Primary Teacher’s Notes And Class Exercises
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EYES, VISION AND EYE CARE

GETTING STARTED

Vision is one of our five basic senses (hearing, touch, smell and taste are the others) through which we experience the world.

Our “vision” system is made up of our eyes and brain. The performance of this system is far better than any machine ever invented. We can see an immense range of colour and detail, and images and colours are updated constantly so that we have seamless vision with no “break in the action” as we turn our heads or look around.

Good vision is very important to our daily life. Many things we take for granted – just moving around, recognising friends, reading or playing sport - are difficult or impossible with poor vision. Many things in modern life would be vastly different if good vision was not standard. Imagine traffic, school, computing, or television, without good vision.

In Australia, if you have poor vision then you can visit an optometrist directly or be referred to an ophthalmologist and get treatment or correction so that you can see well again. However many people in the world don’t have access to the eye care they need, which means they go through life with poor vision. This drastically reduces their chance at education, employment and a wide range of activities. ICEE Sunnies for Sight Day raises money to give sight to these people.

Questions:

How would the world be different if we didn’t have good vision?
If you had vision problems what could and couldn’t you do?
How would vision problems make you feel?
What could you do to overcome the problems?
### Structure of the Eye

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<td>This is the watery liquid that keeps your eyes moist and washes away dust etc. It is made of water, oils and proteins and is produced by the tear glands.</td>
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<td>Cornea</td>
<td>This is the clear front of the eye, which bends and focuses light as it passes through. The cornea needs to be clear so that it can let light into the eyeball – like a window for us to see through. This is why when we look at a person’s eye we see through the clear cornea to the coloured part of the eye.</td>
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<td>This is the round black hole in the centre of the iris. It lets light into your eye so that you can see. Muscles in the iris change the pupil’s size to let the right amount of light into the eye. You might have noticed that your pupil gets smaller when you are in bright sunlight, and bigger at night when it gets darker.</td>
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For eye structure diagrams refer to Appendix 1.

### Exercise:

Group the children into pairs. Each child examines their partner’s eyes – what do they notice?

What colour are their partner’s eyes?

How many parts of the eye can they name?

Ask them to draw their partner’s eye and label the parts.

Looking from the front, they can see the eyelids, eyelashes, sclera (white of the eye), iris (coloured part of the eye) and pupil.

Get them to watch the pupil when their partner closes their eyes for a few seconds and then opens them – they will be able to see the pupil get smaller in response to the light.

Look at the eye from the side, they can see the curve of the eyeball and the cornea – the clear front of the eye.

### Exercise: Structure of the Eye

The students are divided into two equal groups. Using the glossary list included allocate group one as eye structure and group two as definitions.

Group one’s members are named after structures of the eye. Group two’s members are each given a definition. Ask the children to find their matching partner.
HOW WE SEE

Our eyes are our body’s most highly developed sensory organs. A larger part of our brain is dedicated to the function of eyesight than those of hearing, touch, smell and taste combined.

Vision

In order for us to see, light rays reflected from an object first pass through the clear front of the eye (the cornea), where they are partially focused. These light rays then pass through the pupil, and are further focused by the lens onto the retina. The retina is responsible for detecting the light from these images and then causing electrical impulses to be sent to the brain along the optic nerve. The brain then processes those impulses and gives information about what we are seeing.

We can see up close and far away as our eyes focus the rays of light correctly onto the retina.

See Appendix 2

The retina

The retina contains different types of photoreceptors (light sensitive cells) - rod cells and cone cells. Rod cells are very sensitive to low levels of light, while cone cells are very sensitive to different colours. In the human retina, there are many more rod cells than there are cone cells. Human eyes can distinguish millions of different colours. They are also sensitive enough to light that in ideal conditions a candle burning in the dark can be detected more than 5 km away.

In animals, the number of rod cells and cone cells in their eyes is related to the animal’s habits. For example, birds such as hawks have more cone cells than do humans. This lets them see small animals from a long distance away, so they can hunt for food. Eagles and hawks can see 8 times better than humans – a golden eagle can see a rabbit from 2 km away. Nocturnal animals have more rod cells to give them better night vision.

Binocular vision

Why do most animals have two eyes? Each eye captures its own view and the two separate images are sent on to the brain for processing. When the two images arrive simultaneously in the brain, they are united into one picture.

Binocular vision enhances our vision so we can see faint objects. It also allows us to have “depth perception”, where the slight difference between the two images captured by the two eyes is interpreted by the brain to allow us to see the world in three dimensions and to accurately judge the distance to an object. Depth perception is important to precise activities such as catching a ball, pouring water into a cup, reaching out to shake someone’s hand, or threading a needle. Many activities such as sport or driving a car would be difficult or impossible without depth perception.

Some animals, usually prey animals, have their two eyes positioned on opposite sides of their heads. This reduces depth perception but gives them the widest possible field of view, so they can see in all directions and thus keep a lookout for predators. Even without moving their eyes, some birds have a 360 degree field of view.

Exercise / Questions

What sort of eyes do different animals have?

Ask students to name the animals and colour their eyes on the provided activity sheet. See Appendix 3

Exercises: Vision

Ask the children to hold their hand close to their face and look at it. While holding their hand there ask them to look at something far away, like the blackboard or out the window. They will notice how quickly their eyes adjust the focus so they can see clearly.

Ask the children to cover one eye and try various exercises like shaking hands, placing items in boxes, catching a ball. Now ask the children to repeat these exercises using both eyes. They will learn that it is easier to do these tasks with both eyes.
WHAT CAN GO WRONG

There are a number of things that can go wrong with our eyes, causing poor vision or blindness. There can be a problem either in the eye or in the nerves that connect the eyes to the brain.

Refractive error

Sometimes the problem is simply the way the eye is shaped and how light is focussed through the eye. This is called refractive error, and can usually be corrected with glasses. Refractive errors can be mild, where vision is just a bit blurry, or severe, where vision is so blurry people can’t see anything clearly. Types of refractive error include:

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<td>Myopia or Shortsightedness</td>
<td>People who are shortsighted can see well up close, but not at a distance. They might have trouble recognising people across the room, seeing the blackboard from the back of the room, or recognising a bus number as it comes down the street.</td>
</tr>
<tr>
<td>Hyperopia or Longsightedness</td>
<td>People who are longsighted can usually see well at a distance but not up close. People who are longsighted might have trouble reading or working on a computer.</td>
</tr>
<tr>
<td>Presbyopia or Ageing Vision</td>
<td>Presbyopia is a condition where people can’t focus up close. It happens to almost everyone as they age (usually starting at around age 40) – which is why some older people need reading glasses.</td>
</tr>
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</table>

Leading causes of avoidable blindness in the world

Around the world there are many causes of blindness. There are an estimated 37 million blind people in the world including 1.5 million blind children. An additional 124 million have vision impairment from eye disease and at least 300 million have blindness or vision impairment due to uncorrected refractive error. Over 90% of the blind people live in developing countries.

That is a staggering 400 million people with vision impairment – 80% of which is avoidable.

Avoidable vision impairment occurs because there is no eye care available, or because the treatment or correction is too expensive. In developing countries, there may be not enough eye care clinics, optometrists or ophthalmologists to meet the needs of the population, particularly in rural areas.

ICEE Sunnies for Sight Day helps to raise funds to give sight to these people, by providing sustainable eye care services and training local eye care practitioners.

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<td>Cataract</td>
<td>This means that the lens inside the eye isn’t clear – it is cloudy or opaque. A person with cataract can’t see well - it is like looking through a cloudy window - or it may even mean that the person is blind. Cataract surgery, where the cloudy lens is removed and replaced with a new, clear plastic lens, is very common. Cataract is responsible for 48% of world blindness, which represents about 17.6 million people. The development of cataract is usually age related, and protecting your eyes from UV radiation from the sun can help to prevent cataract.</td>
</tr>
<tr>
<td>Trachoma</td>
<td>This is an infection of the eye caused by poor hygiene. With repeated infections, the inside of the eyelid becomes scarred, and the eyelashes turn inwards. The lashes rubbing on the front of the eye can damage the cornea, causing blindness. Trachoma affects about 84 million people of whom about 8 million are visually impaired. It was once endemic in most countries. It is responsible for more than 3% of the world’s blindness.</td>
</tr>
<tr>
<td>Onchocerciasis or River Blindness</td>
<td>Onchocerciasis is an eye and skin disease caused by a worm. It is transmitted to humans through the bite of a blackfly. It has been a major cause of blindness in Africa.</td>
</tr>
<tr>
<td>Vitamin A Deficiency</td>
<td>Children’s eyes need Vitamin A to develop properly, and in many developing countries Vitamin A deficiency is a major cause of blindness. So, as you may have been told, carrots are actually good for your vision – as carrots are high in Vitamin A.</td>
</tr>
</tbody>
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Exercise:
Ask your students to imagine not being able to clearly see.
Ask them what couldn't they do any more? What would be difficult?
Imagine you live in a developing country.
What problems might you have in getting the eye care you need?

Exercise: Blindness
Divide the children into pairs. One child is blindfolded, while the other acts as a guide. Have them do a series of activities - go for a walk, find their bag, put rubbish in the bin, etc.

Children’s Vision
Teachers and carers can play a critical role in the detection of vision problems among children.
The Optometrists Association Australia have developed materials for teachers and parents that provide information about the symptoms of vision problems in children.

They are available on the
Website: http://www.optometrists.asn.au/kidsvis,
or from the Association:
Telephone: (03) 9663 6833;
Fax: (03) 9663 7478;
E-mail: oaanat@optometrists.asn.au
HOW THINGS GET TREATED

Spectacles and contact lenses

People with refractive error usually correct their vision with spectacles or contact lenses. To see clearly they need spectacles or contact lenses.

We generally take spectacles for granted, however they may be one of the world’s most important inventions. The invention of spectacles enabled people see clearly. Just imagine how the world would be if people could not see clearly.

No visual aids existed at the time of the ancient Egyptians, Greeks, or Romans. In a letter written by a prominent Roman about 100BC he expresses his resignation to old age and his complaint that he could no longer read for himself, having instead to rely on his assistant.

Around 1000AD, the first vision aid was invented. The reading stone, what we know as a magnifying glass, was a glass sphere used by monks that was laid on top of the material to be read to magnify the letters.

Nobody knows who “invented” spectacles, however they first appeared between 1268 and 1289AD. They were made from primitive convex shaped glass or crystal stones, surrounded by frames and connected through a rivet. The wearers, mostly monks and scholars, held the lenses in front of their eyes or balanced them on their nose.

The invention of the printing press in 1452 and the growing availability of books prompted the mass production of inexpensive spectacles that were sold in cities by peddlers.

In 1718, Edward Scarlett, a London optician, designed the first spectacles with handles going over the ears to hold them in place.

Today, if people can’t get spectacles or contact lenses then they will have blurry vision. Unfortunately that is the case in many developing countries, where people may not have access to eyecare or may not be able to afford spectacles. Uncorrected refractive error causes poor vision or blindness in at least 300 million people in the world.

Other treatments

There are many treatments for other eye conditions and diseases, such as antibiotics for infection, or surgery for cataracts.

Questions:

How many people in the class wear glasses?
Who else do you know that wears glasses or contact lenses?
Name somebody famous who wears glasses.
KEEP YOUR EYES HEALTHY

You only have one set of eyes, so it's important you look after them. You should:

Eat well

Eyes need good nutrition to develop properly, and to stay healthy. For example, Vitamin A deficiency can cause blindness in children, and vitamins in vegetables and fruit can help to keep your cornea and retina healthy.

Have regular eye examinations

Just like going to the dentist regularly to make sure that our teeth are healthy, we need to check regularly to make sure that our eyes are healthy and working properly. You should go to an optometrist to have your eyes and vision checked every 2-5 years, and more often if you wear glasses or have another eye problem.

Protect your eyes

Sunglasses: While most of us are aware of the damage that ultraviolet light can do to the skin, medical evidence shows that our eyes can also be harmed. UV radiation from the sun absorbed by the eye can contribute to a number of serious eye disorders and diseases.

It is important that you wear good quality sunglasses and a hat when you are outdoors. Slip! Slop! Slap! and Slide! on your sunnies.

Since UV radiation is reflected off surfaces such as snow, water and sand, the risk is particularly high on the beach, while boating, or in snowy mountain areas. The risk is greatest during the mid-day hours, from 10 am to 3 pm, and during the summer months.

Protection should start with very young children and become part of their routine. UV exposure at an early age can be the most damaging in the long-term as the human eye is still developing through childhood and adolescence. Solar radiation damage to the eye may be cumulative and may increase the risk of developing an ocular disorder later in life.

Sunglass design is also important. All sunglasses sold in Australia are required to conform to an Australian Standard, AS 1067, which specifies how much UV protection must be provided. Wrap around glasses are important to prevent light coming in from the side.

The sun: Sunlight is very bright, and looking directly at the sun can be painful, and potentially hazardous. While glancing at the sun only causes your eyes to be dazzled, looking for any period of time is dangerous. For normal unprotected eyes, around 30 seconds of direct exposure is enough to cause permanent impairment of vision.

Looking at the sun during an eclipse is even more hazardous. Normally, the sun's brightness will make you blink or look away quickly before damage can be done. During an eclipse however, the brightness is reduced, so you think you can look for a longer period. However the radiation remains high and you can easily receive enough to cause damage.

Safety goggles: Having your eye badly hit or pierced can cause vision impairment. It is also important to stop your cornea (the clear front of your eye) being damaged. The cornea in some ways is just like other parts of your body - if it is cut then it will cause an opaque scar, which can interfere with vision.

It is therefore important to protect your eyes from accidents. Don’t play carelessly with things that can hurt the eyes.

Exercise your eyes

Your eyes should be able to focus up close and far away. If you only look at things that are up close (like books or computer screens), your eyes can change so that you can no longer see far away. If you are reading or working on a computer you should take regular “eye breaks”, (for a few minutes every half hour at least). Look out the window, or go outside and play or go for a walk.

Questions:

What are some healthy foods?
Who in the class has had an eye examination?
Who regularly wears sunglasses in the sun?
Who needs to wear safety goggles or special eye protection?
Exercise:
Ask the children to write and act out short plays about eye safety and how to protect their eyes.

POSSIBLE RESEARCH AND EXTENSION TOPICS
More detailed investigations can be done on various aspects of vision and eye care. Possible topics could include:

• The history and development of spectacles
• The history and development of contact lenses
• Looking at a particular eye condition in detail (refractive error, cataract, diabetes)
• Interview a person with glasses or contact lenses - ask why they wear them, what they have difficulty with, what they need to do to care for their eyes and spectacles/lenses
• Eye care challenges in a developing country

You may also wish to invite a local optometrist to your school to perform simple vision screening or to give a talk.

Books to read
Helen Keller, by Stewart and Pollyanne Graff
Helen Keller’s Teacher, by Margaret Davidson and Wayne Blickenstaff
Primary Teachers
Class Handouts
EYES, VISION AND EYE CARE

GETTING STARTED
Vision is one of our five basic senses. Our eyes allow us to see both far away and up close, in hundreds of colours. Good vision is important to our daily life.

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For eye structure diagrams refer to Appendix 1
HOW WE SEE

In order for us to see:

1. Light passes through and is focussed by the cornea (clear front of the eye)
2. Then it passes through the pupil
3. Then it gets further focussed by the lens
4. Then it falls on the retina (the back of the eye)
5. This causes electrical impulses to travel along the optic nerve to the brain
6. Where the brain interprets the image
WHAT CAN GO WRONG

Sometimes things go wrong with eyes. There are many different conditions that can cause poor vision or blindness. For example:

- **Refractive error**: means that the eye is the wrong shape (there are several types of refractive error, the most common being shortsightedness or myopia; and longsightedness or hyperopia). People with refractive error need to wear glasses or contact lenses to see clearly.

- **Cataract**: means the lens inside the eye isn’t clear so light can’t get through it. People with cataracts need an operation where the cloudy lens is removed and replaced with a new, clear plastic lens.

Did you know? At least 300 million have blindness or vision impairment due to uncorrected refractive error (they don’t have the glasses they need).

Avoidable vision impairment occurs often because there is no eye care available, or because the treatment or correction is too expensive. In developing countries, there may be not enough eye care clinics, optometrists or ophthalmologists to meet the needs of the population.

ICEE Sunnies for Sight Day helps to raise funds to give sight to these people, by providing sustainable eye care services and training local eye care practitioners.

Sustainable means that the services will keep going using local resources and systems, rather than relying on outside organisations to provide services or funds.

HOW THINGS GET TREATED

Just like medicines and treatments when you’re sick, there are various treatments and corrections when you have problems with your eyes, like glasses, contact lenses, surgery, antibiotics.

KEEP YOUR EYES HEALTHY

You only have one set of eyes, so it’s important you look after them. You should:

- **Eat well.** Eyes need good nutrition to develop properly, and to stay healthy. For example, Vitamin A deficiency can cause blindness in children, and vitamins in vegetables and fruit can help to keep your cornea and retina healthy.

- **Have regular eye examinations.** Just like going to the dentist to make sure that our teeth are healthy, we need to check regularly to make sure that our eyes are healthy and working properly. You should go to an optometrist to have your eyes checked every 2-5 years, and more often if you wear glasses or have another eye problem.

- **Protect your eyes.** Too much sunlight can damage your eyes, so it is important that you wear good quality sunglasses or a hat when you are outdoors, and never look straight into the sun for any period of time. (Around 30 seconds of direct exposure is enough to cause permanent impairment of vision.)

  If your eye is hit or pierced it can cause vision impairment, so don’t play carelessly with things that can damage your eyes.

- **Exercise your eyes.** Your eyes should be able to focus up close and far away. If you only look at things that are up close (like books or computer screens), your eyes can change so that you can no longer see far away. If you are reading or working on a computer you should take regular “eye breaks”, (for a few minutes every half hour at least). Look out the window, or go outside and play or go for a walk.
Primary Class
Fun & Games
**Knowing your Vision**

Using a pencil draw a line linking the word with the correct definition

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Find a Word

Find the words from the list in the table below.
cornea  eyelashes  iris  looking  retina  spectacles  tears  eye  eyelids  lenses  pupil  sight  sunglasses  vision

cornera  eye  eyelashes  iris  looking  retina  spectacles  tears  eye  eyelids  lenses  pupil  sight  sunglasses  vision

S  U  N  G  L  A  S  S  E  S
P  A  V  P  U  P  I  L  Y  E
E  P  L  E  V  L  G  E  X  H
C  R  Y  K  I  O  H  Y  M  S
T  E  A  R  S  O  T  E  L  A
A  T  E  M  I  K  P  L  E  L
C  I  N  J  O  I  R  I  N  E
L  N  R  X  N  N  O  D  S  Y
E  A  O  A  D  G  S  S  E  E
S  I  C  F  B  I  R  I  S  T

www.brienholdenvision.org
Crossword

ACROSS
4. Sight
5. A way to correct vision
9. What we see with

DOWN
1. The round black hole in the eye
2. What you wear to protect your eyes from bright light
3. A way to correct vision
6. Cover of the eye
7. The liquid on the surface of the eye
8. Coloured part of the eye
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DOWN
1. A way to correct vision
2. Sight
4. What you wear to protect your eyes from bright light
5. Clear front of the eye
11. What you see with
Colouring In
Can you colour in Mr. Sunnies? How many colours can you use?
Colouring In

Can you colour in Mr. Sunnies sunglasses? How many colours can you use?
1. Fold your piece of paper in half along the fold line.

2. Cut out the shape along the dotted line with a pair of scissors.

3. Colour in your Mr Sunnies glasses with your favourite colours.

4. Wear for fun or tape over your own sunglasses!
**Songs**

Can you join your friends and sing along to the ICEE songs? Who can sing the loudest?

---

**EYES**

*To the tune of Five Little Ducks*

Under your eyebrows,  
Over your nose,  
Blink blink blink,  
Now what are those?  
Brown and green and grey and blue,  
Open wide, I’m looking at you.

Care for your eyes,  
Here’s what you do,  
Eat fruit and veg,  
Wear sunnies too,  
All these things will help you see,  
Open wide, can you see me!

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**EYES**

*To the tune of Once I Caught a Fish Alive*

Brown, blue, grey and green,  
Neatest things you’ve ever seen,  
Left, right, up, and down,  
Eyes are looking all around.

Eat your veggies and your fruit,  
Wear your hat and sunnies too,  
Doing all of these thing right,  
Keeps your eyes all looking bright.
Maze
Can you follow the maze and help your friend find his sunnies?
Connect the Dots

Using a pencil, can you follow the numbers and draw Mr. Sunnies? When you finish drawing him can you colour him in? How many colours can you use?
Connect the Dots

Using a pencil, can you follow the numbers and draw Mr. Sunnies? When you finish drawing him can you colour him in? How many colours can you use?
Optical Illusions

**Ebbinghaus Illusion:** Which red flower centre is bigger? (The right one? The left one? Actually they are the same size.).

**Why:** Our perception is influenced by any surrounding objects, in this case the white spheres. Since the overall shape of the flower on the right is bigger, some assume the centre is also bigger. Others may see the left centre as being larger because it is bigger than the surrounding spheres.
**Fraser’s Spiral:** Also known as the twisted-cord illusion. It looks as if this is a spiral, but in fact it’s a series of circles.

**Why:** A regular line pattern (the circles) is combined with misaligned parts (the chequered pattern underneath). The black and white lines that make up each circle are slightly curved towards the center of the whole figure. Our eyes try to follow this direction and, helped by the chequered pattern, they ‘jump’ to the next inner (smaller) circle - a jump we fail to detect, so the circles appear as a spiral.
Other Activities

**Blindfold a Friend:** One friend is blindfolded and the other is the guide. The guide has to successfully get them and their blindfolded partner through a pre-planned route around the classroom or school yard. Each pair is timed and the fastest duo wins. This is a powerful tool to demonstrate the difficulty of living with poor vision.

**Blindfold an Instructor:** One friend is blindfolded and the other is the instructor. The instructor has to successfully navigate the blindfolded friend through a pre-planned route around the classroom or school yard using only verbal directions. This is a powerful tool to demonstrate the difficulty of living with poor vision.

**Paper Plate Face:** Hold a paper plate on top of your head and try to draw smiling face. This can demonstrate to students how hard it is to do a simple task when you are unable to see.
The Human Eye - Front View

- Eye Lashes
- Eye Lid
- Pupil
- Iris
- Sclera
The Human Eye - Side View

- Superior Fornix
- Inferior Fornix
- Palpebral conjunctiva
- Bulbar conjunctiva
- Aqueous Fluid
- Cornea
- Iris
- Ciliary Muscle
- Canal of Schlemm
- Sclera
- Choroid
- Retina
- Macula Area
- Optic Disk (Blind Spot)
- Lens
- Vitreous Humour
- Optic Nerve
- Palpebral conjuctiva
- Inferior Fornix