



4: Plant buddies

Curriculum connections

Use of this learning and teaching activity may contribute to achievement of the Standards. Indications of relevant Domains and Levels in the *Victorian Essential Learning Standards* are provided to assist teachers to make decisions about the appropriateness of the activity for their students.

Summary

This activity will help students explore some of the more common companion plants, the relationships they have with each other and with some insects.

Student outcomes

This activity will enable students to:

- explore beneficial relationships between plants and animals in the garden
- understand the concept of an ecosystem in a garden
- build on their own knowledge and experience of relationships within the garden
- understand how companion planting techniques are employed in broad scale agriculture.

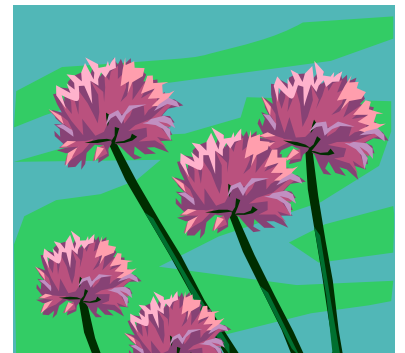
Background notes for teachers

Companion planting (a definition): the grouping together of plants that compliment each other or which will reduce the overall incidence of insect attack or disease.

All plants are affected by the things living around them, including other plants. Companion planting, when done properly can improve the health and vigour of a garden. This phenomenon is the focus of the first part of the 'Plant buddies' activity.

School vegetable gardens are the perfect place to experiment with companion planting to see what happens. When it works companion planting repels, traps and confuses pests allowing predators to eat them; one plant may produce substances to help another plant; or the growing habits of one plant suit that of another. Weeds can also be outgrown with natural 'herbicides', and garden fertility can be improved over time by planting deep-rooted, nitrogen-fixing plants and by allowing garden debris to decay into rich soil.

Companion planting is more than planting things that 'like' each other close together. It is about understanding how things work together in the garden.



Victorian Essential Learning Standards Domains and (Levels):

Humanities (3)
Science (3,4,5)
Interpersonal Development (3,4)
Thinking Processes (3,4,5)
Communication (4,5)

The Design Creativity and Technology Domain may be addressed when 'Plant buddies' is used in conjunction with other activities.

Duration: Part A: 1.5 hours
Part B: 2 hours.

Setting: The classroom or school grounds.

There are many myths about companion planting. This is because many of the 'rules' for companion planting have been developed in Europe and they don't necessarily work here in Australia due to differences in climate, soil, pests and other factors. The approach is therefore to trial each theory with students in your garden. After all, many companion planting strategies are based on historical observations or beliefs about which plants help each other grow better, rather than on strict scientific research. Every garden system is unique so remember that companion planting is not just about putting certain plants together, but is also about the climate, soil, water and overall design of your garden.

Plants that are closely related often have similar nutrient needs; attract or repel the same types of insects; are susceptible to similar diseases, and so on. Learning about these links can inspire close observations and help students make planting decisions – this can be explored in the second part of the 'Plant buddies' activity.

Flower structure is the main criterion scientists use for grouping plants into families. For instance legumes such as peas and beans have irregular flowers with a top and bottom petal surrounded by wing-like petals. Cabbage family plants (brassicas), including broccoli, mustard, turnips and radishes, have four flower petals arranged in a cross shape. Plants in both families have pod-like fruits. Other criteria for grouping plants into families include seed and fruit numbers and types and growing habits.

Although botanists have named about 300 plant families, a handful of large families represent many of our garden staples. These include the mint, cabbage, celery, lily, rose, pea, daisy and grass families. (See Botanical classification table for ideas on which plants are in these families). The potato family *solanaceae* for example, features such garden favourites as tomatoes, capsicums and eggplant, as well as highly toxic plants such as deadly nightshade. Although the flower structure is usually a telltale sign, the average size of different plant species in each family can vary greatly; apple trees, for instance, are in the rose family.

Materials

- plant buddies cards with information about plants (see set 1, 2 and 3 following) – alternatively students may wish to create information cards from their own knowledge and observations
- bulldog clips or string to attach the cards to the students.

References

Jackie French's Guide to Companion Planting in Australia and New Zealand. French, J. Arid Books, Melbourne (2000)

The activity

This is a good activity to undertake using a school buddy system as older students may work with younger students in the garden. 'Plant buddies' has two parts. These activities may be done together or separately.

Notes for teachers

Part A: Companion Planting

1. Students work in pairs and are responsible for planting one 'plant' in the vegetable garden. They must work with the other 'plants' to determine the best position to maximise growth and reduce the impact of insects.

- Insects are then introduced to the garden to test the garden structure to see if the companion planting decisions are effective.
- Students map their garden and reflect on their learnings and insights.

Part B: Plant classification

- Students classify all of the plants in the garden.
- Students investigate scientific classification and its relation to companion planting.

Tips: Encourage your students not to spread out too much in the garden, as they need to be close together for the plants to have an effect.

If you have a class who might get a bit rowdy you may like to create a grid on your garden (with chalk or with witches hats) and encourage students to stand in a line or a square on a grid.

Not all of plants in this activity will be growing in your garden at the same time. This is an opportunity to talk about garden planning and also about the seasonal nature of growing plants.

Part A: Companion Planting

Plants are like people and have likes and dislikes. Ask your students: If you were a plant what do you think you would like or dislike? Create two columns on the board with *like* and *dislike* as the headings and individually, and then as a class, list some of the things that plants might like and dislike about other plants. For example, Dislike (grows in my space, blocks the sun) and Like (smell keeps away insects, keeps to its own area).

- Cut up the attached plant buddies cards and break the class into pairs. Provide each pair of students with two identical 'set 1 cards' (ie: one pair will have 2 celery cards). Ask students to familiarise themselves with their plants.
- Ask each student pair to nominate one person to be the plant and one to be the gardener (ie: celery plant and celery gardener).
- Choose a clear area to call the 'garden' (this can be in the classroom or outside on an area such as a netball court or a large table that all students fit around) as the students are going to become the garden using plant buddies methods.
- The 'plant' students should clip their cards to their clothing so that they can be identified. Ask the plants to stand in the 'garden' and the gardeners to stand on the edge of the garden.
- The gardeners need to give their 'plant' instructions on where to stand, referring to the clues on the cards. The plants are to stand as **close as they can** to the plants that they like to be planted with, and as **far away** from those that they don't. This may take a while as some plants will want to be close to one that wants to be far away from others.
- Once the first half of the garden is planted using the clues on the cards, the gardeners become plants. **One by one** each of the gardeners will receive a 'set 2 card.' The gardeners become these plants and are included in the garden. As a whole group (the original 'plants' are included) students need to decide where the remaining plants fit into the garden by standing as **close as they can** to the plants that they like to be planted with, and as **far away** from those that they don't.



7. Once all of the 'number two' plants have been planted, the remaining gardeners then become the insects found in the 'number 3 cards'. These students try to create disturbance by randomly flying through the 'vegetable patch' to see the reaction of plants. If the plants are planted according to the information on the cards the insects may not have any impact but if there are unprotected plants then the insects may have a field day! (If you have more students you can add in some other factors such as birds feeding on insects, bees pollinating flowers, possums that eat everything, etc).
8. Once the garden is planted and the impact of insects is minimal, each 'plant' places their card on the ground where they are standing. With this information students can map on paper, the 'vegie patch' that has been created to visually represent the garden. With younger students, do this as a group back in the classroom on the whiteboard (marking in one plant at a time and asking the other plants who were close to it to place their plant on the board).
9. As a class discuss the activity in relation to living things. Highlight that the garden ecosystem wouldn't function if too many of the plants/pests were removed (eg. aphids attack fruit trees, however if there are no aphids then birds wouldn't have enough to eat).
10. As a class discuss the following points:
 - Would a farmer plant a paddock of sunflowers next to a paddock of corn? Why? Can students think of some examples of farmers using companion planting to their advantage? (eg: roses in vineyards).
 - Investigate crop rotation and the role of some plants in preparing the soil for another crop.
 - There are many other pests of agricultural crops – research one pest of a food crop (students can choose a food they like to eat). Investigate the issues of plants and animals becoming resistant to chemical herbicides and insecticides in broad scale agriculture – what are the implications of this?

Part B: Plant Classification

Often plants that are closely related have similar nutrient needs, attract or repel the same types of insects and are susceptible to similar diseases. This activity will assist student learning about these links and can help you to better plan your garden to repel or trap pests.



Explain that scientists use classification systems to help identify and classify plants and animals. By organising specimens based on similar characteristics, scientists can also better understand how these species might be related to each other on an evolutionary level. Keys come in many different formats. Some are used to identify organisms into larger categories, such as mammals and reptiles, and others are used to distinguish among closely related species. A **dichotomous key** presents the user with a series of yes/no statements regarding distinct characteristics of the specimen. ("The plant has leaves." OR "The plant does not have leaves.") These statements are sometimes referred to as couplets. A couplet is essentially an either/or choice. The specimen is correctly identified when one makes the appropriate choice for each set of characteristics in a series of consecutive steps.

Split the class into groups of four. Using the *Botanical classification table* on the following page, provide students with a complete list of the plants that they have been investigating in Part A (or choose a variety of foods grown in the school garden). Discuss with students the many ways to classify plants / animals / objects and explain that they will classify the plant buddies they have been working with in the activity.

1. Discuss as a class different ways of grouping objects. Objects can be grouped together based on similar features such as colour, size or shape. Ask why it is important to group objects?

(Example: We are grouping when we organise the utensil drawer in the kitchen to separate knives, forks and spoons.)

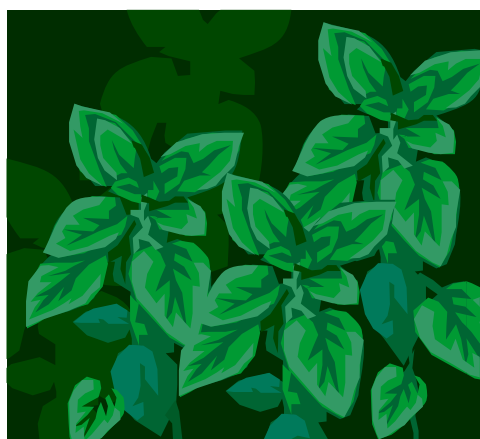
Instruct each group that they will classify the plants in the 'Plant buddies' activity. Each group will have to develop classification rules. Write these rules on a piece of paper (eg. classification by colour, classification by size, classification by sweetness of taste, etc) and look for similar characteristics in each plant to classify it.

2. Introduce dichotomous keys as one way of grouping and identifying. Introduce the term "dichotomy" explaining that it is a division of two different groups or entities where one has a certain quality or attribute and the other doesn't. Essentially it is from a Greek word which means cutting apart.

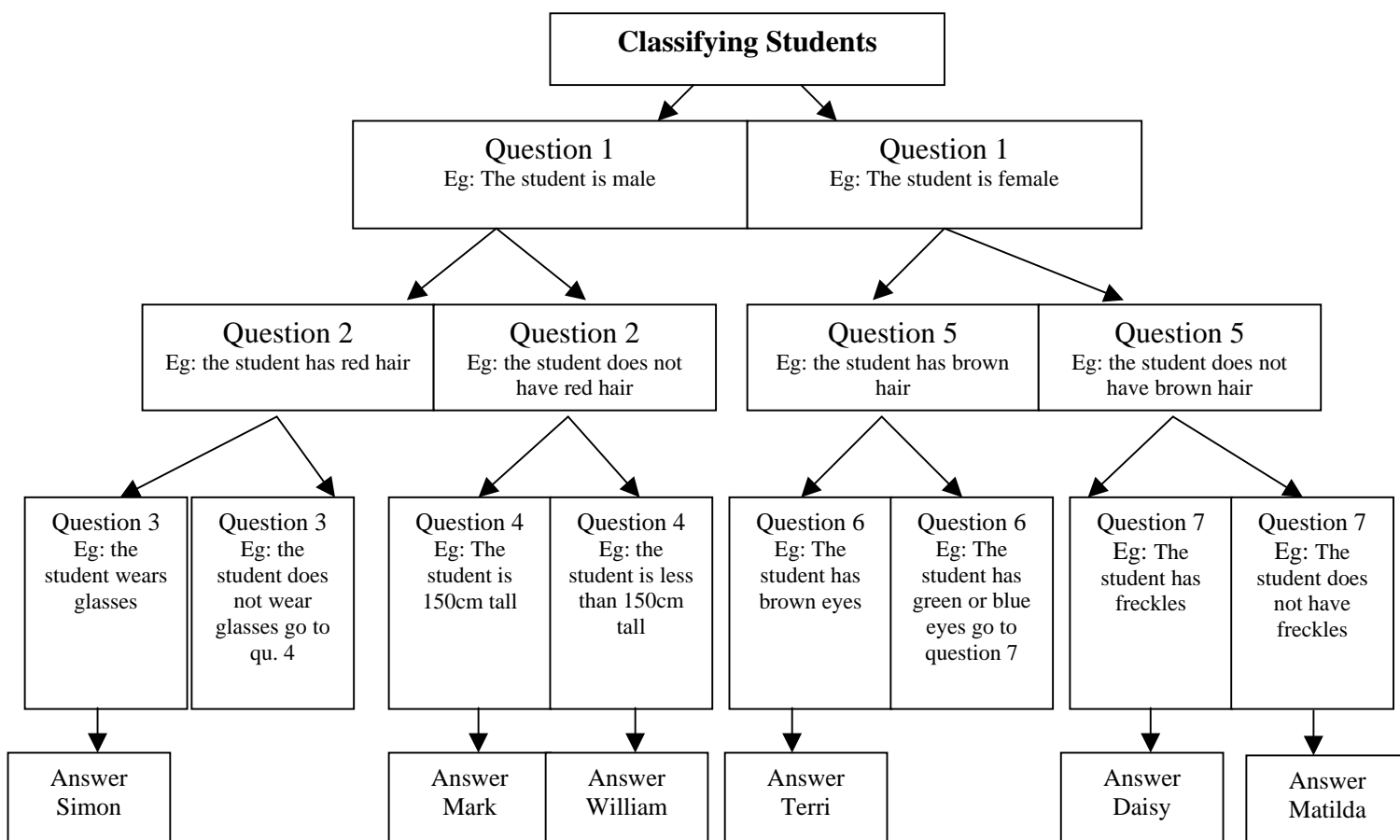
(Example: The people in this room could first be grouped into categories of eye colour. A couplet for this might be: "People who have brown eyes" and "People who don't have brown eyes.")

Explain that plant buddies are loosely based on a botanic process of classification. Scientists look at the flowers, fruit, seeds and growing habits of a plant and classify them in a particular way. Students could look at plants in the school garden and attempt to classify them using botanic methods.)

3. Invite students to create their own dichotomous key to classify the plants they have studied by looking at the flowers of plants. (Teachers may have to bring in pictures or students can explore the garden.)



The key can be constructed like the example below (which classifies students) using yes/no statements:



As a class discuss these findings in relation to the school garden:

- Think about how to make similar cards for your own school/home garden – what sorts of information would be required?
- Brainstorm with your students to design a garden using ‘Plant buddies’ techniques – what are the advantages and disadvantages of doing this as a group?

11. Students should individually think about and record answers to the following questions:

- How can plant buddies help in your school/home garden?
- Are there any plant buddy match-ups that don’t work, based on experience and observation in your garden?
- Is there anything you might think about changing or trialling in your garden as a result of this activity?
- What have you learned that you might tell your parents/grandparents/another gardener?
- Are there other plant buddies you know about that aren’t listed here?

Remember that companion planting is often about trial and error and there are a range of factors that affect the success of ‘plant buddies’!

Extension activities

School garden extension activities

- To enhance mathematics learning outcomes of the above activity create a grid to overlay a garden map (with letters and numbers) and discuss where each plant is situated and how far it can move as defined by the grid.
- In relation to companion planting list some of the problems in the garden:
 - Are there certain plants that are continually being eaten by pests?
 - Is there a low yield of certain fruit or vegetables?
 - Is the soil healthy enough to support the diversity of plants growing?
 - Does your school garden have a problem with weeds? Which ones?As a class, brainstorm of some ways that might rectify or help some of the above problems.
- Undertake scientific experiments with your students to investigate companion planting. Hypotheses and research questions may be inspired by companion planting traditions, personal garden observations, or what students have learned about plant needs from adults or friends, books or the internet. Students may wish to chart plant growth, insect visitors or other factors over time.
- Suggested research topics include:
 - Will a garden bed surrounded with garlic have fewer pests than one with no garlic around it?
 - Will a bigger corn harvest be obtained if beans are grown between corn rows? (**Note:** Give the corn a head start of a few weeks.)
 - Do pumpkins grow bigger if nitrogen-fixing clover is grown between the plants?
 - If we put plants that are supposed to attract beneficial insects in one section of our schoolyard, will we find more of the "good guys" there than in other parts of the school?
 - Will spinach planted in the shade of peas last longer than spinach planted in an open bed?
 - How can we arrange lettuce and onions in a plot to get the best yield?
- Visit a local community garden or a local farm and interview people who grow plants there. How do they do it, why do they do it, what advice do they have, what have they discovered?
- Ask students to use their eyes and hand lenses in the garden to closely observe a variety of flowers in the community, schoolyard, and garden. They can look at and describe or draw each flower as a whole and then take a close-up view. Have them examine the number and nature of different flower parts to think about how botanists classify plants.

Related LandLearn activities

Grow and Gobble activity booklet available on *LandLearn Resource Booklets CD*. Activities include 'Seed viewing', 'Tasting passports', 'Vegie coloured eggs', 'Grow your own fruit and vegies' and 'Vegie bingo'.

SuperSeeds activity booklet on *SuperSeeds CD*. Activities include 'Have you ever eaten grass?', 'Bacteria helping plants', 'Is planting legumes the answer?' and 'The advantages of knowing exactly where you are!'

Plant Power activity booklet available on *LandLearn Resource Booklets CD*. This booklet includes activities relating to plant structure and function.

Botanical classification table

Common Plant name	Latin Family name	Common Family name
Pea	<i>Fabaceae</i>	Pea family
Broad bean	<i>Fabaceae</i>	
Garlic	<i>Liliaceae</i>	Lily family
Onion	<i>Liliaceae</i>	
Wormwood	<i>Asteraceae</i>	Daisy family
Chamomile	<i>Asteraceae</i>	
Sunflower	<i>Asteraceae</i>	
Lettuce	<i>Asteraceae</i>	
Cauliflower	<i>Brassicaceae</i>	Cabbage family
Cabbage	<i>Brassicaceae</i>	
Broccoli	<i>Brassicaceae</i>	
Celery	<i>Apiaceae</i>	Celery family
Dill	<i>Apiaceae</i>	
Parsley	<i>Apiaceae</i>	
Tomato	<i>Solanaceae</i>	Potato family
Eggplant	<i>Solanaceae</i>	
Mint	<i>Lamiaceae</i>	Mint family
Basil	<i>Lamiaceae</i>	
Nasturtium	<i>Tropaeolaceae</i>	Nasturtium family
Stone fruit	<i>Rosaecae</i>	Rose family
Corn	<i>Poaceae</i>	Grass family

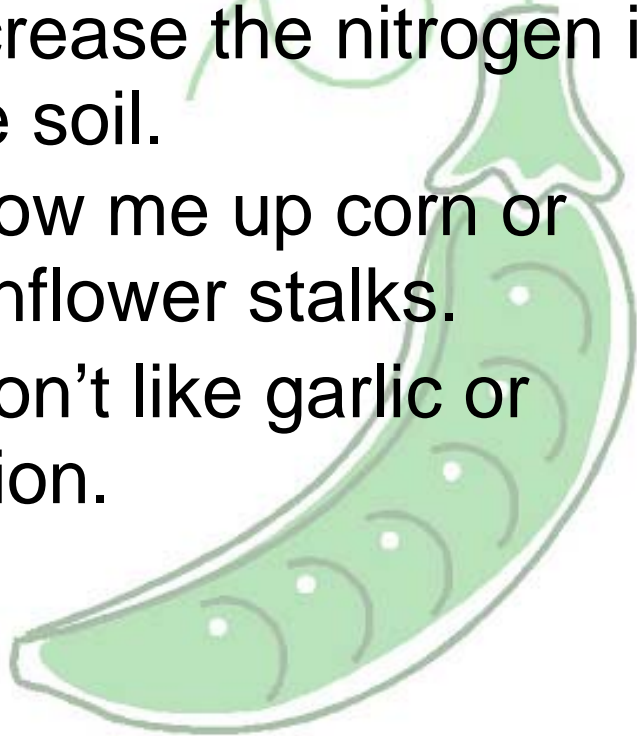
Set 1 cards

Teachers – Print these out twice as you will need 2 copies of each set 1 card

1

Pea

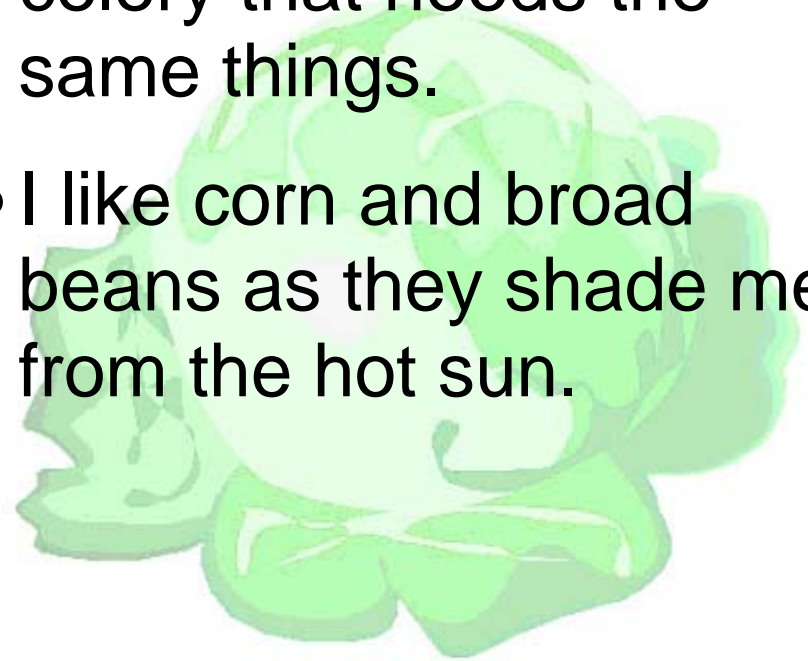
- All plants except garlic and onion like me as I increase the nitrogen in the soil.
- Grow me up corn or sunflower stalks.
- I don't like garlic or onion.



1

Lettuce

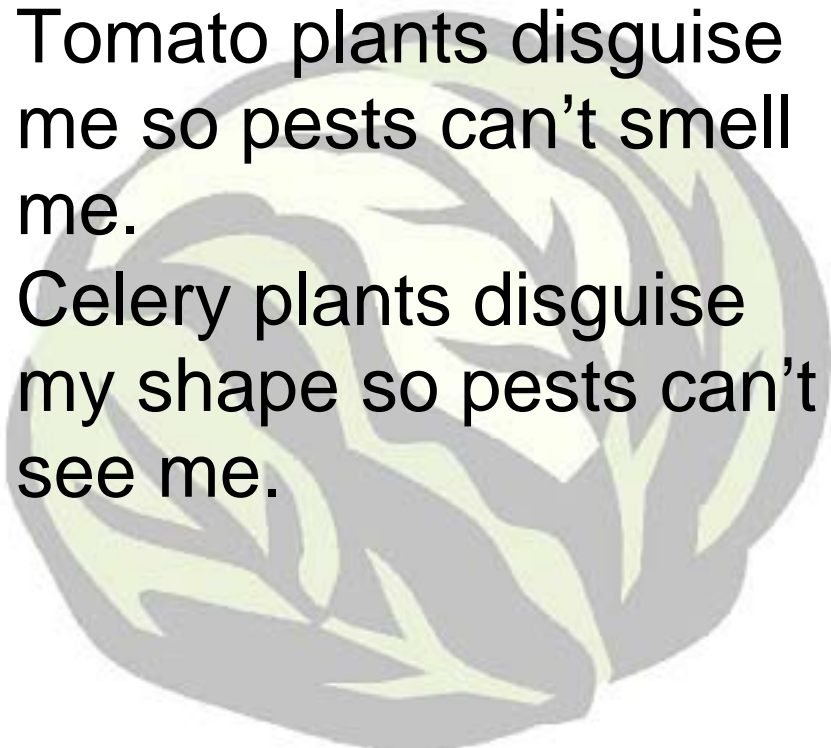
- I need lots of water and food so plant me near celery that needs the same things.
- I like corn and broad beans as they shade me from the hot sun.



1

Cabbage

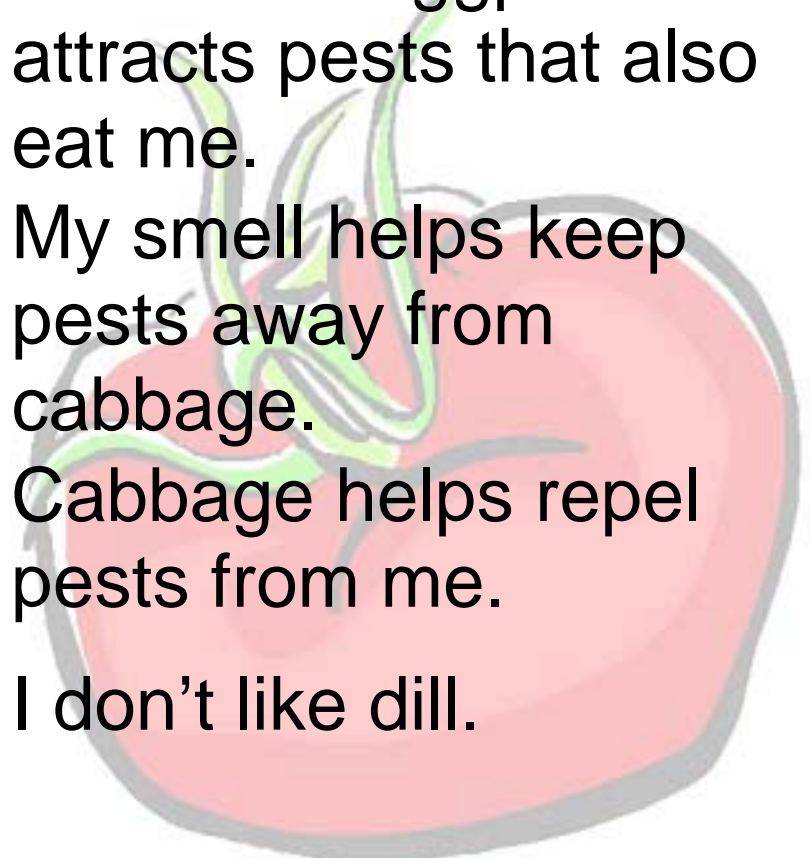
- Cabbage butterfly likes to eat me.
- Tomato plants disguise me so pests can't smell me.
- Celery plants disguise my shape so pests can't see me.



1

Tomato

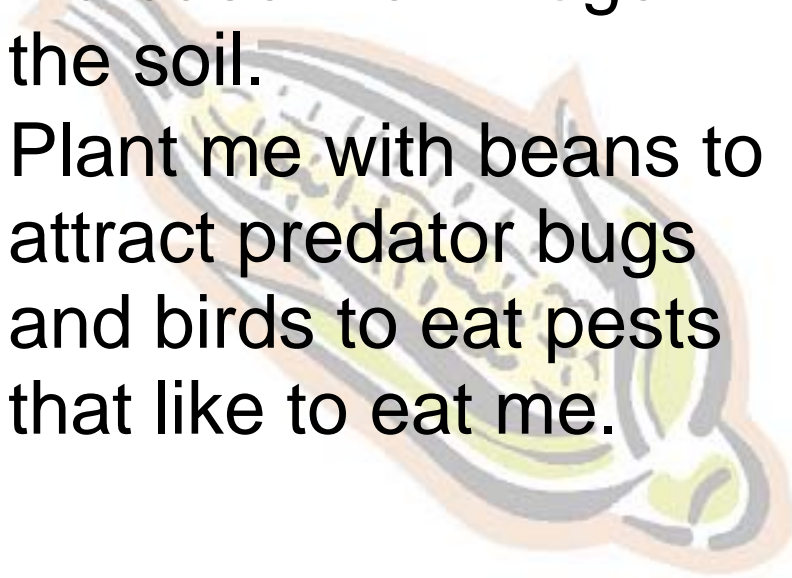
- I don't like eggplant as it attracts pests that also eat me.
- My smell helps keep pests away from cabbage.
- Cabbage helps repel pests from me.
- I don't like dill.



1

Corn

- I don't like sunflowers as they stunt my growth.
- I like peas as they increase the nitrogen in the soil.
- Plant me with beans to attract predator bugs and birds to eat pests that like to eat me.



1

Wormwood

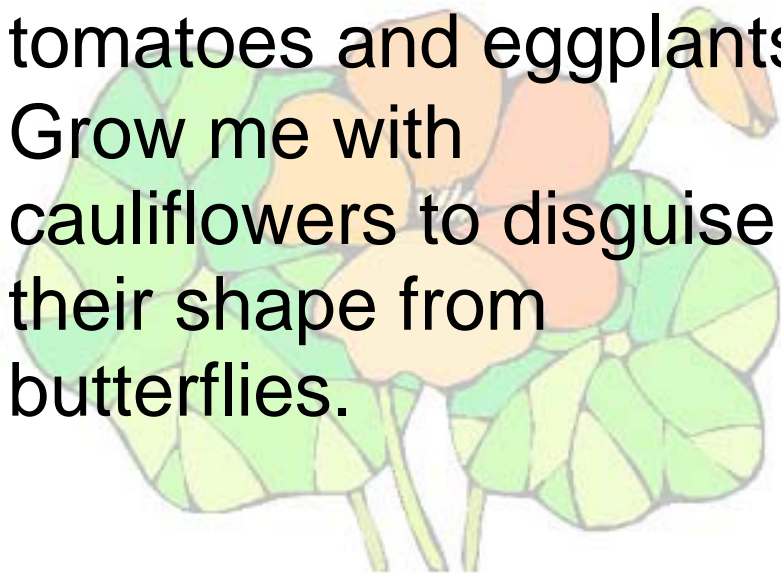
- I repel flies and mosquitoes, moths and butterflies and aphids.
- Don't plant me too close to other plants as I might slow down their growth.



1

Nasturtium

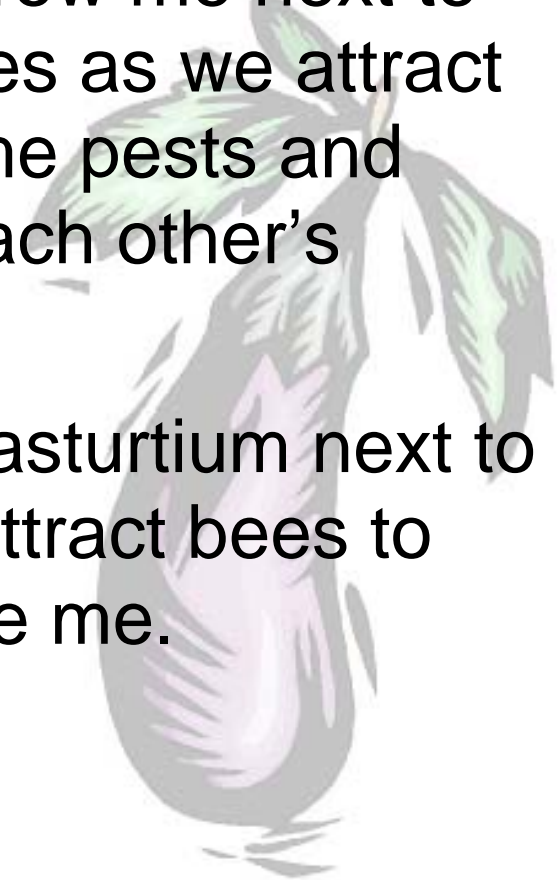
- Aphids and other sap suckers don't like the smell of my flowers.
- I attract bees to pollinate tomatoes and eggplants
- Grow me with cauliflowers to disguise their shape from butterflies.



1

Eggplant

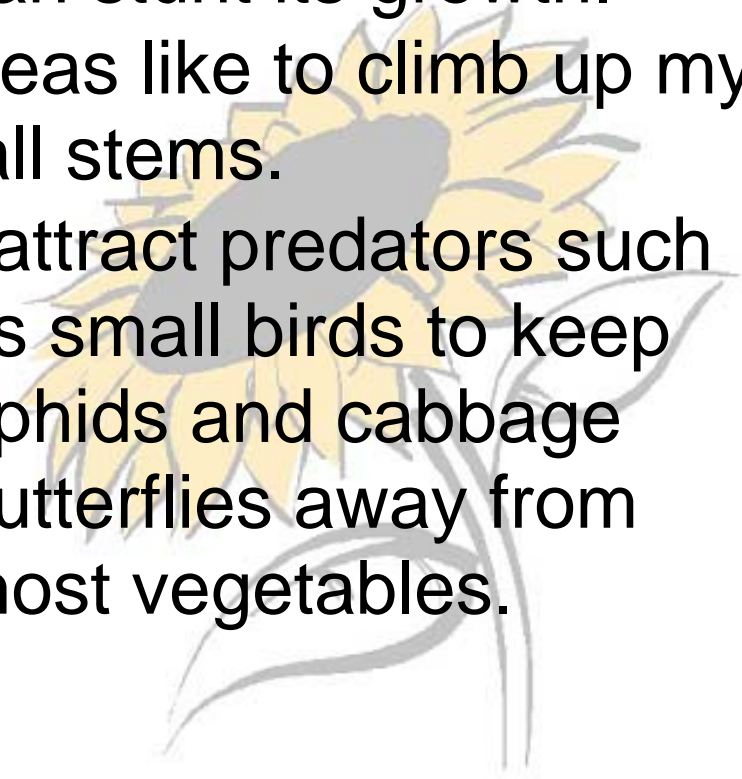
- Don't grow me next to tomatoes as we attract the same pests and stunt each other's growth.
- Plant nasturtium next to me to attract bees to pollinate me.



1

Sunflower

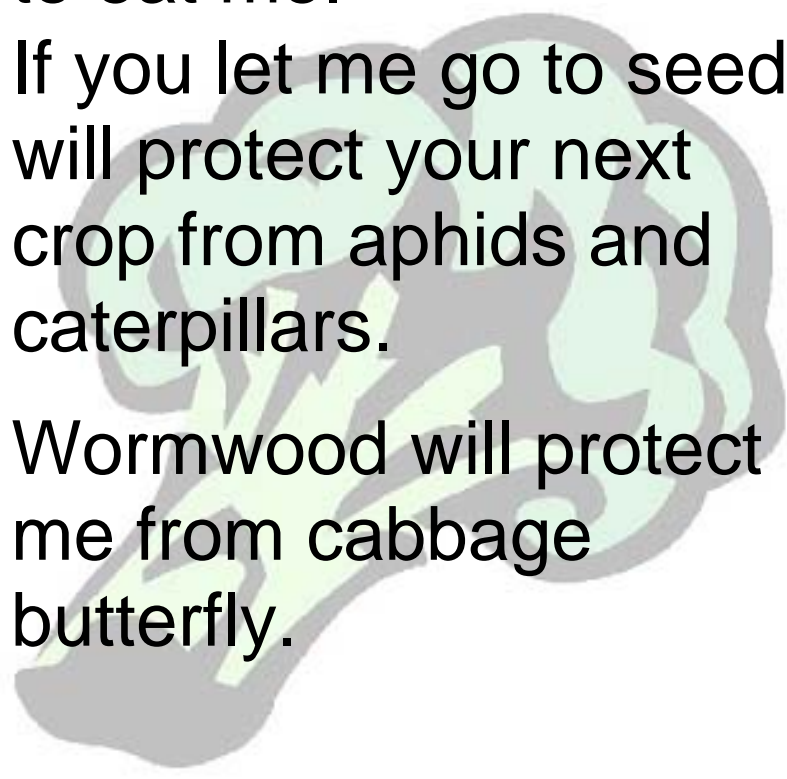
- Corn doesn't like me as I can stunt its growth.
- Peas like to climb up my tall stems.
- I attract predators such as small birds to keep aphids and cabbage butterflies away from most vegetables.



1

Broccoli

- Cabbage butterfly likes to eat me.
- If you let me go to seed I will protect your next crop from aphids and caterpillars.
- Wormwood will protect me from cabbage butterfly.



1

Cauliflower

- Once I have started to rot, I stop seeds of all other plants around me from germinating.
- Cabbage butterfly likes to eat me.
- Nasturtium plants disguise my shape from cabbage butterflies.



1

Celery

- I need lots of water and food so plant me with other plants that need the same such as peas.
- I like to be planted with lettuce as it is small enough not to take my food and water.
- I disguise cabbage from pests.



Set 2 cards

2

Broad Bean

- I increase the nitrogen in the soil so all plants like me except garlic and onion.
- Aphids eat me so plant nasturtium near me.
- Cauliflower, broccoli and cabbage increase my growth.
- I don't like garlic.



2

Garlic

- Grow me under peach and apricot trees to keep the aphids away.
- I repel aphids and other sap suckers from tomatoes, celery and eggplant.
- I repel cabbage butterfly from cauliflower, broccoli and cabbage.



2

Mint

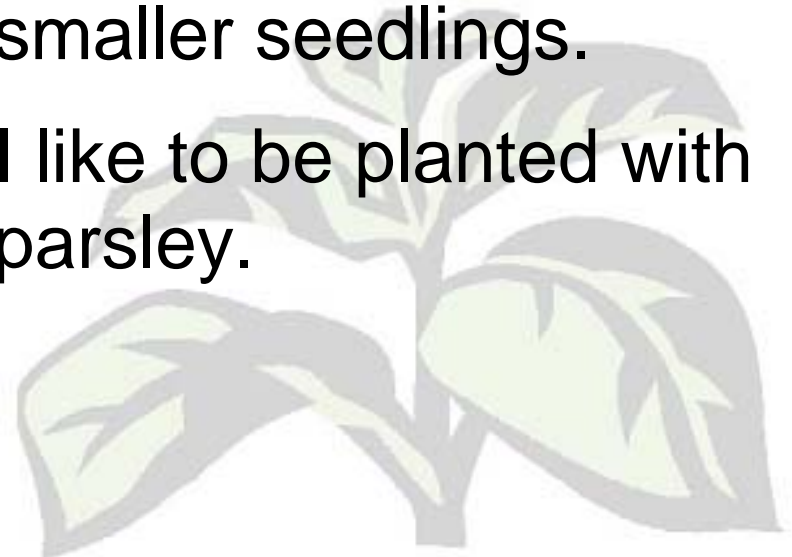
- I repel flies and cabbage butterflies.
- I increase the growth of cabbage, broccoli and cauliflower.
- I don't like to be planted with parsley.
- Onions don't like me nearby as I take their space.



2

Basil

- I repel flies and mosquitoes with my strong smell.
- I repel pests from smaller seedlings.
- I like to be planted with parsley.



2

Peach & Apricot

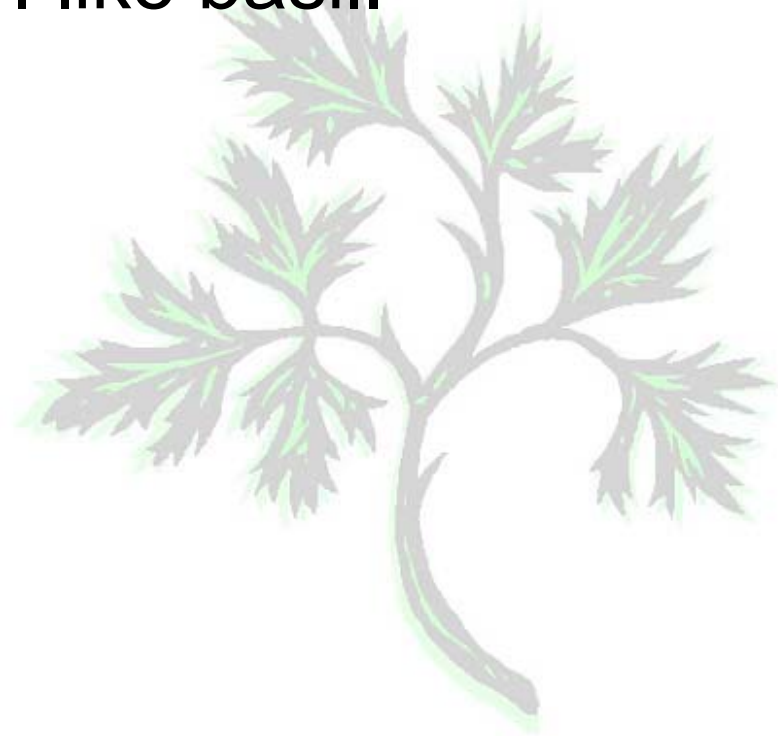
- Dill that has gone to seed helps protect me from pests.
- Aphids like to eat me.
- I like garlic as it keeps aphids away from me.
- Don't plant me too close to other plants as I am too shady.



2

Parsley

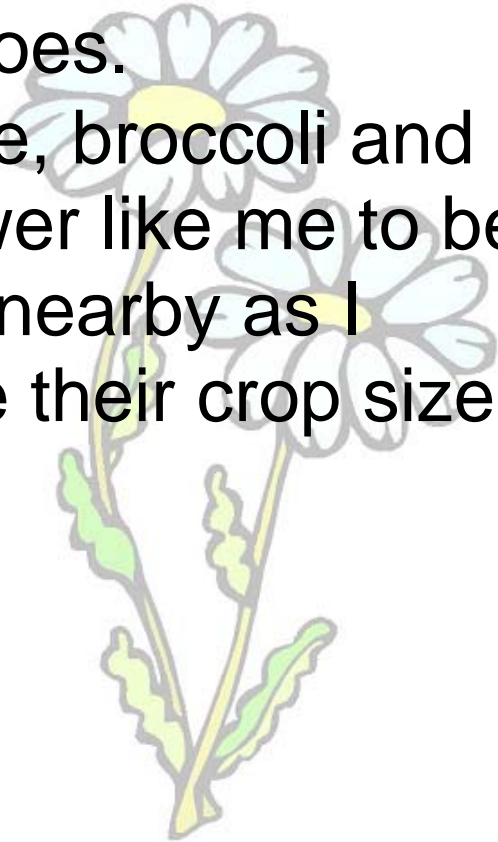
- I don't like mint.
- I like basil.



2

Chamomile

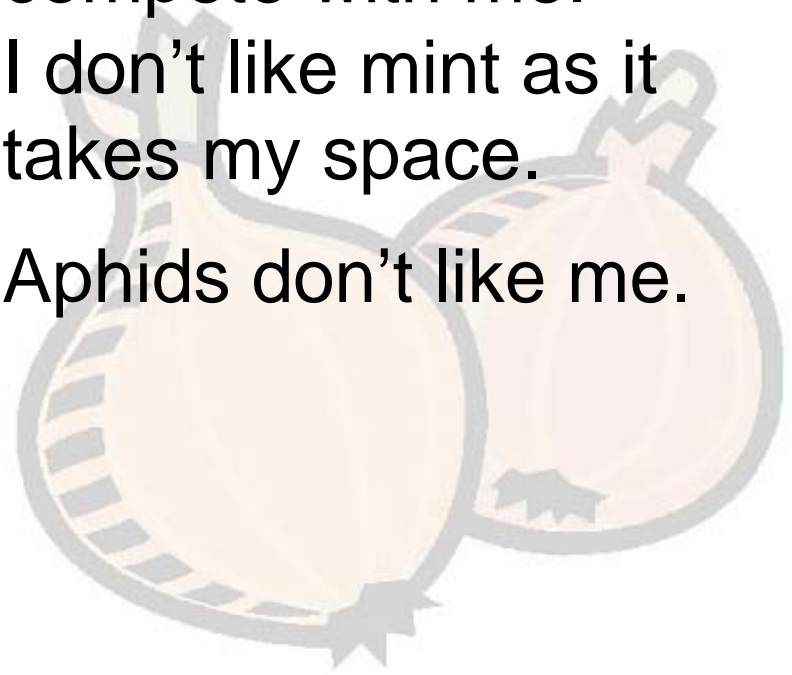
- I repel flies and mosquitoes.
- Cabbage, broccoli and cauliflower like me to be planted nearby as I increase their crop size.



2

Onion

- Lettuce increases my growth and it doesn't compete with me.
- I don't like mint as it takes my space.
- Aphids don't like me.



Dill

- I increase the growth of celery.
- I attract predators to feed on aphids and other sap suckers.
- I help peach and apricot trees after I have gone to seed.
- I repel cabbage butterfly from broccoli, cauliflower and cabbage.



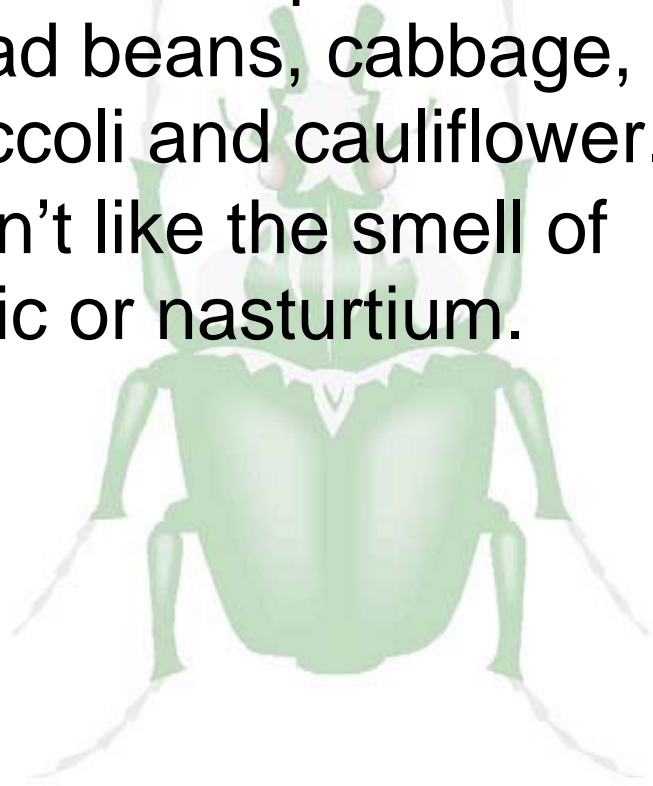
Set 3 cards

3

Aphids

I like to eat:

- Peach and apricot trees, broad beans, cabbage, broccoli and cauliflower.
- I don't like the smell of garlic or nasturtium.



3

Flies & Mosquitoes

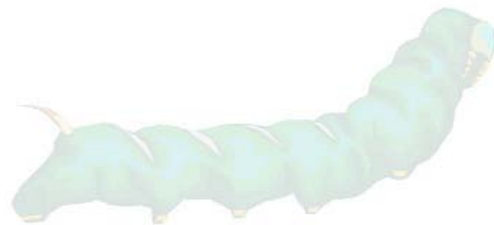
- We don't like the smell of:
 - Basil
 - Wormwood or Chamomile
- We like the taste of gardeners!



3

Cabbage butterfly (and caterpillars)

- I like to eat cabbage, broccoli and cauliflower.
- I don't like the smell of tomatoes.
- Celery confuses me when I am looking for food.



Ideas for classes bigger than 25 students, turn them into:

- Possums
- Worms
- Birds – black birds (not so good) and wrens (good)
- Earwigs
- Chooks

