What's so amazing about God's design of animals?

Interact Teacher Manual
Science
Years 5-8

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## CONTENTS

2 Overview for this Term
3 Introduction
4 Pre-planner Guide
5 Background Information
10 Key Competencies, Habit of Mind, Habit of Character
11 Big Idea, Key Understanding, Focus Question
12 New Zealand Curriculum Requirements
13 Key Areas of Investigation
15 Firing Up
29 Finding Out Further
33 Focusing Forward
39 Scriptures Relevant to this Unit
I Understanding *Interact*
III The *Interact Resources*
IV Options for Using this *Interact Teacher Manual*
V Planning With *Interact*
VI The *Interact* Learning Process
VII Key Learning Intentions
X Acknowledgements
XI Bibliography
## Overview for this Term

This Teacher Manual is for one subject of an integrated unit based around the theme of *God is generous*. The subject of this particular Teacher Manual is shaded grey. Further information about the supplementary books and teaching resources mentioned below are available from www.interactcurriculum.com

<table>
<thead>
<tr>
<th>Year 1-4</th>
<th>Year 5-8</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Devotions</strong></td>
<td><strong>Devotions</strong></td>
</tr>
<tr>
<td>What has God given us and why?</td>
<td>Why is God so generous towards us?</td>
</tr>
<tr>
<td><strong>Social Science</strong></td>
<td><strong>Social Science</strong></td>
</tr>
<tr>
<td>What has God given our country?</td>
<td>How do people value what God has given our country?</td>
</tr>
<tr>
<td><strong>Science</strong></td>
<td><strong>Science</strong></td>
</tr>
<tr>
<td>What’s so fantastic about feathers and fins?</td>
<td>What’s so amazing about animals?</td>
</tr>
<tr>
<td><strong>Health</strong></td>
<td><strong>Health</strong></td>
</tr>
<tr>
<td>What happens inside my head?</td>
<td>What is the potential of my brain?</td>
</tr>
<tr>
<td><strong>Art</strong></td>
<td><strong>Art</strong></td>
</tr>
<tr>
<td>Birds in Contemporary NZ Art</td>
<td></td>
</tr>
<tr>
<td><strong>Language</strong></td>
<td><strong>Language</strong></td>
</tr>
<tr>
<td>How can I express gratitude?</td>
<td>How can I use video to inspire awe at God’s generosity?</td>
</tr>
</tbody>
</table>
INTRODUCTION

What’s so amazing about God’s design of animals? This Interact Science investigation forms part of the theme, God is generous and wants us to be grateful.

Evidence of God’s design in the world is everywhere. God has designed an amazing environment, and created living creatures that are perfectly designed for the environment in which they live.

The more we study animals, the more we come to understand some of the reasons for the uniqueness of each animal. The design of their feet is related to the type of ground or perch those animals or birds stand on. The type of eyes and mouth is related to the type and position of food the animal will eat. The more we notice similarities and differences, the more accurately we can predict how and where an animal lives simply by observing the design features God has given it.

In this investigation, we will have opportunity to observe animals and draw conclusions about the features God has given them, to show care for wild and domestic animals, or to design and make pet enclosures that are respectful of the needs of particular birds, fish or animals.

As we appreciate what we observe and learn about the living things God has created, we are filled with a sense of wonderment and awe. Worship of their creator is an easy response.

If you are new to Interact resources we invite you to turn to Appendix I to learn about the Interact Learning Path on which this Teacher Manual is based, and to gain additional planning help.
WHAT'S SO AMAZING ABOUT GOD'S DESIGN OF ANIMALS?

PRE-PLANNER GUIDE

Resource People

• Park rangers
• Zoologists
• Ornithologists
• Marine life specialists
• Bird Rescue individuals or groups

Special Features could include:

• Creating our own ‘Wow’ booklets, blogs, slideshows or wiki
• Visiting Bird Rescue volunteers, an aquarium or aviary
• Having a ‘Pet Day’ at school
• Adopting an endangered species of bird to monitor attempts to protect their ongoing survival
• Designing a pet enclosure that provides opportunity for a pet to have a good life in the care of its owner
• Providing means of feeding and caring for wild birds or fish in our local environment
• Becoming Nature Guides for Tourists. Set up a simulated bird tour experience, complete with recorded bird songs, our own pictures of native and other local birds or stuffed toy birds which we have set into ‘trees’, or onto a mural. Guide other students and parents through our ‘nature walk’, explaining as fully as possible the things we have learned about the birds we observe
• Becoming Nature Detectives
• Setting up a class aquarium
• Devising ways of attracting birds to our school environs
WHAT’S SO AMAZING ABOUT GOD’S DESIGN OF ANIMALS?

BACKGROUND INFORMATION

God created and cares for animals (Psalm 65:9-13, Matthew 19:29-30, Luke 12:27-28) and expects us to do the same. God has given people the task of ruling over the animals (Genesis 1:20-30, Genesis 9:2), and the more we learn about them, the more we are amazed at God’s design, and the more effectively we can care for God’s creation.

What has God given to all animals?

God has given all animals processes that keep them alive:

- The Nutrition process describes the way animals get their food
- The Movement process describes how animals move
- The Respiration process describes the ways animals breathe
- The Excretory process describes how animals get rid of their wastes
- The Growth process describes growth of animals from conception to birth through infant stages to adulthood
- The Sensing process helps animals to react to changes in the environment and involves specific features like noses, mouths or beaks and the nerve system through the body
- The Reproducing process for animals involves specific features such as eggs which hatch, live births of immature babies or little adults
- The Circulation process describes the movement of blood around the body

We can use an acronym to remember these processes:
MRS GREN, or
MRS C GREN if the Circulation process is included.

What unique features has God given particular animals?

How have birds been designed to survive within their environment?

God has given birds different kinds of feathers, such as down for warmth, contour for protection and colour, and flight feathers for flying.

God has given birds very light bones filled with air to help them fly well. The bone of a bird’s wing is hollow with a series of connecting ribs and spars and a hard outer layer. This makes it both light and strong. An aeroplane wing has been built in the same manner.

God has given birds different shaped wings for the kinds of flying they need to do:
- long wide wings for soaring (hawk)
- long slender wings for gliding (seagull)
- short wide wings for quick movement (fantail)
- short wings for short flights (turkey)
- paddle shaped wings for swimming (penguin)
God has given birds different types of beaks for their eating habits:
- wide flat beaks for scooping (duck)
- hooked beaks for tearing (hawk)
- long pointed beaks for finding food in the mud (heron)
- short strong beaks for crushing seeds (sparrow)
- long thin beaks for getting nectar (tui)
- long sharp beaks for fishing (kingfisher)
- long curved beaks with nostrils at the end for finding insects (kiwi)

God has given birds different types of feet for their environment:
- three toes in front and one behind for perching
- long webbed toes for swimming (duck)
- long legs and separate toes for wading (oyster catcher)
- short legs, back on the body, for diving (duck)
- talons for grabbing (hawk)

How have fish been designed to survive within their environment?
God has given fish gills so that they can survive by 'breathing' under water. Most fish also have a swim bladder that helps them stay at a constant depth without having to keep swimming. God has covered most fish with scales like overlapping armour, and a layer of slime which is a form of protection.

God has given fish different types of mouths for their feeding habits:
- mouths above for the fish that hide on the bottom of the sea
- mouths below for fish that swim at the top of the sea
- mouths in front

God has given fish different types of eyes for their feeding habits:
- eyes that lay flat on the sides of the head (coral fish)
- eyes that bulge out on the head (flounder and blenny)
- eyes that roll back and forward in their sockets (porcupine fish)

God has given fish different types of fins for their movement:
- dorsal fin (on back) and caudal fin (tail) for swimming
- pectoral fin (sides at front) for 'flight' and walking
- ventral fins (sides at back) for going up, down, turning and stopping

How have land animals been designed to survive within their environment?
God has given land animals senses to find the things they need to survive, such as food and shelter. They have eyes to see, ears to hear and noses to smell. They have mouths and digestive systems to gain nutrients from their food.

God has given land animals arms and legs to help with movement, and some have tails.
Background Information continued

God has given land animals different types of eyes for their survival:
- eyes to see long distances (cheetahs, tigers)
- eyes to detect movement (dogs, gorillas)
- eyes to detect colour (monkeys)
- eyes to see all around (crocodiles)

God has given land animals different types of teeth for their feeding habits:
- teeth for cutting or gnawing (rats)
- teeth for ripping (dogs)
- teeth for grinding (cows)

God has given land animals different types of limbs for their movement:
- limbs for climbing (monkeys)
- limbs for running fast (horses, cheetahs, deer)
- limbs for bearing heavy weights (elephants, horses)

How has God designed animals to survive within changing habitats?

Over time an environment can change due to the effects of temperature, weather, seasons, pollution or other manmade interventions. God has created animals with the ability to respond to these changes by fluffing up their feathers or curling up in a ball to keep the heat in; moving to shelter during bad weather; hibernating or migrating to ‘escape’ certain seasons and by adapting to eat available food if their usual sources are polluted or removed.

God has created animals to respond to changes in temperature by:
- altering their layers of insulation

God has created animals to respond to changes in weather by:
- giving them senses to be aware of wind, rain, burning sun or snow

God has created animals to respond to different seasons by:
- programming them to follow set migration paths
- programming them to hibernate at set times
- creating them with the ability to store fat as a food source

God has created animals with senses to detect polluted food sources such as:
- smell to sense rotting food
- taste to detect poisons
- eyesight to see discolouration

God has also created animals with the ability to sense danger and move away from it, to seek food sources so that they can live and to look for shelter and protection from the weather. When this happens, all living creatures can function in harmony.
**Background Information continued**

**How can we show gratitude and care for animals?**


People have been given the task of ruling over the animals. (*Genesis 1:20-30*, *Genesis 9:2*). Adam was instructed to care for the Garden of Eden and all the animals (*Genesis 1:29-30*, *2:15*), and the task to name all the animals (*Genesis 2:19-20*). Noah was instructed to take male and female of every species of animal onto the ark "to keep their various kinds alive throughout the earth" (*Genesis 7:3*).

We are wise to care for the animals we use for our needs (*Proverbs 12:10*). Because of human negligence, greed and ignorance, many animals have become *endangered* or *extinct*. *Endangered* means to be at risk of *extinction*. *Extinction* means the death of an entire family, class or species of living things.

Today, the implementation of protection laws and specific breeding programs work towards the survival of a variety of endangered species of plants and animals.

**Cultural Perspectives**

To the Maori, all of life is seen as a part of creation that is linked intrinsically to all other parts. In pre-settler times, Maori worked with the environment to provide food and shelter while trying to maintain a balance of nature. Identification and classification of living things depended on what part of the Maori way of life they fulfilled. Birds provided feathers, food, fat (for preserving) and bone; fish provided food and sea mammals provided blubber as well as food.

There was a wealth of birdlife in *Aotearoa* when the Maori first arrived. There was also a wide range of insect life on the native forest floor, and so most birds had either lost the use of their wings or preferred to forage in the forest litter. This meant that they were easy prey for humans and the animals they brought with them, such as the dog and the rat.

Cultural practices (*rahui*) were put in place to protect different species of bird from being depleted, but it is clear that the Maori did not succeed in protecting the *moa* from extinction, probably because it was a large source of protein that was readily available. Like the *moa*, the *huia* also became extinct, although not primarily for its meat, but for its feathers.

A similar perspective (placing a *rahui* at certain times) was applied to fishing to ensure the on-going bounty of the rivers, lakes and the sea. It was common practice for the Maori to take the young fish, crayfish or *kina* (sea eggs) and to leave the older breeding females to spawn for further seasons. In a sense, they practised a type of aqua-farming.
As with all Maori interactions with Te Ao Marama (the revealed world of light) there were universal practices guiding fishing and trapping birds and then discarding of the rubbish appropriately. Everything Maori do has an impact on all of life.

When the British first came to New Zealand they had the legacy of the biblical worldview – many varieties of birds and animals were saved from annihilation by Noah and his ark (Genesis 6). They were familiar with a range of animals, both large and small, and were used for intensive farming practices with domestic animals used as ‘labourers’.

At that time there was also scientific interest in how to classify living things. In 1735, Carl Linnaeus published a book called Systema Naturae outlining his idea of how to sort out living things from one another. He wanted to show in a rational way that there was an unchanging order in Biblical creation. For Linnaeus, it was a religious act to spend his life dedicated to describing and naming organisms, because it revealed the glory of God’s creation. Two of Linnaeus’ students travelled with Captain James Cook on his journeys to the South Pacific and were instrumental in recording scientific details of the native flora and fauna.
the key competencies are:

**Practise thinking skills**

the habit of character focus is:

**Gratitude**

the habit of mind focus is:

**Responding with wonderment and awe**
the big idea is:

God is generous and wants us to be grateful

the key understanding is:

God has designed animals with unique features that are perfectly suited to their habitat

the focus question is:

What is so amazing about God’s design of animals?
New Zealand Curriculum requirements

**Students will:**

Vision: Demonstrate a commitment to become *Lifelong Learners*

Principles: Display *Coherence* and show a desire to be *Learning to Learn*

Values: Appreciate *Equity, Respect, Community and Participation*

Key Competencies: Practise *Thinking skills*

Science

**Nature of Science**

*Participating and contributing*

Use their growing science knowledge when considering issues of concern to them

Explore various aspects of an issue and make decisions about possible actions

**Living World**

Recognise that there are life processes common to all living things and that these occur in different ways

Explain how living things are suited to their particular habitat and how they respond to environmental changes, both natural and human-induced
We are investigating:

1.0 What has God given to all animals?
2.0 What unique features has God given particular animals?
3.0 How has God designed animals to survive within a changing habitat?
4.0 How can we show gratitude and care for animals?

For a list of Key Learning Intentions to select from as a skill focus, please refer to the Appendix.
Interact Learning Path | Phase 1

**Firing Up**

*Fire Up* imaginations and learning desires and gain knowledge in the following ways:

**Relate**
Be connected, in engaging ways, with the topic to get ‘hooked’ into learning.
*The exclamation mark reminds us to get enthused.*

**Recall**
Recall prior knowledge of this topic.
*The arrows remind us to consider all we have experienced, learnt and felt about this topic.*

**Raise questions and recognise problems**
Consider what questions we have about this topic that we need to or would like to know the answers to. Identify possible problems. Some of these questions may be springboards into the topic study. Others may become the basis for further research later in the unit.
*The question mark reminds us to question.*

**Research (initial)**
Initiate research in the key areas of investigation, seeking to answer questions as you go.
*The magnifying glass reminds us to go searching.*
Provide an interesting, information-rich environment that engages the students in their learning. The following is a range of suggested ideas:

If responding with wonderment and awe is a characteristic of successful people, and appreciation of God’s generosity and worship God is a characteristic of Christians, how can we become better at it through this investigation? Gather fascinating information about the features of birds, fish and other animals, for your own ‘Wow’ booklet, blog, slideshow or wiki. Begin to collect pictures to investigate the features of living creatures.

In order to learn about how to set up a class aquarium or devise ways of attracting birds to our school environs, begin to gather information about:
- the needs that particular birds or fish have for food, temperature, etc.
- the environments of specific birds or fish and the special design features they have to enable them to live there.

Prepare to become a Nature Detective. Just as detectives can learn a lot about a person without even meeting him or her, there are special features of birds and fish that give us clues about where they live, what they eat, and what they do to keep safe. By looking at their features, we can become good at predicting a lot about the way they live. Begin researching about features of birds or fish so that you know the clues.

Begin research about the features of birds, in order to become a great Nature Guide for Tourists. This will consist of a simulated bird tour experience complete with recorded bird songs, our own pictures of native and other local birds, or stuffed toy birds which we have set into ‘trees’, or onto a mural. We will guide groups of students and parents through our ‘nature walk’, explaining as fully as possible the things we have learned about the ‘birds’ we observe.

Rub a piece of polystyrene against a glass bottle to produce a squeaking noise to attract birds to your playground, so that you can observe them.

• Engages with scientific exploration and discussion
Recall

questions and activities

Assist the students to consider what they already know and to build on that knowledge by asking further questions as they learn. The following is a range of suggested ideas:

Discuss your experiences of keeping pets

Play 21 Questions by choosing an animal, bird, or fish and having others guess what it is in less than twenty one questions. (You may only answer yes or no.) Questions could be about features, habitat, skin covering, classification, e.g. mammal, bird and fish, food, etc. Repeat this exercise at the conclusion of this study and see what else you have learnt

Within a fifteen minute period, create mind maps in groups that describe as much as you can recall about the features and benefits of each feature, of five birds or fish. Consider such things as skin covering, eyes, beaks/mouths, wingspan/tails, legs/fins, feet

Complete a True/False quiz. Identify what you need to learn, and then record additional questions to find out during your research. Repeat the activity at the conclusion of the study

Share your experiences with birds or fish with a partner, and then, in groups of four

Write a vocabulary list of as many words related to this topic as you can. Think of scientific terms, labels for diagrams of birds or fish, words to describe habitat, behaviour, life cycle, etc

Draw and/or label a diagram of a bird or fish with as many terms as you know. Identify what you need to learn and repeat the activity at the conclusion of the study

Throughout this study, stop and give groups of students three minutes to review what they have learnt, and one minute to ask a clarifying question or to answer new questions

Mammals: True or False?

Answer true or false to whether the following statements are characteristics of a mammal.

- have warm blood
- lay eggs
- have no backbone
- have hair, wool or fur
- feed their babies on milk
- have gills to breathe
- are born alive, rather than from eggs
- must live on the land
- do not have feathers
- all eat the same food

*Identifies prior knowledge and experiences*
As a class, identify questions you would like to know the answers to in relation to this topic. The following is a range of suggested ideas:

**Research Questions**
Begin your questions with what, when, who, why, where, and how. For example:

The Focus Question is **What's so amazing about God's design of animals?** The Key Areas of Investigation are:

1. What has God given to all animals?
2. What unique features has God given particular animals?
3. How has God designed animals to survive within a changing habitat?
4. How can we show gratitude and care for animals?

List other questions that might help answer these questions. For example:

- What is a feature?
- What is a habitat?
- How are features similar and different between species?
- How are habitats similar and different?

The answer is 'feather', or 'seagull', or 'fish', or 'fins', or 'egg', etc. Write five questions to which that word is the answer.

Write a list of questions you would like to find the answers to about the features of a specific bird, fish or land animal.

Gather questions you could ask about birds, fish or land animals. Sort them into 1 minute questions, 5 minute questions, 10 minute questions or 1 week questions depending on the amount of thought or investigation required.

**Reasoning Questions**
Focus on parts or elements, processes, comparisons, connections. For example:

Identify questions you could ask about design features of animals to help you become a *Nature Guide* or *Detective*, to design a pet enclosure or to attract birds to your school environment. Sort your questions into **Skinny Questions** (requires a yes/no or 1-2 word answer) and **Fat Questions** (is more open-ended, e.g. “Give three reasons why...” or “Compare...”). Identify **Closed Questions** (requires a little amount of thinking and a short reply) and **Open Questions** (requires a lot of thinking and generation of many ideas). Then try to identify **Closed Skinny Questions, Closed Fat Questions, Open Skinny Questions and Open Fat Questions**.
Immerse yourself in ideas and information about the topic as you develop those skills outlined in the Key Learning Intentions. As you research, try to:

• take notes as individuals or as a class
• identify groups of ideas and sort under headings
• note titles of interesting or helpful resources
• identify new questions you would like to investigate

The following is a range of activities, based on the Key Areas of Investigation:

1.0 What has God given to all animals?

Visit a farm/aviary/aquarium/zoo. Collect facts about the wide variety of living things you observed and how God has given each of them features to help them live

Walk through the bush or view a video clip to observe a variety of animals or birds, noting their features and functions

Keep small fish, birds or mammals or hatch eggs to observe and record information about their growth or life cycle, food preferences, weight gain and behaviour, noting how God has provided for them. Make a big book or slideshow with your own pictures or diagrams to show changes over time

Divide the class into groups to investigate a living process of animals, as below, and report their findings back to the class

1.1 God has given all animals a process to help them get food, so that they can live. The Nutrition process for animals describes the way animals get their food and often involves specific features like a mouth or beak, and internal organs such as stomach and intestine.

Gather a range of pictures of animals and sort them into groups with similar beaks or mouths or teeth. Predict what food they might eat with a mouth like this and give reasons for your predictions. Research to see if your predictions were accurate. Compare the beaks and mouths and teeth of different animals and draw conclusions about reasons for design features, e.g. animals with sharp teeth often eat meat, animals with short beaks often eat seeds.
1.2 God has given all animals a process to help them move. The Movement process describes how animals move and often involves features like muscles and ligaments.

View video clips of birds flying or fish swimming, and identify types that move quickly or slowly, turn quickly or slowly, etc. Notice similar features of slow-moving birds or fish and compare with features of very quick-moving birds or fish.

Compare the process of moving in three different fish (e.g., clown fish, dolphins and sharks) or birds (e.g., sparrow, hawk and chicken).

Compare the movements of a bird or fish with those of other animals, or with movements you might make:
- What are the similarities?
- What are the differences?
- What makes them able to do what you cannot do?

1.3 God has given all animals a process to help them breathe or respire. The Respiration process often involves specific features like lungs or gills.

Observe the dissection of a fish. Identify its breathing apparatus.

Look at diagrams of the respiratory system of a human and discuss:
- What are the similarities?
- What are the differences?
- In what ways has God perfectly designed the fish to be able to breathe underwater?

1.4 God has given all animals a process to help them excrete waste. The Excretory process describes how animals get rid of their wastes and often involves specific features like kidneys and anus.

Compare people’s need to get rid of unwanted rubbish with an animal’s need to get rid of wastes. Marvel at God’s design for animal’s needs.
1.5 God has given all animals a process to help them grow. The *Growth* process describes growth of animals from conception to birth through infant stages to adulthood.

Compare the process of excretion and growth in fish and birds with those of other animals.

Draw life cycle diagrams of frogs or butterflies, and then gather pictures of human babies, young children, older children, teenagers, adults and elderly to make a pictorial life cycle of humans. Discuss:

- How are the life cycles of butterflies and frogs similar?
- How are they different?
- Do people change like butterflies and frogs?
- What can you say about God and God's designs of animals from these observations?

1.6 God has given all animals a process to help them react to changes in the environment. The *Sensing* process helps them react to changes in the environment and involves specific features like noses, mouths or beaks and the nerve system through the body.

Identify the five senses you have – touch, taste, smell, sight and hearing. Fish have the five senses that people have, as well as an extra one: a row of special cells inside a special canal along the surface of the fish's skin, which allows them to detect water vibrations. This means they can detect movement around them and changes in water flow, which helps them find prey or escape from predators, and to choose where to swim. Thank God for the amazing ways that God provides different ways of living creatures knowing about the world around us.

1.7 God has given all animals a process to help them reproduce. The *Reproducing* process for animals often involves specific features like eggs which hatch, or which result in live births.

Gather a range of fish eggs (roe) and bird eggs, e.g. from a duck and a chicken. Compare their colour, size, shape, and how they are protected. Identify how humans use each for food. Marvel at God's creative ways of keeping creation going.
2.0 What unique features has God given particular animals?

Gather information about the unique features God has given particular birds, or particular fish in order for them to function well in their environment. Marvel at how perfectly they have been designed for the environment in which they live. Think of ways that you can respond with wonderment and awe at what you learn. Thank God as part of that response.

Read the following verses from the Bible about how God has created and provided for the needs of animals:

Gen 1:1; Ps 104:10-28; Job 38:39-41; Matt 10:29-31; Eph 3:9; Col 1:16; Rev 4:11

Discuss:
• What do we learn from these verses about what God is like?
• What do we learn from these verses about what animals are like?

Gather magazine pictures of as many different types of skin covering, feet, beaks, mouths, fins, tails, etc., as you can. Make posters or collages entitled 'Wow! God has designed animals perfectly for their needs!' Describe how the different features God has designed help that animal to live.

Gather magazine pictures of as many different types of skin covering, feet, beaks, mouths, fins, tails etc as you can. Glue onto cards. Sort and group pictures of features (e.g. animal feet) that are similar and try to explain why this design is good for a particular habitat.

2.1 How have birds been designed to survive within their environment?

Brainstorm a range of different types of habitat for birds, e.g. wetlands, forest, farmland. Create mind maps to describe features of birds to match up particular creatures that would suit particular habitats. Hypothesise about why certain features are important for certain environments.

Choose a place where you can watch birds, e.g. in your garden, at the beach, by a stream. Observe quietly for several minutes, and describe the habitat and habits of the birds.

Read verses from the Bible that use birds to teach us spiritual lessons. Identify the main ideas:
Ps 91:4; Ps 103:5; Matt 6:26; Matt 23:37

As you look at various pictures of native birds, listen to bird songs from a website, such as the one below. Try to match the song with the picture and write as much as you can recall about each bird:
http://www.nzbirds.com/birds/birdsong.html
God has given birds different kinds of feathers (down for warmth, contour for protection and colour, and flight feathers for flying). Gather feathers. Describe, compare, sort, and explain differences and similarities. Discuss:

- Which feather would be best suited for a quilt? Why?
- Which feather would be best suited for a duvet? Why?

Look at labels for duvets and compare the feel and warmth of a 100% down duvet and a mixed feather and down duvet. Discuss:

- Which would be best for human use in the summer or winter, or in the north or south of our country? Why?

Observe a Maori cloak and identify the different kinds of feathers that have been woven into it.

God has given birds different types of beaks for their eating habits:

- wide flat beaks for scooping (duck)
- hooked beaks for tearing (hawk)
- long pointed beaks for finding food in the mud (heron)
- short strong beaks for crushing seeds (sparrow)
- long thin beaks for getting nectar (tui)
- long sharp beaks for fishing (kingfisher)

Make a pudding for birds with fat, stale bread or cake, birdseed, wheat, broken biscuits, honey, bacon rind and meat scraps. Alternatively, roll a pinecone in porridge and then roll it in birdseed, bread or cracker or cereal pieces and hang in a tree. Record the numbers and types of birds that come to feed in a given time. Graph the results. Compare the features of the birds that came – their wingspan, beak type and foot type – with ducks or kiwis or hawks and suggest reasons for the arrival of birds with similar features.

Research the mechanism of a bird’s beak, or jaws of an animal and compare with scissors, tweezers and dental probes.

God has given birds very light bones filled with air so that they can fly well. Research the structure of the bone of a bird’s wing. It is hollow with a series of connecting ribs and spars and a hard outer layer. This makes it both light and strong. An aeroplane wing has been built in the same manner. Compare bones of birds with bones of cattle or other grazing animals.
Research continued

questions and activities

God has given birds different shaped wings for the kinds of flying they need to do:
- long wide wings for soaring (hawk)
- long slender wings for gliding (seagull)
- short wide wings for quick movement (fantail)
- short wings for short flights (turkey)
- paddle shaped wings for swimming (penguin)

Find examples of pictures of different shaped wings and describe the types of flight that each bird does.

God has given birds different types of feet for their environment:
- three toes in front and one behind for perching
- long webbed toes for swimming (duck)
- long legs and separate toes for wading (oyster catcher)
- short legs, back on the body, for diving (duck)
- talons for grabbing (hawk)

Observe to find footprints of birds on the beach or soft sand. Make plaster cast molds and bring to school to compare. Comment on the reasons for the various types of feet.

Ask questions about and compare different types of feathers/ beaks/ feet/ mouths/ skin-covering and their functions, and marvel at God’s wonderful design. Respond with wonderment and awe as you worship God.

2.2 How have fish been designed to survive within their environment?

Observe fish in an aquarium quietly for several minutes, and describe their habitat and habits.

God has given fish different types of mouths for their feeding habits:
- mouths above for the fish that hide on the bottom of the sea
- mouths below for fish that swim at the top of the sea
- mouths in front

Visit an aquarium to identify fish of each type. Investigate the link between the design and position of their mouth, and their preferred habitat.

God has given fish different types of fins and tails. Trace around shapes of fish and compare their shape, as well as fin and tail size. Predict which ones would be fast swimmers, slow swimmers, quick to turn, slow to turn, etc., by looking at the shape of their bodies, fins and tails.

God has given fish different types of eyes for their feeding habits. Identify the different positions of eyes and predict advantages and disadvantages of each position for finding food, identifying particular types of enemy, etc.

Make a Design Feature Web, writing the name of an animal, bird, or fish, and describing their design features on rays extending from the name.
2.3 How have land animals been designed to survive within their environment?

Choose a place from where you can watch land animals, e.g. a farm or zoo. Observe quietly for several minutes, and notice habitat and habits.

God has given land animals senses to find the things they need to survive such as food and shelter. Gather pictures of animal eyes, ears, noses, mouths or teeth and compare. Predict reasons that the features of each would be suitable for certain environments.

Gather pictures of different types of animal eyes God has given for their survival and group:
- eyes to see long distances (cheetahs, tigers)
- eyes to detect movement (dogs, gorillas)
- eyes to detect colour (monkeys)
- eyes to see all around (crocodiles)

See if you can obtain some animal teeth from a butcher and/or view pictures of animal teeth. Identify how God has given animals different types of teeth for their feeding habits:
- teeth for cutting or gnawing (rats)
- teeth for ripping (dogs)
- teeth for grinding (cows)

Identify different types of limbs for animal movement:
- limbs for climbing (monkeys)
- limbs for running fast (horses, cheetahs, deer)
- limbs for bearing heavy weights (elephants, horses)

Observe animal tracks and draw conclusions about the animal that made them.

<table>
<thead>
<tr>
<th>Research continued</th>
<th>indicators of achievement</th>
</tr>
</thead>
<tbody>
<tr>
<td>questions and activities</td>
<td>• Observes</td>
</tr>
<tr>
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<td>• Pays close attention to details</td>
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Research continued

questions and activities

3. How has God designed animals to survive within a changing habitat?

Brainstorm ways an environment can change (e.g. weather, temperature, seasons, pollution). God has made people and animals able to adapt to difficult circumstances. Research to find ways that animals adapt to:

- changing temperatures, e.g. feathers fluff up, coat gets thicker
- colour of environment, e.g. chameleons, the peppered moth

Investigate migration in particular mammals, birds or fish, finding out reasons for migration, distances travelled, and times and means of travel.

Read Jeremiah 8:7 and find out about the migration patterns of these birds and others.

To survive, animals need food and protection, and to reproduce. Animals have special features which aid survival into the next generation. Complete the following activities:

- Use the internet and other resources to explore the various methods of protection animals use to ensure they live long enough to reproduce. Consider, too, how they protect their young until they can fend for themselves.

- Investigate and describe patterns in the variability of a visible physical feature found within a species, e.g. coat colour in cats, feather colour in budgerigars, human fingerprints, etc. Find pictures and discuss the importance of camouflage to certain animals.

- Make notes of your observations and other interesting points. Collate in a file of the living things you have studied.

indicators of achievement

- Shares ideas
- Uses a range of sources to research
- Uses a range of sources to research
- Uses a range of sources to research
- Uses a range of sources to research
- Identifies main idea
- Sorts and classifies
- Sorts reasonable from unreasonable ideas
Research continued

How can we show gratitude and care for animals?

People have been given the task of ruling over the animals. God wants us to manage creation with respect and care for living things. Because of human negligence, greed and ignorance, many animals have become endangered or extinct. Endangered means to be at risk of extinction. Extinction means the death of an entire family, class or species of living things.

Read the following scriptures about human interaction with living things in God’s creation:
Gen 1:26-29, Gen 9:1-4, Ps 8:6-8, Prov 12:10
Discuss:
• How well do I look after and use God’s Creation?
• In what ways do we rule over animals?
• In what ways are we similar to animals?
• In what ways are we different from animals?
• Why are humans the best part of God’s Creation?
• Have people been responsible in their task of ruling over the animals?
• What happens when they are not responsible?

Work in groups to devise questions to ask a veterinarian about pet care. Conduct an interview and report your findings. List suggestions of things that people could do to address problems of caring for pets during holidays.

Invite an expert from representatives of a conservation group to talk with you about an endangered animal, its features and its conservation.

Complete one or more of the following activities:
• Research and describe, or read poetic descriptions about some species which have become endangered or extinct in our country
• Examine the effect of pollution on animals
• Debate a conservation/exploitation issue
• Describe how to care for pets at home or at school
• Visit a reserve/park to view birds or marine reserve to go snorkelling to see fish. Consider the consequences for animal life, or having reserves and safe haven for wild animals

Have a school/beach/ community/bush Clean Up Day to focus you on a goal of helping to keep your environment unpolluted. Set yourselves a target, e.g. “We aim to pick up 10,000 pieces of rubbish from our local area before the end of the year”
**Interact Learning Path | Phase 2**

**Finding Out Further**

*Find Out Further* and gain understanding in one of two ways:
1. Individual or group investigation
2. Whole class investigation

During this phase the students will gain understanding:

- **Research (further)**
  
  Find answers to other questions generated at the beginning of, or during, the study
  
  *The magnifying glass reminds us to go searching*

- **Reason**
  
  Apply, analyse, interpret, compare and contrast findings
  
  *The arrows remind us to pull apart (analyse) and draw comparisons (compare)*
1. Choose a project you would like to do, and complete the research necessary to enable you to do it well.  
Suggestions include:

- Set up a class aquarium or devise ways of attracting birds to our school environs
- Become a Nature Detective so that you can predict how animals you see live, based on observed characteristics. Find pictures of particular animals you know little about, make predictions, research their eating habits, movements etc, and then quiz each other in pairs about each other's animal. The most accurate Nature Detective wins
- Become a Nature Guide for Tourists in a local area
- Design a pet enclosure that provides opportunity for a pet to have a good life in the care of its owner
- Provide means of feeding and caring for wild birds or fish in our local environment

2. Make a plan

Identify the possible sources of information for your topic and the key words which you will use to search. Design a question of interest, will need to think through the possible answers and make predictions.

3. Research

Gather information about your topic through observation, books, internet or asking experts. Write ideas in point form and draw any diagrams which may help to communicate ideas. Conduct all observations safely and methodically, taking careful notes about your observations. Monitor your thinking throughout the process, and evaluate what you are learning. Frequently ask yourself things like:

- What am I doing now?
- Is it helping me to answer the question I set out to answer?
- Is it answering new questions?
- How would a scientist do this?
- Is there something else I could be doing, or a way of doing this better to help me achieve my goal?

Use De Bono’s Blue Hat by asking:

- What have I done so far and what do I still need to do?

4. Draw conclusions, organise notes and plan to communicate understandings

Decide on an interesting way to present your findings. Write sentences under headings and draw diagrams. Report observations and conclusions, and further research conducted to explain what you have learned. Explain why it helps us to respond with wonderment and awe towards God.
Possible topics and questions to consider include:

Investigate what happens to animals when trees are cut down or earthworks are conducted near a pond

Research further about the impact of predators such as people and other mammals, on native bird and animal life

Use the internet to research and describe how some species have become extinct or are endangered. Discuss the role people have played in causing these species to die out. Consider:

- What could we do to protect endangered species today?
- Do you think it is worthwhile?
- What hinders or prevents us from getting involved?

Some animals are deliberately bred for particular features. On a commercial scale, these programs give rise to new varieties of sheep, and breeds of cats and dogs along with a host of other living things. Choose a species to investigate and trace the path from today’s example back to the earliest ancestor you can find. Do a PMI to consider the pros and cons of such breeding programs

Look at pictures of different kinds of pet enclosures and identify what makes a successful pet enclosure. Design a pet enclosure that provides opportunity for a pet to have a good life in the care of its owner, or provide means of feeding and caring for wild birds or fish in our local environment

Investigate the different types of limbs used for animal movement. Draw examples of different
- Wings, e.g. bird, butterfly, bat
- Legs, e.g. horse, bird, insect
- Tails, e.g. fish, dolphin, snake

Identify the various joints and choose one to create a model for display

Considering that God gave us trees to use for timber, investigate the milling of forests and consider the balance between use of a resource and the impact on ecosystems

Find out about environmental issues in your local area from newspaper articles and interviews and discuss appropriate action

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Consider ways you can apply your ability to reason to your study. The following are a range of ideas, but students and teachers may come up with their own as a result of their research:

- Compare and contrast a number of habitats and comment on how the animals in each are suited to their environment.
- Look at pictures of a bird/fish and make predictions about the habitat or environment and the eating habits, etc., of the animal.
- Design a bird/fish for a particular habitat and draw it.
- Listen to and evaluate different views on such topics as:
  - conservation
  - eradication of pests such as opossums, rabbits, rats, and wild cats
  - problems caused by domestic cats, ‘green corridors’ and ‘green belts’
- Make a submission to owners, authorities, local government, or national government about an issue of concern affecting animals in our country.
- Debate a conservation or exploitation issue, discussing a particular animal’s response to a change in its environment.
- Identify patterns or similarities of features between species of mammals or birds or fish and suggest reasons for these.
- Find examples of technology that people have made that use ideas from animal features.
- Describe the ways in which God has enabled species to adapt to their environment, e.g. camouflage.
- Read Bible verses about the care of animals and establish success criteria upon which to evaluate the way animals are treated.
- Draw a timeline showing times of major influences in the endangering of a particular species.

**Indicators of achievement**

- Distinguishes similarities and differences.
- Draws conclusions.
- Justifies conclusions.
- Uses graphical representations.
- Identifies cause and effect.
- Draws conclusions.
- Justifies conclusions.
- Draws conclusions.
- Justifies conclusions.
- Analyses relationships.
- Distinguishes similarities and differences.
- Distinguishes similarities and differences.
- Identifies cause and effect.
- Distinguishes similarities and differences.
- Analyses relationships.
- Analyses relationships.
- Identifies cause and effect.
- Distinguishes similarities and differences.
- Sequences.
Interact Learning Path | Phase 3

**Focusing Forward**

*Focus Forward* to develop wisdom in the following ways:

**Reflect**
Think deeply about the value and purpose of the subject, consider ethical issues, reflect on findings.
*The arrows remind us to think from a higher perspective, and a deeper perspective*

**Resolve**
Choose. The benefit of our learning is evidenced by what we do more than what we can repeat. We consider how what we have learnt might impact who we are and what we do. De Bono’s Thinking Hats can help in the decision-making process. The ‘thumbs up’ remind us that we can say ‘yes’ to a response of some kind.
*Our learning may have impacted our thinking, our attitudes, our actions, our communication on this topic, or where we stand on an issue*

**Respond**
Take action. We apply our understanding.
*The symbols remind us to consider our thinking, our attitudes, our actions, our communication on this topic, or where we stand on an issue*

**Review and record**
Review the Big Idea, the Key Understanding, the Focus Question, the Habits of Character, the Habits of Mind and the Competencies or Skills you have focused on. Evaluate. Consider what we have done well and how we could have improved. Identify what our next steps are in developing values, habits and skills.
*The arrows remind us that we need to look back in order to move forward*

**Rejoice!**
Celebrate! We celebrate what we have learnt. We celebrate our gifts and talents and developing skills. We celebrate a future and a hope.
*The smiling face reminds us to enjoy!*

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WHAT'S SO AMAZING ABOUT GOD'S DESIGN OF ANIMALS?

FOCUSING FORWARD

Reflect questions and activities

Reflect on what is valuable, important or conclusive about your topic of study by considering one or more of the following. Share your ideas:

All creation is dependent on God: nothing can exist without God. Read the scriptures below and discuss:
Neh 9:6, Ps 104, Col 1:17, Ps 104:14-17, Prov 27:23-27

‘A righteous man regards the life of his animals’, says Proverbs 12:10. Think about what this means and how you could respond to examples of animal cruelty

Write a prayer of gratefulness to God for the wonderful provision we enjoy

Read The Rainbow Fish, an award-winning children’s book drawn and written by Marcus Pfister, and translated into English by J. Alison James. The book is known for its morals about the value of being an individual and for the distinctive shiny foil scales of the Rainbow Fish. Reflect on the fact that God knows every sparrow

We have learnt about how God has given living things what they need to live well in their environment. Discuss:
• How has God designed your body for your environment?
• What tasks has God given you to do?
• How has God provided what you need for you to complete these tasks?
• How are you using what God has given you?

indicators of achievement

• Indicates understanding of biblical principles and analogies
• Understands and expresses uncertainties
• Expresses an opinion
• Evaluates consequences
• Appreciates value of world resources
• Indicates understanding of biblical principles and analogies
• Indicates understanding of biblical principles and analogies
• Expresses an opinion
• Indicates understanding of biblical principles and analogies
• Understands and expresses uncertainties
Resolve
questions and activities

Identify how what you have personally learnt might impact who you are and what you do. Consider how this study might affect your actions in the future:

Heart
Your attitude toward God for the provision of all living things

Your sense of wonderment and awe at God's gift of generosity towards creation

Head
Your thinking about the design features of animals and your perspective on conservation

Hands
Your actions in caring for animals or the environment in which they live

Mouth
How you might communicate a sense of wonderment and awe, or worship to God for the amazing creation and the perfectly designed features of animals

How you might communicate to the public or people in positions of responsibility about the need to care for animals or their environment

Feet
The ways in which your behaviour may change with regard to responding in wonderment and awe, valuing God's creation

Use De Bono's Thinking Hats to determine what response you might choose:

White Hat: What else do you need to learn in order to do this?
Black Hat: What problems might you have in doing this?
Yellow Hat: What might be the benefits of doing this? How will it help? Why is it worth doing?
Red Hat: How do you feel about doing it this way?
Green Hat: How could you do it creatively?
Blue Hat: What might be the process or organising plan you would need to go through to do this well? What have you done so far and what do you still need to do?
Purple Hat: What is God's perspective on this? How could you pray about your response?

Consider ways you need to change your attitude about appropriate and regular pet care

• Makes decisions about possible actions
WHAT’S SO AMAZING ABOUT GOD’S DESIGN OF ANIMALS?
FOCUSING FORWARD

Respond
questions and activities

Take individual or group action:

Change your attitudes
Express gratitude to God for the wild and domestic animals we have in our area

Change your thinking
Outline what you think a biblical perspective on animals might be, give reasons, and discuss common ways that people disregard their responsibilities towards animals

Take action
Attract birds and butterflies into your school grounds by creating a habitat that they would enjoy

Adopt and show care for the fauna of a natural environment in your local community, e.g. a reserve (see Interact Teacher Manual for Social Science)

Identify problems in your local area associated with pollution, and how they affects local fauna. Make an action group to address the problem

Communicate your learning
Create expressions of worship to God in appreciation for living creatures, or for how God gives what we need – poems, artworks, songs, slideshows, etc. and prepare to share them with God and others in a corporate celebration

Communicate in a brochure, poster or seminar about a particular pet, explaining its special design features and how to care for it. Alternately, write a prayer that an animal might pray, thanking God for its unique design features

Draw a flowchart to show metamorphosis of a butterfly or frog

Stand for what is right
List suggestions of things that people could do to address problems of caring for pets during holidays and promote them

Make a submission to owners, authorities, local government, or national government about an issue of concern affecting animals in New Zealand

indicators of achievement

• Develops relationship with God
• Identifies a biblical perspective
• Works well in a team
• Demonstrates care for the environment
• Works well in a team
• Demonstrates care for the environment
• Works well in a team
• Demonstrates care for the environment
• Uses communication technology
• Uses means and media appropriate to the information and the audience
• Uses means and media appropriate to the information and the audience
• Draws pictures, diagrams, graphs
• Applies a biblical world view to personal life
• Makes a stand for justice on an ethical issue
• Expresses an opinion
• Demonstrates care for the environment
• Makes a stand for justice on an ethical issue
WHAT’S SO AMAZING ABOUT GOD’S DESIGN OF ANIMALS?

FOCUSING FORWARD

Review and record

questions and activities

indicators of achievement

Consider what you have learned and the skills you have developed:

Review the Big Idea, Focus Question, and Key Areas of Investigation for this study. Explain what activity or topic interested you the most, and why.

Do a Write-Pair-Square exercise. Write as many answers as you can to the question, How have living creatures been designed to survive within their environment? Pair up with a partner to compare your answers. Add extra answers that your partner thought of to your own notes. Compare with another team and keep adding new ideas.

Play 21 Questions by choosing an animal, bird, or fish and having others guess in less than 21 yes/no questions what it is. Questions could be about features, habitat, skin covering, food etc.

Evaluate the success of your research project in terms of recognising the wonder of creation, and using the knowledge you have gained to benefit people, animals or the environment in which they live.

• Reviews highlights of the study
• Determines whether the information needed as originally defined is met
• Determines whether the information needed as originally defined is met
• Determines whether the information needed as originally defined is met
• Identifies personal strengths and weaknesses
• States what could be done differently next time
WHAT’S SO AMAZING ABOUT GOD’S DESIGN OF ANIMALS?

FOCUSING FORWARD

Rejoice!

questions and activities

Celebrate your learning:

God is generous. Find creative ways of expressing worship to God for the wonders of the animal kingdom

Offer a community Open Day and invite members of the public to view your work, take nature tours, etc., or to purchase your pet enclosures

indicators of achievement

• Celebrates learning
Scriptures relevant to this unit
WHAT'S SO AMAZING ABOUT GOD'S DESIGN OF ANIMALS?

SCRIPTURES RELEVANT TO THIS UNIT

**Genesis 1:20-30**
20 And God said, “Let the water teem with living creatures, and let birds fly above the earth across the vault of the sky.” 21 So God created the great creatures of the sea and every living thing with which the water teems and that moves about in it, according to their kinds, and every winged bird according to its kind. And God saw that it was good. 22 God blessed them and said, “Be fruitful and increase in number and fill the water in the seas, and let the birds increase on the earth.” 23 And there was evening, and there was morning—the fifth day. 24 And God said, “Let the land produce living creatures according to their kinds: the livestock, the creatures that move along the ground, and the wild animals, each according to its kind.” And it was so. 25 God made the wild animals according to their kinds, the livestock according to their kinds, and all the creatures that move along the ground according to their kinds. And God saw that it was good. 26 Then God said, “Let us make mankind in our image, in our likeness, so that they may rule over the fish in the sea and the birds in the sky, over the livestock and all the wild animals, and over all the creatures that move along the ground.” 27 So God created mankind in his own image, in the image of God he created them; male and female he created them. 28 God blessed them and said to them, “Be fruitful and increase in number; fill the earth and subdue it. Rule over the fish in the sea and the birds in the sky and over every living creature that moves on the ground.” 29 Then God said, “I give you every seed-bearing plant on the face of the whole earth and every tree that has fruit with seed in it. They will be yours for food. 30 And to all the beasts of the earth and all the birds in the sky and all the creatures that move along the ground—everything that has the breath of life in it—I give every green plant for food.” And it was so.

**Genesis 9:2**
The fear and dread of you will fall on all the beasts of the earth, and on all the birds in the sky, on every creature that moves along the ground, and on all the fish in the sea; they are given into your hands.

**Genesis 2:15, 19-20**
15 The LORD God took the man and put him in the Garden of Eden to work it and take care of it. 19 Now the LORD God had formed out of the ground all the wild animals and all the birds in the sky. He brought them to the man to see what he would name them; and whatever the man called each living creature, that was its name. 20 So the man gave names to all the livestock, the birds in the sky and all the wild animals. But for Adam no suitable helper was found.

**Genesis 7:3**
... and also seven pairs of every kind of bird, male and female, to keep their various kinds alive throughout the earth.

**Job 38:39-41**
39 “Do you hunt the prey for the lioness and satisfy the hunger of the lions 40 when they crouch in their dens or lie in wait in a thicket? 41 Who provides food for the raven when its young cry out to God and wander about for lack of food?

**Job 41:11**
Who has a claim against me that I must pay? Everything under heaven belongs to me.

**Psalm 8:6-8**
6 You made them rulers over the works of your hands; you put everything under their feet: 7 all flocks and herds, and the animals of the wild, 8 the birds in the sky, and the fish in the sea, all that swim the paths of the seas.

**Psalm 24:1**
The earth is the LORD’s, and everything in it, the world, and all who live in it.

**Psalm 50:10-11**
10 For every animal of the forest is mine, and the cattle on a thousand hills. 11 I know every bird in the mountains, and the insects in the fields are mine.
Psalm 65:9-13
9 You care for the land and water it; you enrich it abundantly. The streams of God are filled with water to provide the people with grain, for so you have ordained it. 10 You drench its furrows and level its ridges; you soften it with showers and bless its crops. 11 You crown the year with your bounty, and your carts overflow with abundance. 12 The grasslands of the wilderness overflow; the hills are clothed with gladness. 13 The meadows are covered with flocks and the valleys are mantled with grain; they shout for joy and sing.

Psalm 91:4
He will cover you with his feathers, and under his wings you will find refuge; his faithfulness will be your shield and rampart.

Psalm 104:10-28
10 He makes springs pour water into the ravines; it flows between the mountains. 11 They give water to all the beasts of the field; the wild donkeys quench their thirst. 12 The birds of the sky nest by the waters; they sing among the branches. 13 He waters the mountains from his upper chambers; the land is satisfied by the fruit of his work. 14 He makes grass grow for the cattle, and plants for people to cultivate— bringing forth food from the earth: 15 wine that gladdens human hearts, oil to make their faces shine, and bread that sustains their hearts. 16 The trees of the LORD are well watered, the cedars of Lebanon that he planted. 17 There the birds make their nests; the stork has its home in the junipers. 18 The high mountains belong to the wild goats; the crags are a refuge for the hyrax. 19 He made the moon to mark the seasons, and the sun knows when to go down. 20 The lions roar for their prey and seek their food from God. 22 The sun rises, and they steal away; they return and lie down in their dens. 23 Then people go out to their work, to their labor until evening. 24 How many are your works, LORD! In wisdom you made them all; the earth is full of your creatures. 25 There is the sea, vast and spacious, teeming with creatures beyond number— living things both large and small. 26 There the ships go to and fro, and Leviathan, which you formed to frolic there. 27 All creatures look to you to give them their food at the proper time. 28 When you give it to them, they gather it up; when you open your hand, they are satisfied with good things.

Proverbs 12:10
The righteous care for the needs of their animals, but the kindest acts of the wicked are cruel.

Jeremiah 8:7a
Even the stork in the sky knows her appointed seasons, and the dove, the swift and the thrush observe the time of their migration.

Matthew 6:26
Look at the birds of the air; they do not sow or reap or store away in barns, and yet your heavenly Father feeds them. Are you not much more valuable than they?

Matthew 10:29-31
29 Are not two sparrows sold for a penny? Yet not one of them will fall to the ground outside your Father’s care. 30 And even the very hairs of your head are all numbered. 31 So don’t be afraid; you are worth more than many sparrows.

Matthew 19:29-30
29 And everyone who has left houses or brothers or sisters or father or mother or wife or children or fields for my sake will receive a hundred times as much and will inherit eternal life. 30 But many who are first will be last, and many who are last will be first.

Matthew 23:37
Jerusalem, Jerusalem, you who kill the prophets and stone those sent to you, how often I have longed to gather your children together, as a hen gathers her chicks under her wings, and you were not willing.
WHAT’S SO AMAZING ABOUT GOD’S DESIGN OF ANIMALS?
SCRIPTURES RELEVANT TO THIS UNIT

**Luke 12:27-28**
27 “Consider how the wild flowers grow. They do not labor or spin. Yet I tell you, not even Solomon in all his splendor was dressed like one of these. 28 If that is how God clothes the grass of the field, which is here today, and tomorrow is thrown into the fire, how much more will he clothe you—you of little faith!

**Ephesians 3:9**
... and to make plain to everyone the administration of this mystery, which for ages past was kept hidden in God, who created all things.

**Colossians 1:16**
For in him all things were created: things in heaven and on earth, visible and invisible, whether thrones or powers or rulers or authorities; all things have been created through him and for him.

**Revelation 4:11**
You are worthy, our Lord and God, to receive glory and honor and power, for you created all things, and by your will they were created and have their being.
THE INTERACT RESOURCES

The *Interact Curriculum* is a biblically-based and integrated programme of learning suitable for students in Years 1-8. It is designed to inspire teachers with a multitude of creative ideas, questions and learning activities through which students can engage in learning about God and his world.

This *Interact Teacher Manual* is part of a set of manuals produced for a single term’s work on an integrated theme. The *Interact Curriculum* provides teacher manuals in the subject areas of Devotions, Science, Social Science, Health and English on 16 such themes over a four-year cycle. Additional resources are also available in other subjects, including reproducible student worksheets entitled Discovery Sheets.

The *Interact Curriculum* is designed to encourage students to interact with God, with others and with their world in the course of their learning day, and it is our intention to serve teachers by resourcing them with leading-edge curriculum material that helps students to:

- Know God
- Learn about People
- Learn about the World
- Develop faith and character
- Develop thinking skills
- Value and serve individuals
- Build community
- Integrate learning areas
- Relate learning to real life
- Understand
OPTIONS FOR USING THIS INTERACT TEACHER MANUAL

Introduction:

This Interact Teacher Manual is designed to give you many different ideas from which to select and plan a programme for your own class. It is recommended that the Interact Learning Path be used as a guide in the planning process, but there is plenty of scope for choice in this manual.

This Interact Teacher Manual will give opportunity for teachers to design either:

(a) A short, more traditional unit of work
By focusing on the Firing Up stage, covering the Key Areas of Investigation as a class, and selecting one or two activities in the Focusing Forward section, a teacher could design a short programme of work for a whole class lasting two to three weeks and follow it with assessment.

(b) A longer inquiry investigation
By working through the process of the Interact Learning Path, it will be possible to develop understanding of key concepts and skills in the Firing Up section, and then to ignite student enthusiasm to take responsibility, in negotiation with the teacher, for their own research, reasoning, reflecting and responding. This will engage the students in developing questioning and research skills and therefore equip and inspire them for future learning.

c) A combination of both
The more independent students in the class could be given more control over their learning by setting them off on their independent inquiry approach whilst the teacher approaches the topic in a more traditional / teacher-centred approach with the remainder of the class.

N.B. Regardless of what approach to the material is used, the Interact Learning Path provides the structure so that students are given opportunity to have some degree of choice about their learning. Because they have more ownership, deeper and more independent learning may occur.
PLANNING WITH INTERACT

1. Term Overview
   Read the Term Overview document at the front of the Term Folder to understand the integrating thread of the term and the national curriculum requirements.

2. Understanding Interact
   Read the Understanding Interact section on page (I) so that you are confident in understanding the principles and processes of the Interact Resources.

3. Overview and Introduction
   Read these pages to understand what this subject area is about, and where it fits into the integrated term’s work.

4. Big Idea and Focii
   Read the Big Idea, the Habit of Character Focus and Habit of Mind Focus, the Key Understanding and the Focus Question which summarise the main focii of this unit.

5. Biblical World View and Background Information
   Read these pages to familiarise yourself as a teacher with the content being taught this term. Look up the Scriptures (found at the end of the manual for your convenience).

6. Key Areas of Investigation
   These four points summarise the content the students may learn in this subject. Confirm with your national requirements and determine your priorities.

7. Key Learning Intentions
   These points give ideas for Skills you can select as focii during this unit. All the skills listed are found in the Indicators of Achievement throughout the book, and any can be selected to become the focus of your teaching and assessment of skills for this subject this term. Determine what is appropriate for your class.

8. Plan for School-wide Activities or Visitors
   Meet several times with other staff to engage personally and corporately with the term theme and plan school-wide activities.

9. Determine Main and Subsidiary Topics
   Determine the main focus topic for your class (e.g. Science, Social Science, Health) this term and the supporting topics. Note that the main focus topic may vary between classes. At the conclusion of the term, when school-wide presentations are made, all students may benefit from each other’s deeper learning in particular topics.

10. Plan
    Plan, using the Interact Learning Path as a guide.

Have a great term teaching!
The Interact Learning Process

The Interact Curriculum resources are being developed in a framework of learning, developed by Helen Pearson, called the Interact Learning Path.

The Interact Learning Path helps students to recall prior knowledge, to develop knowledge, skills, understanding and godly wisdom, to consider how what they have learned impacts who they are and what they do, to respond with the benefit of new skills and understanding, to evaluate their work, and to celebrate their learning in a range of ways as outlined below:

We hope you enjoy discovering, with your students, a fresh perspective on the world!
# KEY LEARNING INTENTIONS

**We are learning to:**

<table>
<thead>
<tr>
<th>Relate</th>
<th>Engage</th>
<th>Engages with scientific exploration and discussion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recall</td>
<td>Remember</td>
<td>Identifies prior knowledge and experiences</td>
</tr>
</tbody>
</table>
| Raise questions and recognise problems | Enquire | Writes questions to identify what we want to know  
Designs open-ended questions |
| Form a hypothesis | | Defines a problem  
Identifies possible solutions |
| Research | Plan | Plans a schedule of tasks  
Predicts  
Recognises dangers |
| Gather information | | Uses a range of sources to research  
Conducts surveys and interviews  
Gathers samples  
Makes observational drawings  
Reads diagrams |
| Understand scientific language | | Defines scientific terms  
Uses scientific vocabulary |
| Test a hypothesis | | Chooses appropriate equipment  
Uses a systematic approach  
Uses consistent procedures  
Uses equipment safely  
Makes fine measurements  
Observes  
Pays close attention to details  
Is honest in recording data |
### Key Learning Intentions

**We are learning to:** continued

<table>
<thead>
<tr>
<th>Research continued</th>
<th>Reason continued</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Process information</strong></td>
<td><strong>Interpret information</strong></td>
</tr>
<tr>
<td>Describes findings</td>
<td>Identifies cause and effect</td>
</tr>
<tr>
<td>Shares ideas</td>
<td>Distinguishes similarities and differences</td>
</tr>
<tr>
<td>Creates a model</td>
<td>Sequences</td>
</tr>
<tr>
<td>Identifies main idea</td>
<td>Analyses relationships</td>
</tr>
<tr>
<td>Sorts reasonable from unreasonable ideas</td>
<td></td>
</tr>
<tr>
<td>Sorts and classifies</td>
<td></td>
</tr>
<tr>
<td>Reports observations</td>
<td></td>
</tr>
<tr>
<td>Reports conclusions</td>
<td></td>
</tr>
<tr>
<td>Explains phenomena</td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>Record data</th>
<th>Draw evidence-based conclusions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uses graphical representations</td>
<td>Draws conclusions</td>
</tr>
<tr>
<td></td>
<td>Justifies conclusions</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Reflect</th>
<th>Identify a biblical perspective</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reflect on reliability and validity of findings</td>
<td></td>
</tr>
<tr>
<td>Understanding and expresses uncertainties</td>
<td></td>
</tr>
<tr>
<td>Appreciates value of world resources</td>
<td>Indicates understanding of biblical principles and analogies</td>
</tr>
</tbody>
</table>

| Discuss ethics                      |                                  |
|-------------------------------------|                                  |
| Expresses an opinion                |                                  |
| Evaluates consequences              |                                  |
## Key Learning Intentions

We are learning to: continued

<table>
<thead>
<tr>
<th>Resolve</th>
<th>Makes decisions about possible actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Make judgments</td>
<td></td>
</tr>
<tr>
<td>and decisions</td>
<td></td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Respond</th>
<th>Develops relationship with God</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respect God</td>
<td>Identifies a biblical perspective</td>
</tr>
<tr>
<td></td>
<td>Applies a biblical world view to personal life</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Participate and contribute</th>
<th>Works well in a team</th>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Present information</th>
<th>Draws pictures, diagrams, graphs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Uses communication technology</td>
</tr>
<tr>
<td></td>
<td>Uses means and media appropriate to the information and the audience</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Act on issues linked to science learning</th>
<th>Expresses an opinion</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Demonstrates care for the environment</td>
</tr>
<tr>
<td></td>
<td>Makes a stand for justice on an ethical issue</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Review and record</th>
<th>Reviews highlights of the study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Make judgments about the process</td>
<td>Determines whether the information needed as originally defined is met</td>
</tr>
<tr>
<td></td>
<td>Identifies personal strengths and weaknesses</td>
</tr>
<tr>
<td></td>
<td>States what could be done differently next time</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Rejoice!</th>
<th>Celebrates learning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Celebrate</td>
<td></td>
</tr>
</tbody>
</table>

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ACKNOWLEDGEMENTS

Developing the Interact Curriculum has been the result of over twenty-five years of thinking and working in the education field, and therefore twenty-five years of gleaning ideas and principles from a multitude of mentors, advisors, observations, teaching experiences, books and curricula from around the world.

It would not be possible for me to acknowledge all those who have contributed to my thinking. As Woodrow Wilson once said, “I not only use all the brains that I have, but all that I can borrow.” Certainly I am indebted to the many advisors in New Zealand, Australia, North America, England, Indonesia and Africa, who have contributed their critique and assistance in writing these books.

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Helen Pearson

Co-author, Editor and Publisher of Interact Curriculum
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