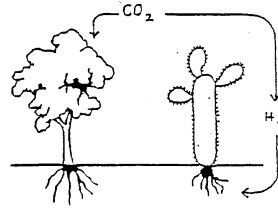
Social

These are questions about people, their relationships, their traditions, culture and the way they live. They include questions about how, for example, gender, race, disability, class and age affect social relations.

The Value of Plants

Cultural

Recognition of plants in our lives reflected through religion, festivals and storytelling.



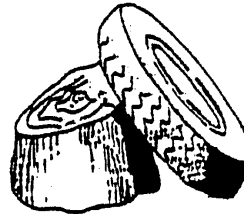
Life Support

Plants provide oxygen, protect soils and regulate water

cycles in all environments from dry desert to wetlands.

Habitat

Plants can provide living spaces for many species of animals as well as other plants.



Raw Materials

Plants provide us with industrial /manufacturing materials and chemicals.

Decorative

Beautiful plants enhance our lives.

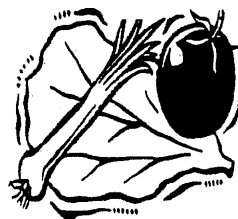


Genetic Store

Cultivated varieties can be improved by breeding with wild varieties.

Food

Plants provide many different foods for humans as well as for other animals.



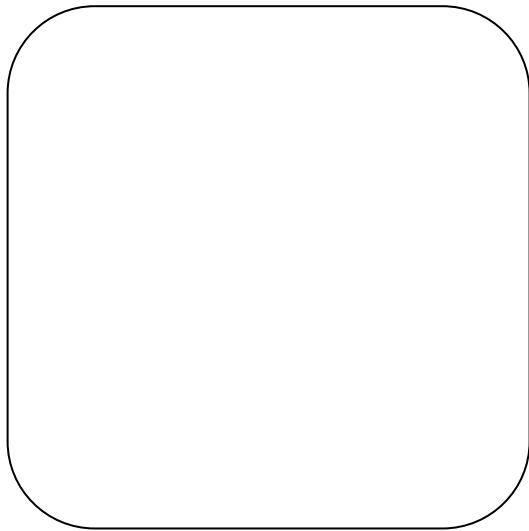
Medicines

“Green” medicine has been used for thousands of years.

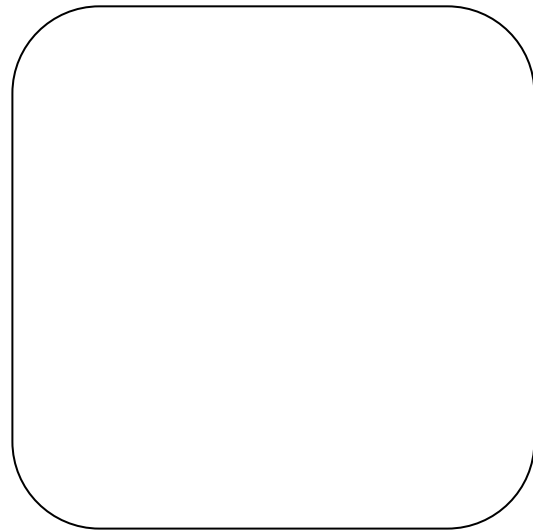
Starting the Day the Botanical Way

Did you know that in the time between getting up and going to school you use many plants without even knowing it?

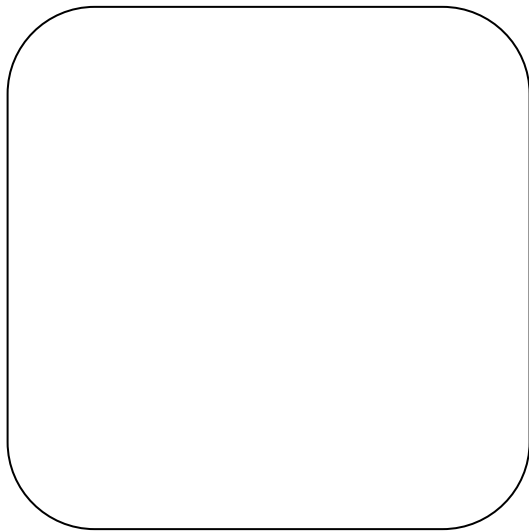
Explore the glasshouses to find and draw these useful plants. Read the information on the white labels and look out for these symbols:



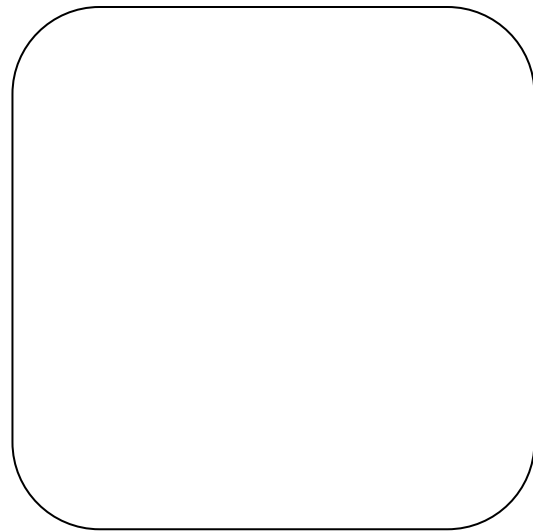
A plant we use in
the bathroom



A plant we eat
for breakfast



A plant we drink
for breakfast



A plant we wear
to school

Starting the Day the Botanical Way

SUGGESTED ANSWERS

Toiletries

Soap	Citrus fruit oils (Mediterranean House)
Shampoo	Olive oil (Mediterranean House)
Shower/bath gel	<i>Aloe vera</i> (Arid House)
Moisturiser	

Toothpaste	Cinnamon (Subtropical House)
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Breakfast

Spreads	Olive oil (Mediterranean House) Yellow colour using dye from annatto (Tropical House)
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Marmalade	Orange, lemon and lime (Mediterranean House)
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Grapefruit	Grapefruit (Mediterranean House)
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Drinks	Citrus juice, e.g. orange (Mediterranean House) Tropical juice, e.g. pineapple (Subtropical House) Coffee (Subtropical House) Tea (Subtropical House)
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Cereals (e.g. Coco-pops)	Rice (Subtropical House) Cocoa (Tropical House) Sugar from sugar cane (Subtropical House)
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Getting dressed

Shirt or blouse	Fabric from cotton (Subtropical House) Starch from taro or cassava (Tropical House)
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Shoes	Rubber (soles) (Tropical House)
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The Family Medicine Chest

Allergies

- Eczema: evening primrose oil, skin steroids from sisal, hydrocortisone from yams, *Aloe vera*
- Asthma: ephedrine from *Ephedra* species, theophylline from tea

First Aid

- Cotton – swabs, bandages, plasters
- Adhesive for plasters – latex (Rubber tree), rosin (from pine trees)
- Antiseptics – witch hazel, pine oils, *Aloe vera*

Travel sickness

- Alkaloids and atropine from deadly nightshade
- Hyoscine from thorn apple

Contraception

- Diosgenin from yams
- Elephant's foot
- Condoms (latex)

Coughs, colds and headaches

- Coughing – cinnamon, thyme (as thymol), mint (as menthol), liquorice
- Breathing – eucalyptus
- Headaches – aspirin (originally from Willow), codeine from poppy
- Flu – allicin from garlic
- Migraine – feverfew

Constipation

Laxatives – senna, castor oil

Surgery (pain relief)

Hyoscine from thorn apple

Heart Complaints

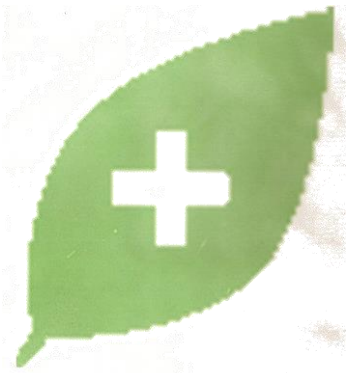
- bromelain from pineapple (to treat thrombosis)
- digitalis from foxglove, atropine from deadly nightshade (regulates heartbeat)

Aids (research)

Moreton Bay Chestnut

Cancers

- Leukaemia: rosy periwinkle
- Breast, ovarian, cervical cancer: taxol from yew
- Cancerous cells: ricin from castor oil
- Current research: meadow saffron



The Wotangu - where next?

This is a role-play activity based around the *Wotangu* tree that grows in Cameroon (as well as other parts of sub-Saharan Africa and islands including Madagascar).

Recent research has shown that an extract from the bark of this tree can be used to prevent prostate cancer.

Read the information about the Wotangu tree and then take on different roles to debate the issue, for example:

Drug company
representative

Environmentalist

Local landowner

Worker from the
local village

Fact File

- The Latin name of the plant is *Prunus africana*.
- It is also known as red stinkwood, iron wood, African plum and bitter almond.
- It is a tall tree (up to 30m) with a straight trunk. The leaves are oval-shaped and the tree is evergreen. The fruits are round, about the size of a coffee grain and intensely bitter. The wood is reddish brown, heavy and hard.
- An extract called *Pygeum* has been traditionally used as a medicine by local people to treat ailments such as fever, malaria, stomach pains and insanity.
- Research with mice has found evidence that *Pygeum* can also be used to prevent prostate cancer.
- The collection of the bark for this purpose (and other medicinal uses) has resulted in the species becoming endangered.

How is the bark harvested?

The bark can be harvested in three main different ways:

- 1. Total bark removal.** This is when the tree is cut down and all the bark is removed. This results in the highest yields but the whole tree is felled.
- 2. Girdling.** This is when bark is removed in strips around the whole circumference of the trunk, often resulting in death of the tree.
- 3. Removing opposing quarters.** This is the most sustainable way of harvesting the bark. However, it results in lower yields.



Prunus africana bark being stripped from the trunk

Variation

Look around at the people in your group. Do they all look the same? No, they vary. They all have different weights, heights, skin and hair colouring. However, they are all members of the same species.

Variation can be described as:

Differences in features between species or between members of the same species.



As well as humans, different plants of the same species have small variations between them.

For example, think of a holly bush. Have you ever noticed that each leaf is slightly different from another?

How could you measure and record their differences? You could look at:

- the length of each leaf
- the number of prickles
- the colour
- whether it has berries
- how far it is from the ground



Choose a plant from inside one of the glasshouses or outside in the gardens and explore the variation of different members of this species.

Variation: Recording Page

Name of species:	
Variation	Measurements

Can you think of any reasons *why* features of members of the same species show variation?