TEACHER NOTES

UNDERSTANDING PHOTOGRAPHY
(SUPPLEMENTARY NOTES)

Terms 2-3, 2019
CELEBRATING WA’S
AMAZING
BIODIVERSITY
through the camera lens

It’s easy to enter!
• DISCOVER: Find out about WA’s unique species, the threats they face and how people can help.
• PLAY: Grab a camera and spend some time developing your photography skills.
• EXPLORE: Get outside and capture the diversity of our state’s plants, animals and landscapes.
• SHARE: Compose a captivating caption that highlights the biodiversity story of your favourite photo.

WIN
Share in $25,000 in cash prizes for yourself and your school

Choose one or more of the following categories to FOCUS on:
• FOCUS on: WA’s native species.
• FOCUS on: WA’s habitats and ecosystems.
• FOCUS on: Sustainability in WA.

Prizes will be awarded for each category in the following age groups: Years K-2, 3-6, 7-10 and 11-12.

Teacher notes, submission guidelines and competition rules can be found online at mediaeducation.com.au/competitions

Chevron Australia is proud to continue its support of the Chevron Focus Environment competition as a way of raising awareness among students about protecting and managing the environment.
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All images are student submissions from the 2014-2018 Chevron Focus Environment competition and Rob McLean, unless noted.
INTRODUCTION

Celebrating WA’s amazing biodiversity through the camera lens
The Chevron Focus Environment competition encourages students to engage with WA’s biodiversity through the mediums of photography and caption writing.

One of the aims of the competition is to encourage young people to experiment with photography as an art form and as a way of communicating ideas about the environment.

These notes are designed to provide teachers with additional background information and activity ideas to help students learn about how a camera works and a range of functions that can used to achieve different photographic effects, eg. depth of field, camera shake, long shot, optical zoom, and exposure.

THE CAMERA

What type of camera can I use?
You can use any camera, including one built in to a smart phone or a tablet, but digital photographs must have a minimum resolution of 300dpi.

Purpose-built digital cameras have a number of features that can be adjusted when the camera is in semi-automatic and manual modes. These give the operator greater control over the quality and character of the final image.
Smart phone and tablet cameras have the capability to focus, zoom and use the flash just as purpose-built cameras in automatic mode do. They also have the capability to adjust the exposure by tapping on screen. Other adjustments can be made after the shot has been taken.

For the purposes of the competition, basic digital manipulation of photographs is permitted, but any deemed to have been heavily enhanced will not be eligible for a prize. The images may be presented in colour, sepia or black and white.

Let students explore the capabilities of their cameras before they take photographs for the competition. If they are familiar with the camera and what it can do, they will develop an instinct for manipulating the functions to produce images that will capture the attention of the audience.
How a camera works

To get the most from their cameras, students will need to have a basic understanding of photography.

Photography is possible because of light. The word, from its Greek origin, means drawing with light. To form an image, a camera’s sensor, or film, must be exposed to light.

The passage of light through a camera

APERTURE
Light enters the camera through the aperture at the front of the camera. The aperture opens and closes like the iris of an eye, letting in more or less light as needed.

LENS
Light passes through a lens which bends the rays of light to focus on the sensor. The focal length of the lens is the distance between the lens and the sensor. A zoom lens has an adjustable focal length. When the focal length is increased, the image is magnified and the subject appears closer.

SHUTTER
When the shutter button on the outside of the camera is pressed, the shutter opens allowing light to reach the sensor.

SENSOR
In a digital camera, the sensor is the most valuable part of the camera. Its role is to collect light and create an image of the subject being photographed. The image is then split into millions of pixels. The colour and brightness of each pixel is recorded as a number and stored in the camera’s memory card.

The scientific principles behind photography have not changed since its early days. What has changed is our knowledge and understanding of each stage of the process and developments in technology. These have allowed us to turn science into art.
KEY PRINCIPLES OF PHOTOGRAPHY

The amount of light exposed to the sensor and how much of this is needed to form a good image is determined by four factors:

- **The amount of available light**: eg. bright sunlight, moonlight.
  
  The amount of available light is an external factor which we may or may not have control over. Indoors, this can be controlled more effectively than outdoors where we can only create shade from the sun over which we have no control.

- **Exposure to light**, given as an ISO number.
  
  - In bright conditions, the sensor has more light available to it so it requires less exposure, eg. ISO 100.
  
  - In dull conditions, the sensor has less light available to it so it requires more exposure, eg. ISO 1600.
  
  - Using an ISO that is too high may give a grainy image.

- **Shutter speed**, measured in fractions of a second.
  
  Shutter speed is a measure of how long it takes the shutter to open and then close. The slower the shutter moves, the longer it remains open, exposing the sensor to more light.
  
  - In bright conditions, less light is required to reach the sensor so a faster shutter speed is used, eg. 1/2000 of a second.
  
  - In dull conditions, more light is required to reach the sensor so a slower shutter speed is used, eg. 1/15 of a second.

- **Aperture size**, measured in f-stops.
  
  As the aperture size increases, a greater area of lens is exposed and more light is allowed into the camera. The f-stop value is inversely proportional to the size of the aperture so as the aperture increases in size, the f-stop value decreases.
  
  - In bright conditions, less light is required to enter the camera so a smaller aperture is used, eg. F/22.
  
  - In dull conditions, more light is required to enter the camera so a wider aperture is used, eg. F/2.8.
  
  - In automatic mode, the camera strives to adjust the aperture and shutter speed to achieve the best exposure for the given light conditions.

These factors make up what is known as The Exposure Triangle.

In automatic mode, the camera controls each function to achieve the best exposure. In semi-automatic mode, the operator has some control and in manual mode, the operator has full control of all functions.

The elements of the Exposure Triangle are interdependent and they can be manipulated to create different effects.
Exposure
With each incremental rise in ISO, the time the sensor needs to be exposed to light is halved.

- In identical conditions, ISO 200 would require half the exposure time to take the same shot as ISO 100.
- In identical conditions, ISO 100 would require four times the exposure time to take the same shot as ISO 400.

A higher ISO (eg. 800) can be used to capture a moving subject in focus because it requires less exposure to light and so the shutter speed can be increased.

Shutter speed
In identical conditions:

- For stationary shots, $1/60$ is the normal shutter speed.
- To show movement, to be slightly blurred while the rest of the shot is in focus, a slower speed is used; eg. $1/8$ to $1/30$.
- To freeze the action as a crisp, sharp image while the background is blurred, a faster speed is used; eg. $1/125$ to $1/500$.

Longer shutter speeds may result in blurry images as the operator may have ‘camera shake’. A tripod or other support should be used when working with a slow shutter speed.

Aperture
The key benefit of aperture control is the ability to create images with ‘depth of field’ in which different parts are in focus while others are blurred.

- A shallow depth of field in which the point of focus in the foreground is sharp while the background is blurred is created using a wide aperture.
- A deep depth of field in which the point of focus in the background is sharp while the foreground is blurred is created using a narrow aperture.
- A middle depth of field in which the point of focus in the middle ground is sharp while all around is blurred is created using a mid-point aperture.

With each incremental rise in f-stop, the size of the aperture doubles; eg.

- The area of the aperture at $F/8$ is twice the area at $F/16$.
- The shutter speed required at $F/8$ would be half that required at $F/16$.

To zoom or not to zoom?
When the focal length of the lens is increased, the image is magnified and the subject appears closer. When it is decreased, the reverse is true.

Using the zoom feature on a camera allows you to have a closer view of a distant subject. There are two types of zoom:

- **Optical zoom** - The subject appears closer by adjusting the position of the lens; the shot is taken and the image is created. The quality of the image remains intact.
- **Digital zoom** – The centre of the image that reaches the sensor is magnified to a full-size image. The clarity of the image is reduced as the pixels have been enlarged to fit the same area as the original image. To maintain image clarity, it may be preferable to turn off the digital zoom and simply move closer to the subject.
THREE STEPS TO BECOMING A PHOTOGRAPHER

The purpose is for students to understand how the camera can be manipulated to produce a wide range of effects. Initially, their subjects can be whatever is available. They can even create their own subjects from random objects available in the classroom and outside. But as students develop their photographic skills, encourage them to focus on the features of natural landscapes, plants and animals.

Encourage students to keep a portfolio of a selection of their shots, briefly explaining how they were composed and captured. As they look back, they will not only see how they have improved as photographers but they will appreciate the aesthetic value of the special effects they create.

Step 1 – automatic mode

With the camera in automatic mode, students can concentrate on composing great shots while the camera makes the necessary adjustments. They will need to determine what they want to focus on as the camera cannot know this.

- **Focus.** What effect is created in the final image when you focus on points at different distances from you: close by, medium distance, far distance?
- **The rule of thirds.** Create an imaginary nine-square grid on the LCD screen. Line up points of interest with the lines or intersections. This places them off-centre and gives you the scope to balance the shot with something else and create interest by giving a point to focus on. It shows where a subject is looking or where it is moving to. This allows the viewer to look or ‘move there’ too. Another point of interest can be created in the space beside the main subject. But remember, there will be times when you want the subject in the middle of the shot.

- **Fill the frame.** For close-up shots, don’t be afraid to zoom in or move closer to the subject so they fill the frame.
- **Bring distant subjects closer.** The zoom feature will allow you to take a shot as if you were much closer to your subject.
- **Depth of field.** This technique can make 2D images come alive. You can manipulate your photo so that part of the image is in sharp focus while the rest is blurred.
• **Play with shutter speed.** Capture the sensation of movement or the idea of stillness by adjusting the shutter speed. A faster shutter speed is great for capturing fast action, such as moving wildlife.

• **Move to the level of the subject.** Lie down or climb up, whatever is necessary to take the shot from the same level as the subject. (line of sight)

• **Look up, look down and all around.** Shoot the subject from all angles. (line of sight)

• **Add a point of focus to landscape shots.** Not only will this add interest to the photograph, it will also give a sense of scale.

• **Check the surroundings.** Is there anything you want to add or remove before you shoot?

• **Check the background.** Do you need to reposition the subject or yourself to avoid a ‘photo bomb’ effect?

• **Vary the lighting.** Use shade and part-shade. Take shots with the light source coming from different angles (front and back lighting). Be aware of shadows! Can you manipulate the functions to create an image in which the subject is sharp and clearly visible?

• **Take multiple shots.** The beauty of the digital camera is you can delete unwanted shots so it’s always worth taking several of the same subject, with slight adjustments to each. After uploading and viewing them on a computer screen, you can then choose the ones you want and trash the rest.

• **Experiment with focus lock.** Depress the shutter button halfway to lock the focus and exposure. Keeping pressure on the button, recompose the shot then depress the button completely. What different effects can you create?
• **Expect the unexpected.** When something unexpected happens, you need to be ready to snap it quickly. Smartphones and tablets are often the best option here. The interest factor of these shots can make up for them not being ‘technically perfect’.

![Photo 1](image1.jpg)  ![Photo 2](image2.jpg)

• **Macro, close-up, portrait or landscape.** Not sure which mode to use? Try them all and see which gives the image you’re trying to achieve.

  o **Macro shot**
    Do you want to see something in minute detail; eg. the centre of a blossom, an insect’s features? Then macro is the shot for you. What do you have to do with your camera to achieve this shot in the detail you require?

  o **Close-up shot**
    Why have you chosen it? What different patterns and textures does it have? How much detail do you want the image to include? Walk around it. Check the light and shadows. Take several photographs, from different angles and levels, with and without the Rule of Thirds, the zoom function, the focus lock and the flash, and any combination of these. Vary the distance, measured in paces, from which you take each shot.

  o **Portrait/medium shot**
    Take time to record points of interest, where they are in relation to each other and their relative sizes. How many places can you stand to get a different perspective, ensuring all points of interest are always included? Can balance be achieved from each perspective? Check the light and shadows. How will they affect the shot? Can more shade be created? Take several shots from each perspective, with and without the Rule of Thirds, the zoom function, the focus lock and the flash, and any combination of these.

  o **Landscape/long shot**
    What are the points of interest and what proportion of the shot do they take up? Is there anything to provide a sense of balance, of scale? Take several shots from each, with and without the Rule of Thirds, the zoom function, the focus lock and the flash, and any combination of these.
Step 2 – semi-automatic mode

In **semi-automatic mode**, the user can take control of some functions and discover the special effects that can add depth and character to a photograph while the camera makes the necessary adjustments to achieve the best possible exposure.

Ensure students know what all the buttons, dials and icons on their camera mean. Encourage them to use the manual as a resource to inform them of its features and capabilities.

In this mode students can,
- **Set the exposure** - take shots in a range of light conditions.
- **Use under/over exposure** - deliberately alter the exposure of the photograph, in increments of 1/3 to + / - 2, using the under/over exposure dial.
- **Use aperture priority mode (AV or A)** - create ‘depth of field’ which shows some parts of the image in focus while others are blurred. This highlights the in-focus part of the image.
  - A shallow depth of field in which the foreground is in focus, is created using a wide aperture; eg. a sharp portrait against a soft blurred background.
  - An image with a deep depth of field showing the background in focus is created using a narrow aperture; eg. an object in the distance in focus while the foreground is softly blurred.
  - Setting the aperture between the two creates a middle depth of field. An object in the centre of the image is in-focus while all around is softly blurred.
- **Use shutter priority mode (TV or S)** – use different speeds for different purposes.
  - With skill, an operator can use a fast shutter speed to create action shots in which a moving subject is caught in focus while the rest of the image is blurred.
  - A slow shutter speed allows you to show movement while keeping the rest of the shot in focus, and to take photographs in areas of dim light where a flash is not allowed; eg. a theatre, a church.
  - ‘Camera shake’ is always a risk when using a slow shutter speed. This results in unwanted blurred photographs. Encourage students to rest their elbows on something for support as they take their shots or better still, use a tripod.
- **Use the flash** - add extra light to the scene but be aware of the effect it may have. With many cameras the flash is either on or off but some allow you to turn it on in stages so you are in control of how much extra light is added.

**Activities**

- Revisit the sites and retake the shots taken in automatic mode. This time, experiment with the aperture and shutter priority modes and the ISO value to create different effects.
- Summarise what you have discovered. Compare the different photographs of the same shot. Which look best and why? Do others agree?
- Search the internet for examples of images illustrating different photographic effects. Some may explain how they were achieved. Get creative and add to your portfolio of images, explaining how the effects were achieved.
- Visit areas that provide a consistent moving subject; eg. the ocean, a river, a waterfall, moving traffic, a sports event, shopping mall, a market, a park, a zoo. Add to your portfolio by experimenting with different function combinations to shoot images that have character, created by freezing the action in sharp focus against a blurred background or showing the action as a slight blur while everything else is in focus.
- Find areas that provide a variety of lighting conditions; eg. outside: full and dappled sunlight, shade, full cloud, part cloud, dawn, dusk, full, part and no moonlight; inside: sunlight, fluorescent and incandescent light, candle and firelight, churches, theatres. Extend your portfolio by experimenting with different function combinations to shoot images that have atmosphere, created by the use of light.
- Investigate how to create torchlight ribbons. Ask someone to wave a torch while you take the shots. Try in different lighting conditions.
- The students cannot damage their cameras by playing with the settings. The worst that can happen is they will take terrible shots which can easily be deleted. Each ‘mistake’ made is one step closer to a deeper understanding of photography.
Step 3 – manual mode

In semi-automatic mode, the camera always tries to compensate for the settings chosen; it is programmed to give the best possible exposure. But students may wish to explore further and extend their portfolios, investigating the effects on the image of adjusting one function while the others remain constant.

In doing so, they will become increasingly familiar with the scale of each feature and discover how to fine-tune them to create exactly the desired effect.

Activities

- Secure the camera on a tripod. Take a medium-shot photograph in automatic mode. This is the control photograph. Identify and record the ISO, shutter speed and aperture values. Switch to fully manual. Take a series of repeat shots, keeping the exposure and shutter speed constant and work through the full range of aperture values. Repeat with the ISO and aperture constant and work through all the shutter speeds. Finally, keep the aperture and shutter speeds constant and vary the ISO.
- Upload and analyse the photographs, comparing them with the control. Were any photographs similar to the control? How did the images alter in each series? Would it be useful to repeat this exercise for close-up and long shots? How might the images in a series change if all the functions were changed, beginning at their lowest values and increasing by one increment each time, or two beginning at their lowest value and one at its highest?

Being familiar with their cameras and understanding the effects that changing the different functions can create will give students the confidence and ability to compose and capture interesting subjects for their competition entries.