

Kit 1:

Eye Health

Guide Dog Discovery Centre
Curriculum Worksheets



Teachers Guide to Kit 1: Eye Health

The first kit of resources focuses on the role and biological basis of eyesight as well as the concept of eye health and safety.

In this guide:

- Key Messages & Learnings for This Module
- Quick Overview of the Provided Activities
- Other Suggested Learning Activities
- Background Reference Information
- Useful Websites
- Resources for Provided Activities
- Curriculum and Outcomes Information

Key Messages & Learnings for this module

1. Human eyes are very sophisticated and effective with many parts all working together with the brain to create what we call 'sight'. This includes capabilities such as stereo and peripheral vision as well as the ability to see colours.
2. Most people rely heavily on their sight. In fact for most humans, sight is the dominant sense. Losing some or all of this ability can be very difficult.
3. Many types of blindness can be prevented or limited by:
 - a. a healthy lifestyle (as recommended to prevent diabetes and heart disease)
 - b. avoiding accidents
 - c. having regular eye checks throughout life

Food for Thought: Blindness is a relative concept

Discussing the fact that there are many causes of vision impairment that affect vision in different ways (and that these can change dramatically throughout a person's life) is a useful way of building your students' awareness of disability as an open-ended (and rather arbitrary) concept rather than a fixed definition.

There are many different kinds of vision impairments that affect vision in different ways. Vision impairment is the most common disability in Australia and indeed most parts of the world. Hundreds of thousands of Australians are blind or vision impaired, while millions have an eye condition of some kind.

Some causes blindness and vision impairment are congenital and present from birth, others are due to genetic conditions which appear anytime from infancy to adulthood. Others are caused by injury or as a side-effect of disease. Many cases are age-related and/or linked to chronic health conditions such as diabetes or heart disease.

As much as 75% of vision impairment is thought to be preventable or treatable, if we include people who could see well if they had spectacles or contact lenses.

Quick Overview of the Provided Activities

1.1 All in a Day's Work

This is a straightforward activity that aims to focus students' attention on how much sighted people rely on their eyesight. It is designed so you can use it in two optional parts – one ideal as a weekend homework task. Simply copy either one or both sides of the worksheet.

1.2 Better than the Movies

This worksheet is designed to be used after a teacher-led discussion on the structure of the eye. A reference sheet is provided overleaf. There are no special requirements.

1.3 Seeing in Stereo

This activity is actually a set of 4 activities designed to be used in a long lesson slot where groups of students rotate through each activity then complete the worksheet.

Activity	Gear You'll Need
1	Small soft balls or bean bags (tennis balls are ideal) Suitable space for students to throw (and miss!) the balls Student instruction sheet (provided)
2	Cardboard paper tubes Student instruction sheet (provided)
3	Copies of the target rings (provided) Marble sized lumps of play dough (or modelling clay) Student instruction sheet (provided)
4	Piece of cardboard, scissors, string, two small toys (action figures are ideal) Paper and pencils for students to use Student instruction sheet (provided)

1.4 Colours and Sideways

There are two parts to this activity, designed together to build awareness of both colour vision and peripheral vision (both possible because of the structure of the retina – refer to next page). You will need a chair, chalk or string, access to a dimly-lit space and several pieces of coloured paper or card

1.5 Eye-Friendly Foods

Designed to be used after a teacher-led discussion on healthy eating. Ideally provide magazines or newspapers but if this is difficult, a back-up sheet is provided with pictures of food types.

1.6 Spot the Hazard

This worksheet is designed to be used at any stage and is a useful lesson filler or homework task. There are no special requirements.

Background Reference Material

Eye Structure

Retina

The retina is a tissue: think thumbnail-sized area on the back surface inside the eye. It's here that more than 130 million light sensitive cells turn light signals into nerve signals that the brain then decodes into pictures.

Most of the cells (about 125 million) are shaped like rods and they are very, very sensitive to variations in light and dark and so can work in even the lowest light levels, especially after the pupil size adjusts.

The other 6 million cells in the retina are shaped like cones. There are three different types of cones, each extremely sensitive to a particular type of light, which makes them very, very good at detecting colours and detail. But the cones only work if there is plenty of light, which is why humans see colours very poorly in dim light whereas in the right light most of us can differentiate between over 10 million colours!

Most of the cones are found in the centre of the retina, the place called the macula, right at the back of the eye. If you have a healthy macula you'll have good central vision and be able to see small details. Very few cones are found along the outer sides of the retina, which is why we find it harder to detect details and colour in peripheral vision.

Iris & Pupil

The iris is actually a coloured ring of tiny muscles that work together and the pupil doesn't really exist – it's just a gap in the iris. The iris muscles automatically contract or relax, which changes the size of the pupil and controls the amount of light entering the eye.

Cornea

The cornea is the lens that focuses light from outside so that it comes into our eyes in a format our brains can make sense of. Tiny muscles make the cornea flatter or thicker depending on how far away we are looking.

Light signals are inverted as they go through the cornea so they arrive at the retina upside down relative to the outside world but our brains automatically turns the messages back the right way up.

Eye Health

The main eye health and eye safety messages can be summarised by just six pieces of easy 'eye-advice'!

1. Don't smoke
2. Eat lots of fruit and vegetables
3. Be active
4. Be sun-smart
5. Protect your eyes
6. Have regular eye checks

This can be simplified even further for younger students to just three messages:

1. Stay healthy
2. Protect eyes (from sun and accidents)
3. Have regular eye checks

Colour Blindness

Colour blindness rarely means only seeing black-and-white. Most of the people referred to as 'colour blind' can actually see some colours but not the full range seen by other humans. This means they can't tell the difference between colours that other people can tell apart easily. The type of colour blindness depends on which type of cone cells are affected. Quite a lot of people (mostly males) have what is called Red-Green colour blindness.

Some animals can see colours that humans can't. For example, bees can see ultraviolet light and some snakes can see infra-red light.

'Classroom Guru' Material

- Eyes are formed in utero when a small part of brain tissue migrates to the front of the skull and changes into the eyeballs (which do not grow after birth!)
- The eyes are so fragile and easily damaged that the body has developed several protective structures to keep them safe. These can be effectively explained to students through the use of metaphors:

'Bony fortresses' to protect from blows to catch debris	Cheekbones, eye socket and eye brows. Even the nose helps!
'Flexible, self-renewing hedges'	Brows and lashes
'A multifunction automatic defence shield' which is self lubricating, self cleaning and antiseptic	Eyelids

- Blue and green irises let in more light than dark coloured ones. They developed through evolution to help people in less sunny lands (northern lands during previous ice ages) to see better in poor light.
- Animals without stereo vision don't need their eyes to focus on the same thing so their eyes can usually move independently of each other (birds are a good example).
- The tiny piece of tissue in the inner corner of the human eye is actually a remnant of a second eyelid from our ancestors. Some animals still have this second inner eyelid (which closes from the centre of the face outwards!)
- The average blink takes a third of a second.

Other Teaching Ideas

Ways to Challenge Your Students

- Write explanations of the human eye and human vision to an alien from a dark planet.
- Draw and label your own diagram of the human eye.
- Learn about the work of Dr Fred Hollows and do an oral report for the class.
- Design and conduct a survey and graph the results. Possible research questions include: How common are different eye colours in our school? How many people wear glasses or contact lenses?
- Play an eye-matching game. Take digital photographs of all the students' faces from your class as well as other members of your school community. Cut out and display only the eyes and see how many students can guess correctly which eyes belong to whom.
- Assign a task of comparing the features of mammalian eyes with eyes of other types of animals.
- Assign a report about the benefits of stereoscopic vision, including pictures of some of the activities humans can do because they can 'see in stereo'.
- Invite your students to design a poster, leaflet or other device to communicate one of the main eye health messages. Older students could be challenged to develop an advertising campaign (eg press, radio and TV advertisements).
- Cover some balloons with papier mache then cut each in half and engage groups of students in building a model of an eye.
- Hold a mini competition (individually or in groups) to challenge your students to see how many eye tasks (or eye hazards) they can think of.
- Invite older students to write a play to communicate eye health and eye safety messages. Challenge them to see how many messages they can work into their script.
- Hold a cooking lesson and/or collect recipes which use eye-healthy ingredients.
- Set a homework task of mapping eye hazards at each student's home or in their community.

Visits

- Pay a visit to a local optician.
- Ask if anyone knows someone living with blindness or serious vision impairment. Invite that person to be a guest speaker.
- Invite a guest speaker.

Classroom Setup Ideas

- Create an optician's corner as a learning centre (eye glasses, magnifying glasses, optical illusions, sizing cards).
- Create a wall display of different types of animal eyes including insects, fish, reptiles, birds and mammals.
- Set up a display table with objects that focus on using the eyes (pale/dark colours, matt and shiny fabrics, books about eyes, collection of glasses, sunglasses, safety glasses, binoculars, microscope, eye bath, eye patch, kaleidoscope, lights, lava lamps, hologram paper, cellophane).

Useful Websites

Eye Anatomy & Function

<http://faculty.washington.edu/chudler/eyetr.html>
<http://faculty.washington.edu/chudler/bigeye.html>
<http://faculty.washington.edu/chudler/retina.html>

Perception and illusions:

<http://faculty.washington.edu/chudler/eyeper.html>
<http://www.exploratorium.edu/snacks/iconperception.html>
<http://pbskids.org/zoom/activities/do/thaumatrope.html>
<http://pbskids.org/zoom/activities/sci/phenakistoscope.html>
<http://pbskids.org/zoom/activities/phenom/afterimage.html>
<http://pbskids.org/zoom/activities/sci/peripheralvision.html>
<http://library.thinkquest.org/J002330/opill.htm>

Eye Health & Safety

<http://faculty.washington.edu/chudler/eyesafe.html>
www.cyh.com/SubDefault.aspx?p=255

Relevant Extracts from the WA Curriculum Framework

Learning Areas and Outcomes information for Kit 1

	Outcomes	Learning Focus for Middle Childhood Phase
SCIENCE: Life & Living	<ul style="list-style-type: none"> • Students understand their own biology and that of other living things, and recognize the interdependence of life. • Students investigate aspects of time, place, culture, resources and systems to understand and act on important issues in their social and environmental world. In these investigations, they use skills of critical inquiry and ethical decision making in order to become informed, active citizens. 	<p>Structure and life processes</p> <ul style="list-style-type: none"> • an organism's structure or body system enables it to carry out life processes (eg, senses can detect changes in the outside environment; muscles enable movement; lungs or gills enable breathing) • external and internal factors that can impact on living things (eg pollution, diet, diseases) • ways to identify parts of living things (eg magnifier, microscope) • all living things are made of cells
HEALTH & PE: Active Citizenship	<ul style="list-style-type: none"> • Students know and understand health and physical activity concepts that enable informed decisions for a healthy, active lifestyle. • The student recognises that there are different aspects to personal health and how these contribute to their overall health, safety and physical activity. 	<p>Health as a balance of physical, mental, emotional and social aspects</p> <ul style="list-style-type: none"> • concepts related to diet, exercise, rest, harm avoidance and reduction, friendships, self-understanding • appraising active lifestyle components in daily life • personal and group actions that incorporate understandings of influences on health • assessing reliability of personal health information, products and services <p>Meaning and dimensions of health</p> <ul style="list-style-type: none"> • health has aspects that can be classified into physical, mental and emotional, and social dimensions (eg, relationships and friendships are aspects of social health) • people's attitudes towards personal health are varied • people can enhance their health by developing positive attitudes and taking positive action • health is optimised when the dimensions are balanced <p>Ways to keep healthier and safer</p> <ul style="list-style-type: none"> • behaviours and situations that can be identified as potentially harmful, risky or hazardous • ways to respond individually to harmful or risky behaviour and hazardous or emergency situations <p>Resources and consumer skills</p> <ul style="list-style-type: none"> • information, products and services that meet personal health needs

All in a Day's Work



How many ways do you use your eyes before you get to school?

Try to think of at least 20.

1.
2.
3.
4.
5.
6.
7.
8.
9.
10.
11.
12.
13.
14.
15.
16.
17.
18.
19.
20.

Any others?

21.
22.
23.
24.

All in a Day's Work (the homework part!)

Write a "To Do" list for your eyes for one weekend (try starting from when you open your eyes in the morning to when you go to sleep each night).

How many things can you list?

Getting ready	Eating & Washing	Getting around
Going Places	Playing Sport	Playing Games
Art & Craft	Cooking	Hanging Out & Relaxing
Helping Out	Friends & Family	Homework & Practising

Better than the Movies

Most of us have the best movie-making gear right in front of our faces!



What to Do

Match the camera or movie gadget with the part of the human eye that does the same job, only better!

Camera Movies Gadget	Human Eye
Cinema Screen	Cornea
Camera Lens	Rods
Curtains	Retina
Light Sensitive photo paper - colour	Iris
Power Supply & Control System	Eyelid
Camera Lens Cap	Optic nerve & muscles
Light sensitive film – black and white	Cones

Challenge Question

Can you think of any ways the human eye is even better than a movie camera?

.....

.....

.....

.....

Seeing in Stereo

Why do we have eyes on the front of our heads instead of on the sides?

Try the **Seeing in Stereo** activities and then answer the questions below.

Question 1:

Do you see different things through each eye or does what you see in one eye overlap with what you see with the other?

.....
.....

Question 2:

Is it easier to judge how far away something is by using one eye - or by using two?

.....
.....



Humans and some other animals have what is called stereo vision, which means we have two eyes that each give the brain a slightly different, but overlapping, view of things. This is very useful for judging distances.

Try to think of at least 3 things that stereo vision helps people do:

1.
2.
3.

Any extras?

4.
5.

Seeing in Stereo: Activity 1

Keeping an eye on the ball

In teams of 2 or 3, try throwing and catching a small ball or bean bag between each other a few times.

Move closer together or further apart until it is not easy but you are still catching most throws.

Now try again from the same distance but, this time, take turns wearing a patch over one eye.



How much difference does the eye patch make?

Seeing in Stereo: Activity 2

Silly Sausages & Holey Hands

The first bit

1. Hold your index fingers up about 10 cm in front of your eyes, pointing towards each other.
2. Leave your fingers there but shift your attention to something in the distance.
3. What do you see between your fingers?

The second bit

1. Now use one hand to hold the cardboard tube up to one eye.
2. Hold the other hand at the end of the tube, with the palm facing towards you.
3. Keep both eyes open and slowly move the empty hand along the side of the tube, towards your face.



Seeing in Stereo: Activity 3

Dough Drops

1. Choose someone to be The Dough Boss and someone to be The Dough Dropper.
2. The Dough Boss's job is to try to give directions that will enable The Dough Dropper to drop small balls of dough as close to the centre of the target as possible.

BUT ...

The Dough Boss is only allowed to say left or right, or forward or back and can only have one eye open at any time.

The Dough Dropper must keep both eyes shut and must keep their arm at shoulder height.

Remember



- Take turns in your group.
- If you have time, try with The Dough Boss standing at different distances away or compare how much easier it is if the Dough Boss has both eyes open.

Seeing in Stereo: Activity 4

Mixing it Up

1. Sit in front of the cardboard screen.
2. Close the left eye, look through the viewing holes and draw what you see.
3. Now draw what you see with the right eye closed.
4. Finally draw what you see with both eyes open.



Colours & Sideways

Activity 1: Night Colours

What to learn

Human eyes are very, very good at detecting colours – but only if there is plenty of light.

What to do

Test how well you and your classmates can see colour in different light conditions. You will need some pieces of different-coloured paper or card and a room you can darken enough so that you can only just make out shapes.

Give your eyes about a minute to adjust to the dim light then look at each coloured card in turn. Then turn up the light and look at the cards again.



How did you do?

What colours are hardest to see in low light?

Which are easiest?

Does the shade of colour make a difference?

Activity 2: To the Side

What to learn

Human sight may work best for things in front of us but we still have some useful vision to the side of our faces as well. This is called **peripheral vision**. It is useful – especially for spotting dangers – but most of us don't see things as accurately to the side as we do in front.

What to do

Test your peripheral vision - the ability to see things towards the side of the head rather than out front.

You will need some pieces of different-coloured paper or card.

Place a chair on the ground and draw a large semi-circle on the ground around the chair (with chalk or string - or even sand).

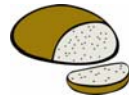
Ask someone to sit on the chair and look straight ahead, no matter what. Tell them you will hold up a piece of coloured paper and ask them to say when they can see it but they are not to move their heads or turn their eyes – they must keep looking forwards.

Now hold the coloured paper and walk around the circle from behind the chair towards the front. Note on the ground where you are when the person on the chair can see the colour correctly.

Repeat with the other side and other colours.



You can use these pictures to sort out which foods are best for your eyes.



Spot the Hazard



Most people don't realise how fragile our eyes are and that accidents are a major cause of blindness. We all need to take extra good care of our eyes.

The best way to start is by always wearing sunglasses and a hat outside.

What to do

Draw or describe an eye-hazard in each of these places.

In the garden	At the Beach	In the Playground
In the Kitchen	In the Shed	At home
Playing Sport	In the Bush	

How you could reduce the danger of an eye-accident?

.....
.....



In the space below, design a poster to remind people of how to protect their eyes. (Include at least one eye-safety tip)