# Science – What's that? – learning to use keys for identification in biology

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**Number of lessons:** four

**Year level(s):** seven

**Australian Curriculum content descriptions:** Classification helps organise the diverse group of organisms (ACSSU111 - Scootle )

Construct and use a range of representations, including graphs, keys and models to represent and analyse patterns or relationships in data using digital technologies as appropriate (ACSIS129 - Scootle )

**Achievement standards:** By the end of Year 7, students classify and organise diverse organisms based on observable differences. Students draw on evidence to support their conclusions. They communicate their ideas, methods and findings using scientific language and appropriate representations.

## Lesson 1: Dichotomous keys

### Context

Accurate identification of species is essential in biology. In these three lessons, students will build on pre-existing knowledge of hierarchical taxonomy (Kingdom, Phylum, Class, Order, Family, Genus, species) to observe and identify features important in identification of Eucalypts. Students will practice using a dichotomous key, and then a multi-access key. Students will practice observation and classification skills. The sequence of lessons will conclude with students identifying a Eucalypt in their own environment using an on-line key. While the lessons are

designed for Victorian conditions, alternatives for other states of Australia are also provided.

## Materials and equipment

- Dichotomous key of a pencil case example provided (Appendix 5)
- Dichotomous key of a pencil case as a table example provided (Appendix 4)
- Dichotomous key of a pencil case template provided (Appendix 3)
- Google slide presentation provided

## Safety Advice

nil

## Objectives

Students understand that:

- Classification improves understanding
- Dichotomous keys ask yes/no questions about features that do not change

## Introduction

To engage students' interest, create a dichotomous key of a group of different dog breeds, and give each student a picture of each different dog. They need to make it visible for everyone to see. Begin by asking students to stand, then ask a single student to create a way to divide the class in two. This might be "big dogs" and "small dogs". Students move into progressively smaller and smaller groups according to the questions they create. Model this until students are confident. Explain the purpose is to identify one dog as an individual. Add to the class flow-chart on the board as the key develops.

## Core

1. Students will create a dichotomous key of their own pencil case. This can be complex for students, and many students struggle with asking a yes/no question, instead coming up with questions such as "is it red or blue?".
2. Begin by modelling using the closest pencil-case. Tip it on the desk and scatter the contents. Decide on a characteristic that will divide the contents into two. An example of how this might be done has been provided, but there are many ways of classifying so use one that makes sense to you.
3. Proceed by having students contribute suggestions for yes/no questions to help with your classification. Beware of questions like "Is it red or blue?" and redirect students to phrase it as a yes/no question ("Is it red?").
4. When students are ready, they should classify their own pencil case contents, recording the results as a flow chart dichotomous key. A template has been provided but is of limited usefulness as the students may need more or fewer classifying questions.

## Conclusion

Explain that the students have used created a dichotomous key. Provide further information as in the slide show link below (four slides). Emphasise that dichotomous keys must use features that do not change.

## Extension

Extension students may enjoy using or creating the key in the table form (example provided).

## Resources

Worksheet:

1. Dichotomous Key example for pencil case – see appendix
2. Dichotomous Key template for pencil case – see appendix
3. Dichotomous Key table example for pencil case – see appendix

## Useful links:

1. Provide further information as in this slide show (four slides). https://docs.google.com/presentation/d/1ofEEd99CsqlzZ85hNTA18WanruMSxiRgmfylN9cYNVs/present?ueb=true&slide=id.g3abb0d00d2_0_12

# Lesson 2: Botanical terms

## Context

Accurate identification of species is essential in biology. In this lesson, students will learn how to observe and identify features important in identification of Eucalypts. Key botanical terms will be taught. Students will practice observation and classification skills.

## Materials and equipment

Plant material from a range of Australian plants (preferably Eucalypts) could be provided by an enthusiastic teacher. Photographs are alternatives.

Glossary sheet provided - see appendix 1 and 2

## Safety advice

Nil

## Objectives

Students understand that:

- The language of botany aids description

## Introduction

To engage students' interest, consider information from this article (https://www.abc.net.au/news/science/2018-01-26/eucalyptus-trees-an-iconic-australian/9330782 ) and introduce it as a "Fun Fact" or a spot quiz. For example:

1. How many different types or species of gum trees do you think there are in Australia? Stand up if you think it is more than 10? More than 50? Etc keep going until the class is all seated. The answer is around 900 species. They are organised into three genera Eucalytpus, Corymbia and Angophora.
2. Gum tree leaves contain an oil, which gives them that smell. What do you think that is for? The answer is to repel pests. Leaves in the Kimberley area also contain traces of gold.
3. Eucalypts include the tallest flowering plant in the world, and grow in all parts of Australia except very dry deserts.
4. Finally, spread out either pictures of gum tree leaves and flowers and seeds, or samples of the real thing that you collected on your way to work. Let students look, discuss and touch these things, and start to explore how they might be different.

## Core

Explain that students will be required to identify a gum tree in their environment, but to do that, they will need to learn some of the terms botanists use. A glossary list has been provided, but it is best to start with things the children know, such as labelling the trunk, and discussing the difference between flowers and seeds. The multi-access key for Victorian eucalypts (link provided)

is very forgiving, and students may be able to narrow their tree down to 1 or 2 species without learning ANY specialist terms. Students requiring extension will enjoy the scientific terminology.

1. After some direct instruction, provide students with an activity to match the terms with their definitions, and paste them in their books. Options here include:
2. Providing a blank glossary sheet for students to research definitionsWork through definitions together and students to draw pictures where appropriate
3. Print the glossary, laminate, and cut up to provide as a puzzle to solve in groups

## Conclusion

Have a game of Splat to consolidate the vocabulary. To play this, the class is divided into two teams. The teacher writes key vocabulary on the white board, and two players (one from each team) stand a set distance from the board. The teacher reads a definition of one term, and the students race to be the first to cover the correct term with their hand, calling out Splat! The first student to get the right word wins a point for their team. Beware. This is noisy.

## Extension

Extension students may be provided with more complex vocabulary terms.

## Resources

**Digital:**

**Worksheet:**

1. Glossary - see appendix 2
2. Glossary blank - see appendix 1

**Useful links:**

1. https://www.abc.net.au/news/science/2018-01-26/eucalyptus-trees-an-iconic-australian/9330782
2. Ducksters website (https://www.ducksters.com/science/)
3. This website has a more extensive glossary and many other resources: (https://www.enchantedlearning.com/subjects/plants/)
4. Royal Botanic Gardens multi-access key to the Eucalypts (https://vicflora.rbg.vic.gov.au/static/keys/eucalypts)

# Lesson 3 & 4: Identifying a species

## Context

Accurate identification of species is essential in biology. In this final lesson of the series, students are shown how to use the multi-access website provided by the Royal Botanic Gardens to identify a Eucalypt. Students will practice observation and classification skills. This could be used as an assessment task.

## Materials and equipment

Access to the internet and a suitable device

One or more gumtrees. It is always helpful to know what they are before you start.

## Safety Advice

Outdoor activities require adequate adult supervision, sunscreen, closed shoes and hats. Beware of insect bites and stings.

## Objectives

Students experience an authentic task of identification of species

## Introduction

To engage students' interest, consider "Three Quick Questions. Each student has a small white board and marker (or blackboard and chalk). The teacher asks each student to write their own answer to a question that the teacher asks of the class. After a time (varied according to complexity and student ability) the teacher calls "One, Two, Three, Show me" and students hold their boards so the teacher can see. It is difficult for other students to see others answers and so this is a formative assessment task. Suggested questions may include:

1. What is the reproductive part of a flowering plant called? (a flower)
2. What is the word for the angle between a leaf stalk and the stem? (Axil).
3. How many species of gum trees are there? (more than 900)

## Core

Explain that students will be required to identify a gum tree in their environment. This is difficult and requires them to collect as much information as they can from the tree. Provide the data collection sheet and ask them to work in pairs to try to answer as many questions as possible. The class should then return to the classroom and use the Vicflora site provided in the resources list to add information to the key. With each answer they give, the number of possible tree species

decreases. If there are questions they don't understand, they can ignore them. Encourage students to work on simple characteristics like flower shape and colour, how many fruits are in a cluster, how tall the tree is and what sort of bark it has. Another visit to the tree may be required before the students are satisfied.
To complete the task, the students could write a short written report for submission stating the scientific name of the tree and the characteristics they used to identify it.

## Conclusion

If students are using the multi-access key, it is possible to look at information and pictures for the main options once they have narrowed the choices down to a manageable number. This website also provides a very clear classification of each tree (kingdom, phylum, etc through to species) which helps students understand that the learning they have done about biological classification is used every day by taxonomists.

## Extension

Able students have the opportunity to identify more Eucalypts, or to explore plant anatomical terms more thoroughly.

## Resources

**Digital:**

Internet access allowing students to use links provided

**Worksheet:**

**Useful links:**

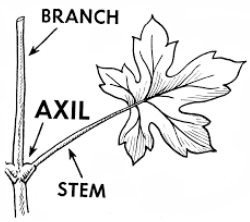
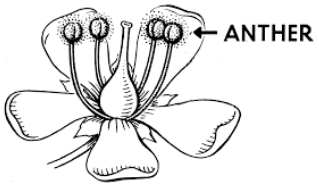
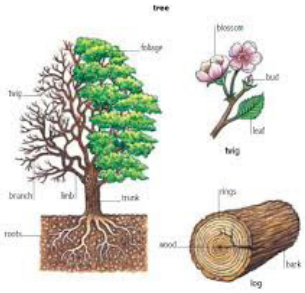
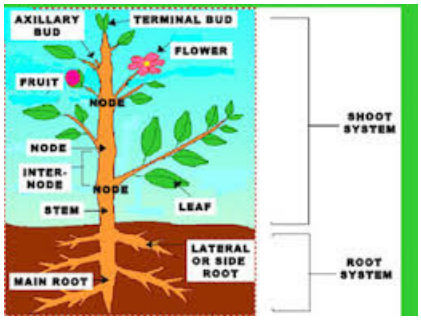
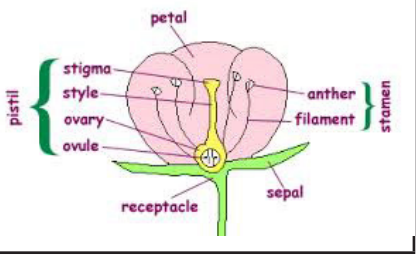
1. Royal Botanic Gardens multi-access key to the Eucalypts: https://vicflora.rbg.vic.gov.au/static/keys/eucalypts
2. Australian National Botanic Gardens key to Eucalypts https://www.anbg.gov.au/cpbr/cd-keys/euclid3/euclidsample/html/learn.htm
3. Lucid Key to identify Eucalypts for states other than Victoria http://keyserver.lucidcentral.org:8080/euclid/player.jsp?keyId=2

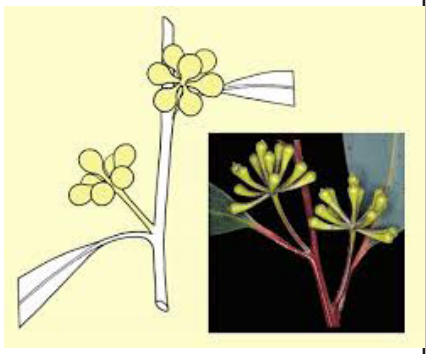
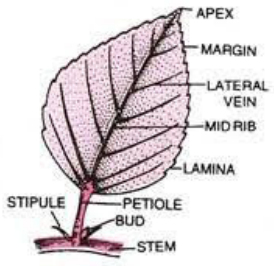
## Appendix 1: Botanical Glossary - blank

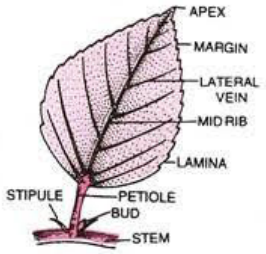
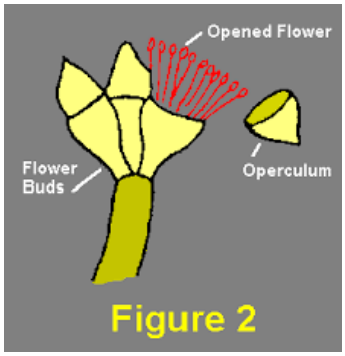
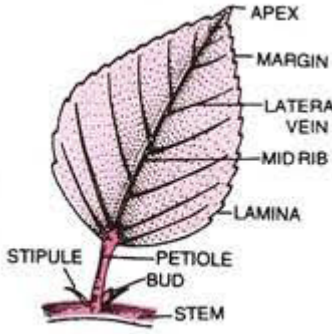
| Term | Definition and explanation |
|---|---|
| Axil | |
| Anther | |
| Bark | |
| Branchlet | |
| Bud | |
| Flower | |
| Fruit | |
| Glaucous | |
| Habit | |
| Inflorescence | |

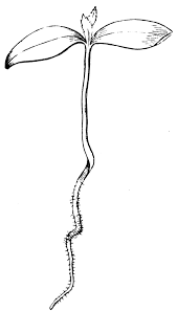
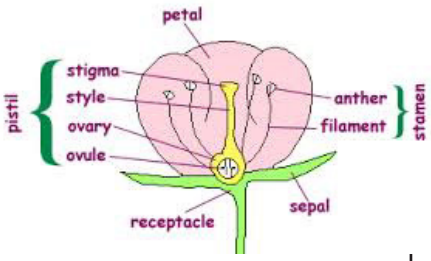
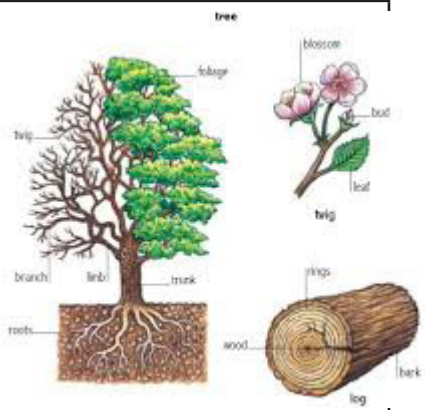
| | |
|---|---|
| Leaf | |
| Margin | |
| Operculum | |
| Petiole | |
| Seed | |
| Seedling | |
| Sheen | |
| Stamen | |
| Trunk | |
| Vein | |

## Appendix 2: Botanical Glossary - complete

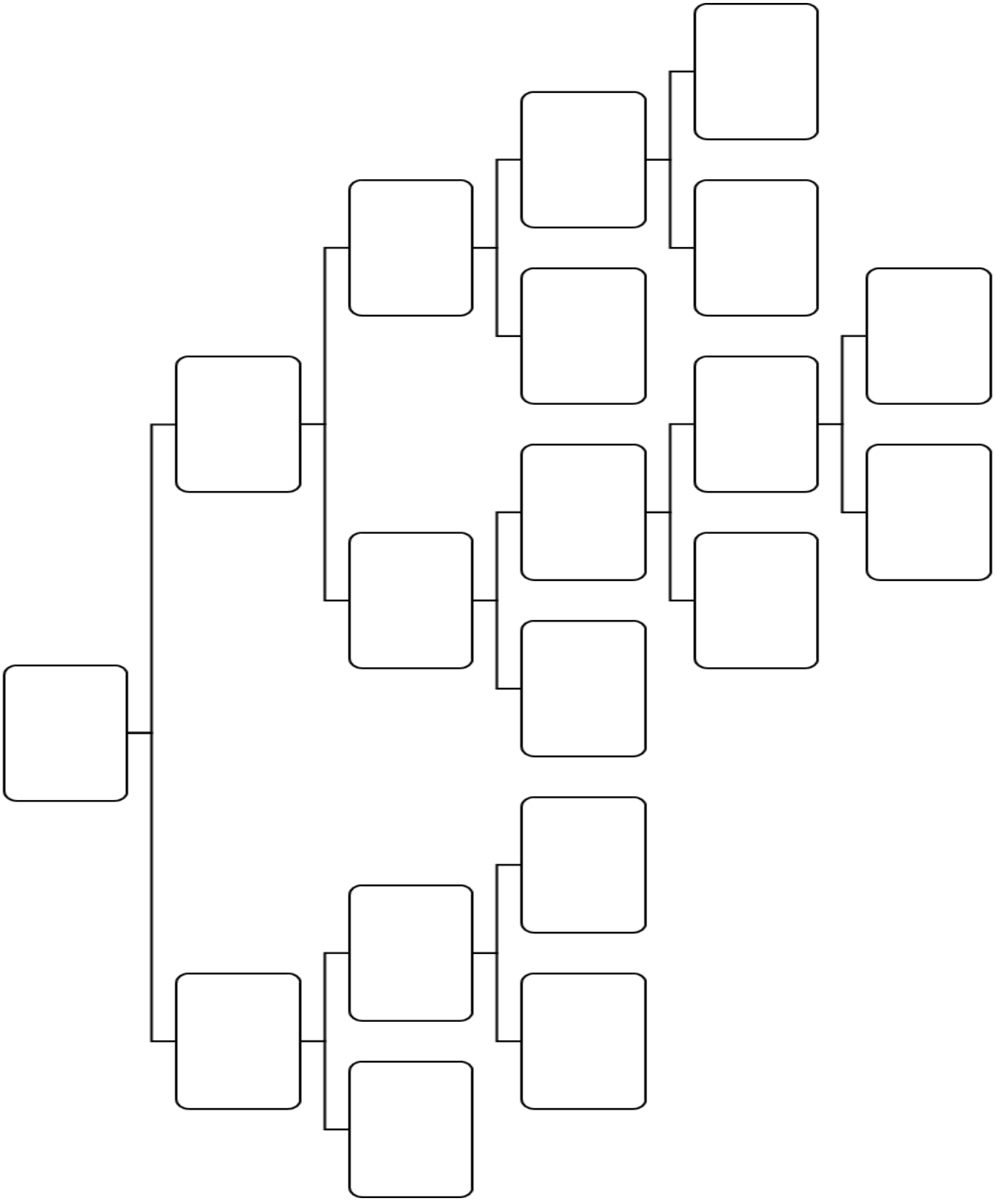
| Term | Definition and explanation | Image |
|---|---|---|
| Axil | The upper angle between a leaf stalk or branch and the stem from which it is growing |  |
| Anther | The part of the stamen that collects the pollen |  |
| Bark | The tough protective outer sheath of the trunk, branches and twigs of a tree or shrub |  |
| Branchlet | A small branch, usually at the end of a larger branch |  |
| Bud | A bud is a small, developing part of a plant that will grow into a flower, a new leaf or a stem. |  |
| Flower | The flower is the reproductive unit of flowering plants (angiosperms). Flowers usually have petals, pistils, sepals and stamens. |  |

| | | |
|---|---|---|
| Fruit | A fruit is the part of a flowering plant that contains the seeds |  |
| Glaucous | Coloured pale grey or bluish-green, especially when covered with a powdery residue. |  |
| Habit | The general shape of growth, especially of a plant. Eucalypts may be a tree (growing from a single trunk) or a mallee (multiple trunks start at ground level). |  |
| Inflorescence | Inflorescence is the a type of flower in which there is more that one flower in a single structure. |  |
| Leaf | A leaf is an outgrowth of a plant. Most leaves are flat and their main function is to make food through photosynthesis. |  <br>Fig. 5.51. Parts of a typical leaf. |

| | | |
|---|---|---|
| Margin | The margins of a leaf are its edges. |  <br>Fig. 5.51. Parts of a typical leaf. |
| Operculum | Something resembling a lid or cover. |  |
| Petiole | A petiole is a leaf stalk. A leaf without a petiole is sessile. |  |
| Seed | The seed is the reproductive unit of some plants. |  |

| | | |
|---|---|---|
| Seedling | A young plant, soon after germination |  |
| Sheen | a bright, smooth surface: | |
| Stamen | The stamen is the male reproductive parts of a flower. It consists of the filament and the anther, which produces pollen. |  |
| Trunk | The trunk of a tree is the stem that supports the crown. |  |

## Appendix 3: Dichotomous Key Template



## Appendix 4: Dichotomous Key table for pencil case example

| | |
|---|---|
| 1.Can not write | Go to 2 |
| 1.Can write | Go to 3 |
| 2. has multiple parts | Go to 4 |
| 2. is a single piece | Go to 5 |
| 3. Has a felt tip | Go to 6 |
| 3. Has no felt tip | Go to 7 |
| 4. is made of plastic and metal | Pencil sharpener |
| 4. is made of plastic only | Glue stick |
| 5. is made of wood | Ruler |
| 5. is made of rubber | Eraser |
| 6. has a round cross-section | Texta |
| 6. Has an oval or rectangular cross-section | Highlighter |
| 7. Has ink | Pen |
| 7. Has no ink | Pencil |

## Appendix 5: Dichotomous Key diagram for pencil case example