

produced by

imagine

CREATED BY

scitech

PERTH • AUSTRALIA

LEARN • PLAY • DISCOVER

# BACKYARD ADVENTURES

## EDUCATOR'S GUIDE



GRAND RAPIDS  
PUBLIC MUSEUM

*Be curious.*



grpm.org



## Contents

<b>Exhibit Overview</b> .....	2-4
<b>Exhibit Activities</b> .....	5-13
<b>Post-visit classroom activities</b> .....	14-24
<b>Extended school project</b> .....	25

## Exhibition background

From the biological interactions between plants and insects, and the zoology of nocturnal animals to the horticultural know-how that goes into growing giant vegetables, the mathematical genius needed to lay pavers and the feats of construction that can go on in the shed, the backyard is full of science.

Scitech has created a travelling back garden, complete with a decaying house, giant mechanical skipping rope and garden golf that will engage visitors with science and technology and enable them to continue discovering after they leave the exhibition.

## Visitor appeal

Backyard Adventures is targeted at children aged between 5 and 12 years, although the exhibition does provide opportunities for learning and engagement for people of all ages.

The diversity of subject material will enable varied interest groups to become engaged with the exhibition, be they interested in gardening, zoology or physics.

The backyard enables visitors to engage with exhibits in a familiar environment, with similar experiences available to visitors in their own home situation. Many of the exhibits can be duplicated by visitors in their own gardens, taking the science center experience to a new level of engagement.



# EXHIBITION FLOOR PLAN

JANUARY 24, 2026 – SEPTEMBER 7, 2026

CREATED BY  
**scitech**  
PERTH • AUSTRALIA

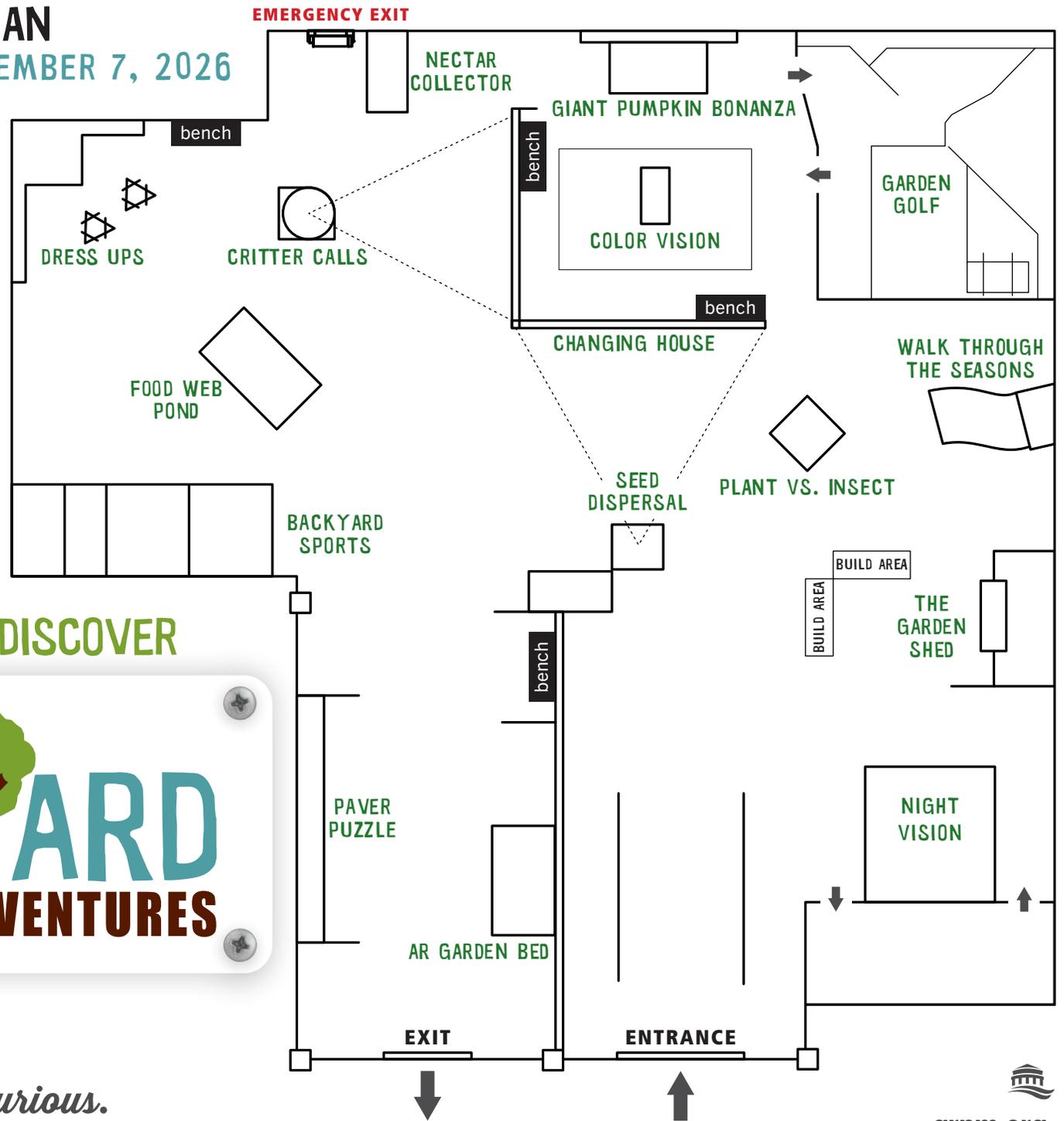
produced by  
**imagine**

LEARN • PLAY • DISCOVER



GRAND RAPIDS  
PUBLIC MUSEUM

*Be curious.*





## The Exhibition

*Backyard Adventures* consists of 16 interactive science exhibits. All exhibits are accompanied by graphic panels outlining what the visitor needs to do, explaining the science principles of the exhibit and providing additional information that may be of interest to people who want to know more.

### KEY MESSAGES

#### 1. Science is in everything and everyone can be a scientist

Visitors will be amazed at the science they can find in their own backyards. By observing science in a relatable context, they are encouraged to appreciate the biodiversity of their gardens (Food Web Pond), use problem solving (Garden Golf) and explore the physics of the tool shed (Garden Shed).

#### 2. There is more to your backyard than you imagine

The exhibition focuses on seeing the unseen and taking a closer look at the world around you. The exhibition draws the visitor into the garden, making them more aware of their local world and how things interact, operate and live in that environment. Exhibits such as 'Plant vs Insect', the 'Bee's Eye View' and the 'Nectar Collector' enable visitors to discover details they normally don't see and ask questions about how organisms live in different environments.

#### 3. Active outdoor play can benefit physical and mental health

Research has found being active outdoors is good for our mental health as well as our physical wellbeing. Being physically active helps lower the levels of obesity and related diseases, but just being outdoors can help reduce stress, anxiety and depression. Add creative and challenging activities and the health benefits increase further. Work up a sweat in this exhibition as you cycle on the 'Nectar Collector', get on the treadmill in 'Walk through the Seasons', jump over our 'Giant Skipping Rope' and exert some energy with 'Backyard Sports'.



## Exhibit Activities

### Night vision

Investigate the creatures that live in your garden at night. What do they do when you go to sleep? Try to find the animals in their own environment.

SCIENCE LINKS: Biology, ecology



### Color vision

Take a look at the garden through the eyes of a bee or a dog. Using special lenses, see how different creatures see the world around us.

SCIENCE LINKS: Biology, light (physics)

### Walk through the seasons

Plants grow very slowly. Take a walk through our digital garden and observe plants growing in super time. Can you spot the changes that usually take months or years to happen?

SCIENCE LINKS: Biology, ecology, weather





## Giant pumpkin bonanza

Do you have what it takes to grow a giant pumpkin? Try your hand at creating the world's biggest vegetable in our specially designed vegetable patch.

SCIENCE LINKS: Agriculture, horticulture

## Food web pond

Explore the intricacies of animal-insect-plant interactions at the pond. Investigate which creatures rely on other creatures to survive in this frog-eat-insect world.

SCIENCE LINKS: Biology, ecology



## Exhibit Activities

### Nectar collector

Jump on board the flying bee for a bee's eye view of the garden. Try your luck at pollinating flowers and collecting pollen for honey production. It's not as easy as it seems!

SCIENCE LINKS: Biology, ecology



### Seed dispersal

Take a look at a number of plants and see what mechanisms they use for spreading their seeds through the environment.

SCIENCE LINKS: Ecology, physics

### The garden shed

The everyday garden shed; a haven for power tools, ladders and lawn mowers. Step inside the shed and see what you can create with the tools and objects on the work benches.

SCIENCE LINKS: Physics, electronics, engineering, problem solving





## Paver puzzle

Someone has started this DIY project and hasn't had time to complete it. Can you help complete the path using odd shaped pavers?

SCIENCE LINKS: Problem solving, mathematics

## Critter calls

Investigate some of the animal noises that can be heard in the backyard. Can you match the call to the source? Is it a bird, frog or insect – the answer may surprise you.

SCIENCE LINKS: Biology, sound (physics)



## Plant vs insect

Who will win? The plant or the insect? Examine the plant-animal interactions as you challenge friends in this interactive game. Arm yourself with natural defense mechanisms to beat your opponent.

SCIENCE LINKS: Biology, ecology, evolutionary biology

## Exhibit Activities

### Dress ups

Designed for the younger ones, visitors can step inside the costume of a spider, bee or ladybug and experience the exhibition from a different perspective. Great for photo opportunities!

SCIENCE LINKS: Biology



### The changing house

Stand back and watch as this amazing house changes through the seasons. Observe the effects of plants and animals and be intrigued by the process of decay. This exhibit uses a clever combination of physical walls and projection mapping to create a range of scenarios.

SCIENCE LINKS: Ecology, weather

### Backyard sports

How fast can you throw a ball or kick a soccer ball? Check your speed and compare with your friends. A radar speed camera will record the speed of your throw and display it on a digital screen.

SCIENCE LINKS: Exercise science, physics





### Garden golf

Try your hand at the backyard-themed mini golf. Be warned - you'll need more than good putting skills to get around this course!

SCIENCE LINKS: Physics, problem solving



### Augmented reality garden bed

Dig down in the 'dirt' and see if you can spot the different layers of soil. Use your hands to make it rain and see the effects.

SCIENCE LINKS: Soil science, weather, biology, electronics



## Exhibit Activities

This exhibit is designed to be highly interactive and hands-on to encourage visitors to learn through discovery and play. Many educators who plan field trips like to use scavenger hunts or activity guides printed on clipboards. This is a great strategy to encourage engagement and connect to classroom learning objectives! However, having a clipboard and pencil might hinder students from active participation in the exhibit interactives.

If you are looking for additional ways to prompt students as they explore the exhibit, consider using the prompts on the following pages. They are designed to help learners digest the new information and make connections to broader science and math concepts. Adult chaperones could raise these questions in discussion with student groups inside of the exhibit, or students could complete them on the bus ride back to school or in the classroom.



### PHYSICS AND MATH

#### How fast can you throw?

- This exhibit uses a RADAR to measure speed. How does a RADAR work?
- Name 2 other uses for a RADAR machine.
- What is the slowest you can throw (while standing at the top of the net) and still hit the target?

#### Mini golf:

- What forces are acting on the ball when it is rolling down a hill?

#### Paver puzzle:

- Make a pattern with the shapes and draw your pattern.
- What is a tessellation?
- What do all the shapes have in common?
- Which of the paver shapes are parallelograms?

#### Pumpkin growing game:

- What units are used to measure the amounts of fertilizer and water used?
- Which fertilizer is best for growing things big?

## BIOLOGY

### Plant vs insect:

- Which trait should you pick for an insect to beat a plant that has thorns?

### Food web pond:

- Draw the food chain in the game.
- What does the fish eat?
- What eats the fish?

### Nocturnal Animals:

- What animals can you see in the night-vision camera?
- What do racoons eat?
- Which of these animals are native to North America?

### Color vision:

- What colors can dogs, bees, and humans all see?
- What colors can bees see that humans can't?

### Critter Calls:

- Name all the birds you can find in this section.
- How are western diamondback rattlesnakes unique?
- How large do crickets grow?

### Seed Dispersal:

- Which seeds float on the water?
- Why do plants need to disperse their seeds?



### Connect and Reflect.

Encourage students to reflect on and share their reactions to the exhibit. The following prompts could work in various formats, including journal reflections, think-pair-share discussions, or whatever works best for you!

- What is the most interesting thing you learned in this exhibit?
- What surprised you?
- What activity did you have the most fun with?
- What does this exhibit remind you of? Does it connect to any prior memories or learning experiences? Any movies, books or shows?
- What questions do you have after exploring this exhibit?

## Answer Key

### PHYSICS AND MATH

#### How fast can you throw?

- This exhibit uses a RADAR to measure speed.

How does a RADAR work?

*The RADAR sends out lots of pulses that bounce off the ball as it travels. These pulses bounce back to the RADAR so it can calculate the speed.*

- Name 2 other uses for a RADAR machine.  
*Many possible answers, including: sports like tennis, speed cameras, weather prediction, airplanes.*
- What is the slowest you can throw (while standing at the top of the net) and still hit the target?  
*Approximately 20km per hour.*

#### Mini golf:

- What forces are acting on the ball when it is rolling down a hill?  
*Gravity and friction.*

#### Paver puzzle:

- What is a tessellation?  
*An arrangement of flat shapes that has no gaps and no overlaps.*
- What do all the shapes have in common?  
*They are all quadrilaterals (they all have 4 sides!).*
- Which of the paver shapes are parallelograms?  
*The square, the rectangle, and the parallelogram.*

#### Pumpkin growing game:

- What units are used to measure the amounts of fertilizer and water used?  
*Fertilizer is in pounds, water is in quarts.*
- Which fertilizer is best for growing things big?  
*Phosphorus.*

### BIOLOGY

#### Plant vs insect:

- Which trait should you pick for an insect to beat a plant that has thorns?  
*Wings.*

#### Food web pond:

- Draw the food chain in the game.  
*The picture should have the kingfisher at the top, then the fish, then the tadpole, then the mosquito larvae, then the pondweed.*
- What does the fish eat?  
*Tadpoles.*
- What eats the fish?  
*The kingfisher.*

#### Nocturnal Animals:

- What animals can you see in the night-vision camera?  
*Red fox, rabbit, cat, opossum, raccoon.*
- What do raccoons eat?  
*Raccoons are omnivorous and eat both plants and animals. This includes nuts, fruits, seeds, frogs, bird eggs, fish, insects, and worms.*
- Which of these animals are native to North America?  
*Bullfrog, Raccoon, Opossum, Barn Owl, Green Tree Frog, Red Fox.*

#### Color vision:

- What colors can dogs, bees, and humans all see?  
*Red and green.*
- What colors can bees see that humans can't?  
*Ultraviolet.*

#### Critter Calls:

- Name all the birds you can find in this section.  
*Chicken, American Robin, Red-tailed Hawk, crow, raven*
- How are western diamondback rattlesnakes unique?  
*The series of black and white bands just above their rattles make the western diamondback rattlesnake look different from other rattlesnakes.*
- How large do crickets grow?  
*Crickets vary in length from 0.12 to 2 inches.*

#### Seed Dispersal:

- Which seeds float on the water?  
*Coconut and matchbox bean.*
- Why do plants need to disperse their seeds?  
*So that plants do not have to compete with their parent for space, light, water and nutrients.*

## POST-VISIT CLASSROOM ACTIVITIES

### Activity 1

#### MY FAVOURITE GARDEN ANIMAL

The students research one of the animals from their garden and produce a report including a picture, description, habitat, food and the life cycle of the animal.

#### MATERIALS

- library books
- internet



## POST-VISIT CLASSROOM ACTIVITIES

### Activity 2

### ACCOMMODATE A CRITTER

#### MATERIALS

- Cardboard boxes
- Plasticine
- Paint
- Feathers
- Popsticks
- Other craft material that is available



Encourage your students to carefully think about what the living needs of their favourite garden animal are. Brainstorm what the essentials are for their survival –

- water
- food
- sunlight
- shelter
- air

In addition to survival we also have a responsibility for any creature kept in captivity to ensure it has enough room –

- to move around and to get exercise
- to be in fresh air and sunlight (if applicable)
- to socialise (if applicable)
- to be comfortable
- to have privacy
- to be secure

Encourage students to spend time thinking about the perfect enclosure for their animal and to ensure it meets the requirements for the particular animal they have chosen.

The students will build a diorama of the enclosure including the animal. Encourage students to view the enclosures of others.

## POST-VISIT CLASSROOM ACTIVITIES

### Activity 3

### WHAT ANIMALS LIVE IN THE SOIL?

#### Part 1: Setting the trap

##### Intro

What animals do you think live in the soil? – worms, ants, cicadas, termites etc., but also micro mini beasts (microorganisms).

How will we find out? – we will set a trap, put some fruit and vegetables for them in the ground.

What things will we use? – discuss netting, markers, fruit and vegetables.

##### Task

The students get into their groups of 3 and decide which pieces of food they are going to use (can only choose 4 different types). Now they will need to get the nylon netting and place all the food inside. Use the elastic band to tie up the trap which will look like a bag. The students will now need to get a popsicle stick and write the group members on it. Finally place a piece of colored ribbon around the top of the popsicle stick. Now get the students to hold their bags and head out into the garden where you have pre-selected your spot to bury the traps. Get the students to dig a hole about 8 inches deep and place the trap in the hole. The students will need to fill in the hole and place their popsicle stick directly above their buried trap. The bags will need to be left for 5 weeks.

##### Conclusion

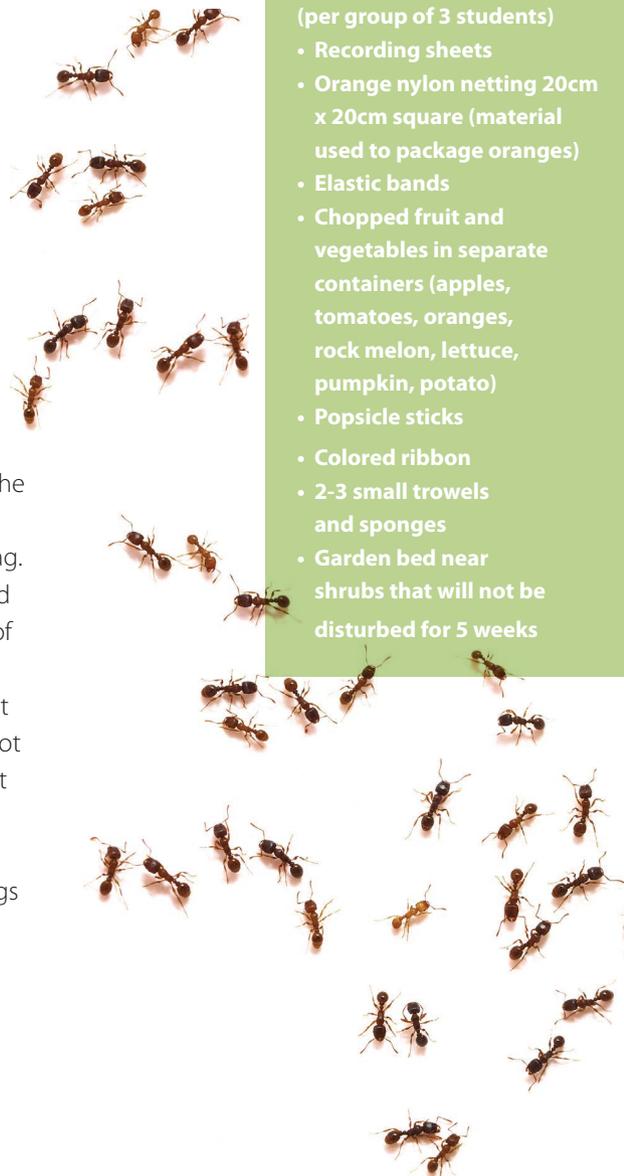
Mark on the calendar the date when the traps are to be dug up.

What do they think they will find in 5 weeks time?

#### MATERIALS

(per group of 3 students)

- Recording sheets
- Orange nylon netting 20cm x 20cm square (material used to package oranges)
- Elastic bands
- Chopped fruit and vegetables in separate containers (apples, tomatoes, oranges, rock melon, lettuce, pumpkin, potato)
- Popsicle sticks
- Colored ribbon
- 2-3 small trowels and sponges
- Garden bed near shrubs that will not be disturbed for 5 weeks





## POST-VISIT CLASSROOM ACTIVITIES

### Activity 3

### WHAT ANIMALS LIVE IN THE SOIL?

#### MATERIALS

(per group of 3 students)

- Disposable gloves for each student
- Magnifying glasses and microscopes to see microorganisms
- Petri dishes
- Insect identification book
- Tray
- Recording sheet (to be continued from setting the trap)
- 2-3 small trowels and sponges

#### Part 2: Finding the beasts

##### Intro

Today we are going to dig up our traps. What do you think we will find? Might there be worms? How might the food have changed?

##### Task

Get the children to put on some disposable gloves and collect a tray per group. Head out to the garden to where the traps have been planted. Get each of the groups to carefully dig up each of their traps and place them into their trays.

Once back in the classroom get the groups to slowly open their traps and observe what large animals they can see. They should write down any animals that they know. It is also important to get the students to observe how decomposed the food has become.

Depending on how many microscopes you have available get the students to place a piece of food onto the petri dishes and observe under the microscopes how many microorganisms they can find. Get the students to draw pictures of the microorganisms.

##### Conclusion

What animals did we find in the soil?

Why is it important that they are there?





## POST-VISIT CLASSROOM ACTIVITIES

### Activity 4

### GROW MUNG BEANS



#### MATERIALS

(per person per group)

- Empty jar
- Mung beans
- Elastic band
- Water
- Chux pad
- Marker pen

First, soak some dried mung beans for a couple of hours.

Then place them in an empty jar and cover the top of the jar with a Chux pad held in place with an elastic band. Water the seeds twice a day by pouring water into the jar and draining it out through the Chux. Put a mark on the side of the jar to see how much more space the seeds take up.

After about a week, your sprouts will be ready to eat. The students can also look at individual beans, draw them and see the roots and the shoots.

You can discuss with the students that seeds need water to germinate but they carry their own food with them in the seed just like the baby chick has enough food to grow inside the egg.



## POST-VISIT CLASSROOM ACTIVITIES

### Activity 5

### MYSTERY SEEDS

#### MATERIALS

- Several seed packets
- Bulk quantity of assorted flower seeds
- Envelopes of 8.5x11 paper
- Alfoil

1. In groups, examine different seed packets and discuss the shapes of the seeds and what they need to grow. Determine the sort of information that is displayed on the packet.
  2. Discuss and blackboard details.
  3. Show students the container of mystery seeds (assorted flower seeds).
  4. Challenge students to design their own seed packet for the mystery seeds. They will need to include an illustration and title on the front, and basic growth/care instructions on the back.
  5. Designs can be drawn on the front of an envelope or on a piece of 8.5x11 paper, cut and/or folded to form a suitable seed packet.
  6. Once completed, the packets can be filled with a small quantity of the mixed flower seeds and then sealed.
  7. Students can take a packet home to plant in their garden or they could be sold to other classes for a small cost to raise funds for a school environment project.
  8. Plant and care for some of the seeds in pots in the classroom and record the growth of the plants by photo. Compare the original seed to the final plant.
- \* *Bulk flower seed can be obtained from the local seed supplier but needs to be ordered a few days in advance. Ensure that you only combine seeds that germinate at around the same time of year – the seed company can advise you on this aspect and growth/care instructions.*



## POST-VISIT CLASSROOM ACTIVITIES

### Activity 6

### SWEET SMELLS

Why do plants smell? They make a smell in order to attract insects to pollinate them. Not all plants smell sweet like the rose! Get the students to research 'stinking plants' on the net.

We are going to use the sweet smell of plants to make something which will make our homes smell nice and remove nasty smells.

1. Smell and discuss the various herbs, spices and scented oils. Students may like to place them in groups – spicy smells, lemony smells, peppermint smells, flowery smells...
  2. Spray a short burst from the can of air freshener and discuss the length of time that the smell lasts.
  3. Invite students to design and make their own long-lasting air freshener or drawer/cardboard freshener using the materials available. (The pot pourri should be contained between two pieces of fabric, e.g. sachet, folder, shaped container... and can be decorated with scraps of various trims.)
  4. Display and evaluate the completed 'air fresheners'.
  5. Students may like to design their own test to determine which is most effective – a commercial air freshener or their own product.
- \* *Powdered Orris root can be added to the mixture of herbs and spices to preserve the scent longer - it can be purchased from health shops.*
- \*\* *Students can assist in the collection of aromatic herbs.*

### MATERIALS

- Assorted aromatic herbs and spices (rosemary, mint, lemon verbena, pelargonium leaves, lavender, cloves, cardamom, vanilla pod ...)
- Perfume oils (rose, violet, lavender, orange ...)
- Assorted fabrics (gauze, net, common, satin ...)
- Assorted trims (lace, ribbon, colored threads...)
- Glue,
- Scissors
- Can of air freshener



## POST-VISIT CLASSROOM ACTIVITIES

### Activity 7

### SEED DISPERSAL

#### Part 1: Dispersal by explosion or by animal

##### Nature Table

It's important for the plant to spread their seeds to give them room to grow. Some seeds are spread by the wind (dandelions, plane trees), some by water (coconut), some by explosion (lupins, peas) and some by animals (fruit, bindis). Start a collection of different types of seeds and create a nature table.

##### Exploding Bags - Dispersal by explosion

When opening a bag of candy one must be careful not to open the bag too fast or the candy is thrown in all directions. Some plants spread their seeds like this. The seed pods dry out until they get to a point where they burst open and fling the seeds in all directions.

Students can be given small envelopes (or make their own) and some mung beans. They will then rip open the envelope and measure how far the beans have spread.

##### Fruit Kebabs and Velcro – seed dispersal by animal

Burrs attach to an animal's fur and can be carried for miles to a new home. The students attach a Velcro dot (hook part) to their clothes. Which material does it easily attach to? How long does it stay on their clothes? How far can you take it?

Some plants make their seeds inviting to animals as food. When the animals eat the fruit they will release the seed or maybe swallow it and fly away, dropping the seed in their poo later on. People like eating fruit too. Bring different fruits into the classroom and cut them up and look at the seeds. Make fruit kebabs for the students to eat.



## POST-VISIT CLASSROOM ACTIVITIES

### Activity 7

### SEED DISPERSAL

#### Part 2: Dispersal by wind

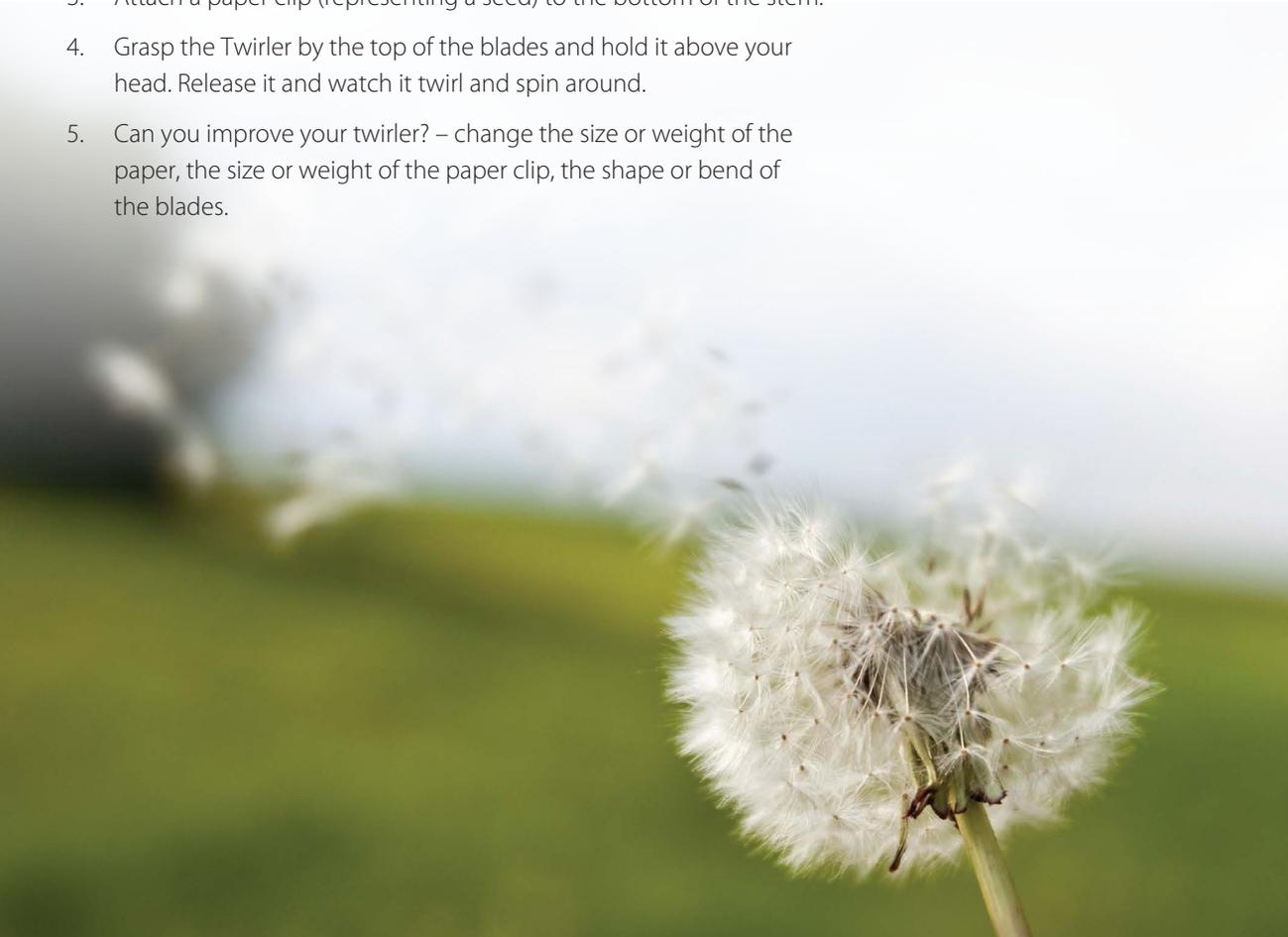
#### TWIRLER – seed dispersal by wind

Many seeds use the wind to help them fly away from the parent\ plant. The students can make twirlers and measure which one goes the furthest. Students can design their own twirlers.

1. Cut around the template and along the solid lines.
2. Leaving the stem straight, fold along the dotted lines so that one of the blades is folded forwards and the other backwards.
3. Attach a paper clip (representing a seed) to the bottom of the stem.
4. Grasp the Twirler by the top of the blades and hold it above your head. Release it and watch it twirl and spin around.
5. Can you improve your twirler? – change the size or weight of the paper, the size or weight of the paper clip, the shape or bend of the blades.

#### MATERIALS

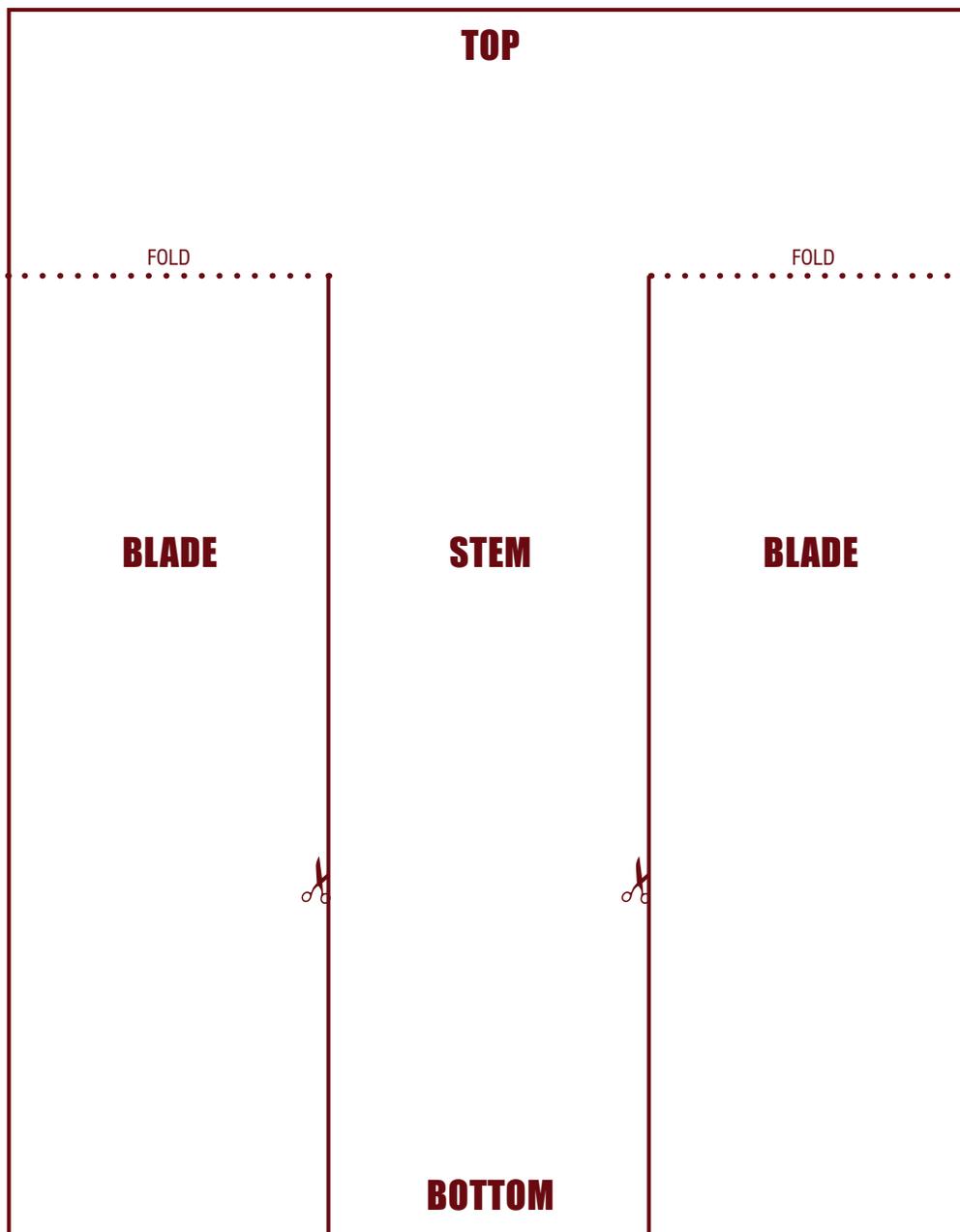
- Stiff paper & ordinary paper
- Scissors
- Paper clips (different sizes)
- Twirler Template (see next page)



**POST-VISIT CLASSROOM ACTIVITIES**

Activity 7

**SEED DISPERSAL TWIRLER TEMPLATE**





## POST-VISIT CLASSROOM ACTIVITIES

### Activity 8

#### BUILD A BIRD FEEDER

1. After discussion of the types of birds that visit their gardens and the types of foods they eat, the students identify the birds for which they will make the feeder and the appropriate food.
2. The students select a carton that has an opening marked in ink and has a starting point cut out for them.
3. They carefully cut out the opening.
4. Then they poke a stick or colored pencil through the hole at the base of the carton, through to the other side (this provides a perch for the visiting bird).
5. The students may choose to decorate their feeder or leave it as it is (the wax integrated cardboard keeps the feeder waterproof for a few weeks).
6. The students provide the correct food for the feeder and choose an appropriate area to hang it at home.
7. Discuss the suitability of the hanging area with regard to the safety of the birds (keeping them clear of cats and dogs) and from where the birds can be seen by the students but not scared by human activity around the home.
8. Encourage students to keep a record of the birds that visit their feeders in a week.

#### MATERIALS

(per student)

- 1x 20ounce drink carton
- A long colored pencil or a long stick (8 inches)
- Scissors
- Marker
- String, wire and hook
- Bird seed
- Bird books – for identification

You could also try making a bird feeder with a large coke bottle.

Put a hole on two sides at the bottom and insert a stick.

Make 3 – 4 slits in the coke bottle up the side.

Insert birdseed through the top.

Tie string around the top and hang in the garden.



## EXTENDED SCHOOL PROJECT

Get all hands on deck with this wonderful cross-curricular project. Have your class use their maths and technology skills to build a bird box, then leave it outside and see what kind of wildlife your creation attracts.

Your students will love seeing the results of their hard work and you can use the animals you observe as inspiration for science lessons, writing assignments and even art projects.

The first step is to convert metric measurements to imperial!

Install a camera in the bird box with a live feed to a computer to see what's happening inside the box!

# DIY Bird box

**Tools required**

**Materials required**

**Assembly**

- Cut plywood to the sizes as per above
- Pre-drill holes as per above, approx. 5mm in from the edges
- Hole saw panel D and panel B if mounting a wireless CCTV camera
- Nail or screw optional log G to panel D over hole
- Nail or screw a small piece of mesh to back of panel D for bird to climb inside the box
- Nail or screw E and F to D keeping top flush
- Nail or screw B to top and C to bottom
- Centre box on A and screw together
- Screw H roof panel to the top of box
- Attach with nails or screws to tree
- **Optional camera to see inside the nest**  
Eg. Night/day wi-fi network security camera with motion activation and secure cloud storage

**scitech** [www.scitech.org.au](http://www.scitech.org.au)