## **ZOO ENCLOSURE DESIGN - STUDENT JOURNAL**

STAGE 3 - SCIENCE & TECHNOLOGY, MATHEMATICS Stage 4 - Science, Mathematics, Mandatory Technology Stage 5 - Science, Mathematics, Design & Technology



Modern Zoos are education and research facilities that support wildlife conservation both on-site and in the wild. This resource will support you to make reasoned, evidence-based decisions about the current and future role of animals in zoos, including ethical considerations.

### PROJECT OUTLINE

#### AT SCHOOL

Students begin the journey to help Taronga Zoo expand its facilities to hold one additional animal. This will be a stand-alone exhibit and students need to consider all the criteria involved is providing a facility such as this. A student journal will guide students through the research and design process to be undertaken.

#### AT THE ZOO

Using the provided proforma students will carry out enclosure assessments considering the pros and cons and the changes they would recommend making. They will also review barrier and containment design.

#### **ZOO WORKSHOP**

Interact with animals and learn about their adaptations, habitats and needs to ensure your enclosure meets all design requirements. Develop a deeper understanding of what you want visitors to experience through your design, ensuring Zoo Keeper safety and access.

#### **BACK AT SCHOOL**

It is time to tackle the Define, Ideate, Prototype and Reflection phase of the design process. To begin students will define their chosen animal and consider...**How does a modern zoo enclosure meet the needs of both animals and people?** 





### **ENCLOSURE DESIGN STUDENT JOURNAL**

STAGE 3 - SCIENCE & TECHNOLOGY, MATHEMATICS STAGE 4 - SCIENCE, MATHEMATICS, MANDATORY TECHNOLOGY STAGE 5 - SCIENCE, MATHEMATICS 5.1, DESIGN & TECHNOLOGY

### **EXHIBIT DESIGN FOR A MODERN ZOO**

#### STUDENT NAME:

#### PURPOSE

Taronga Zoo wants to expand its facilities to hold one additional animal. This will be a stand-alone exhibit and you are required to design this facility. In order to do this the facility must meet:

- the <u>Taronga Conservation Society Australia Animal Welfare Charter</u>
- ✤ State legislative exhibit requirements
- Animal Husbandry requirements
- Workplace Health and Safety requirements
- the needs of the visitors viewing the facility
- the call to action to achieve positive behaviour change for wildlife

### **INQUIRY QUESTION** - How does a modern zoo enclosure meet the needs of both animals and people?

This project would be ideally undertaken in groups.

#### **DESIGN THINKING PROCESS**

The Design Thinking Process is a methodology that provides a solutionbased approach to solving problems. This lesson sequence will follow the steps involved in the process to design an enclosure for Taronga Zoo.



CLASS:\_





## AT SCHOOL – BEFORE THE ZOO – EMPATHISE

Empathise - Conduct research in order to develop your knowledge about your inquiry question.

#### **ROLE OF THE MODERN ZOO**

Zoos have existed since the mid-18<sup>th</sup> Century, but over time the design of zoo exhibits has changed to reflect of the values and understandings of society, particularly in the field of Science.

Modern zoos endeavour to be leaders in Conservation. Their ethos is to protect wildlife and build a sustainable future for people and wildlife. This is done through education, transformational guest experiences, caring for wildlife and participating in wildlife conservation initiatives that ensure long-term security of wildlife in sustainable ecosystems and habitats.

#### **SPECIES IN OUR CARE**

Taronga cares for approx 4,000 animals from over 350 species, many of which are threatened or critically endangered. Taronga participates in a number of conservation initiatives which demonstrate positive impact for wildlife habitats and communities. Examples of this are breeding and research programs, such as the Animal Gene Storage Resource Centre of Australia, located at Taronga Western Plains Zoo and Sydney, which includes a "Frozen Zoo" of genetic material. This program aims to develop techniques in the collection, preservation and storage of genetic material. This work is important for endangered and vulnerable species.

All species in our care have a clear role that contributes to conservation or education outcomes.





#### VARIOUS 'ROLES' OF SPECIES AT TARONGA

• **Safety Net Species** – species that are under threat of extinction in the wild and are part of regional and international captive breeding programs that are designed to ensure the species' survival in captivity.

• Ambassador Species – species that support conservation messages, and have the capacity to harness visitor and community action behind conservation efforts.

• Enabling Species – species that enable visitors to make connections with animals and create emotional bonds that stimulate learning and positive actions.

• **Research Species** – species that enable research which supports our conservation efforts or improvements in the care and wellbeing of wildlife.

#### **ANIMAL WELFARE CHARTER**

When designing zoo exhibits, Taronga aims to reproduce (as closely as possible) the animal's natural environment, taking into consideration their behavioural and physiological needs. Upholding dignity and respect is vital. This is why species specific research is so important.

An exhibit should provide visitors with a better understanding of the relationship between animals, the environment and themselves.



### AT SCHOOL – BEFORE THE ZOO – EMPATHISE

Empathise - Conduct research in order to develop your knowledge about your inquiry question.

#### THE 5 W'S – UNDERSTANDING THE ROLE OF THE ZOO

Before visiting the Zoo, use the information on the previous page and your own research to develop an understand the role of a modern zoo.

WHY - why does Taronga Zoo exist?

**WHERE** – where is Taronga Zoo and Taronga Western Plains Zoo located and how does that influence what enclosures are found at each location?

WHEN – when did Taronga Zoo first open and when have new major enclosures been developed?

**WHAT** – what types of animals are kept in the Zoo's and how will they inspire action and change peoples attitudes and behaviours? (hint – visit <u>www.taronga.org.au</u> and look at their conservation status)

WHO –who's need must to be considered when designing an enclosure?



### AT SCHOOL - BEFORE THE ZOO - EMPATHISE

Empathise - Conduct research in order to develop your knowledge about your inquiry question.

### **CASE STUDY - THE SOUTHERN CORROBOREE FROG**

#### The Corroboree Frog is considered a safety net species at Taronga Zoo

Taronga in collaboration with other partners, is heavily involved in the breeding and release of Southern Corroboree Frogs through the National Recovery Program. This program involves breeding frogs in our breeding units that contain computerised temperature and water filtration systems. They are set up with dual thermostats and alarms to ensure the temperature stays within the optimal range. One of these breeding units can be seen next to Reptile World at Taronga Zoo, Sydney.

#### **Population Numbers**

Use the graph below to examine population numbers of the Southern Corroboree Frog and the need for zoo breeding programs.

The most reliable monitoring technique is to survey the number of breeding males. The breeding males reliably respond with their threat call when researchers shout near their sphagnum nests and the calls can be easily counted. In 2009, the first Corroboree Frog eggs were reintroduced back into the wild. The frogs that survived from these eggs became sexually mature and started being recorded as breeding males in 2012.



The graph shows the number of Southern Corroboree Frog males recorded in annual surveys from 2003-2016.



Source: http://www.corroboreefrog.org.au/



## AT SCHOOL – BEFORE THE ZOO – EMPATHISE

Empathise - Conduct research in order to develop your knowledge about your inquiry question.

#### CASE STUDY - THE SOUTHERN CORROBOREE FROG

#### Questions

- 1. How many calling male Southern Corroboree Frogs were surveyed in 2003?
- 2. Describe the changes in the population since 2003.
- 3. In what years was the Southern Corroboree Frog's population at its highest?
- 4. Predict what would have happened to the population if there had been no intervention.
- 5. When were the first eggs reintroduced into the wild?
- 6. How long did it take for the eggs to become sexually mature breeding males?
- 7. How many breeding males were surveyed in the re-introduced site in 2016?
- 8. Why do you think there were less calling males surveyed in 2016 than in 2012?

#### Additional Activities

- Learn about species heights and lengths while practicing estimation, measurement and comparison skills at <u>http://www.arkive.org/education/teaching-resources-7-11</u>
  - Use your knowledge of how to calculate area and perimeter to design correct enclosures at <u>http://mrnussbaum.com/zoo/</u>





While at the Zoo (as you visit exhibits and during your workshop), take notes and photographs associated with the following elements of enclosure design



#### ANIMAL NEEDS (DIETARY, VETERINARY, ENCLOSURE SIZE, VEGETATION, SHELTER, PRIVACY, ENRICHMENT, TRAINING ETC)

While at the Zoo (as you visit exhibits and during your workshop), take notes and photographs associated with the following elements of enclosure design

### **VISITOR EXPERIENCE**

#### **KEEPER SAFETY AND ACCESS**

#### EXHIBIT COMMUNICATION (SIGNS ETC)

While at the Zoo (as you visit exhibits and during your workshop), take notes and photographs associated with the following elements of enclosure design

#### **GENERAL EXHIBIT TYPES**

#### **ACTIVITY BASED DESIGNS**

#### **BUILDING MATERIALS**

While at the Zoo (as you visit exhibits and during your workshop), take notes and photographs associated with the following elements of enclosure design

### Types of barriers / containment Complete the table below by visiting four different types of enclosures

ENCLOSURE	DESCRIPTION OF BARRIER	ADVANTAGES	DISADVANTAGES	CHANGES YOU Would Make

While at the Zoo (as you visit exhibits and during your workshop), take notes and photographs associated with the following elements of enclosure design

#### Exhibit assessment

Name of exhibit:		

Species present: \_\_\_\_\_

What environment is	
being created and	
how has this been	
achieved?	
List the materials	
that have been used	
in the construction of	
the enclosure.	
Describe some of the	
structural and	
behavioural	
adaptations of the	
animal/s in the	
exhibit.	
What exhibit	
features cater	
specifically to the	
animals?	
What docian	
alomonts on ablo	
visitors to croate a	
deep connection	
with the gnimal/s?	
with the driffidits?	
How does the	
signage increase	
understanding and	
change peoples	
attitudes and	
behaviours?	
How does the	
enclosure ensure the	
Keeper's safety?	11
	1

Focus your question by articulating the problem you want to solve

#### **\*** DEFINE THE PROBLEM

The empathise phase has allowed you to develop a deep understanding of the issue. Now it is time to apply that knowledge to a specific problem. Use the inquiry question as a starting point.

Inquiry question: How does a modern zoo enclosure meet the needs of both animals and people?

As a staring point, develop some branching questions to help break down the task.

For example : - What animal/s will our enclosure house?

- Who are the different groups of people that interact with a zoo enclosure?

In your groups, brainstorm additional branching questions to help focus your project vision. Spend time finding answers to your questions.



Focus your question by articulating the problem you want to solve

#### **\*** DEFINE YOUR TARGET AUDIENCE

Research the target audience specific to the Zoo.

Why is it important to consider your target audience when designing an enclosure or visitor experience?



Focus your question by articulating the problem you want to solve

#### **\*** DEFINE ROLES AND CREATE A TABLE

Outline significant events within the project and decide on timeframes. A table can be a good way to represent timeframes. Assign tasks to each group member based on their strengths.



Focus your question by articulating the problem you want to solve

### DEFINE YOUR CHOSEN ANIMAL

It is important that you have a good understanding of your chosen animal to create a suitable enclosure. As part of your design process, it is a legislative requirement that your exhibit has at minimum a basic sign. The following research will assist with creating a sign. Remember to use multiple sources to gather the information below.

Chosen animal/s:\_



Focus your question by articulating the problem you want to solve

#### Conservation Status of Species – IUCN Red List <a href="http://www.iucnredlist.org/">http://www.iucnredlist.org/</a>

The Conservation Status of the \_\_\_\_\_ is \_\_\_\_

#### **CURRENT THREATS**

#### VARIOUS 'ROLES' OF SPECIES AT TARONGA

• Safety Net Species – species that are under threat of extinction in the wild and are part of regional and international captive breeding programs that are designed to ensure the species' survival in captivity or those species that are part of a threatened species recovery program

• Ambassador Species – species that support conservation messages, and have the capacity to harness visitor and community action behind conservation efforts

• Enabling Species – species that enable visitors to make connections with animals and create emotional bonds that stimulate learning and positive actions that will help save species

• **Research Species** – species that enable research which supports our conservation efforts or improvements in the care and wellbeing of wildlife.

### THE 'ROLE' OF MY CHOSEN ANIMAL AT TARONGA IS....

### BACK AT SCHOOL- IDEATE

Brainstorm creative solutions

#### **\*** IDEATE - BRAINSTORMING EXHIBIT DESIGN FOR YOUR CHOSEN ANIMAL/S

On butchers paper, sketch different design ideas for your exhibit. As a group, sketch five ideas for peer feedback. Your design ideas must be detailed enough that someone else can look at them and understand them. Be sure to include drawings, labels for each feature, explanations etc. Remember, there are no bad ideas in the ideate phase – give yourself and your team total freedom; no idea is too farfetched.

### ✤ FEEDBACK

You will need quality feedback to help you decide on the best idea for your group to take through to the prototyping stage.

Take your five sketches to survey a number of your peers for feedback. During this time ensure that all group members go and give feedback to other groups.

To show that you've considered the feedback, record some of the most useful feedback on your designs below.



### **BACK AT SCHOOL- PROTOTYPE**

Design and build a representation of all or parts of your solution

### 

Collate all the feedback and choose the sketch that your group will take to the prototyping phase.

Your prototype needs to incorporate the key elements of your design and can take the form of a:

- digital model (e.g using google sketchup)
- physical 3D model
- physical 2D model

Specific requirements:

- -The model must be no bigger than A3.
- -The model must show the dimensions of the exhibit through a scale

#### THE PITCH

Your group needs to create a digital poster that outlines THE PITCH for your design. Why is your design so important and why should the Zoo build it? What resources will be needed to create the exhibit and how much will it cost?

To ensure that your group addresses all the requirement, allocate jobs to each team member.





### **FINAL REFLECTION**



1. Evaluate your contribution to team tasks? Did you understand your roles and responsibilities? What were the challenges and successes of working as part of a team?

2. What skills do feel you have developed while undertaking this design project?

3. What did you enjoy most and least about undertaking this project?

4. Reflect on your processes for empathising, defining, ideating and prototyping?





Taronga Conservation Society Australia Animal Welfare Charter https://taronga.org.au/sites/default/files/content/pdf/Animal Welfare Charter.pdf

Designing Zoos https://www.waza.org/

Zoolex https://www.zoolex.org/gallery/

Trends in Exhibition http://www.joncoedesign.com/trends/exhibit\_trends.htm

Planning Zoos for Generations http://www.clrdesign.com/our-work

Animal Behaviour and Exhibit Design http://zoodesign.files.wordpress.com/2011/03/chapter-18-integrating-animal-behavior.pdf

The Portico Group http://porticogroup.com/portfolio/exhibit\_design

Zoo Habitats - Manufacturers http://www.pangea.dk/zoo-habitats

Visitor Learning http://australianmuseum.net.au/Making-a-difference-what-have-we-learned-about-visitor-learning/

Conservation Status of Species – IUCN Red List <a href="http://www.iucnredlist.org/">http://www.iucnredlist.org/</a>

General Standards for Exhibiting Animals in NSW <a href="https://www.dpi.nsw.gov.au/animals-and-livestock/animal-welfare/exhibit">https://www.dpi.nsw.gov.au/animals-and-livestock/animal-welfare/exhibit</a>

Policy for Managing Solitary Elephants in NSW

http://www.dpi.nsw.gov.au/\_\_data/assets/pdf\_file/0010/264484/Policy-on-the-management-of-solitary-elephants-in-NSW.pdf



## SYLLABUS LINKS

Stage 3, 4, 5 - Science, Technology, Engineering and Mathematics

### INTEGRATED CURRICULUM

This program can be delivered to meet outcomes explicit to subject areas or as part of an Integrated Unit of work across Science, Technology, Engineering and Mathematics. The central theme to the project "How does a modern zoo enclosure meet the needs of both animals and people?" Through delivering integrated curriculum we strive to enrich student learning by providing rich, authentic and contextual learning experiences.

#### LITERACY LINKS

This program includes links to the <u>National Literacy Learning Progressions</u>:

Speaking and Listening (listening, interacting and speaking) Reading and Viewing (understanding texts) Writing (creating texts, informative and persuasive text indicators and handwriting and keyboarding)

#### STAGE 3

#### **SCIENCE AND TECHNOLOGY**

ST3-1WS-S plans and conducts scientific investigations to answer testable questions, and collects and summarises data to communicate conclusions

ST3-2DP-T plans and uses materials, tools and equipment to develop solutions for a need or opportunity

ST3-4LW-S examines how the environment affects the growth, survival and adaptation of living things

ST3-5LW-T explains how food and fibre are produced sustainably in managed environments for health and nutrition

#### MATHEMATICS

MA3-1WM describes and represents mathematical situations in a variety of ways using mathematical terminology and some conventions

MA3-2WM selects and applies appropriate problem-solving strategies, including the use of digital technologies, in undertaking investigations

MA3-5NA selects and applies appropriate strategies for addition and subtraction with counting numbers of any size

MA3-7NA compares, orders and calculates with fractions, decimals and percentages MA3-9MG selects and uses the appropriate unit and device to measure lengths and distances, calculates perimeters, and converts between units of length

MA3-10MG selects and uses the appropriate unit to calculate areas, including areas of squares, rectangles and triangles

MA3-18SP uses appropriate methods to collect data and constructs, interprets and evaluates data displays, including dot plots, line graphs and two-way tables

### LEARNING ACROSS THE CURRICULUM









# SYLLABUS LINKS

Stage 3, 4, 5 - Science, Technology, Engineering and Mathematics

### STAGE 4

#### **SCIENCE**

SC4-2VA shows a willingness to engage in finding solutions to science-related personal, social and global issues, including shaping sustainable futures

SC4-3VA demonstrates confidence in making reasoned, evidence-based decisions about the current and future use and influence of science and technology, including ethical considerations

SC4-4WS identifies questions and problems that can be tested or researched and makes predictions based on scientific knowledge SC4-5WS collaboratively and individually produces a plan to investigate questions and problems

SC4 – 8WS selects and uses appropriate strategies,

understanding and skills to produce creative and plausible solutions to identified problems

SC4 – 9WS presents science ideas, findings and information to a given audience using appropriate scientific language, text types and representations

SC4 – 14LW relates the structure and function of living things to their classification, survival and reproduction

#### MATHEMATICS

MA4-2WM applies appropriate mathematical techniques to solve problems

MA4-5NA operates with fractions, decimals and percentages MA4-6NA solve financial problems involving purchasing goods MA4-12MG calculates the perimeters of plane shapes and the circumferences of circles

MA4-13MG uses formulas to calculate the areas of quadrilaterals and circles, and converts between units of area

### **TECHNOLOGY (MANDATORY)**

Outcome 1 - knowledge, understanding and appreciation of and skills in design processes, design theory and the work of designers (4.1.1, 4.1.2)

Outcome 2 - knowledge of and skills in researching,

experimenting, generating and communicating creative design ideas and solutions (4.2.1, 4.2.2)

Outcome 4 – knowledge, understanding and appreciation of the impact innovation and emerging technologies on the individual, society and the environment (4.4.1)

Outcome 5 - knowledge of and skills in managing quality solutions to successful completion (4.5.1)

Outcome 6 - understanding and appreciation of and skills in evaluating and reflecting on the success of their own and others' design activities (4.6.1, 4.6.2)

### STAGE 5

#### SCIENCE

SC5-2VA shows a willingness to engage in finding solutions to science-related personal, social and global issues, including shaping sustainable futures

SC5-3VA demonstrates confidence in making reasoned, evidence-based decisions about the current and future use and influence of science and technology, including ethical considerations

SC5 – 5WS produces a plan to investigate identified question, hypotheses or problems, individually and collaboratively SC5 – 8WS applies scientific understanding and critical thinking skills to suggest possible solutions to identified problems

SC5 – 9WS presents science ideas and evidence for a particular purpose and to a specific audience, using appropriate scientific language, conventions and representations

SC5 – 14LW analyses interactions between components and processes within biological systems.

SC5 – 15LW explains how biological understanding has advanced through scientific discoveries, technological developments and the needs of society

#### MATHEMATICS 5.1

MA5.1-2WM selects and uses appropriate strategies to solve problems

MA5.1-3WM provides reasoning to support conclusions that are appropriate to the context

MA5.1-8MG calculates the areas of composite shapes, and the surface areas of rectangular and triangular prisms MA5.1-11MG describes and applies the properties of similar figures and scale drawings

#### **DESIGN AND TECHNOLOGY**

Objective 1 - Knowledge and understanding of design concepts and processes (5.1.1, 5.1.2)

Objective 2 - Understanding and the appreciation of the impact of past, current and emerging technologies on the individual, society and environments (5.2.1)

Objective 3 - Knowledge and understanding of the work of designers and the issues and trends that influence their work (5.3.1, 5.3.2)

Objective 4 - Knowledge and understanding of skills in innovation, creativity and enterprise (5.4.1)

Objective 5 - Skills in communicating design ideas and solutions (5.5.1)

Objective 6 - Knowledge and understanding of and skills in managing resources and producing quality design solutions (5.6.1)

