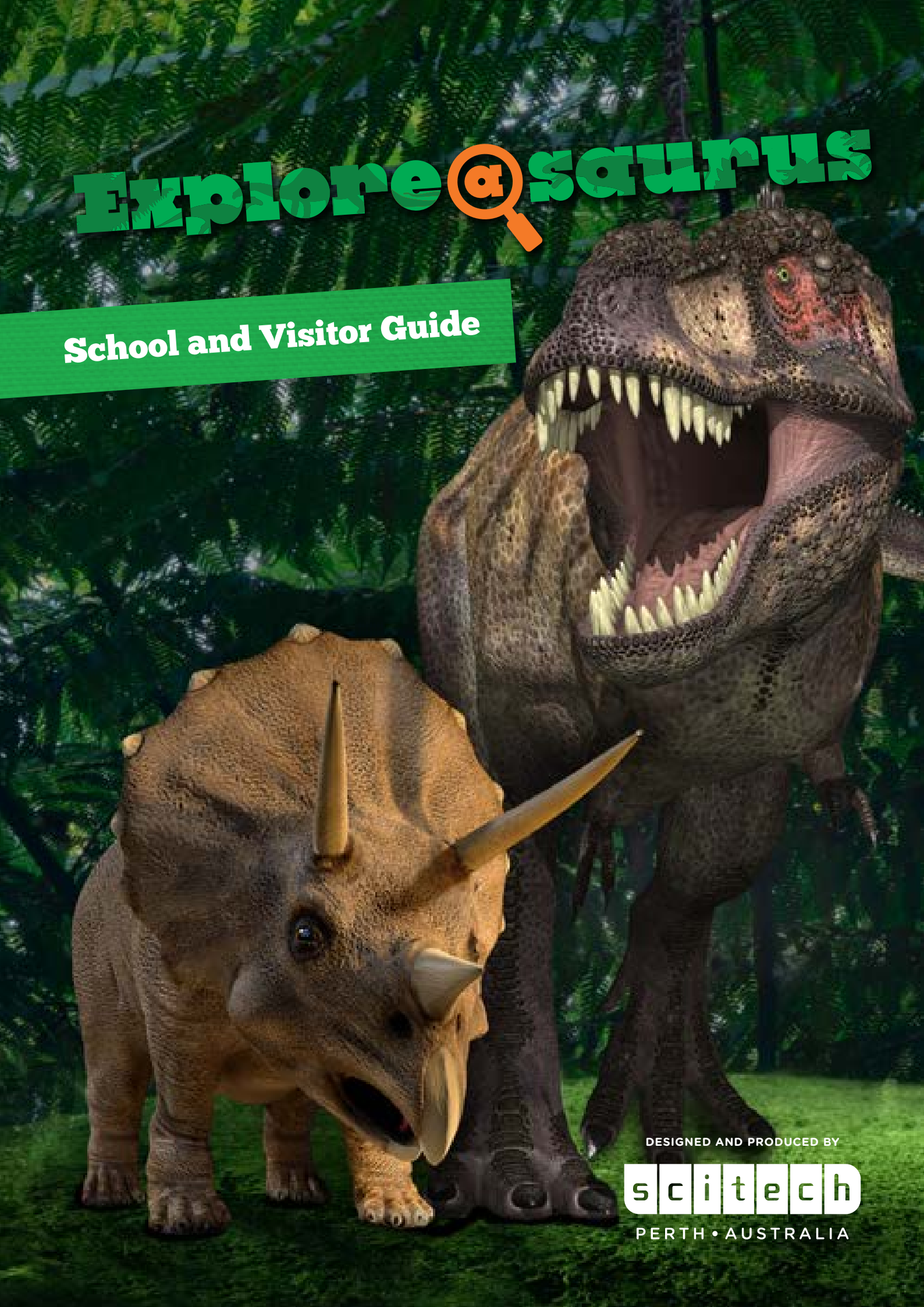
Explore@saurus

School and Visitor Guide



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PERTH • AUSTRALIA

CONTENTS

EXHIBITION OVERVIEW

Step back in time to when dinosaurs reigned supreme, using concepts of palaeontology and forensics to learn how dinosaurs lived in Explore-a-saurus. Through exciting interactive experiences, you'll discover what dinosaurs ate and how fast they ran, what colour they may have been and how they cared for their young.

Meet moving and roaring animatronic versions of some of the world's most famous dinosaurs including Tyrannosaurus Rex, the King of the Cretaceous Period, and Muttaburrasaurus, one of the most complete dinosaur skeleton specimens ever found in Australia.

This exciting and interactive exhibition links visitors to the evolution of our planet through STEM themes (science, technology, engineering and maths).

Use biology to discover what made dinosaurs thrive in their environment for so many millions of years or use maths skills to test the strength of a T-rex bite. Engineer pipe trumpets to replicate dinosaur sounds and investigate the technology that make our animatronic dinosaurs move and roar.

Visitors will be captivated and surprised as they explore life on this planet many millions of years ago.

VISITOR APPEAL

Explore-a-saurus has been developed to engage children aged between 5 – 12 years and their families, although the exhibition provides a broader appeal to fascinate and inform people of all ages.

Different exhibits will appeal to different ages with Dinosaur Dig and Paint-a-saurus capturing the attention of primary school groups, while secondary school students can test their strength against the Might of a T-Rex bite or use problem solving skills in Track-a-saurus.

Family visitors can work together to control Robo-saurus and see how dinosaurs became extinct in the theatrette.

Visitors will be captivated by the collection of animatronic dinosaurs that move and roar in replica settings of their prehistoric environment.

Great opportunities exist for media exposure and sponsorship, as Explore-a-saurus taps into the eternal fascination of life on Earth, millions of years ago.

Key Messages

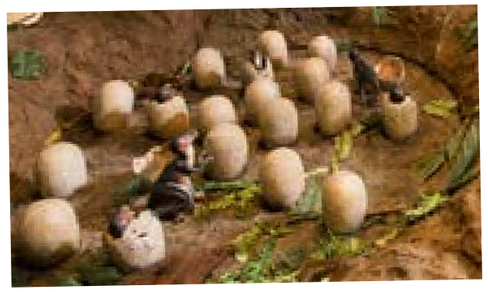
1. Palaeontologists use evidence to find out about dinosaurs
2. We can use scientific method to work out how dinosaurs lived
3. Animals are adapted to their environments

EXHIBITS

Animatronic Dinosaurs

Come face to face with a Triceratops, Muttaburrasaurus, Maiasaura, Stegosaurus, Apatosaurus and Tyrannosaurus Rex.

Science Links: Palaeontology, Biology, Evolutionary Biology



Dinosaur Hide and Seek

Put on the cloaks and try to camouflage yourself against different backgrounds.

Science Links: Biology (adaptations)

Might of a T-Rex Bite

Step inside the jaws of a T-Rex and see how strong you are.

Science Links: Biology, Physics (forces)

Dinosaur Dig

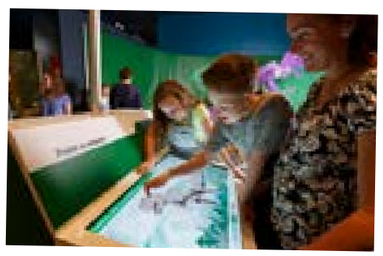
Be a paleontologist and dig through the ‘dirt’ to see what you can uncover.

Science Links: Palaeontology, Biology

Insects Trapped in Time:

Examine the insects trapped in amber to learn about the environment the dinosaurs lived in.

Science Links: Palaeontology, Biology



Paint-a-saurus

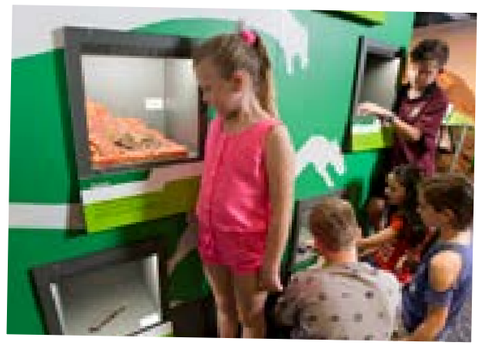
Explore dinosaur colours by painting a dinosaur for camouflage or based on modern bird colouring.

Science Links: Palaeontology, Biology (adaptations), Scientific Method

Tone-a-saurus

Engineer and experiment with different tubes to see what sounds dinosaurs might have made.

Science Links: Palaeontology, Biology, Acoustics



Munch-a-saurus

Examine teeth, stomachs and fossil poo to work out what the dinosaurs ate.

Science Links: Palaeontology, Biology, Biochemistry, Scientific Method

How Did Dinosaurs See?

Look through the eyes of a dinosaur to find out how meat eaters and plant eaters see the world differently.

Science Links: Biology (adaptations), Palaeontology, Optics

Ancient Plants

Make a rubbing of a fossil plant and match it to the ancient plants.

Science Links: Palaeontology, Botany, Evolutionary Biology

Dinosaur Eggs

Use your observation skills to work out which are eggs and which are rocks.

Science Links: Biology (reproduction), Scientific Method

Dinosaur Theatrette

Step inside and see how the dinosaurs became extinct and what palaeontologists have discovered millions of years later.

Science Links: Physics, Earth and Space Science, Climate Science, Palaeontology

Robosaurus

Control different parts of the dinosaur to make it move.

Science Links: Physics, Animatronics

Trackasaurus

Can you analyse the fossil footprints to solve the mystery of what happened?

Science Links: Palaeontology, Scientific Method

Speedosaurus

Follow the dinosaur tracks to see how fast the dinosaur moved.

Science Links: Biology, Physics, Mathematics, Palaeontology

Quizasaurus

Test your knowledge of all things dinosaur.

Science Links: Palaeontology, Biology, Science Communication

Jigasaurus

Help rebuild a dinosaur from the bones that have been found.

Science Links: Palaeontology

Information contained in this guide was correct at the time of printing

RESEARCH QUESTIONS

Welcome to Explore-a-saurus! This exhibition is all about how scientists can find out what things were like in the past. Head to each exhibit in this worksheet and see what things you can discover.

RESEARCH QUESTIONS
AGES 4-8

Dinosaur Hide and Seek

1. What is it called when animals are the same colour as where they live?_____
2. Give one reason why an animal might want to hide:_____
3. What colour might a dinosaur that lived in the desert have been? Why?_____

_____

Toneasaurus

4. Try some different length tubes. Which sounds higher, the long tubes or the short tubes?_____
5. Which dinosaur would make a deeper sound, a big one or a little one?_____
6. Why do you think dinosaurs and other animals would call or make sounds?_____

_____

Anamatronic Dinosaurs:

7. Which of these dinosaurs was a good mother?_____
8. Which dinosaur lived in Queensland, Australia?_____
9. Which dinosaur was the heaviest?_____

Did you know?

Lots of dinosaurs actually had feathers, including relatives of the Tyrannosaurus Rex. Many scientists think T-Rex might have had feathers too!

RESEARCH ANSWERS
AGES 4 - 8

Dinosaur Hide and Seek

1. Camouflage
2. So they can't be seen by predators and/or prey
3. Students may pick any reasonable desert colour and justify with reasoning such as: "so they could blend into the desert", "so they could hide", "because that is the same colour as the desert", etc.

Toneasaurus

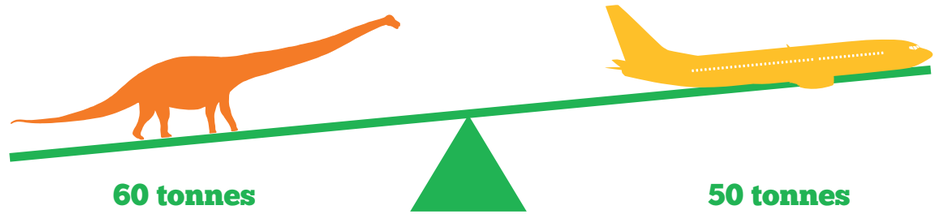
4. The short tubes
5. A big dinosaur
6. Acceptable answers include: to talk to each other, to find each other, because they are scared, to scare away predators

Anamatronic Dinosaurs

7. Maiasaurus
8. Muttaburrasaurus
9. Apatasaurus at 25 tonnes

Did you know?

The largest known dinosaur, Dreadnoughtus schrani, was over twice as long as a normal bus, and heavier than a Boeing 737 at 60,000kg.



RESEARCH QUESTIONS AGES 8-12

Become a palaeontologist for a day and learn how the dinosaurs lived in Explore-a-saurus. To test your investigation skills, find each pictured exhibit and see if you can find the answers to these questions. You may need to read the signs carefully.

Animatronic Dinosaurs

1. Name one thing that scientists originally got wrong when first putting together dinosaur bones?

   _____

2. Why do scientists think that Maiasaura brought food to its young?_____

   _____

3. Why do scientists think that Stegosaurus had a slower metabolism than other dinosaurs its size?

   _____

4. How do scientists know that Tyrannosaurus Rex's jaws were strong enough to bite through bone?

   _____

Speedosaurus

5. How do scientists find out the speed of a dinosaur?_____
6. Name one reason why an asteroid strike would wipe out the dinosaurs:_____

Munch-a-saurus

7. What four things can scientists look at to figure out what a dinosaur ate?_____

   _____

8. How can scientists find out what a dinosaur ate from its teeth?_____
9. What do plant-eating dinosaurs' teeth usually look like?_____
10. What kind of teeth do you have? How does this show what type of food you eat?_____

How did dinosaurs see?

11. What is the difference in eye position between a carnivore and herbivore?_____
12. Why do **carnivores** need their eyes in that position?_____
13. Why do **herbivores** need their eyes in that position?_____

Dinosaur hide and seek

14. What is it called when an animal blends in with its surroundings?_____
15. Would predators ever need to camouflage themselves and why?_____

RESEARCH ANSWERS AGES 8-12

Animatronic Dinosaurs

1. Stegosaurus was originally constructed with its back plates lying flat; Muttaburrasaurus was given a thumb spike incorrectly; Apatasaurus bones were mixed in with another dinosaurs; Apatasaurus was originally thought to have a drooping tail
2. Because the bones of juveniles were too small to allow them to walk
3. Because of the internal structure of the bones
4. Pieces of shattered bone found in T-Rex's fossil poo; and bite marks from T-Rex teeth found on other dinosaurs bones.

Speedosaurus

5. They calculate it from the height of the dinosaur's hip (its leg length) and the distance apart of its footprints.
6. Correct answers include:
   - Dust might have covered the planet, blocking out the sun's light and making it too cold for the dinosaurs to survive
   - Dust might have covered the planet, blocking out the sun's light and causing plants to die. This would in turn cause herbivorous dinosaurs to die, then carnivorous dinosaurs
   - Dust might have covered the planet, trapping heat and making it too hot for the dinosaurs.

Munch-a-saurus

7. Their teeth, claws, stomachs, and poo
8. Scientists can tell by the shape of the teeth. (We can compare the shape of the dinosaur's teeth with the shape of teeth from living animals. It is likely that animals with similar teeth will have similar diets)
9. Flat, not pointed. Some had peg-like teeth for stripping vegetation off branches, some had grinding teeth to chew up their food
10. Students should recognise that they have mostly flat teeth, but they have four pointed teeth. This indicates that humans are naturally omnivores – we have teeth for slicing in the front, incisors for biting flesh, and wide, flat teeth for chewing.

How Did Dinosaurs See?

11. Carnivores have eyes in front, herbivores have an eye on either side of the head
12. It helps them to see their prey more clearly, including how far away it is
13. Peripheral vision allowed them to see predators sneaking up on them.

Dinosaur Hide and Seek?

14. Camouflage
15. Yes, so they could hide while waiting for prey, then jump out at the last second for a greater chance of catching the animal.

Dinosaurs didn't really go extinct! Most of them did, but some survived, and eventually evolved the ability to fly. We now call them birds, but scientists consider them to be just another type of dinosaur. They are closely related to velociraptors.

POST-VISIT CLASSROOM ACTIVITIES

ACTIVITY 1

MAKING TRACKS AND CASTS

What you need

- Some damp sand
- A long strip of cardboard to circle the footprint
- A large ice cream container for mixing
- A wooden spoon

What to do

- Make an impression in the sand – use your own hand or foot, or if you have a cooperative animal on hand you could use their foot
- Circle the impression with the cardboard and secure with staples or paper clips. This is just to stop the plaster running
- Mix the plaster according to the instructions on the bag
- Pour and wait about 10 minutes for the plaster to harden
- Remove the cardboard circle
- The plaster cast becomes the negative impression of the footprint. To make a positive version, press the negative impression into a soft material like clay. Circle the clay impression and repeat the plaster pour

Questions

1. Who else makes plaster impressions of footprints or tracks?
2. If there was not any plaster to fill an animal's footprint, what must have fallen into the impression to preserve it?

Extend and discuss

Go for a walk around the school or home and look for impressions left in concrete footpaths. What stories can the students generate from these marks?

ACTIVITY 2

A QUESTION OF SCALE

In this activity you will explore how to increase the scale of a drawing using a grid.

What you need

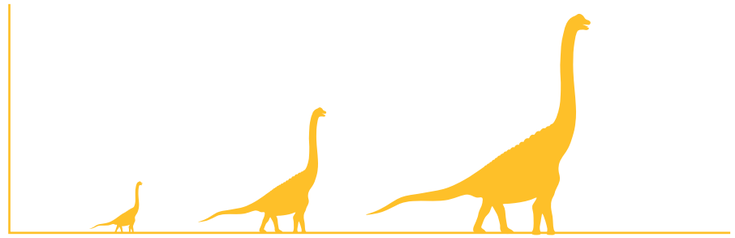
- A drawing of a dinosaur
- Ruler
- Pencil
- Eraser
- A3 paper for the enlargement

What to do

- You are going to scale up a drawing of a dinosaur using the grid method. Draw a 10 x 10 grid over your dinosaur. Decide on the ratio of enlargement for the dinosaur - would you like to scale the drawing up by a factor of two, four or ten?
- On the larger paper, construct the next 10 x 10 grid according to the ratio you have chosen
- Remove from heat and allow to cool.
- Put some of your dinosaurs or bones into each tray and distribute your cooled mixture evenly between each tray.
- Before the lesson, cover each tray with a bit more sand.
- Hand out trays, popsticks and paintbrushes to students.
- Let them know that they will be paleontologists today, digging bones out of the clay. They can use the popsticks to scrape away the clay at first, but they might need to use the brushes when they get close to their "fossils" so they don't damage them!

Extend and discuss

- Why does the surface area of an animal increase at the square of the enlargement but the mass of the animal increase at the cube of the enlargement?
- Palaeontologists have observed that the length of a dinosaur is often about five times the length of its femur or thighbone. What is the relationship to human height and femur length?
- Palaeontologists have also connected foot length to height, as well as stride length. Try graphing the foot length of students in your class with their heights. Was there a strong connection between the length of student's feet and their height?



ACTIVITY 3

WHAT HAPPENS TO WEIGHT WHEN SIZE DOUBLES?

What you need

- Models of dinosaurs
- Plasticine
- Set of kitchen scales

What to do

You are going to find out how much weight dinosaurs gained as they grew. When dinosaurs grew in size their weight increased at an exponential rate. This means that if the dinosaur doubled its size or dimensions, the weight increased at a cube rate that is 2 x 2 x 2 or by a factor of 8.

You will need to make a plasticine model of a dinosaur and compare its weight with a model which has been doubled in length, height and width, that is, twice as big in every dimension.

- Make a small plasticine model of a dinosaur, for convenience's sake try to make its height and length a convenient whole number of centimetres
- Weigh the plasticine model
- To double the size of the original plasticine model, all components have to be twice as big
- Weigh the larger plasticine model
- Now make one last model which is three times the original size and weigh it
- Write all your measurements down

Dinosaur	Size	Weight Estimate	Actual Weight
1			
2	2*Dino1 =		
3	3*Dino1 =		

Extend and discuss

Find out how much a few different dinosaurs grew over their lifetimes.

- How much weight must they have gained?
- How much weight would they have gained in a year, month, or even a day?
- Which dinosaur grew the fastest?
- Which grew the slowest?

ACTIVITY 4

DINO EXCAVATION

This is a good one for younger ages. You can also buy excavation kits with plastic bones for older children, which can be dug out and then put together to form a complete skeleton.

What you need

- Pack of model dinosaurs or plastic bones
- 1 tray per group of four
- One popsicle stick and paint brush per child
- An old pot
- 1 cup sand
- 1 1/2 tsp cream of tartar
- 1/2 cup corn-starch
- 1/2 cup water

What to do

- Combine the sand, cream of tartar, corn-starch and water in the pot the night before doing the activity and place over a medium hot stove
- Heat, stirring, until the mixture begins to thicken
- Remove from heat, allow to cool, then cover your dinosaurs or bones and let harden overnight
- Distribute between the trays and cover with some more sand
- Give children trays and tools and let them discover

Extend and discuss

Have children discuss what they can guess about what they have found. For example, if they found a very sharp tooth, they might guess it came from a meat eating dinosaur. If they found a dinosaur with a long neck, they might guess it ate leaves from the tops of the trees, etc.

Have children discuss the differences between the model dinosaurs they found – size, shape etc.

ACTIVITY 5

DESIGN A THEME PARK FOR DINOSAURS

Have students undertake this fun project which includes many areas of the curriculum. For younger children, you could first engage them in a whole class discussion on the topic. Then have them draw the theme park and then write down a few of the things that would be different from a theme park for people – such as the size of the rides and what types of foods would be served.

The task

1. Design the layout of a theme park to be visited by dinosaurs. Place rides, shops and facilities at convenient locations. Be prepared to justify your design and placement of facilities
2. Make a sketch of your layout, or a model of your park
3. Present your ideas to the rest of your class

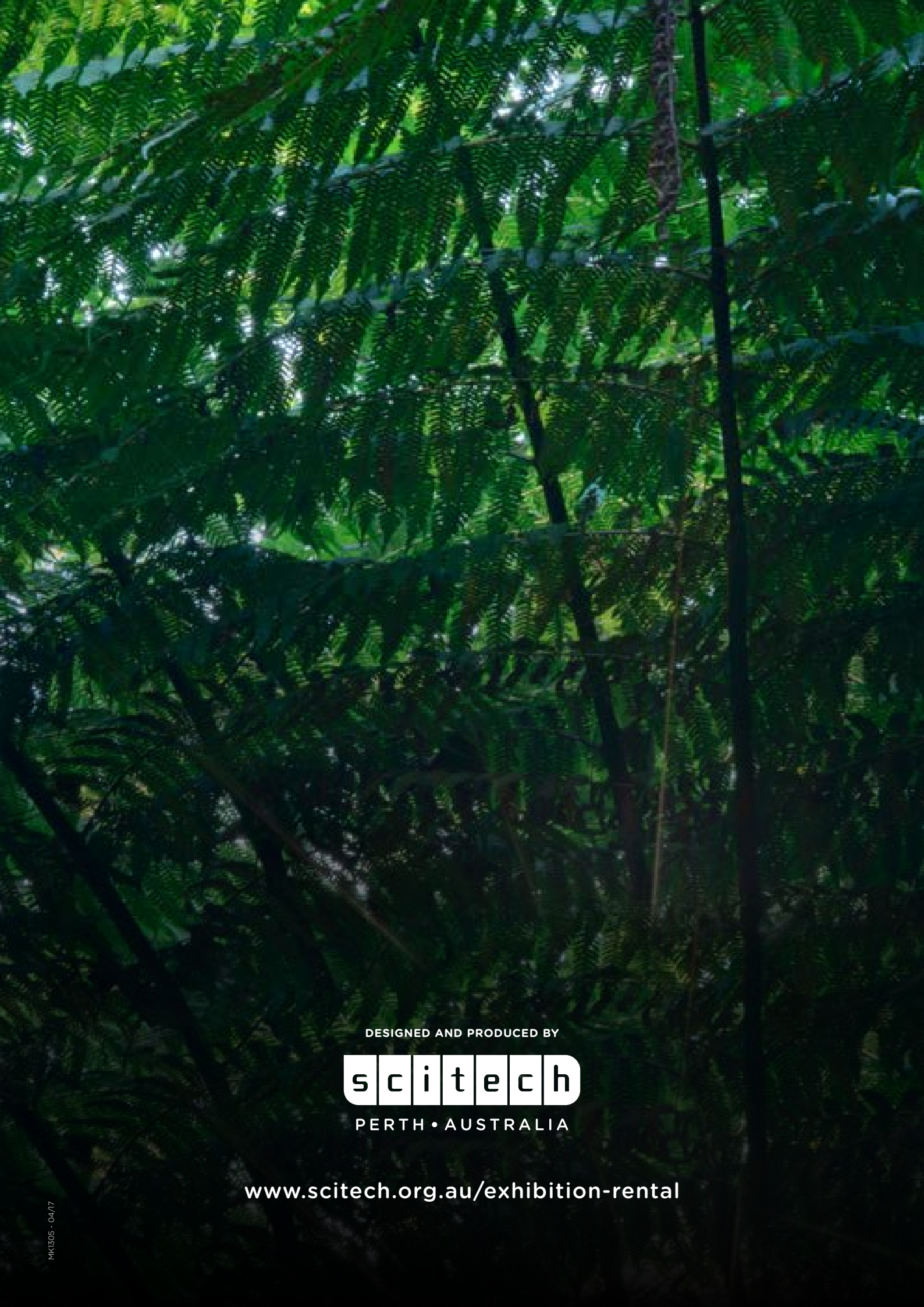
Considerations

There are many things that need to be considered in the design of a theme park. Not only do you need to think about the rides that will be offered, but also what facilities you will need to provide.

Some things you will need to decide on are:

- What menus will the food stalls offer?
- How will you design the toilets?
- What are the height and weight limits for each ride?
- Have you designed the layout for easy access for all dinosaur sizes?
- Do you need a locker space? How big do the lockers need to be?

There are other things you will need to consider in your design. What allowances do you need to make for different dinosaurs? Have you catered for both carnivores and herbivores?



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