**Quick Summary**

This unique program is part of the 2020 STEM Design Challenge. Year 9-10 students will help to solve two big STEM challenges:

* Keepers need a variety of enrichment ideas to care for giraffes
* Keepers need a variety of enrichment ideas to care for lions

This Teaching Guide includes activities that you can do with your students before, during and after your excursion. It will help to build foundational knowledge, ensure maximum benefit during the excursion and extend learning once back at school.



**What Students Will Learn**

* Zoo animals and the work of keepers
* STEM skills such as scientific observation and Design Thinking
* How to express their ideas through Project Based Learning
* How to enhance their creative thinking skills

**Victorian Curriculum Links**

* Science – Scientific knowledge and understanding of the world changes as new evidence becomes available; science knowledge can develop through collaboration and connecting ideas across the disciplines and practice of science
* Design & Technologies – Apply design thinking, creativity, innovation and enterprise skills to develop, modify and communicate design ideas of increasing sophistication
* Critical & Creative Thinking – Investigate the kind of criteria that can be used to rationally evaluate the quality of ideas and proposals, including the qualities of viability and workability
* Personal & Social Capability – Evaluate own and others contribution to group tasks, critiquing roles including leadership and provide useful feedback to peers, evaluate task achievement and make recommendations for improvements in relation to team goals

**Learning Sequence**

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**After Your Excursion**

1. 100 in 10 (p. 5)

2. Choose Your Idea (p. 5)

3. Prototype (p. 6)

4. Test (p. 6)

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**During Your Excursion**

1. Watching Animals (p. 4)
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**Before Your Excursion**

1. Design Brief (p. 2)

2. Animal Smarts (p. 3)

3. Plan Your Visit (p. 3)

**Design Thinking**

The process of Design Thinking is not linear. Students may need to return to different stages of the framework in order to deepen their learning or choose another idea to prototype.

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| --- | --- | --- | --- |
| **Understand**Be caring, ask questions and define the challenge | **Ideate**Imagine creative solutions to the challenge | **Prototype**Show your idea by using what’s available | **Test and Refine**Test, share, evaluate and improve your idea |

Look for these logos in this Teaching Guide to identify each stage Design Thinking.

**Before Your Excursion**

**1. Design Brief**

**This activity will:** introduce your students to the Design Brief in the STEM student workbook. The Design Brief describes the user and the challenge that students will be solving. It outlines what students will be doing at every stage of Design Thinking.

**Preparation:**

* Download the Student Workbook at [www.zoo.org.au/education/excursions/caring-for-animals-9-10-semester-1-20/](http://www.zoo.org.au/education/excursions/caring-for-animals-9-10-semester-1-20/) (under ‘Program Resources’).
* Familiarise yourself with the Design Brief.
* Read the Judging Criteria if you would like students enter the STEM Design Challenge competition. You are welcome to use this criteria (or your own) as part of assessment.
* You will need share the Design Brief with your students, either printed or electronically.

**Instructions:**

1. Read through the Design Brief (Page 1 of the Student Workbook) with your students. Discuss the Understand stage of Design Thinking, which involves being caring, asking questions and defining the challenge.
2. Explain that the Ideate, Prototype and Test and Refine stages will occur back at school.
3. Read through the Judging Criteria if your students are entering the STEM Design Challenge competition. Or use this moment to discuss how students will be assessed.

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**2. Animal Smarts**

**This activity will:** start the ‘Understand’ stage of the Design Brief by watching videos
and listening to the Fauna podcast.

**Preparation:**

Open these links:

* ‘Zoos Victoria is Fighting Extinction’ video – [www.youtube.com/watch?v=qPrUvuKJs6E](http://www.youtube.com/watch?v=qPrUvuKJs6E)
* ‘Animal Smarts’ Fauna Podcast (20 minutes) – [www.zoo.org.au/education/fauna-podcast/](http://www.zoo.org.au/education/fauna-podcast/)
* ‘A Day in the Life of an Animal Trainer’ video – [www.youtube.com/watch?v=6QoUT4vO-Lk](http://www.youtube.com/watch?v=6QoUT4vO-Lk)
* ‘Orang-utans interact through technology’ video – [www.youtube.com/watch?v=0lvV87nBXrA](http://www.youtube.com/watch?v=0lvV87nBXrA)

**Instructions:**

1. Watch the ‘Zoos Victoria is Fighting Extinction’ video.
2. Ask students, “Why it is important to help endangered animals to thrive in the wild?”
3. Share the following questions with students:
	* Why is it important the Zoo to employ animal trainers?
	* What is meant by ‘positive reinforcement training’?
	* How might scientists and Zoo keepers judge if animal enrichment is working?
	* What are some other benefits of training Zoo animals?
4. Listen to the Fauna Podcast ‘Animal Smarts’ (Episode 1).
5. Discuss student answers. Write a list of what students have learnt so far about animal welfare and enrichment at Melbourne Zoo.
6. Write a list of research questions students have about animal enrichment for lions and giraffes.
7. Watch ‘A Day in the Life of an Animal Trainer’ and ‘Orang-utans interact through technology’.
8. Ask students to identify what enrichment they saw in the videos.
9. Remind students that they will continue their research during their excursion to the Zoo.



**3. Plan Your Visit**

**This activity will:** help your group prepare for your excursion to Melbourne Zoo.

**Preparation:** Open your excursion confirmation email from Zoos Victoria to find out your workshop time/s. This will help you and your students plan your day.

**Instructions:**

1. Visit the Plan Your Visit webpage – [www.zoo.org.au/education/plan-your-visit/plan-your-visit-melbourne-zoo/](https://www.zoo.org.au/education/plan-your-visit/plan-your-visit-melbourne-zoo/)
2. Open the Zoo map – [www.zoo.org.au/melbourne/melbourne-zoo-map/](https://www.zoo.org.au/melbourne/melbourne-zoo-map/)
3. Use the map to plan what you will be doing at the Zoo.
4. You may like to ask questions like, “What will you need to find out?” and “What are you most looking forward to?”

**Teaching Tip:** Ask your students about how they would like to record their research at Melbourne Zoo. They may like write, draw, take photos or record short videos. This is also a good time to discuss what students will need to bring for a great excursion e.g. appropriate clothing, rubbish-free lunch

**During Your Excursion**

**(What to do when you’re not in a workshop with a Zoo teacher)**

**1. Watching Animals**

**This activity will:** help students develop their scientific observation skills by looking at how enrichment encourages animals to act in natural ways within their zoo habitat.

**Instructions:**

This activity can be done at any animal habitat area.

1. Before you approach the habitat, ask students to share their tips for observing animals e.g. staying quiet, walking slowly, viewing from different angles
2. Walk to the zoo habitat and ask students to begin to watch. You might like to set a timer on your phone, just like a scientist would, to keep everyone on track.
3. Ask them to watch:
* The animal from different angles e.g. its body features,
* For signs of where the animal is in its animal’s lifecycle
* Enrichment to help it use its senses e.g. hidden food, browse (leafy branches)
* Enrichment to help it move e.g. uneven logs, rocks, ropes, wood wool (looks like straw)
* Enrichment to help it behave in natural ways e.g. places to sleep, social play
1. Ask students to quietly share what they saw with the person next to them.
2. Ask students to think about how their observations can help them with solving the challenge of creating enrichment for lions and giraffes.



**2. Visitor Enrichment**

**This activity will:** build student knowledge about how all animals need enrichment, including humans!

**Preparation:** Use your map to navigate your way around the Zoo.

**Instructions:**

1. Explain to students that Melbourne Zoo also provides enrichment for young visitors. Playgrounds and interactive areas encourage children to use their senses, move and behave naturally.
2. As you walk the paths of the Zoo, stop at different play areas. What enrichment can students see? Here are some places you could visit:
* Wild Sea – sandpit area after the pelicans
* Lion Gorge – water play area next to the lions, cat play area just past the snow leopards
* Carousel Park – children’s playground
* Australian Bush – Loos Yourself Maze after the emus
* Meerkats – tunnels that children can crawl through
* Bathrooms, water fountains and food outlets

Melbourne Zoo acknowledges the Traditional Custodians of the land on which we live and work, and pay our respects to Elders both past and present.

**After Your Excursion**

**1. 100 in 10**

**This activity will:** help students brainstorm their ideas for solving the big challenges.

**You will need:**

* The Design Brief (in the Student Workbook)
* Pens or textas
* Something for small groups to write their ideas on e.g. large piece of paper, whiteboard
* A stopwatch or timer

**Instructions:**

1. Look at the Design Brief and ask students to decide which challenge they would like to work on i.e. animal enrichment for giraffes or animal enrichment for lions
2. Divide students into small teams, based on their animal choice. This will be the team they will work with on their prototype. If you are entering the STEM Design Thinking Challenge competition, limit each group to a maximum of six students.
3. Tell students that the goal of this activity is to come up with lots of ideas that will solve the big challenge. There will be time at the end to discuss each idea. For now, they will have 10 minutes to write down as many ideas as possible 🡺 100 ideas is the goal.
4. As a class, set some rules to guide the brainstorm. Everyone should feel like they can share their idea openly, there are no bad ideas, one idea at a time and use “and” to build on ideas.
5. Pass out the pens and paper/whiteboards.
6. Ask each team to work out how they will record their idea (e.g. everyone writing, one person to scribe) and set the timer to 10 minutes.
7. Give warnings when the timer goes past 8 minutes and 9 minutes. Encourage students to write all their ideas down, even the ones that include big dreaming.
8. When the timer reaches 10 minutes, ask students to stop writing and count up how many ideas they thought of.

**Teaching Tip:** When students are brainstorming, it is best for a teacher to step back and not participate. Pauses in conversation often lead to new and creative thinking.

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**2. Choose Your Idea**

**This activity will:** help your students choose an idea to prototype and test as a team. It is the final part of Ideate in the Design Brief. This activity helps students identify patterns and themes.

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**You will need:**

* The idea lists that teams created during the ‘100 Ideas in 10 Minutes’ activity
* A device/computer with Internet access to do a fast check of each idea

**Instructions:**

1. Ask each team to look at their list of ideas.
2. Each team chooses their ‘Top 5’ ideas – the ones they like or find most interesting.
3. Look at the ‘Top 5 ideas’ more closely. Are the ideas similar?
Do they have things in common? Is there a way to mash ideas together to improve an idea?
4. What might students have to think about during decision-making? e.g. timelines, materials available, personal strengths of each team member
5. Ask each team to decide on one idea that everyone wants to prototype and test.
6. Do a fast check on the Internet. Has someone already thought of this idea? Did it work? Can it be improved?
7. Finish by explaining that designers have a growth mindset. Teams might have to return to their ideas list if the first idea they choose does not work out. Ask students to keep their list somewhere safe in case they need to look at it again.

**Teaching Tip:** Give students time decide on an idea. They will develop their interpersonal skills and learn how to make team decisions. If they are stuck, encourage them to be curious about one idea, knowing that they may have to return to their list to try another.

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**3. Prototype**

**This activity will:** help your students complete the Prototype stage of the Design Brief. A prototype is a visual representation of an idea, using the materials and technologies available.

**Preparation:** You may need to support students with identifying what materials they will use to build their prototype. It is recommended they use recycled materials where possible. Encourage students to return to the Design Brief when needed.

**Teaching Tips:**

* Ask students to focus on the challenge they have selected, the user (Justine Felix) and the functionality of their idea. They can return to the Design Brief and their research when needed.
* It might be useful to set deadlines to help teams stay on track.
* Encourage ‘quick fails’ where students try different ideas and quickly assess if the idea will work. This might include sketching out their idea to think it through.
* If entering the STEM Design Challenge competition, use the Judging Criteria
to help students assess and reflect on this stage of Design Thinking as they go.

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**4. Test**

**This activity will:** enable students to test and share their prototype.

**Preparation:** You may need to think through what audience you would like students to get feedback from e.g. other students, a vet, animal expert, Biodiversity Officer from your local council/shire

**Instructions – Presentation:**

Student teams will need to practice how they will present their prototype to others. They might do a speech, a performance, animation or create interesting signage as part of a showcase. If teams want to enter the STEM Design Challenge competition, they will need to create a video of 2 minutes or less (refer to the Judging Criteria for more information) and upload it at [www.zoo.org.au/education/enter-the-stem-design-challenge/](http://www.zoo.org.au/education/enter-the-stem-design-challenge/)

**Instructions – Workable Model:**

If student teams have created a prototype that is a workable model, they may be able to test its design features. For example:

* Test whether the prototype is safe for animal
* Test whether the prototype can withstand the power/weight of the animal
* Test whether the prototype will last a while or break apart

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**5. Refine**

**This activity will:** enable students to evaluate and improve their prototype.

**Instructions – Refine:**

Once students have received feedback, it is ideal to give them some time to refine their design. This stage of Design Thinking shows students that the engineering process does not stop after they have presented an idea. Designs are modified over time so that a better solution can be reached.

1. As teams to share what they learnt during the ‘Test’ activity. They may like to synthesise their thinking by writing reflections on pieces of paper and then group by common themes.
2. Encourage each team to brainstorm how their prototype could be changed.
3. If time, student teams could physically adjust their prototype.

**Teaching Tip:** Remind students that Design Thinking is a process for testing and learning, not for getting to the ultimate solution the first time. At Zoos Victoria, people use Design Thinking regularly to test new solution ideas and work out all the kinks.

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**Thanks for participating in Zoos Victoria’s STEM Design Challenge. Together, we are creating a world that is rich in wildlife and providing young people with an education worth having.**

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