2019-2020 EXHIBIT DESIGN CHALLENGE

The ZOOMS STEM Design Challenge offers students a chance to develop a solution to a ‘real’ problem faced by Zoo Keepers 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

For 10 years, most of the nocturnal exhibit hallway located at the center of the Tropics Trail has sat nearly empty and boarded up. Currently the zoo is seeking funding to revitalize this space with a new theme: Creatures of the Canopy. The zoo hopes for the space to lead visitors on an immersive walk through the layers of the rainforest and encounter animals that live in each level while also providing an interactive children’s play area. Included in this plan are the current nocturnal hallway residents: The Linne’s two-toed sloth pair and baby, Norman, Lily and Tofu, and the 14 ft. Burmese python, Nikita. The zoo would like help in redeveloping this area for these animals and choosing new smaller rainforest species to add to the space. The final plan should balance keeper, visitor, and animal needs while also highlighting important rainforest conservation issues.
THE TASK

The exhibit design challenge will require students to redesign and build an exhibit model of the new Creatures of the Canopy exhibit to meet animal, visitor, and keeper needs. Students will need to make special considerations such as:

- What will need to be changed/added to meet keeper, animal and visitor needs?
- Where and how big should the new animal spaces be for the sloths and python?
- How can a small educational children’s play area be added while fitting with the theme?
- How can the animals be organized in the space to lead visitors on an immersive walk through the levels of the canopy?
- What will guests learn from visiting this space about rainforest conservation issues?
- Which rainforest animal(s) could be chosen to add to the space? What would their space look like?

A CLOSER LOOK AT EXHIBIT DESIGN

Zoos are frequently welcoming new animals, whether it be in a brand-new exhibit or in an existing one. Whatever the case may be, the zoo’s exhibit designer’s job is to design the best environment for the animals as well as the keepers and the visitors.

Designing an exhibit starts by researching the animal’s natural environment to learn all they can about the animal’s habitat, including the plants, climate, and topography. Research might also include a consideration of the animal’s behavior, such as how much space it needs, if it climbs, jumps, or swims, and how strong it is.

Working cooperatively with curators, zookeepers, educators, artists, engineers, and many others, exhibit designers must also consider the needs of the keepers, through creating functional and easy to clean spaces, and the visitors, by creating exhibits that are educational, interactive, and deliver an important message about conservation. Balancing these needs in one design is a difficult job with many differing opinions and constraints!
PROJECT REQUIREMENTS BY LEVEL

Level 1: 3rd – 5th Grade Requirements

☐ Development of a **3D model** that closely resembles the shape/size of the current exhibit space. (No dioramas)
  - Choose at least 1 more rainforest animal to exhibit in the space

☐ **Profile drawing** (See Figure 1) OR **basic bird’s eye view blueprint** (See Figure 2)
  - Include measurements/dimensions of key exhibit features (tree height, barrier height, water depth etc.)
  - Label key features and design elements.

Level 2: 6th-8th Grade Requirements

☐ Development of a **scaled 3D model** according to current Zoo exhibit blueprint measurements.
  - Choose at least 2 more rainforest animals to exhibit in the space

☐ **Profile drawing** of the exhibit (See Figure 1)
  - Drawing should represent panoramic view of exhibit
  - Label key exhibit features (trees, ramps, enclosure barriers)

☐ **Scaled bird’s eye blueprint including:** (see Figure 2)
  - Labeling of key features and design elements
  - Include chart of scaled and real-world measurements of exhibit features as well as the scale being used.

Level 3: 9th-12th Requirements

☐ Development of a **scaled 3D model** according to current Zoo exhibit blueprint measurements.
  - Choose at least 3 more rainforest animals to exhibit in the space

☐ **Profile drawing** of the exhibit (See Figure 1)
  - Drawing should represent panoramic view of exhibit
  - Label key exhibit features (trees, ramps, enclosure barriers)

☐ **Scaled bird’s eye blueprint including:** (see Figure 2)
  - Use of technology (CAD) is encouraged to draft an accurately scaled blueprint, but it is not required to participate.
  - Labeling of key features and design elements
  - Include chart of scaled and real-world dimensions of exhibit features as well as the scale being used.
  - Mark changes in elevation for both land and water features.
  - Total volume/area of the enclosure(s) and any water or shelter features.
  - Include any important material and safety specifications for real world materials used in exhibit (ex: glass thickness, fence or visitor barrier height, water depth, type of plants being used, dimensions of zookeeper and shift doors)

*Figure 1*
Profile drawing design of the snow monkey exhibit.

*Figure 2*
Bird’s-eye blueprint design of the snow monkey exhibit at the Minnesota Zoo.
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? What does its natural habitat look like? Does research support decision-making throughout the design process?

- **Constraints:** What factors prevent a perfect design? Could your solution exist in real life? What issues might you encounter if your plan was chosen to build?

- **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 are the main features of the new exhibit? What are the measurements/dimensions? How does it differ from the current space? Is there a theme? What are the real life materials that would be used?

- **Solution:** How does the exhibit design act a solution to the problems mentioned in the challenge?
  - How does the design meet animal, keeper and visitor needs?
  - Is the space functional, safe, and does it mimic the animal’s natural habitat?
  - Does the new design include any zoo specific requested features?
  - Does the new design improve current challenges of the exhibit?

- **Conservation Connection:** How does exhibit design help the Minnesota Zoo with conservation efforts? How is the animal doing in the wild? What can visitors learn at the exhibit to help them act on behalf of 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 exhibit redesign solution. Evidence of design/redesign and connection to conservation.
3. **Addressing Solution Requirements (30 pts)**
   a. How does the exhibit balance and meet the needs of animal, keeper, and visitor needs?
   b. Is the design realistic? Is the new design an overall improvement for the space? Have all challenges of the space been considered and solved?
   c. Model and birds eye blueprint represents a scaled version of the actual zoo space. (Level 2-3) or represents the general shape of the exhibit (Level 1)
   d. Profile drawing or birds eye view includes measurements of key features (Levels 1-3)
4. **Teamwork/Presentation (15 pts)** Effective communication, organized presentation and trifold, team demonstrates collaboration.

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 (provided in workshop) 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.

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 to qualify to advance to the exhibition.
- 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 2018-2019 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:

- Attend the ZOOMS Design Challenge Workshop in September
- Participate in pre/post ZOOMS program teacher and student 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.
### IMPORTANT DATES

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