2019-2020 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. From designing an enrichment, to building a model of a renovated animal exhibit, 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. Selected students are invited to showcase their design challenge solution in the ZOOMS Design Challenge Exhibition in March at the Minnesota Zoo for a chance to win a backstage pass experience with our animals!



THE CHALLENGE

It has almost been 5 years since the 910,000 gallon tank in Discovery Bay became home to three female Hawaiian Monk Seals: Koa, Paki, and Ola. Currently, the Minnesota Zoo is the only location outside Hawaii to see this critically endangered species. These animals pose a particularly unique challenge for zookeepers when providing enrichment as majority of the seals have visual impairments that must be considered when safely introducing anything new for them to explore. Zookeepers would like to find new and creative ways to encourage the natural behaviors and senses of these deep water divers while carefully considering their safety and sight restrictions.

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THE TASK

The Enrichment Design challenge will require students to design a durable and unique enrichment device to engage the Hawaiian Monk Seals at the Minnesota Zoo.

Level 1: Design one enrichment device to be used by one of the Hawaiian Monk Seals: Koa, Paki, or Ola.

Level 2 and 3: Design two separate enrichment devices for choice of two Hawaiian Monk Seals: Koa, Paki, or Ola.

Students will need to make special considerations such as:

- What type of enrichment would serve the species best?
- 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 encourage natural behaviors?
- What materials are most durable and safe to avoid immediate destruction from the animal?
- How will the animals' visual impairments be taken into consideration?

A CLOSER LOOK AT ENRICHMENT

Animals in zoos don't 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.

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PROJECT REQUIREMENTS

Level 1: 3rd – 5th Grade Requirements

- ☐ Develop **one** enrichment prototype to meet the enrichment needs of one of the Hawaiian Monk Seals: Koa, Paki, or Ola.

- ☐ **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: 6th-8th Grade Requirements

- ☐ Develop **two** enrichment prototypes. Design an enrichment specific for a choice of two Hawaiian Monk Seals: Koa, Ola, or Paki.

- ☐ **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: 9th-12th Grade Requirements

- ☐ Develop **two** enrichment prototypes. Design an enrichment specific for a choice of two Hawaiian Monk Seals: Koa, Ola, or Paki.
  - Prototype must be a 'workable' design. *(ex: If automated to release treats, enrichment prototype must be able to perform the task)*
    - Note: Prototype does not need to be made out of actual real life materials to be workable.

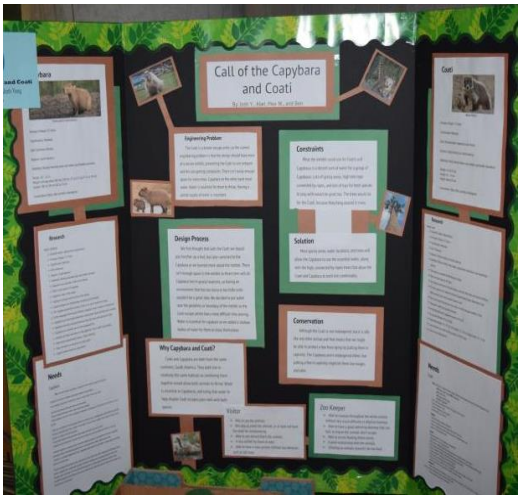
- ☐ **Prototype Blueprint: Metric Measurements/Dimensions of Enrichments**
  - Detailed specifications of actual materials to be used (ex: *color, thickness, strength, weight, material, estimated cost if possible*)
  - Dimensions of all enrichment design features
    - Include height/depth measurements 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



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ADDITIONAL REQUIREMENTS FOR ALL LEVELS



Poster Tri-Fold: A visual presentation documenting the following:

- ☐ ***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 other facts 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 solutions. How did you modify your design along the way? Save sketches and documents created through the process to document evolution of idea.
- ☐ ***Final Design*:** Select best solution. What will the design be called? What individual does it serve? What are the main features? What are the dimensions/measurements? What are the real life materials and specifications (Level 3) that are used to make the design?
- ☐ ***Solution**:* How does the enrichment act as a solution to the problem?
    - Does the enrichment encourage natural behaviors? How?
    - Is the enrichment object safe, functional, and engaging?
    - Are there instructions for the zookeeper for how to use and clean the enrichment?
    - Is the enrichment challenging without being too difficult? It is realistic?
    - 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? 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):** Presentation and demonstration of engineering design process was used in development of enrichment design solution. Evidence of design/redesign and connection to conservation.
3. **Addressing Solution Requirements (30 pts)**
    a. How does the enrichment match the animal as an individual?
    b. Are the materials and planned location for use safe for the animal using it?
    c. Does the enrichment encourage natural behaviors of the species?
    d. Instructions on use, cleaning, and implementation of enrichment for zookeeper is included
    e. Prototype blueprint includes measurements of key features, openings, dimensions, etc.
4. **Teamwork/Presentation (15 pts)** Effective communication, organized presentation, demonstrates collaboration. Tri- fold board is well organized and follows guidelines of what to include.

ADVANCING TO THE ZOOMS EXHIBITION

How do I select the top projects to advance to the ZOOMS Exhibition?

Host an Exhibition Event – Invite MN Zoo staff to attend

One or two education staff members may be available to attend to listen to student presentations. Appointments for zoo staff to attend your school's exhibition must be scheduled 2 weeks in advance. We cannot guarantee availability to attend. Please contact Kristi.Berg@state.mn.us to arrange.

Classroom Showcase/Teacher Choice

Teachers may use the evaluation criteria rubric and evaluate projects individually or host their own Design Challenge Classroom Showcase with the teacher submitting the top student designs to the Minnesota Zoo before the deadline in mid-February.

How many projects can I submit to the Zoo for review?

- Each teacher may submit maximum of **¼** of the number of projects created**.**
    - *Example: 15 total projects = 3 to 4 project submissions*
- All teachers can submit a minimum of one project
- Not all projects submitted will advance to the March ZOOMS Exhibition. Projects will be narrowed by zoo staff and announced in mid-February.
- All schools are guaranteed to have one group from their school advance to the exhibition. Only 40 elementary, 40 middle school, and 40 high school projects will be chosen.

What must be included in each project submission?

- [ ] Online Google Submission Form
    - Student written description of the solution and how it met design requirements
    - Shared link to google drive folder of group project photos
        - 1-2 Photos of up close views Tri-Fold Board
        - 1-2 Photos of prototype (may be with or without students)

Conditions

- Open to all 3rd-12th grade teachers and their students
- Students must work in a group of 2-4 students
- Teachers must register to participate no later than Friday September 13th.

REGISTRATION

Teacher and student participation in the ZOOMS Design Challenge is FREE! Teachers can also attend a full one-day training on **Tuesday September 24th from 9 am-3 pm** to gain background knowledge of the challenge and gather resources to implement into the classroom.

Register online by visiting mnzoo.org/stem and clicking the 'Apply Now' link under the 2019-2020 Design Challenge. The first 10 elementary teachers, 10 middle school teachers, or 10 high school teachers who register will receive a $200 stipend upon completion of the following:

- Attendance to one of the ZOOMS Design Challenge Workshops offered
- Participate in a pre/post ZOOMS program assessment surveys
- Implement the ZOOMS design challenge in your classroom
- Submit student projects to be reviewed by the Minnesota Zoo in mid-February.
- Send chosen advancing teams to participate in the ZOOMS Design Challenge Exhibition in March.

FIELD TRIP FINANCING OPPORTUNITIES

There may be financial assistance to fully fund or reduce the cost for your school to visit the Minnesota Zoo to help support implementation of the ZOOMS Design Challenge. Certain criteria must be met in order to qualify. Please inquire by emailing STEM@mnzoo.org for further questions.

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IMPORTANT DATES

Closing date for Registration	Friday September 13, 2019
ZOOMS Design Challenge Workshop	Tuesday September 24, 2019 9 am – 3pm
Design Challenge Implementation Support *(Optional)*	Saturday October 12, 2019 9 am -12 pm
Closing Date for Top Project Submissions	Thursday February 13, 2020 by 12 pm
Projects Advancing to Exhibition Notified	Wednesday February 19, 2020
Elementary ZOOMS Design Challenge Exhibition	Tuesday March 17, 2020 9 am-2:30 pm
Middle School ZOOMS Design Challenge Exhibition	Wednesday March 18, 2020 9 am-2:30 pm
High School ZOOMS Design Challenge Exhibition	Thursday March 19, 2020 9 am -2:30 pm

CONTACT

Contact Kristi Berg for further questions and information.

Email: STEM@mnzoo.org
Phone: 952-431-9243
Visit mnzoo.org/stem to learn more!



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