Tech for Global Good
Save the Species Challenge

Grade Levels: 7-12

Duration: Four sessions (60 minutes each)

In this lesson, students consider the complex challenges facing endangered wildlife. Each team of students develops and presents plans that protect the needs and constraints of a different species around the globe.

Outline

Session 1: Frame the Challenge	**60 min**
This first session sets the stage for the challenge. Teams research the problem and begin brainstorming solutions.	
Session 2: Develop Solutions	**60 min**
Teams develop solutions, give and receive feedback.	
Session 3: Iterate	**60 min**
After reviewing examples of real-world solutions, teams refine their ideas and prepare to present them to others.	
Session 4: Present	**60 min**
The project culminates as teams present their ideas.	

Grade Levels: 7-12

Duration: Four sessions (60 minutes each)

Concepts/Skills

Environment, brainstorming, problem-solving, communication, conservation, systems design

Objectives

Students will:

- Identify a specific problem within the complex needs of an endangered species.
- Create solutions that address the needs of a protected area.
- Refine their solution based on feedback from another team.
- Present their ideas to communicate the need addressed, a solution, and its impact.

Materials and Preparation

Materials

The Tech for Global Good videos	Materials
 □ 3 videos based on the 2019 Tech for Global Good laureate **Smart Parks** • **The Problem** *(1:30 min)* • **The Solution** *(1:38 min)* • **The Impact** *(1:01 min)* □ 4 videos based on the 2021 Tech for Global Good laureate **Wild Me** • **The Problem** *(2:23 min)* • **The Innovators** *(1:59 min)* • **The Solution** *(2:53 min)* • **The Impact** *(1:33 min)*	□ Species Packets (Assign 1 animal per team and distribute 1 Species Packet per student) • **Black Rhinos** • **Orangutans** • **Red Knots** • **Sharks**  □ Devices for students to watch videos (1 per team of 3-6 students)  □ Sticky notes (3 colors)  □ Chart paper  □ Markers, pen/pencil and other writing utensils 

*All resources connected to this lesson can also be found at **The Tech for Global Good: Save the Species webpage**.

Preparation

1. Watch and review all of the resources to become familiar with the material:
   - 4 Species Packets (Black Rhinos, Orangutans, Red Knots, Sharks) (See pages 4-9 of each packet for background reading.)
   - 3 Smart Parks videos. *(Approximately 5 min total)*
   - 4 Wild Me videos. *(Approximately 9 min total)*
2. Divide students into teams of 3-6 and assign each team one of the four species. (If possible, have at least two teams working on each of the animals).
   - Prepare one Species Packet for each student.
3. Set up and organize materials for student brainstorming and presentations.
4. Determine the format, process, and audience for student presentations.

Presentation Options

There are a number of options for presentations which can vary from an informal class discussion to a formal event. Choose a format and tools that fit your resources and focus. When possible, involve students in the planning and process, especially if you are able to invite additional audience members to attend.

Presentation Tools	Audience
   • Posters • Slide decks • Videos  • Online tool: document, web page, etc.  • Prototypes: storyboards, 3D models, diagrams, etc.	Consider inviting additional audience members to the presentations as well. • Another group of learners • Family and friends • Professionals or community stakeholders (For example: conservationists, engineers, biologists, etc.)

Presentation Process

- **Gallery Walk:** Teams set up tables or posters with their information. Half of the class presents while the other half rotates and provides feedback. After a set time period, teams switch roles.
- **Class Presentations:** Teams take turns standing up in front of the class and presenting their ideas with accompanying visual aides (posters, slide decks, etc.)
- **Panel:** A panel of special guests provides additional targeted feedback.
- **Asynchronous:** Teams share their work online (web page, documents or videos) and receive feedback via an online form.

Consider combinations of these options as well. *For example:* Presentations followed by an untimed gallery walk.

Background Information

Tech for Global Good

The Tech for Global Good is an initiative to create the next generation of innovators ready to tackle the toughest challenges facing our planet. Every year The Tech recognizes innovators who use technology to improve lives. Their stories are inspiration for the Tech for Global Good Design Challenges. These design challenges engage students in taking a systematic and empathetic approach to addressing social and engineering problems faced around the world.

This lesson profiles two organizations working to protect endangered species:

- **Wild Me,** a 2021 Tech for Global Good Laureate, uses machine learning to track wildlife populations. Their platform blends structured wildlife research with artificial intelligence, community science, and computer vision to speed population analysis of animal species around the globe, and to develop new insights to bring an end to extinction.
- **Smart Parks**, a 2019 Tech for Global Good Laureate, creates solutions for parks that protect endangered species. For example, the company made highly durable, solar-powered sensors that track rhinos in a park in Rwanda. The devices work indefinitely and can't be detected by poachers, allowing parks to keep tabs on their most at-risk animals.

Systems Design Challenges

Systems Design Challenges present students with a real-world problem that is part of a complex system. Students examine the intricate parts of that problem as they design potential solutions. By the end of a systems design challenge, students will be able to articulate a potential solution, the real-world problem it addresses, and the effects their idea might have on other components of that larger system. Systems Design Challenges use the **Innovation Design Process** and **Innovator Mindsets**. This focus on the process builds students' problem-solving capacity and self-confidence, preparing them for careers of the future and empowering them to create change in the world.

Activate Prior Knowledge *(10 min)*

Session One	60 min total
Activate Prior Knowledge	10 min
Introduce the Challenge	10 min
Research	20 min
Brainstorm	15 min
Debrief and Share	5 min

1. Describe The Tech for Global Good program. Tell students that during this project they will have the opportunity to try to solve a global problem by designing a solution that uses technology for good.
2. Invite student responses and lead a short discussion about what they already know about endangered species.

   Guiding Question:

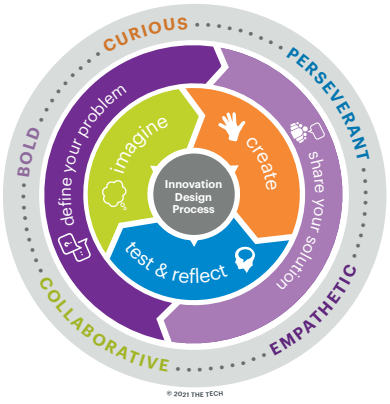
   - *What have you seen or heard about efforts to protect endangered species?*
3. Help students notice the ripple effects of these problems on other aspects of the environment and even their own lives.
   - Ask: *How do you think the extinction of a species affects other life on earth?*
   - During the discussion point out:
     - Losing one type of pollinator could endanger plant reproduction, including food crops for humans.
     - Losing a predator could increase prey populations and throw an ecosystem out of balance.

Introduce the Challenge *(10 min)*

1. Play The Problem videos for both laureates.
   - Smart Parks, **The Problem** *(1:30 min)*
   - Wild Me, **The Problem** *(2:23 min)*
2. Encourage students to make connections between the problems presented in both videos.
3. Introduce the **Design Challenge Scenario:**

You and your team run an animal conservation foundation that develops innovative technology and policy plans to help save endangered and threatened animals. Four communities around the world have reached out to you for help. Your team will use your skills as communicators, researchers, collaborators, and creative problem-solvers to assist one of these communities in developing plans to help create more sustainable environments for animals and humans.

4. Introduce students to the **Innovation Design Process**.
   - Explain that students will examine a complex systemic design problem, develop solutions to the problem, and then share and present their ideas.
   - Note that the design process is iterative, and that they will revisit phases throughout.



5. Explain the design problem and presentation. Address any questions that students have:

Design Problem	You and your team run an animal conservation foundation. Community members who work with [your species] have asked your team to develop plans for helping to conserve this animal population.	
Presentation	Your conservation team will need to create a presentation to share your plan with the community, including: • The problem your team has identified and addressed. • Your team's solution for this problem. • Story of how your solution will impact one person in the community (a student, a tour guide, a scientist, etc.).	

6. Divide students into teams and distribute the Species Packets. Their first task will be to determine the specific problems facing their animal species in various locations around the world. *(See pages 4-9 in the Species Packets.)*

- **Black rhinos**
- **Orangutans**
- **Red knots**
- **Great white sharks**

Research *(20 min)*

1. Have students read the background information about their animal population. *(See pages 4-9 in the Species Packets.)*
   - Try a jigsaw reading in which teams divide the reading between their members and then share what they have learned with each other.
2. Students should use the information and questions in the packet to guide their discussion.
3. They should take notes and collect information to inform their brainstorming, solution development, and presentations
4. Encourage teams to conduct additional research on the topic throughout the entire design process. This can be done through background information and resources you provide, or through their own research online.

Tech Tips

See our **educator guides and videos** for more design challenge facilitation techniques.
For this lesson check out:

- Innovation Design Process
- Facilitating Brainstorming
- Sharing Solutions

Real-world Connections

Endangered Species
Students can investigate their specific species and the effects of species extinction with some of the following resources.

- **Species List | Endangered, Vulnerable, and Threatened Animals:** Background Information from the World Wildlife Foundation on each species on the global lists.
- **Endangered Species**, Encyclopedia Entry, National Geographic
- **IUCN Red List of Threatened Species**
- **MpalaLive**: Animal profiles, live cams, and interviews with scientists who work with the animals in Kenya's Laikipia area.
- **When It Comes to Conservation, Are Ugly Animals a Lost Cause?**, Smithsonian Magazine

Biodiversity
Provide students with context by directing them to resources about why biodiversity is important and the effect of loss of species on the world.

- **Services Provided by Biodiversity - Biodiversity (US National Park Service)**
- **Global Biodiversity**, Encyclopedia Entry, National Geographic

Interdisciplinary Connections
Many of the challenges facing species are connected to the economics of poaching and fishing.

- **What is Poaching? The Illegal Wildlife Trade Explained**, WorldWildlife.org

Historical information about populations and areas that have been rehabilitated and their impact on their environment can provide inspiration. Examples include: wolves in Yellowstone, Loess Plateau rehabilitation in China, and sea otters in kelp forests.

- **Wolves of Yellowstone**, National Geographic video *(5:19 min)*
- **The Age of Nature | The Impact of the Loess Plateau Rehabilitation Project | Episode 1** | PBS, YouTube *(2:50 min)* Oct., 2020
- **Bringing Back Sea Otters Benefits People, Too | Science**, Smithsonian Magazine

Consider providing students with resources that examine related biological and scientific elements. *For example:* Technologies used to develop amebocyte lysate (LAL) could be useful for the Red Knot team to examine more closely. LAL affects horseshoe crabs, which are the birds' primary food source.

- **The Blood Harvest**, *The Atlantic*: An article on the amebocyte lysate (LAL) development process

Brainstorming *(15 min)*

1. Once teams understand the situation, they should move on to brainstorming aspects of the problem and possible solutions. *(See page 10 in the Species Packets.)*
2. As these problems are complex, it can help to break down the various aspects of the problem before looking at potential solutions.
3. Possible **Facilitation Questions** include:
   - *What do you already know about this topic? What ideas have already been tried?*
   - *What challenges will you need to address in order to help solve this problem?*
   - *What might be some communication challenges within this community? What about infrastructure or other challenges?*
   - *Who might be the best people to work with to help address this problem?*

Brainstorming Tech Tip

Remind teams to encourage anything and everything during brainstorming.

- Think of wild ideas.
- Go for quantity over quality.
- Be creative!

For suggestions on structuring a brainstorm session see **Tech Tip: Facilitating Brainstorming** (PDF and Video).

Debrief and Share *(5 min)*

1. Have teams share their progress and next steps.
   - This can be as simple as asking them to share one idea from their brainstorming that they are excited about.

Adaptations for Distance Learning

- Have students research their species asynchronously.
- Use an online collaborative tool for brainstorming and creation (Jamboard, Slides, Padlet, Seesaw, etc.).
- Have teams or students develop their solutions asynchronously and come back together for feedback and presentations.
- Invite special guests to a virtual presentation and celebration.

For more tips on adapting Design Challenges to a virtual setting see our **Educator Tips for Remote STEM Learning**.

Review Design Process *(10 min)*

1. Remind students what their final presentation will include: their focused problem, a solution, and an impact story.
2. Let students know that during this session they will work on developing their solution and share their initial ideas with another team to receive feedback.

Session Two	60 min total
Review Design Process	10 min
Create Solutions	30 min
Share Solutions and Feedback	20 min

3. Remind them that they are working on a systems design challenge, so both the problem and solutions can be multifaceted.
   - *For example:* Their solution could be a plan that outlines a new technology, information/marketing, a policy or law, or even funding. It could even combine one or more of these categories into a comprehensive plan.
4. Similarly, the design product they create in their solution will vary depending on the problem they are trying to solve. It could be a technology, event, program, advertising campaign, or business plan.

   For example:
   - If they need to raise awareness about the dangers of feeding wild birds, then they might develop a commercial.
   - If they need to solve for communication between organizations, then they might develop an app that tracks distribution of data across different agencies.

   Note: Keep this variety of solutions in mind, but wait to provide teams with specific examples until they are struggling to come up with ideas on their own.
5. Introduce the following steps then let teams work:
   - First, teams should review ideas from their brainstorming and pick or combine ideas to focus on for the core problem(s) they are addressing.
   - Then they should choose the brainstormed solutions that align with the problem(s) they are addressing
   - Remind them that they can use articles and technology provided to do more research in order to refine their solutions.

Creating Solutions *(30 min)*

1. Give students time to develop their focused problem and solution for that problem. *(See page 11 in the Species Packets.)*
2. Rotate around the room and engage in discussions with teams in order to:
   - Have them articulate the problem they are addressing.
   - Help them move past a sticking point or endless debating by prompting them to make a decision or research more to inform their solution.
   - Have them share interesting findings from their research.

Sharing Solutions & Feedback *(20 min)*

1. Share the process for the Listen and Help Feedback Protocol. *(See page 12 in the Species Packets.)*
   - Explain that the goal for the activity is to get thoughtful and critical feedback from peers.
   - Encourage students to focus on both strengths and next steps in their feedback. If using simple sentence frames, introduce them at this time. *For example:* "I like..." or "I wonder..."

Listen and Help Feedback Protocol

	Team Presenting	Audience
3 min	**Present their design solution.**	Silently listen. Take notes.
3 min	**Respond to clarifying questions.**	**Ask clarifying questions.**
2 min	Silently listen. Take notes.	**Provide feedback.**

2. Pair teams. (If possible, pair teams with others that are working on the same species.)
   - Assign one team to present first. The other team will be the audience, listening and providing feedback.
3. Act as timekeeper for the class. After the first team has presented, they should change roles and repeat the process.
4. After the Listen and Help Feedback Protocol is finished, have students take a few minutes to reflect on the feedback and think about how it affects their perspective on their solutions.
5. Have teams share initial thoughts and next steps for Session 3. *(See page 13 in the Species Packets.)*

Tip: See The Tech's **Peer Feedback Protocol** for more suggestions on facilitating this process including Distance Learning adaptations.

Session Three	60 min total
Real-World Solutions	7 min
Refine Solutions	18 min
Prepare Presentations	35 min

Real-World Solutions *(5 min)*

1. Iteration is an important part of the design process. In this session, students will revise their solutions based on feedback and new information.
2. Before they begin iteration, expand students' understanding of the types of solutions and impact by having them see two examples of solutions and impact.
3. Use the following videos:

Smart Parks	Wild Me
• The Solution *(1:38 min)* • The Impact *(1:01 min)*	• The Solution *(2:53 min)* • The Impact *(1:33 min)* • **Optional:* The Innovators *(1:59 min)*

(If time is limited, choose one organization to focus on.)

4. Have students quickly reflect on what they noticed about these solutions and how that might change their own ideas.
   - In addition, they can consider how "The Impact" video told the story of the effects the solutions had on their communities.

Refine Solutions *(18 min)*

1. Give teams time to develop their second iteration of a solution.
   - They should incorporate feedback from the Listen and Help Feedback Protocol and any new thoughts based on The Tech for Global Good laureate examples.
   - Remind them that they can use the articles and technology provided to do more research in order to refine their solutions.
2. **Facilitation questions** for iteration can include:
   - *What new ideas and feedback do you have?*
   - *How can you use these ideas to improve your solution?*
3. With 10 minutes remaining, ensure students have moved on to creating their impact story.
4. **Facilitation questions** for developing impact stories can include:
   - *Who would be most positively impacted by your solutions?*
   - *What parts of that person/group's story would be most compelling to share?*
   - *How will your story illustrate the impact of your solution?*

Prepare Presentations *(35 min)*

1. Describe the format and process for student presentations. (Reminder: See Preparation for detailed options.)
2. Encourage students to think about how they can both show and tell their ideas.
3. Address any questions regarding:
   - Design product format
   - Presentation process, timing, and tools
   - Audience
4. Remind students of the content of the presentation
5. Set expectations that all team members will participate in the presentation.

Presentation	• The environmental problem your team has addressed. • Your team's solution for this problem. • Story of how your solution will impact one person in the community (a student, a tour guide, a scientist, etc.)	

6. Support teams in developing presentation materials, planning, and practicing their presentations.

Dealing with suggestions and criticism
A skill that requires practice is responding to suggestions and feedback. Share suggested prompts for appropriately responding to suggestions and criticism, such as asking for clarity if needed or simply saying "Thank you, we will consider that."

Extension
Have students continue their research and get involved in efforts to support endangered species.

Examples include:
- Presenting to community leaders and organizations that work on the same types of problems.
- Running an awareness and action campaign.
- Sharing their ideas on social media.

Set the Stage *(10 min)*

Session Four	60 min total
Set the Stage	10 min
Presentations	40 min
Debrief	10 min

1. Make sure students have set up their presentations and have the resources they need to share their ideas.
2. Take a few minutes to review the process for presentations.
3. Review audience role. If there are additional audience members, introduce the teams and the overall challenge.
4. Review the positive feedback process and tools you will use during the presentations.

   Some examples include:
   - If the audience and students are rotating to see team posters, have them record feedback on sticky notes or notecards.
   - If students are giving a formal presentation, encourage a few individuals to share one thing they like about the solution and a suggestion for improvement after each team presents.

Presenting *(40 min)*

1. Have teams present their solutions.
2. Keep track of time to ensure that all teams have a chance to present and receive feedback.
3. If time allows, have teams respond to additional questions.
4. In addition to any questions generated by the audience, you may want to provide a list of **Suggested Questions:**
   - *What inspired you to develop this idea?*
   - *Why did you choose this particular solution?*
   - *What questions did you have as you worked on this project? What do you still want to learn about this problem?*
   - *What is one thing you changed about your idea as you worked on it?*
   - *What is something you would change or want to improve if you had more time?*

Tip: Share student solutions, photos, and videos with The Tech Interactive, #TheTechforGlobalGood.

Debrief *(10 min)*

1. Celebrate student work and reflect on the experience.
2. Debrief the project as a class. Discuss what students saw and learned from the process and each other's work.
3. **Debrief questions** can include:
   - *How did your understanding of the problem change throughout this project?*
   - *What part of the process did you like most?*
   - *What was most challenging?*
   - *What would you change about your solution?*
   - *How did this make you think about how you can impact the world?*

Standards Connections

Next Generation Science Standards

* Indicates science content integrated with engineering.

Grades	Standard	Description
6-8	MS-ESS3-3	Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.*
9-12	HS-LS2-7	Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.*
9-12	HS-ETS1-1	Analyze a major global challenge using criteria and constraints that account for societal needs and wants.
9-12	HS-ETS1-2	Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
Additional Standards		MS-LS2-5, HS-ESS3-4, HS-ETS1-3, HS-LS4-6

Common Core State Standards: English Language Arts

Grades	Standard	Description
7-10	CCSS.ELA-LITERACY.SL.[7-10].1	[Initiate *Grade 9-10*] Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on [*Grade 7-10*] topics, texts, and issues, building on others' ideas and expressing their own clearly [and persuasively *Grade 9-10*] .
7-8	CCSS.ELA-LITERACY.SL.[7-8].4	Present claims and findings, emphasizing salient points in a focused, coherent manner: – [with pertinent descriptions, facts, details, and examples *Grade 7*] – [with relevant evidence, sound valid reasoning, and well-chosen details *Grade 8*] Use appropriate eye contact, adequate volume, and clear pronunciation.
9-10	CCSS.ELA-LITERACY.SL.9-10.4	Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task.