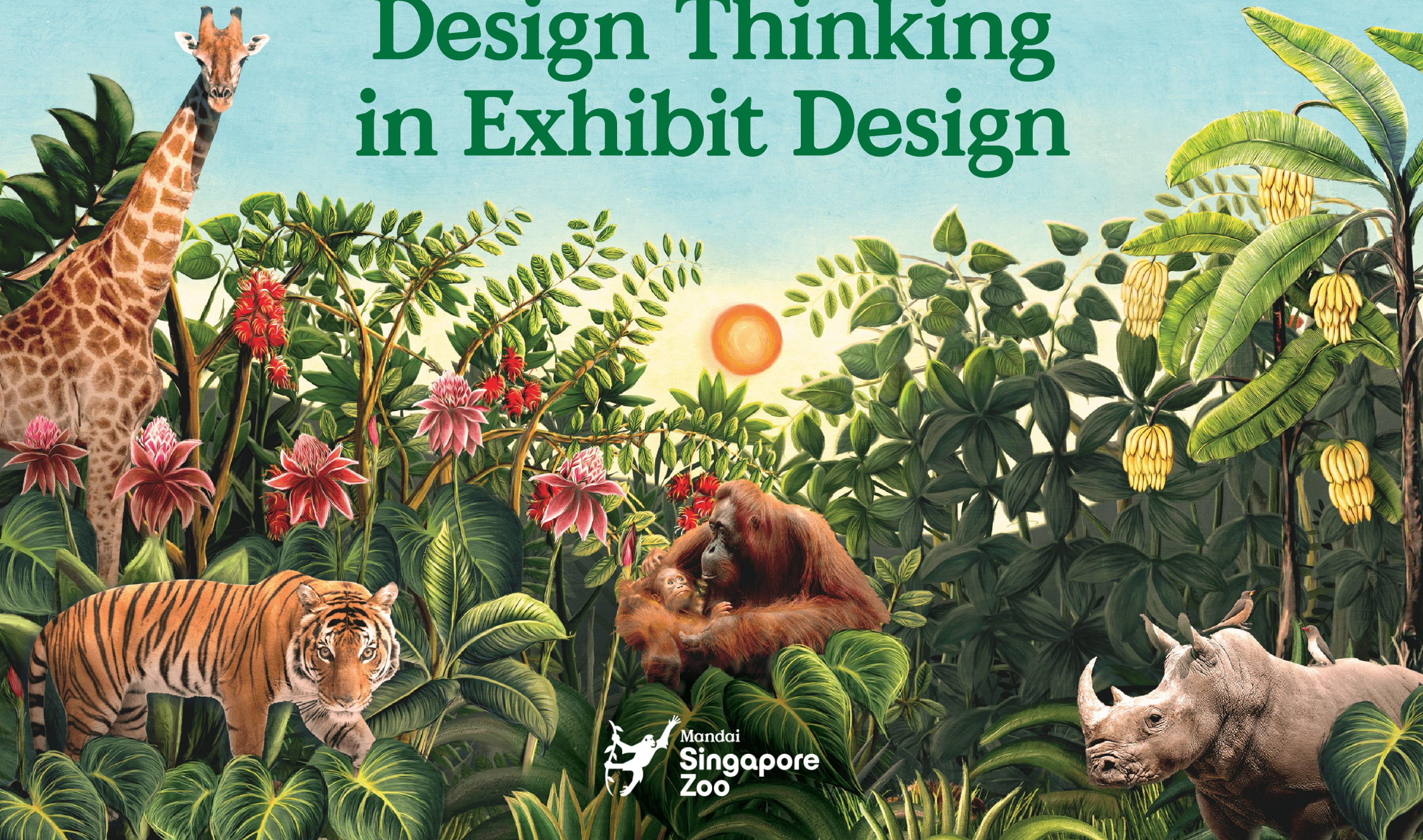
Teachers' Guide to Design Thinking in Exhibit Design



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About This Resource

This resource supports you in conducting a learning journey to use STEM skills to explore exhibit design at Singapore Zoo.

It is a step-by-step guide to navigating the Design Thinking process and getting your students to develop their ideas for an animal exhibit.

The resource also enables you to facilitate students in gathering and integrating information from various sources and apply them in a real-world design task.

About Design Thinking in Exhibit Design

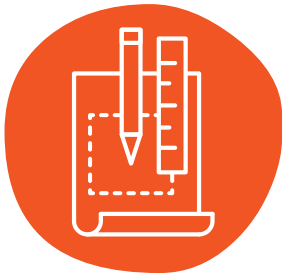
Exhibit design is a complex process with many considerations for animal welfare, aesthetics, and safety for our animals, staff and guests. Design Thinking helps you and your students integrate design with other STEM topics such as animal biology, engineering and material science to develop an idea for an animal exhibit.

Using Design thinking as an approach helps students break down the problem into logical steps and innovate solutions which are user-centric. The five steps in Design Thinking are:

Define

Empathise

Ideate



Prototype

Test

Note:
In the typical Design Thinking process, defining the problem usually comes after a phase of discovery and empathy with the user. For this activity, the task has been defined for you so, we have placed it as the first step.

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Step 1: Define The Challenge

About exhibit design in Mandai Wildlife Reserve

We aim to provide the best care possible for our animals in the parks. Well-designed animal exhibits provide for the animals' physical and behavioural needs and help them thrive under human care. They also keep the animals, staff and park guests safe while providing guests opportunities to connect with animals and nature.

Introduce the task

Let your students know that an animal's exhibit is its home in Singapore Zoo. Ask your students to imagine that they are animal exhibit designers at Singapore Zoo.

They have been assigned to build an exhibit for one or two of the animals on the right.

Present the Challenge

How might we design an exhibit that is suitable for your animal(s) so that they can thrive in a wildlife park?

Orangutan

Roti Snake-necked Turtle

Malayan Tiger

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Step 2: Empathise

About This Step

Design Thinking is a user-centered design process. In the 'Empathise' phase, students research and observe to uncover the needs of the user, in this case, the animal they have been assigned. They do so by:

1. **Researching the habitats, needs and behaviours of the animal in class**

2. **Observing the animal and their exhibits in Singapore Zoo**

Zookeepers and park guests also use the exhibit. However, we will focus on the **animals as the users** for the purposes of this activity.

Introduce the 'Empathise' Phase

You may want to ask the following questions to get students to start thinking about the animals' needs:

- What do we need to understand before designing an animal exhibit?
- What do living things need to survive?
- Besides air, food and water, what else might the animal need to be happy and healthy?
  - Scaffold: What do you need to be happy and healthy? Might an animal also need these things?
- Do all animals have the same needs?

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Step 2: Empathise

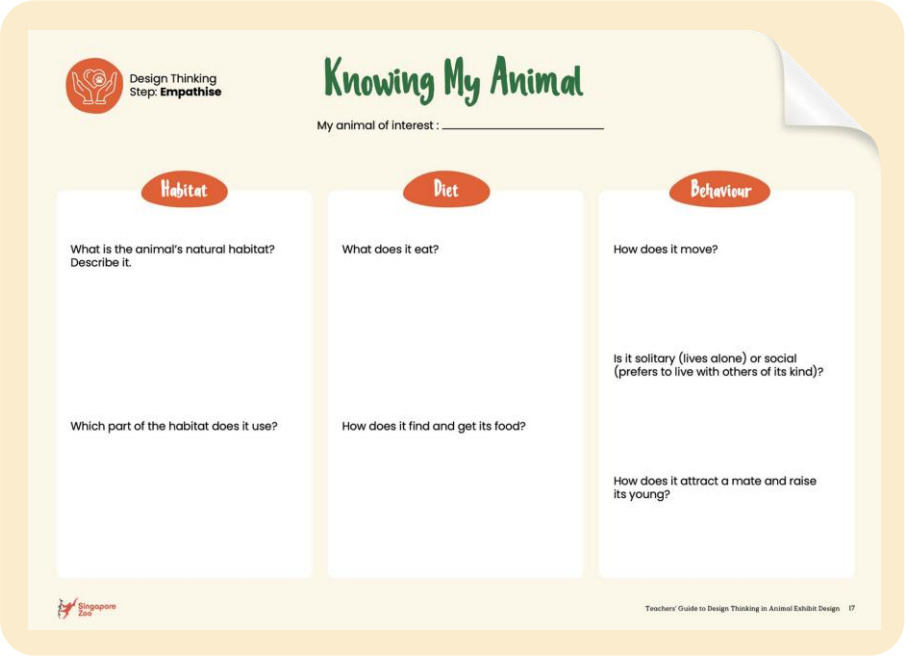
1 Research in Class

You may prompt your students to use the links provided in the **Links for Research** on page 12 to discover more about the species. You may also encourage students to look for their own reliable sources of information.

Encourage your students to find out:

- **What is the animal's natural habitat? Describe it. Which part(s) of the habitat does it use?**
- **How does the animal move?**
- **What does it eat?**
- **How does it find its food?**
- **Is it solitary (lives alone) or social (prefers to live with others of its kind)?**
- **How does it attract a mate and raise its young?**

You may wish to print the **Knowing My Animal** worksheet on page 16 for your students to record what they have discovered.


Design Thinking Step: **Empathise**

Knowing My Animal

My animal of interest : _____

Habitat

What is the animal's natural habitat? Describe it.

Which part of the habitat does it use?

Diet

What does it eat?

How does it find and get its food?

Behaviour

How does it move?

Is it solitary (lives alone) or social (prefers to live with others of its kind)?

How does it attract a mate and raise its young?

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Step 2: Empathise

2 Observations in Singapore Zoo

Visit Singapore Zoo and prepare your students to record their observations of the animals and their exhibit.

The animals in this activity can be found in the following exhibits:

At Tigers

At Orangutan Island

At Reptopia

Use the **Observing My Animal** worksheet on **page 17** to record these observations:

Design Thinking Step: **Empathise**

Observing My Animal

My animal of interest : _____

Guiding Questions

Use these questions to make notes about your animal and its exhibit.

- What do you see in the exhibit that helps your animal:
  - Feel comfortable?
  - Feed like they would in the wild?
  - Behave like they would in the wild?
- What do you see in the exhibit that helps people:
  - View the animals easily and clearly?
  - Feel excited about being with animals?
  - Have fun learning about the animals and how to protect them?
- What do you like about the exhibit? Is there anything about the exhibit you would change?

Draw or write down your observations here!

Singapore Zoo

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- **What do you see in the exhibit that helps your animal:**
  - **Feel comfortable?**
  - **Feed like they would in the wild?**
  - **Behave like they would in the wild?**
- **What do you see in the exhibit that helps people:**
  - **View the animals easily and clearly?**
  - **Feel excited about being with animals?**
  - **Have fun learning about the animals and how to protect them?**
- **What do you like about the exhibit? Is there anything about the exhibit you would change?**

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Step 3: Ideate

About This Step

In this phase, invite students to generate as many ideas as possible for their animal's exhibit. These ideas provide the fuel for building prototypes later.

For an effective ideation session, encourage your students to:

- Be visual (write or draw ideas)
- Build on each other's ideas
- Defer judgement on other's ideas

Facilitating ideation

Use the **Animal Profiles** in this resource to remind students of their animals' natural history.

Print the **Animal Exhibit Ideas** worksheet on page 18 with these prompts to encourage a broad spectrum of ideas while keeping students on task:

- How might we improve the exhibit you just saw so that the animals can [*insert natural behaviour*] better?
- How might we design features that will keep the animals mentally and physically active so that they can stay healthy?
- How might we include features which allow guests to observe the animals up close?
- What materials can we use that are durable and safe for the animals?

Note:
You can gather your students in the sheltered huts or open spaces to record their observations and ideas.

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Step 4: Prototyping

About This Step

In Prototyping, students create iterations of representations of their best idea to elicit feedback and improve their design. The build-test-iterate cycle helps students to think through doing and understand the user better.

Prototyping is short and quick so that students do not get attached to their ideas and are open to feedback and improvement

Facilitating Prototyping

- Get students to discuss and agree on one idea to work on.
- Remind them that the prototype needs to show how their idea meets the animals' physical and behavioural needs.
- Let them know that they will need to share their idea using their prototype with the class and receive feedback for improvement.
- Let them know how long they have.
  (15 mins is recommended)

Tips:

This activity is best done in class where there is access to a wide variety of prototyping materials.

Using recycled or natural loose parts is encouraged.

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Step 5: Test

About This Step

Testing the prototype is part of the iterative process to refine the students' exhibit design ideas. In this step, they present their ideas clearly using their prototype and elicit feedback from users. In this case, you may want to get classmates or a panel of teachers to roleplay users and contribute comments and questions on the feasibility and utility of their ideas.

The students then record and implement changes to improve their prototypes and arrive at a better solution.

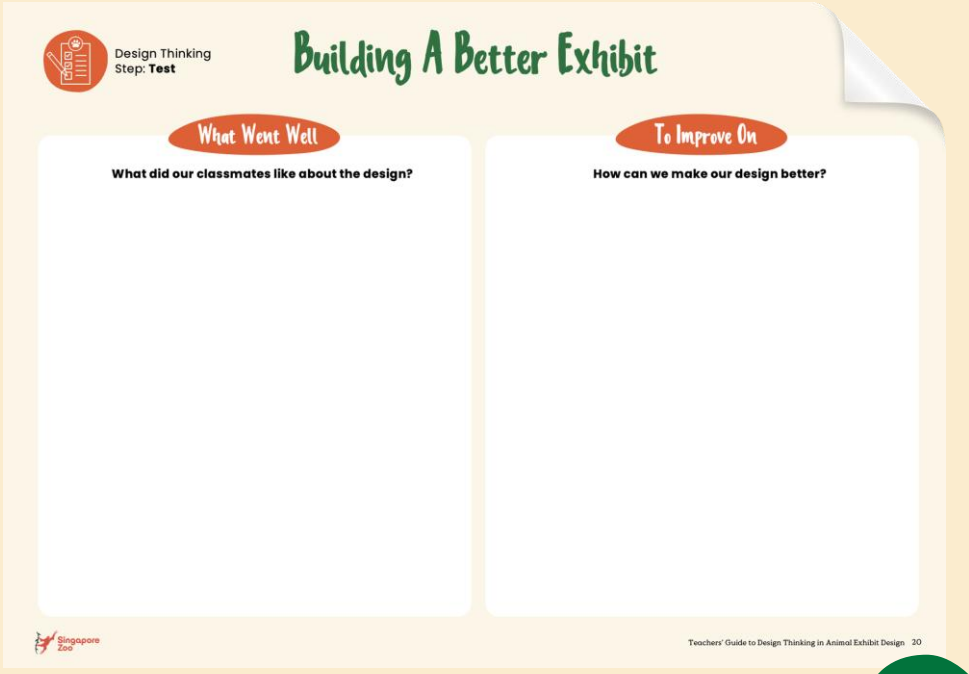
Facilitating Testing

Brief testers

- Testers will need to evaluate prototypes based on how well they meet the needs of the animal they are roleplaying.
- You may want to provide them a copy of the Animal Profile of the animal they are roleplaying as reference.
- Guide them to give feedback what they liked and what can be improved.

Brief presenters

- Let them know that the feedback they receive will help them make their final solution better.
- Have the group make notes of the feedback using the **Building A Better Exhibit** worksheet on page 19.
- Prompt them to think about how to improve their prototype after feedback.


Design Thinking Step: Test

Building A Better Exhibit

What Went Well

What did our classmates like about the design?

To Improve On

How can we make our design better?

Singapore Zoo

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About Our Animals

Different animals have different needs.
Use the curated links and animal profiles in the following pages to discover the natural history of the following animals:

Malayan Tiger

Orangutan

Roti Snake-necked Turtle

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Links For Research

Malayan Tiger

1. **Basic Information**
   https://www.mandai.com/en/singapore-zoo/animals-and-zones/malayan-tiger.html
2. **Bongsu and Intan, our Malayan tigers**
   https://www.facebook.com/MandaiWildlifeReserve/videos/happy-international-tiger-day-/1229487655528180/
3. **Conservation Champions - Saving Tigers (includes caring for tigers)**
   https://www.youtube.com/watch?v=1rZBX13Q7O8

Roti Snake-necked Turtle

1. **Basic Information**
   https://www.mandai.com/en/singapore-zoo/animals-and-zones/roti-snake-necked-turtle.html
2. **Ask Mandai Anything - Roti snake-necked turtle care and conservation**
   https://www.youtube.com/watch?v=JdKwaMBCwsw
3. **Repatriating Roti snake-necked turtles for conservation**
   https://www.youtube.com/watch?v=pzVSSNM-zXw

Orangutan

1. **Basic Information**
   https://www.mandai.com/en/singapore-zoo/animals-and-zones/orangutan.html
2. **Creating a safe future for orangutans in Sumatra**
   https://www.mandainature.org/en/home/what-we-do/project-map/creating-a-safe-future-for-orangutans-in-sumatra.html

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Malayan Tiger

Find them at Tiger Exhibit!

Bongsu

Intan

Habitat

Malayan tigers live in tropical rainforests of Malaysia.

Tigers are one of the few big cats that enjoy swimming.

Diet

Meat

Adaptations

Tigers are stealthy hunters. They have stripes to help them camouflage in the shadows and increase their chances of a successful hunt.

With sharp claws and powerful muscles, tigers can climb trees to avoid danger, hunt or scan their surroundings.

Tigers are agile and can leap up to 10m.

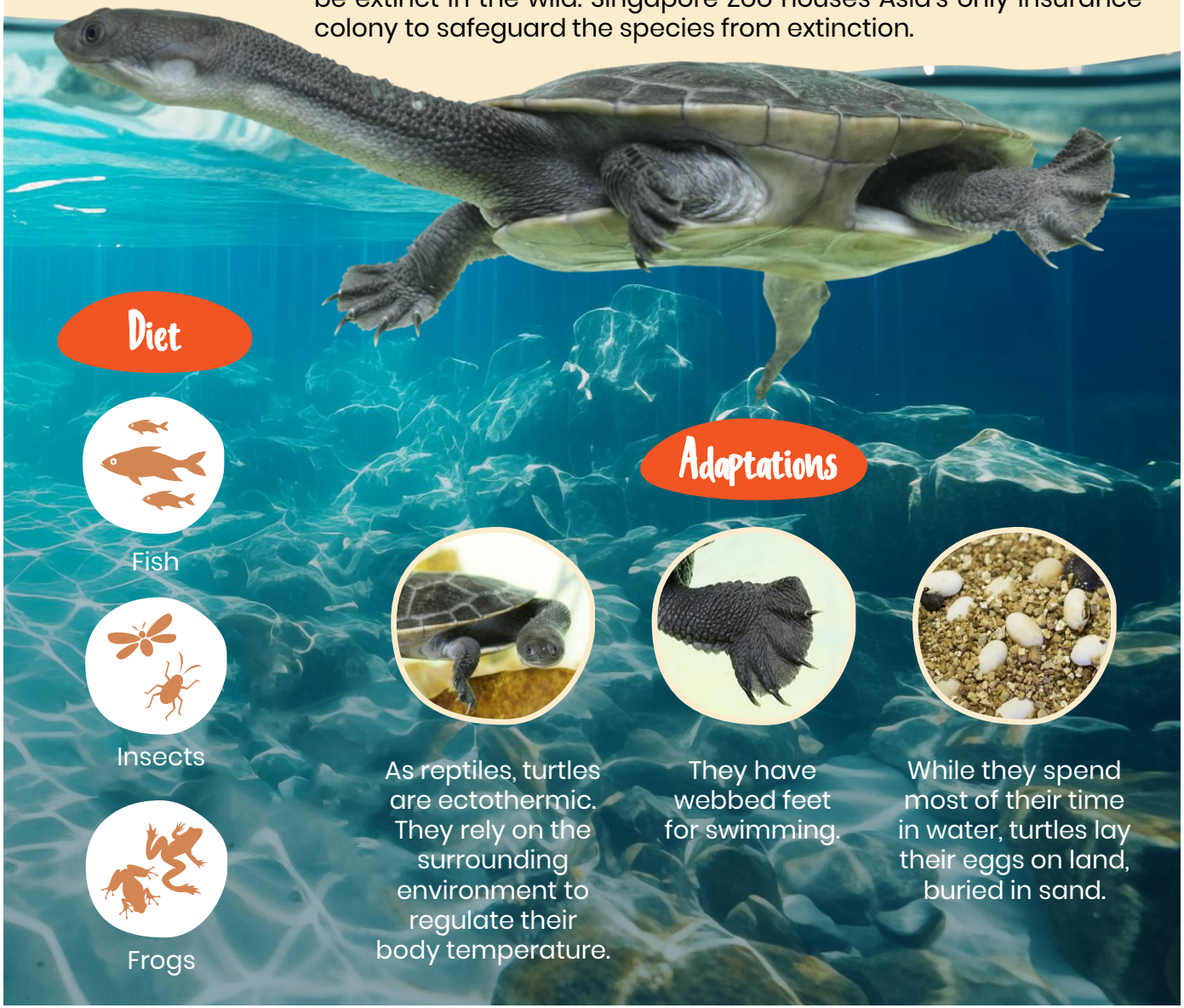
Roti Snake-necked Turtle

Find this turtle at Reptopia!

Habitat

The Roti snake-necked turtle is endemic to Indonesia. It lives in shallow freshwater lakes, wetlands and has adapted to living in rice fields.

Unfortunately, due to heavy poaching, the species is believed to be extinct in the wild. Singapore Zoo houses Asia's only insurance colony to safeguard the species from extinction.



Diet

- Fish
- Insects
- Frogs

Adaptations

As reptiles, turtles are ectothermic. They rely on the surrounding environment to regulate their body temperature.

They have webbed feet for swimming.

While they spend most of their time in water, turtles lay their eggs on land, buried in sand.

Orangutan

Find them at Orangutan Island! Gibbons and otters share their exhibit. The keepers must ensure that the living space meets the needs of all the animals.

1

Orangutan

2

Pileated Gibbon

Gibbons prefer to stay high up in the trees. They are agile and move by swinging and leaping from branch to branch.

3

Asian Small-clawed Otter

These agile swimmers live in freshwater, swamps, rivers and mangroves.

Habitat

Orangutans live in tropical rainforests of Borneo and Sumatra. They spend most of their time in the treetops.

Here in Singapore Zoo, a free-ranging exhibit provides guests a barrier-free view of the orangutans.

Diet

Fruits

Seeds & Nuts

Insects

Adaptations

Orangutans live high up in the trees. Their long limbs allow them to move easily through the forests.

Orangutans are known to make and use tools to solve problems. We provide them with enrichment such as puzzle boxes to practise problem solving and keep them mentally healthy.

In the evenings, they make nests in the tree canopies to keep their young safe from danger.

Design Thinking
Step: **Empathise**

Knowing My Animal

My animal of interest : _____

Habitat

What is the animal's natural habitat? Describe it.

Which part of the habitat does it use?

Diet

What does it eat?

How does it find and get its food?

Behaviour

How does it move?

Is it solitary (lives alone) or social (prefers to live with others of its kind)?

How does it attract a mate and raise its young?

Design Thinking
Step: **Empathise**

Observing My Animal

My animal of interest : _____

Guiding Questions

Use these questions to make notes about your animal and its exhibit.

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- What do you see in the exhibit that helps people:
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  - Feel excited about being with animals?
  - Have fun learning about the animals and how to protect them?

- What do you like about the exhibit? Is there anything about the exhibit you would change?

Draw or write down your observations here!

Design Thinking
Step: **Ideate**

Animal Exhibit Ideas

My animal of interest : _____

Guiding Questions

Use these questions to help you design an exhibit for your animal.

- What does this animal need in its exhibit? (E.g. orangutans need trees)
- What might we have in our design to encourage natural behaviours? (E.g. high climbing structures)
- How might we keep the animals mentally and physically active?
- How might we design the exhibit such that guests can get up close without spooking the animals?
- What materials might we use that will be safe and durable for animals?

As a group, brainstorm as many animal exhibit ideas as you can. Write or draw them here.

Design Thinking
Step: **Test**

Building A Better Exhibit

What Went Well

What did our classmates like about the design?

To Improve On

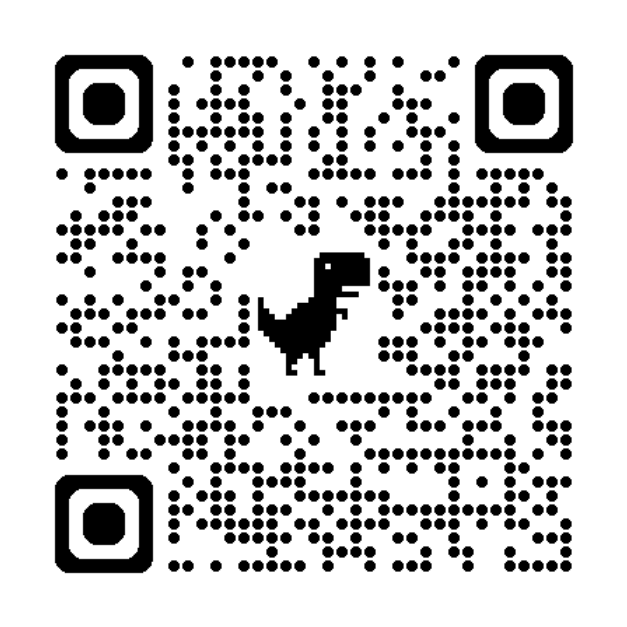
How can we make our design better?

Navigating Around

Tips:
Here are two ways to find your way around Singapore Zoo and plan your preferred route!

1. **Download and print our digital map**
2. **Download the Mandai App on your mobile**

1



[Download a map of Singapore Zoo here]

2

[Download the Mandai App here]

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