



Modern Zoo – Reimagined Facilitator Guide

Overview:

Students will learn about a variety of animals, their basic needs, and natural habitats, then build engineering skills as they design and construct an interactive enclosure with a simple machine for each animal, based on the challenge presented. This project is designed for teams of 2-4 students. Each challenge calls for a different simple machine. The project also focuses on using the design thinking process** and 21st century skill-building through creative and critical problem solving, collaboration, and communication.

Depending on class timeline, each team can work on the same animal simultaneously each class period (5 animals in total) but if time is limited, each team might opt for a different animal. In the latter case, it would be ideal to allot time for each team to present their project to the group along and allow students to play with each other's models.

Optional extensions will offer students deeper and more cross-disciplinary standards-based learning experience. Extensions are flexible and will include opportunities for bringing digital literacy and technology, language arts, career exploration, financial literacy, and more advanced science content into the project.

** Design thinking: While Students are designing their animal enclosures, they should be thinking about the experience from both the animals' and visitors' experiences. Their enclosure design should include those perspectives. If using the 3DuxDesign Site Plan, after each team has an opportunity to learn about their animals' needs, one member from each team should convene to discuss and negotiate spaces for each animal.

Grades

- K-3
- 4-5 (with "Snack Shack: Financial Literacy" extension)

Time A:

1. Expect **45-60 minutes** per zoo animal for engineering/physical science/life science only version:
2. **60+ minutes** for optional cross-curricular extensions for deeper learning. These extensions include:
 - a. Digital literacy researching animals and habitats. Creating data sheets.

3Dux|Design

Modern Zoo – Reimagined Facilitator Guide

- b. Life science – deeper dive into animal adaptations.
- c. Language arts – creating an informational display for visitors.
- d. Technology – using a variety of technology tools to create a presentation for the 3duxdesign global student showcase.
- e. Financial literacy – snack shack extension.

Resources:

1. Facilitator guide
2. Printed student challenge cards
3. Optional draft and graph paper

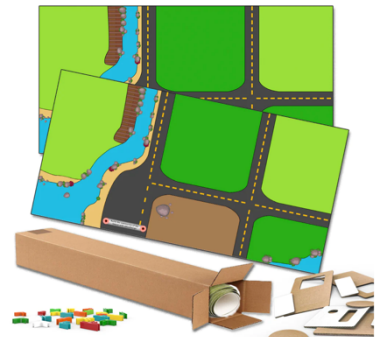
Materials:

- Printed challenge cards
- [3DuxDesign GOBOX Classroom](#) (for up to 25 students) (as seen below)
- [3DuxDesign machine-maker kit](#) (for up to 25 students) OR assorted craft material (see machine maker kit for suggested materials) (as seen below)
- Scissors
- Pencils and scrap paper
- Markers/paint



Optional Materials:

- [3DuxDesign Site map](#) (adds land and space constraints, helps with scale, design thinking and creates a more realistic zoo experience)
- Internet access
- Technology for presentations (phone camera, WeVideo, iMovie, chatterpix, stopmotion app etc.)





Modern Zoo – Reimagined Facilitator Guide

Project Guide for Limited Time: (45-minute sessions)

Depending on time available, each team in class may focus on the same animal during one class period (**option 1**) or each team may be assigned a different animal (**option 2**). In the first option, you would need 5-6 class periods to complete the entire zoo plus snack shack. You do not need to complete each animal, so this project is flexible based on your timeline. Alternatively, if each team within a class focuses on a different animal, you may complete the project in one class period. Ideally, there would be additional time for students to learn about each animal from peer presentations. This would include a minimum of one period for learn/design/build, and one period for finalizing project/team presentations. Keep in mind, in this latter case the projects would need to be stored in between the 2 class sessions.

1. **Option 1:** If focusing on one animal per class period, suggested order from easiest to hardest (penguin, tiger, polar bear, elephant, panda, mystery mammal).
 - a. Lead the class in a brief discussion about the animal, its natural habitat, and needs for survival. Be sure discuss need for shelter, water, and food for survival. Note that animal enclosures must support the animals' needs, but the enclosure design should also take into account visitor experience. You may find these 3–5-minute videos relating to the simple machine useful. You can watch this as a facilitator guide or share with students.
 - Penguin challenge/levers: <https://youtu.be/9DtXBYtTPH8?t=76>
 - Tiger challenge/inclines: <https://www.youtube.com/watch?v=N45IGUxAACA>
 - Polar Bear/linkages: <https://youtu.be/D3aWHv2SypQ>
 - Elephant/pulleys: https://youtu.be/W_vtKNPIrfq
 - Panda – multiple machine options (advanced)
 - Mystery mammal/wheel and axle: <https://youtu.be/6oFRxU4yaVo>
 - b. Break into groups teams of 2-4 students. Distribute materials.
 - c. Print and distribute one animal challenge card for each team.
 - d. Each team will draft their design.
 - e. Rapid prototype, test, adapt as needed.
 - f. If time allows, dismantle, decorate, reassemble.
 - g. Group sharing: **complete at least one of the following:**
 - i. Each team can present their design to the class.



Modern Zoo – Reimagined Facilitator Guide

- ii. Students can also visit other projects to explore and compare designs.
 - iii. Option 3: Students may create a short video clip of their project using flip or similar technology.
 - iv. Younger students may use Chatterpix app to narrate the project through their animals' perspectives.
 - h. **Optional:** If possible, class can leave up display for the week and allow students from other classes and grades to see the projects and explore how simple machines work.
2. **Option 2:** One unique animal per team. If possible, allow one class for the build, one class period for learning from each other/class presentations.
- a. General group discussion about animal habitats and needs. Review project.
 - b. Divide into teams of 2-4 students.
 - c. Distribute challenge cards. Each student team will be assigned a different animal. Note that the panda (requires 2 machines) and mystery mammal (requires independent research) may be more challenging and can be either excluded or given to specific teams likely to be successful.
 - d. Teams should take time to research their animals based on challenge cards. If digital research available, allow students to use the national geographic link to learn more.
 - e. If using the 3DuxDesign Site Plan, team representatives should take 2 minutes to negotiate plots of land.
 - f. Teams will draft enclosure design, considering both the needs of the animals and visitor experience.
 - g. Rapid prototype, test, adapt as needed.
 - h. Dismantle, decorate, reassemble.
 - i. Group sharing options for limited time (least time to most time).
 - i. Each team can create a flip or short video including basic information about the animal, the enclosure, and how their machine works.
 - ii. Younger students may use Chatterpix app to narrate the project through their animals' perspectives.
 - iii. Each team can present their design to the entire class (1-2 minutes per station)
 - iv. Students can create a written description of their animal along with a draft of the enclosure and machine design.



Modern Zoo – Reimagined Facilitator Guide

Student teams can take a few minutes to visit each station and learn. (allow 2-3 minutes per station).

Project guide with optional extensions

The timeline of this project is very flexible and based on extensions chosen.

In this scenario, you may wish to coordinate classroom learning with LMC/maker space for deeper and more standards-aligned, cross-curricular learning opportunities. In this format, it is suggested each team focus on a different animal and extra time be allotted for student teams to create and share more formalized presentations. Assigning animals to each team may be guided by anticipated level of challenge. Order from easy to hard is the following: penguin, tiger, polar bear, elephant, panda, mystery mammal.

Each project may include research, design thinking, engineering, art, literacy, and a presentation component so team selections may also consider individual student strengths in these areas.

General group discussion about animal habitats and needs, adaptations, zoo design, careers and more. Suggested videos include:

- **Visit the San Diego Zoo** <https://kids.sandiegozoowildlifealliance.org/videos>
- **Visit a zoo Down Under:**
<https://www.youtube.com/watch?v=5YBRu5JFHmw>
- **Virtual field trip to South Africa**
<https://www.youtube.com/watch?v=xQEIfcAXIHU>
- **Let's go on a safari** <https://www.youtube.com/watch?v=kcrZsyjrj8A>
- **What do zookeepers do?**
<https://www.youtube.com/watch?v=OZLwkl8YwNU>
- **Zoo jobs:** <https://www.youtube.com/watch?v=z6RI4yzNefA>
https://www.youtube.com/watch?v=QWWLtG3J_TI
- **Animal mimicry:** <https://www.youtube.com/watch?v=cV0kkFMK2CI>
- **Animal adaptations:** <https://youtu.be/m2MibjJgyjs>
- **12 endangered animals / how you can help read aloud:**
<https://www.youtube.com/watch?v=rpWxnOz71bE>

1. Divide into teams of 3-4 students.
2. Distribute challenge cards. Each student team will be assigned a different animal. Note that the panda (requires 2 machines) and mystery mammal

3Dux|Design

Modern Zoo – Reimagined Facilitator Guide

(requires independent research) may be more challenging and can be either excluded or given to specific teams likely to be successful.

3. Teams should take time to research their animals based on challenge cards. If digital research available, allow students to use [the national geographic link](http://bit.ly/3nENdHR) to learn more. <http://bit.ly/3nENdHR>
4. To increase the life science, language arts and digital literacy aspect of this project, teams may create data sheets specifying details about the animal including. Use the suggestions below based on student grade level and your teaching goals. This data may be converted into written format appropriate for facilitator's (or students') chosen presentational style (report style, animal information plaque for visitors, a self-guided visitor PowerPoint, narration for visitor information video etc.).
 - Animal Classification: Students should identify the animal's kingdom, phylum, class, order, family, genus, and species.
 - Habitat: Students should describe where the animal lives, including the climate and geographic location.
 - Diet: Students should describe what the animal eats, including any special adaptations for capturing or digesting food.
 - Behavior: Students should describe the animal's behavior, including social habits, mating habits, and any special behaviors such as migration or hibernation.
 - Life Cycle: Students should describe the animal's life cycle, including how they reproduce, how long they live, and any special developmental stages such as metamorphosis.
 - Threats and Conservation Status: Students should describe any threats to the animal, such as habitat destruction, hunting, or pollution, and the current conservation status of the animal.
 - Fun Facts: Students should include at least one or two interesting and fun facts about the animal that may not be commonly known.
5. If using the 3DuxDesign Site Plan, team representatives should take 5 minutes to negotiate plots of land for each animal based on needs.
6. Each team may learn more about simple machines by facilitator or by watching appropriate components of the 3DuxDesign video series.

Penguin challenge/levers: <https://youtu.be/9DtXBYtTPH8?t=76>

Tiger challenge/inclines: <https://www.youtube.com/watch?v=N45IGUxAAcA>

Polar Bear/linkages: <https://youtu.be/D3aWHv2SypQ>

Elephant/pulleys: https://youtu.be/W_vtKNPIrfq



Modern Zoo – Reimagined Facilitator Guide

Panda – multiple machine options (advanced).

Mystery mammal/wheel and axle: <https://youtu.be/6oFRxU4yaVo>

7. Each team will draft a design for the enclosure and machine based on the challenge card specifications, Teams should consider both the needs of the animals and visitor experience. Expect this phase to take 45-60 minutes.
 8. Create a prototype of the enclosure and machine, test, adapt as needed.
 9. Dismantle, decorate, reassemble. (Expect this phase to take 30-45 minutes)
 10. Group sharing options for tech/ELA integration time.
 - a. Each team can create a 3-5 minute “visitor information” video with detailed information about the animal, the enclosure, and how their machine works. If team is working on the penguin enclosure, the video should explain how visitors can safely feed them fish.
 - b. Each team can create a live presentation of their animal and their design to share with the class/family visitors. This may include a PowerPoint or similar presentation as well. Students may create the content for the student audience or as a facilitator, you may opt to have them design the presentation as if they are presenting to the zoo staff or to visitors. This will add some design thinking.
 - c. Students can create a written description of their animal along with a draft of the enclosure and machine design. Student teams can take a few minutes to visit each station and learn. (Allow 2-3 minutes per station).
-
1. Print one animal challenge card for each team. Lead the class in a discussion about the animal, its natural habitat, and needs for survival. Be sure to discuss need for shelter, water, and food for survival.
 2. Break up into groups. Teams of 2-4 students focus on same animal during a class session.
 3. Each team will draft their designs.
 4. Rapid prototype, test, adapt as needed.
 5. If time allows, dismantle, decorate, reassemble.
 6. Group sharing
 - a. Each team can present their design.
 - b. Or students can also visit other projects to learn and compare designs.
 7. If possible, class can leave up display for the week and allow other students to see the projects and explore how simple machines work.



Modern Zoo – Reimagined Facilitator Guide

Financial Literacy/Entrepreneurship Extension Grades 4-5

Use the “Snack Shack” challenge cards as a guide for student teams to design a shop that will make profits to support the zoo (1-2 class periods). [Find this lesson extension under “extension” tab.](#)

Technology Extension Ideas:

1. Add lighting to the zoo using the GOBOX PRO
2. Bring life the zoo with the Build-a-Bot Add-on kits.
3. Create a more visitor-interactive experience using micro bit technology (try hummingbird kits, Lego spike, or others).
4. Expand video skills with green screen, stop motion, time lapse technology (WeVideo, iMovie).
5. Add graphic design by creating an advertisement for each animal enclosure.