MINNESOTA ZOO®

ZOOMS!
STEM DESIGN CHALLENGE
PRESENTED BY FLINT HILLS RESOURCES

2018-2019 EXHIBIT DESIGN CHALLENGE

The ZOOMS STEM Design Challenge presented by Flint Hills Resources 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

The Minnesota Zoo is home to six abandoned moose calves that arrived in the summer of 2014. Currently visitors may see either one or two moose roaming at a time in their habitat along the Northern Trail. As the 40th year anniversary of the Minnesota Zoo is underway, the zoo is looking to revitalize the moose exhibit to highlight the amazing conservation work being done to save the declining wild moose population in Minnesota. Although planning for a moose exhibit is only in the brainstorming phase, zoo exhibit designers hope to split the exhibit in 2 to allow for more than 1-2 moose to be visible for visitors at a time. They'd also like new interpretive theming, more immersive visitor spaces, and better viewing angles. Keepers are also hoping for a better training and enrichment area to improve visibility during scheduled demonstrations available to the public. The Minnesota Zoo would love to see some creative design ideas to help guide their brainstorm of what a new moose exhibit could look like while better accommodating the needs of the moose, keepers, and visitors.

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THE TASK

The exhibit design challenge will require students to redesign and build an exhibit model of the current moose exhibit to meet moose, 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?
- ☐ How can the space be used to provide better training and enrichment opportunities?
- ☐ Can the new design improve the quality of the visitor's experience and improve visibility of the moose?
- ☐ What will guests learn from visiting this exhibit? How can the space be redesigned to be more immersive while keeping a conservation focus?
- ☐ How can the exhibit be split in two to allow more moose to be on exhibit at once without losing its naturalistic feel?

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!

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PROJECT REQUIREMENTS

Level 1: 3rd – 5th Grade Exhibit Design Challenge

- ☐ Development of a **3D model** that closely resembles the shape/size of the current moose exhibit space. (No rectangular dioramas)
- ☐ **Profile drawing** of the exhibit (See Figure 1 or Figure 2)
  - Identify all of viewing angles from each key visitor location. (see Figure 2)
- ☐ **Basic bird's eye view blueprint** of exhibit including measurements/dimensions of key exhibit features (tree height, barrier height, etc.)
  - If applicable to design, include substrate or water feature depth.



Figure 1
Profile drawing of an exhibit.

Level 2: 6th-8th Grade Exhibit Design Challenge

- ☐ Development of a **3D model** that is scaled according to moose exhibit Zoo blueprint measurements.
- ☐ **Scaled bird's Eye blueprint of new design which includes:**
  - **Label key features** and their real-world measurements as well as the **scale being used**.
  - Length of walls/sides of enclosure including viewing space for visitors and keeper access areas.
  - Total square ft. of the enclosure and any water or shelter features.
- ☐ **Profile drawing** of the exhibit (See Figure 1 or Figure 2)
  - Identify all of viewing angles from each key visitor location. (see Figure 2)
  - Label key exhibit features (trees, ramps, enclosure barriers)

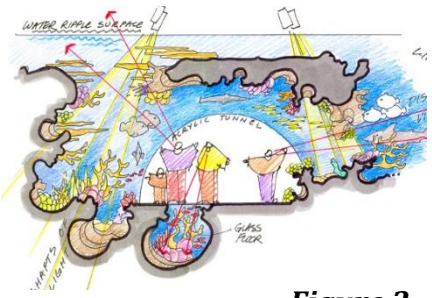

Figure 2
Viewing angles drawn (in red) in a profile drawing of an exhibit.

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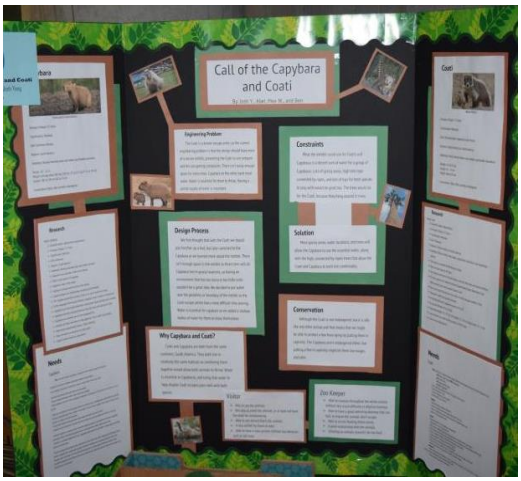
ADDITIONAL REQUIREMENTS FOR ALL LEVELS



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

- ☐ ***Problem***: Why is this solution needed?
- ☐ ***Research*:** What are the natural behaviors of the animal? 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? Include a final profile drawing and blueprint.
- ☐ ***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?
    - What environmental enrichment opportunities are there?
    - Is the space functional, safe, and does it mimic the animal's natural habitat?
    - 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?

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EVALUATION

Exhibits will be evaluated based on the following criteria: *(A rubric will be provided at the teacher workshop)*

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 (20 pts)**
    a. How does the exhibit balance and meet the needs 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?
    c. Model and blueprint (Level 2) represents a scaled version of the actual zoo space.
    d. Profile drawing including measurements of key features
4. **Teamwork/Presentation (15 pts)** Effective communication, organized presentation, demonstrates collaboration.

ADVANCING TO THE ZOOMS EXHIBITION

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

Option 1: 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.

Option 2: 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.

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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 and 40 middle school projects will be chosen.

What must be included in each project submission?

☐ Online Google Submission Form
(Link to submission form will be shared at fall teacher workshop)

- 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 students with prototype

Conditions

- Open to all 3rd-8th 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 14th.

REGISTRATION

Teacher and student participation in the ZOOMS Design Challenge is FREE! Teachers can also attend a full one-day training on **Tuesday September 25th 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 and 10 middle 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.

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IMPORTANT DATES

Closing date for Registration	Friday September 14, 2018
ZOOMS Design Challenge Workshop	Tuesday September 25, 2018 9 am – 3pm
Design Challenge Implementation Support *(Optional)*	Saturday October 13, 2018 9 am -12 pm
Closing Date for Top Project Submissions	Thursday February 14, 2019 by 12 pm
Projects Advancing to Exhibition Notified	Wednesday February 20, 2019
Elementary ZOOMS Design Challenge Exhibition	Tuesday March 19, 2019 9 am-2:30 pm
Middle School ZOOMS Design Challenge Exhibition	Thursday March 21, 2019 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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