**Quick Summary**

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

* The Zoo Shop Manager needs a new product to raise money for endangered African animals

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**

* How a not-for-profit organisation raises funds for animals in the wild
* How to apply their skills and understanding through Project Based Learning
* How to use Design Thinking to generate, produce and test their solutions
* To do develop their creative thinking and growth mindset

**Victorian Curriculum Links**

* Business & Economics – Explore the nature of innovation and discuss how businesses seek to create and maintain a competitive advantage in the market, including the global market
* Business & Economics – Explore and observe the characteristics of entrepreneurs and successful businesses
* Design & Technologies – Generate, develop and test design ideas, plans and processes using appropriate technical terms and technologies including graphical representation techniques
* Critical & Creative Thinking – Consider how problems can be segmented into discrete stages, new knowledge synthesised during problem-solving and criteria used to assess emerging ideas and proposals
* Personal & Social Capability – Perform in a variety of team roles and accept responsibility as a team member and team leader, assessing how well they support other members of the team

**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)

3. Test (p. 6)

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**Before Your Excursion**

1. Design Brief (p. 2)

2. Video Research (p. 3)

3. Plan Your Visit (p. 3)

**During Your Excursion**

1. Conservation Spotto
(p. 4)

2. Story of Stuff (p. 4)

**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/running-a-zoo-9-10-terms-1-2-2020/](http://www.zoo.org.au/education/excursions/running-a-zoo-9-10-terms-1-2-2020/) (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. Video Research**

**This activity will:** will develop student knowledge about Werribee Zoo’s

current projects that help raise money for endangered animals.

**Preparation:**

Open these videos:

* ‘Zoos Victoria is Fighting Extinction’ – [www.youtube.com/watch?v=qPrUvuKJs6E](http://www.youtube.com/watch?v=qPrUvuKJs6E)
* ‘How much do you know about African Wild Dogs’ – [www.youtube.com/watch?v=0wAcq8Dw-vg](http://www.youtube.com/watch?v=0wAcq8Dw-vg)
* ‘Rhino Fund Uganda’ – [www.youtube.com/watch?v=PGCdwXb23DY](http://www.youtube.com/watch?v=PGCdwXb23DY)
* ‘Zoos Victoria staff get to know Beads for Wildlife’ – [www.youtube.com/watch?v=UUIdUtvnOHQ](http://www.youtube.com/watch?v=UUIdUtvnOHQ)

**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. Introduce African animals by watching the videos ‘How much do you know about African Wild Dogs’ and ‘Rhino Fund Uganda’.
4. Write a list of what has been learnt so far about endangered African animals.
5. Watch the ‘Zoos Victoria staff get to know Beads for Wildlife’ video and ask students:
	* How has the Melako community changed in ways that help wildlife?
	* What are the benefits for community in finding a stable income?
	* How has the retail team at Zoos Victoria contributed to the Beads for Wildlife project?
6. Write a list of questions that students have about the STEM Design Challenge.
7. Remind students that they will continue their research during their visit to Werribee Zoo.



**3. Plan Your Visit**

**This activity will:** help your group prepare for your excursion to Werribee 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-werribee-open-range-zoo/](https://www.zoo.org.au/education/plan-your-visit/plan-your-visit-werribee-open-range-zoo/)
2. Open the Zoo map – [www.zoo.org.au/werribee/werribee-zoo-map/](https://www.zoo.org.au/werribee/werribee-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 when we’re at the Zoo?”

**Teaching Tip:** Ask your students about how they would like to record their research. 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**

**1. Conservation Spotto**

**This activity will:** help students to learn how Werribee Zoo raises awareness and funding to help endangered animals.

**Instructions:**

1. Explain to students that Werribee Zoo has many projects that educate visitors and encourage them to take action for conservation. For example, you might have heard about the project ‘They’re Calling on You’ that educates people about the impact that mining for mobile phone parts has on gorillas. This project encourages people to recycle their old mobile phone so the parts can be reused.
2. As you walk around Werribee Zoo, ask students to look out for:
* Signs and keeper talks that share information about conservation
* Signs and keeper talks that encourage people to take action
* Ways that visitors can give money to the Zoo
1. Your safari tour will also include information about conservation.

**Teaching Tip:** Slowing down will help students deepen their learning and reduce fatigue.



**2. Story of Stuff**

**This activity will:** build your students understanding of the life cycle of everyday items.

**Preparation:** You will be using a paper Werribee Zoo map for this activity

**Instructions:**

1. Explain to students that every product that we use in our daily lives has a story. Together you are going to tell the story of a Werribee Zoo map.
2. Show students your paper Werribee Zoo map and ask:
	* What is this map made of? (It’s made from recycled paper)
	* Where do you think the Zoo go this paper from? (It was bought from an online store)
	* What materials were used to make this paper? (Paper from the recycling bin, water, bleach, vegetable ink)
	* Where might the paper have been made? (It was made in a factory in Sydney)
	* How did the paper travel to the Zoo? (The paper travelled by plane and then by truck)
	* How long will this map be used for? (Most people only use their map for one day at the Zoo)
	* What should we do with the map when we have finished with it today? (Reuse or recycle it)
3. This is called ‘Life Cycle Thinking’. Companies use it when they want to make a new product. It helps them think about how much the product will cost, what materials will be used and what impact it will have on the environment.
4. Encourage students to use ‘Life Cycle Thinking’ as they start to think about what product they would like to design for fundraising for African Wild Dogs.

Werribee 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 to refresh students’ memories of the STEM Design Challenge.
2. Divide students into small teams. 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 and that there are no bad 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.

**You will need:**

* The idea lists that teams created during ‘100 Ideas in 10 Minutes’
* 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.

1. 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?
2. What might students have to think about during decision-making? e.g. timelines, materials available, personal strengths of each team member
3. Ask each team to decide on one idea that everyone wants to prototype and test.
4. Do a fast check on the Internet. Has someone already thought of this idea? Did it work? Can it be improved?
5. 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 (Sam the Shop Manager) 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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