

## 2020-2021 ENRICHMENT DESIGN CHALLENGE

The ZOOMS STEM Design Challenge offers students a chance to develop a solution to a ‘real’ problem faced by Zookeepers and staff at the Minnesota Zoo. While designing an engaging enrichment for an animal, the problem will challenge students to use the engineering design process while applying their science and math knowledge, creativity, and problem solving skills to best solve the problem and present a solution.



### THE CHALLENGE

As one of the most beloved animals at the Minnesota Zoo, our 9-year-old female red panda, Min, can often be found resting on her favorite tree branch in her Tropics Trail habitat that she shares with two Transcaspian urials. Described as sweet and shy, Min has been a challenge to provide enrichment for. In the past, she has shown minimal interest and hesitates to explore anything when the two urials are near. Zookeepers have identified five goals for Min that they would like help achieving through enrichment.

These goals include:

- increasing her activity levels
- encouraging her to explore more of her enclosure
- helping her gain confidence to explore enrichment around the urials
- finding a better way to cool down in the Tropics humidity.
- helping Min through the transition of transferring from the Tropics to a share a more ideal home outdoors on the Northern Trail with the Sichaun takins as detailed in the new master plan.



*Transcaspian urial*

While considering these goals and Min’s individual needs, developing an enrichment that also encourage natural behaviors will ensure she stays happy, healthy, and mentally engaged.

## THE TASK

The enrichment design challenge will require students to design a durable and unique enrichment device to engage the Minnesota Zoo's female red panda, Min.

**Level 1:** Design one enrichment device that meets a zookeeper goal for Min.

**Level 2 and 3:** Design two enrichment devices to meet two different zookeeper goals for Min.

Students will need to make special considerations such as:

- What natural behaviors of the species will be encouraged through this enrichment?
- How can the enrichment be designed with the current exhibit layout in mind?
- How will you expect the animal to interact with the enrichment?
- How will the enrichment be designed to meet zookeeper goals?
- What materials are most durable and safe to use with the animal?
- How will the animal's individual preferences and needs be considered?

## A CLOSER LOOK AT ENRICHMENT

Animals in zoos do not have the same opportunities for physical and mental stimulation that wild animals do, so zookeepers provide the animals with objects or changes to their environment that will stimulate the behaviors of healthy wild animals. Enrichment can help to improve animal welfare and reduce stress.

Enrichment gives animals something to think about, encourages exercise and gives animals a degree of control of their environment by giving them choices. Basically, enrichment helps keep animals active and interested in their environment. Zoos may do this by presenting objects for animals to explore (manipulable), or changing how their food is presented to encourage natural foraging and hunting behaviors (dietary enrichment).

- Encourage animals to use their natural abilities
- Increase their activity
- Allow them to make choices
- Give them new experiences.
- Animals in a stimulating environment have fewer physical problems, breed more successfully, are better parents and live longer.
- Challenges and stimulation make animal life in captivity more normal and visitors are more likely to see natural behavior from behaviorally-enriched animals.



## PROJECT REQUIREMENTS

### Level 1: 3<sup>rd</sup> – 5<sup>th</sup> Grade Requirements

- Develop **one** enrichment device that meets a zookeeper goal for Min.
  - \*May represented in picture form or as a 3D prototype.
- Prototype Blueprint: Measurements/Dimensions of Enrichment**
  - Length, width, height of key features, including dimensions of openings/holes if applicable (English or metric) and suggested materials for real life design.
  - Optional:
    - Volume: How much food it can hold
    - Area of any openings/holes
    - Area of any key measurable surfaces

### Level 2: 6<sup>th</sup>-8<sup>th</sup> Grade Requirements

- Develop **two** enrichment devices to meet two different zookeeper goals for Min.
  - \*May represented in picture form or as a 3D prototype.
- Prototype Blueprint: Metric Measurements/Dimensions of Enrichments**
  - Length, width, height of key features and suggested materials for real life design.
  - If applicable – include measurements for:
    - Volume/amount of food it can hold
    - Circumference of any openings/holes
    - Surface Area of sides

### Level 3: 9<sup>th</sup>-12<sup>th</sup> Grade Requirements

- Develop **two** enrichment devices to meet two different zookeeper goals for Min.
  - \*May represented in picture form or as a 3D prototype.
- Prototype Blueprint: Metric Measurements/Dimensions of Enrichments**
  - Detailed specifications of actual materials to be used (ex: *color, thickness, strength, weight, material, estimated cost if possible*)
  - Dimensions of all enrichment design features
    - Include height/depth measurements for designs that are hung or submerged
  - If applicable - include measurements for:
    - Volume/amount of food it can hold
    - Circumference of any openings/holes
    - Surface Area of sides





MINNESOTA ZOO®

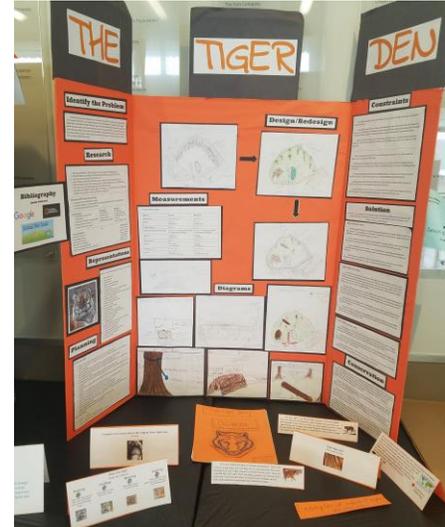


## ADDITIONAL REQUIREMENTS FOR ALL LEVELS

**Presentation of Engineering Process:** A visual presentation documenting each step during the design process.

High Tech Presentation Options:	Low Tech Presentation Options:
<ul style="list-style-type: none"> <li>• Google Slides (preferred)</li> <li>• Key Note</li> <li>• Power Point</li> <li>• Prezi</li> </ul>	<ul style="list-style-type: none"> <li>• Tri Fold Board</li> <li>• Poster</li> <li>• Booklet</li> </ul>

*Minimum required sections for teachers preferring adapted/reduced written/typed material for their students (at teacher's discretion). Students should still be prepared to either address or answer questions related to non-required sections.*



**Problem:** Why is this solution needed?

**Research:** What are the natural behaviors of the animal? How does the species spend its day in the wild? What adaptations and safety considerations are important to know before designing? What are typical enrichments used with the animal? What does the animal like/dislike?

**Constraints:** What factors restrict a perfect design? Could your solution exist in real life? If the animal was to use your prototype, what might impact a successful use of the enrichment?

**Planning:** Brainstorm possible ideas. Save sketches, journal notes, and documents created through the process to document evolution and collaboration of ideas.

**Final Design:** Select your best idea, design it, and then describe it. How does it solve the design challenge?

- How did you modify your final design solution idea along the way?
- What will the design be called?
- What are the main features and real life materials?
- What are the dimensions/measurements?
- Are there instructions for the zookeeper for how to use and clean it?
- How does it meet the enrichment goals set by the zookeepers?

**Conservation Connection:** How does designing and using enrichment help the Minnesota Zoo with conservation efforts? How is the animal doing in the wild? What are researchers learning about the animal and what are the methods they are using to study them? How can enrichment help encourage visitors to want to act to help protect wildlife?



## EVALUATION

1. **Creative Ability (10 pts):** Approach and solution is innovative and unique
2. **Use of Engineering Process (30 pts):** Demonstration of how the engineering design process was used in the development of the enrichment design solution. Evidence of design/redesign and connection to conservation was addressed.
3. **Addressing Project Requirements (30 pts)**
  - a. Does the design meet zookeeper enrichment goals?
  - b. How does the enrichment match the animal as an individual?
  - c. Are the materials and planned location for use safe for the animal using it?
  - d. Does the enrichment encourage natural behaviors of the species?
  - e. Instructions on use, cleaning, and implementation of enrichment for zookeeper is included
  - f. Prototype blueprint includes measurements of key features, openings, dimensions, etc.
4. **Teamwork/Presentation (15 pts)** Effective communication, organized presentation, demonstrates collaboration. Presentation is well organized and follows guidelines of what to include.

## Conditions

- Open to all 3rd-12<sup>th</sup> grade teachers and their students
- Students should ideally work in groups of 2-4 students.
  - **Note:** If students are unable to collaborate with a school classmate, they may choose a ‘thought partner’ (sibling, parent, neighbor) to demonstrate collaboration and document feedback on design ideas from another perspective during the planning phase. This is up to the teacher’s discretion.
- Teachers must register to participate no later than Friday November 13<sup>th</sup>, 2020.

## ASSESSING PROJECTS

### Teacher Choice

Teachers may use the Zoo evaluation rubric and evaluate projects individually or host their own Design Challenge Virtual/Classroom Showcase.

### Virtual Feedback Session with the a MN Zoo Education Staff

*While we hope to offer this as an option, due to limited and undetermined staff availability during school year, this is tentative. Teachers will be notified if/when this option becomes available.*

An education staff member may be available to listen to student presentations or provide feedback on design solutions during the planning phase. Appointments for zoo staff to meet virtually with your students must be scheduled 2 weeks in advance. Please contact [Kristi.Berg@state.mn.us](mailto:Kristi.Berg@state.mn.us) to arrange.



MINNESOTA ZOO®



## ZOOMS Exhibition

In a typical year, we would have teachers submit their top projects to be reviewed and invite select students to attend our ZOOMS Exhibition in March. Due to the uncertainty of our current situation, we will be prepared to have students exhibit their work virtually or in person depending on Minnesota Department of Health guidelines at the time. Details on the format of the exhibition will be shared with teachers at a later date.

## TEACHER SUPPORT

Teacher and student participation in the ZOOMS Design Challenge is FREE! Teachers will be given access to Basecamp, an online communication portal for teachers to access digital resources to support implementation of the design challenge with their students.

This year, to provide more flexibility for teachers to participate, we will be offering the design challenge training in the form of a self-guided teacher power point along with a few other supporting resources that teachers can access on their own timeline when they are ready to plan and gain important background information to share with their students. Teachers will also receive ongoing support through Basecamp from zoo staff throughout the school year to assist in answering student questions, clarifying project requirements, and helping with curriculum planning.



## REGISTRATION

Register online by visiting [mnzoo.org/stem](http://mnzoo.org/stem) and clicking the 'Apply Now' link under the 2020-2021 Design Challenge.



MINNESOTA ZOO®



### IMPORTANT DATES

Closing date for Registration	Friday November 13, 2020
ZOOMS Design Challenge Self-Guided Training	Will be available on Basecamp when teachers are given access in late August.
Dates listed below are <b><i>tentative</i></b> but should be used as a guide for project completion. The ZOOMS Exhibition format will be announced at a later date.	
Closing Date for Top Project Submissions	Thursday February 11, 2021 by 12 pm
Projects Advancing to Exhibition Notified	Wednesday February 17, 2021
Elementary ZOOMS Design Challenge Exhibition	Tuesday March 16, 2021
Middle School ZOOMS Design Challenge Exhibition	Wednesday March 17, 2021
High School ZOOMS Design Challenge Exhibition	Thursday March 18, 2021

### CONTACT

Contact Kristi Berg for further questions and information.

Email: [STEM@mnzoo.org](mailto:STEM@mnzoo.org)

Visit [mnzoo.org/stem](http://mnzoo.org/stem) to learn more!

Thank you to our  
**ZOOMS! Sponsors**



Burlington Northern Santa Fe  
Donaldson Company  
J.A. Wedum Foundation  
Verizon

