ZooMS! Exhibit Design Challenge

Minnesota Zoo

2016-2017

The ZooMS 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 engineering a model of a renovated animal exhibit, the problem will challenge students to use their science and math knowledge, creativity, problem solving, and research skills during the engineering design process in order to best solve the problem and present a solution. Selected students will then be invited to showcase their design challenge solution in the ZooMS Design Exhibition in March at the Minnesota Zoo for a chance to win a backstage pass experience with our animals!



The Challenge

The Minnesota Zoo opened in Apple Valley, MN nearly 38 years ago. Many changes have occurred over this time including the addition of new exhibits, new animals, and brand new experiences for visitors to enjoy. The snow monkey exhibit, found at the heart of the zoo, is one exhibit that remains largely unchanged. The old cement 'pit' style, currently seen in this exhibit, have faded away. With visitor belongings falling in the habitat, shift doors freezing shut, and keeper access limited with machinery to carry in deadfall, it is a space that possesses challenges for everyone because of its age. As a trend setter in immersion exhibits with a conservation focus, the Minnesota Zoo would like to bring the snow monkey exhibit into the 21st century and provide the keepers, visitors, and large troop of monkeys, a more functional, engaging, and enriching habitat.

The Task

The Exhibit Design Challenge will require students to redesign and build an exhibit model of the current Snow Monkey (Japanese Macaque) exhibit to meet monkey, 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 more environmental enrichment opportunities?
- ☐ Can the new design improve the quality of the visitor's experience and prevent objects from falling in to improve the safety of the guests and the animals?
- ☐ What will guests learn from visiting this exhibit? How can the space be redesigned to be more immersive?
- ☐ How can a new design allow keepers to better care for the monkeys and educate guests about the work and role of the Minnesota Zoo?
- ☐ In what ways can the design encourage the new species to position itself closer to visitors for up close interaction?

A Closer Look at Zoo 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 look into 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!

The Solution Requirements

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



Figure 1
Profile drawing of an exhibit.

- Development of a **3D model** that closely resembles the shape/size of the current snow monkey 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)
  - ☐ Include **measurements/dimensions of key exhibit features** (tree height, barrier height, etc.)
    - If applicable to design, include substrate or water feature depth.

Level 2: Middle School Exhibit Design Challenge

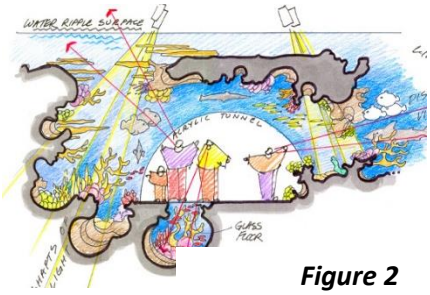
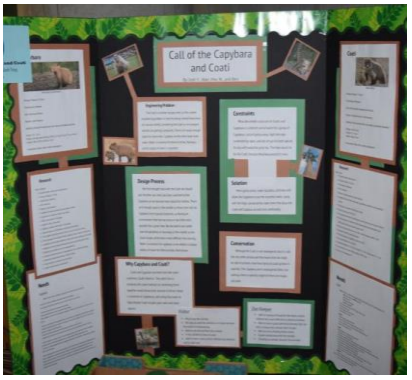


Figure 2
Viewing angles drawn (in red) in a profile drawing of an exhibit.

- Development of a **3D model** that is scaled according to zoo blueprint measurements.
- **Birds Eye detailed 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)

ALL Levels of student submissions for the exhibit challenge will need to include:

- ☐ **3D Exhibit**: Hand built scale model of renovated Snow Monkey space.
- ☐ **Poster Tri-Fold**: A visual presentation documenting the following:



  - ❖ ***Identify Problem***: Why is this solution needed?
  - ❖ ***Research*:** Does the exhibit design demonstrate knowledge of the animals it serves and their environment? Were natural behaviors of the species and common zoo husbandry practices considered when determining materials and exhibit features?
  - ❖ ***Design Process:*** Prototype ideas. How did you modify your design along the way? Save sketches and documents created through the process
  - ❖ ***Prototype Description*:** What are the main features of the exhibit? What are the measurements/dimensions? How will animals, keepers, and visitors interact with the space? How does it differ from the current space? Is there a theme?
  - ❖ ***Constraints*:** What factors prevented a perfect design? Could your solution exist in real life? What issues might you encounter if your plan was chosen to build?
  - ❖ ***Solution***: How does the exhibit design act a solution to the problems mentioned in the challenge?
    - Does the exhibit include opportunities for environmental enrichment?
    - Is the space functional, safe, and does it mimic the animal's natural habitat?
    - Does the space include engaging interpretation and a creative use of space for viewing opportunities?

- ***Conservation Connection**:* How does the solution/process connect to conservation efforts? What is the conservation story that can be shared with guests? What does exhibit design have to do with conservation?

The 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?
    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 (10 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 at your school attended by Minnesota Zoo Staff
One or two education staff members may be available to assist in informally evaluating or listening to student presentations. Because of staff time constraints and the number of student participants, education staff are not able be the sole evaluator. We ask teachers to be responsible for determining which projects advance to the zoo for consideration. Appointments for zoo staff to attend your school's Exhibition Day must be scheduled 2 weeks in advance. We cannot guarantee availability to attend. Please contact Kristi.Berg@state.mn.us to arrange.

Option 2: Plan a Classroom Showcase
Teachers may use the evaluation criteria rubric provided and host their own Design Challenge Classroom Showcase with the teacher submitting the top student designs to the Minnesota Zoo before February 19th to be involved in the Design Exhibition. Contact Kristi.Berg@state.mn.us for exhibition registration of school wide winning designs.

How many projects can I submit to the Zoo?

- Each teacher may submit up to **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.

What must be included in the zoo submission?

- Online Submission Form (can be emailed or mailed)
  - Names of team members
  - Teacher and school name
  - Grade
  - Student written description of the solution and how it met design requirements
- 1 Photo Word document including:
  - 1-2 Photos of up close views Tri-Fold Board
  - 1-2 Photos of Students with prototype
- Signed Media Release Form

Conditions

- ☐ Open to all 3rd-8th grade teachers and their students
- ☐ Students must work in groups of 2-4 students
- ☐ Teachers must register to participate no later than Monday September 19th.

Teacher Registration and Design Challenge Implementation Training

Teacher and student participation in the ZooMS Design Challenge FREE! Teachers can also attend a full one-day training (recommended!) in the fall to gain background knowledge of each challenge and gather resources to implement into the classroom.

Register online by visiting mnzoo.org/stem and clicking the 'Apply Now' link under the 2016-2017 Design Challenge The first 10 elementary teacher and 10 middle school teacher registrations will receive a $200 stipend upon completion of the following:

- ☐ Attendance to one of the ZooMS Design Challenge Workshops offered
- ☐ Participate in periodic ZooMS program assessment surveys
- ☐ Implement the ZooMS design challenge in to your classroom
- ☐ Submit student projects to be considered for the ZooMS Design Challenge Exhibition in March.

Important Dates

Closing Date for Application Forms	Friday, September 23rd	
ZooMS: Design Challenge Workshop (*Choose one*)	Tuesday September 27th	9:00 am – 3:30 pm
	Saturday October 1st	9:00 am – 3:30 pm
**Design Challenge Implementation Support -*Optional*	Saturday October 29th	9:00 am – 12 pm
	Saturday November 19th	9:00 am – 12 pm
Closing Date for Top Project Submissions	Thursday February 16th	
Projects Advancing to MN Zoo ZooMS Exhibition Notified	Wednesday February 22nd	
Elementary ZooMS Design Challenge Exhibition	Tuesday March 21st	
Middle School ZooMS Design Challenge Exhibition	Thursday March 23rd	

** A zoo classroom will be reserved and available to serve as an open ended Design Challenge Implementation Support space for teachers to come to the zoo to work with the ZooMS coordinator, collaborate with other teachers, or work independently anytime between 9 am and 12 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!



3M

Merchant & Gould
An Intellectual Property Law Firm

The Pentair Foundation

BNSF Railway

Medtronic

Minnesota Zoo