



<p>Description</p> <p>During this lesson, learners will work in teams to design and build a model of a shelter that would be capable of keeping an animal safe from a severe weather event. Learners will have to consider the needs of the animal, such as food and water, as well as the dangers of the storm, such as high winds or rising flood waters.</p>		
<p>Grade Level</p> <p>K</p>	<p>Objectives</p> <p>Students will:</p> <ul style="list-style-type: none"> • Design and create a device to keep animals safe during a storm. • Describe what animals (and other living things) need to stay alive. 	<p>Grade Levels in adaptations (Appendix A)</p> <ul style="list-style-type: none"> • 2 - 4, Middle School, High School, After School
<p>Duration</p> <p>Three 45-minute sessions</p>	<p>Tech Tips</p> <p>Our Tech Tips and their accompanying videos can be found here.</p> <ul style="list-style-type: none"> • Assessment • Sharing Solutions • The Language of Engineering • What is Engineering? • Materials Strategies for Engineering Design 	
<p>Standards Connections</p> <p>Note: Bolded parts of the standards are fully met by this lesson.</p> <ul style="list-style-type: none"> • NGSS Performance Expectations (Engineering PE) K-2-ETS1-1. Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool. • NGSS Disciplinary Core Ideas (DCI) Defining and Delimiting Engineering Problems (ETS1.A) A situation that people want to change or create can be approached as a problem to be solved through engineering. • NGSS Science and Engineering Practices (SEP) Asking Questions and Defining Problems <ul style="list-style-type: none"> • Define a simple problem that can be solved through the development of a new or improved object or tool. • NGSS Crosscutting Concepts (CCC) 6. Structure and Function: <ul style="list-style-type: none"> • The shape and stability of structures of natural and designed objects are related to their function(s). • NGSS Science Standards (Science PE) <u>Next Generation Science Standards: (K-LS1-1):</u> Use observations to describe patterns of what plants and animals (including humans) need to survive. 		



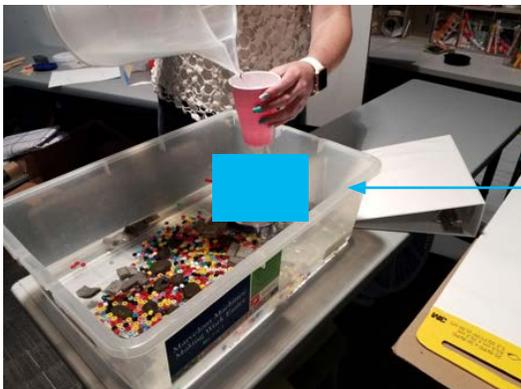
Set up and Prep for Classroom

- Collect building materials (see list below).
- Organize classroom to allow learners to work in groups of 2-4.
- Prepare Test Rig. Consider preparing two Test Rigs to allow more teams to test as they build.

Test Rig materials

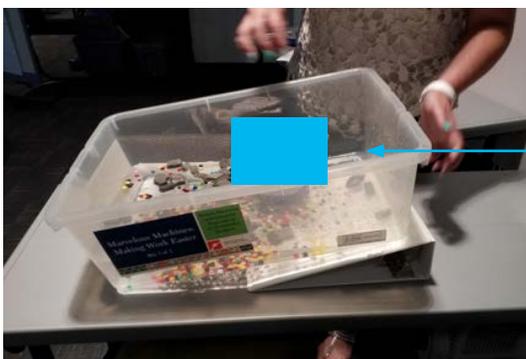
- Items to simulate debris (beads, marbles, pebbles, sticks, small lengths of chenille stems etc. (Optional: take learners outside to gather their own debris.)
- Watering can (you can also use a plastic cup with holes poked in the bottom and a second cup for pouring)
- A long, narrow, clear plastic bin (such as a 28 qt. “under the bed” storage box).
- Two gallons of water (depending on the size of your bin).
- Binder or other wedge-shaped object
- “Sizing” paper (a piece of paper with a circle drawn on it to show the maximum size a device may be).
- Plastic sleeve for sizing paper
- Measuring cups
- Towels (for drips after testing)

For the first test, fill the plastic bins with about two gallons of water and simulated debris. Start with the bin on a flat surface. When a team is ready to test their device, they will place it in the bin. The first test is rain simulation. Using the watering can or plastic cup, pour approximately one cup of water from the bin on the device. This test determines whether the design is water-tight (see image of Test 1 set-up below).



Student device

For the second test, keep the device in the water and slowly slide a binder under the bin of water. This will mimic the device flowing downstream in the flood. This test determines whether the device’s contents remain dry while moving around in the current and debris (see image of Test 2 set-up below).



Student device



Materials (per class of 32 students working in pairs)*

Structural pieces (~64 total)	Connectors (~144 total)	Other materials (~200 total)	Possible set up
<ul style="list-style-type: none"> • Cardboard - various sizes • Foam or pool noodle material • Plastic - various sizes • Cloth - various sizes 	<ul style="list-style-type: none"> • Water-resistant clay - divided into 3cm chunks (optional) • Small hair clips • Paper clips • String - cut into strips • Tape (optional)** • Toothpicks 	<ul style="list-style-type: none"> • Plastic lids • CDs • Plastic plates • Plastic cups • Plastic bowls • Paper cups • Corks • Straws • Popsicle sticks 	

Organize the materials by type so students can easily see what is available and make them accessible. Send teams to the table one at a time or have one member from each team access the materials. See Tech Tip: [Materials Strategies for Engineering Design](#) for more materials management suggestions.

*Many of these materials are suggestions based on what learners have found useful. It is not necessary to have all of the building materials listed. Feel free to use other materials you have on hand.

**Tape can make a challenge easier or more accessible; however, when tape gets wet it may become less sticky and cause frustration. Tape can makes clean-up more difficult.

A. Introduction

This lesson is designed to be used as either an inquiry-based learning experience, alongside teaching of the content standard introduced and taught after the initial design challenge, or as an application of previously covered content material.

1. Lead a discussion to introduce the concept of engineering and the engineering design process. See Tech Tip: [What is Engineering?](#) for information on discussing engineering, problem-solving and creative thinking with students.
2. Introduce the idea of an “engineer” and discuss what engineers do:
 - *Based on what we know about engineering, what do you think an engineer does?*
 - *What kinds of projects or objects might engineers work on?*
 - *What are some problems you have solved or want to solve? (DCI)*
3. Explain to students that they are going to solve a problem as engineers. Discuss students’ prior knowledge of what **living things** (animals, plants, humans, etc.) need to **survive**, to stay alive and healthy.
 - To introduce the design challenge, show learners video clips or images of a flood. Build up background knowledge by leading a discussion with students:
 - *What is a **flood**? Possible answers include: Water pooling in the street or in homes. Water overflowing in rivers.*
 - *What happens during a flood?*
 - *How might a flood affect an animal? Will a deer be affected the same way as a bird?*
 - *How might a dog or cat be affected by a flood?*
 - *Sometimes items get carried away by the water in a flood, like branches or belongings left in a yard. These items are called **debris**. How might debris in the flood water cause problems?*
4. Introduce the engineering challenge scenario that students will be working to solve. For grades 2 - 4, Middle School, High School, After School modifications, see Appendix A.



In 2017, many neighborhoods in San Jose, CA were evacuated due to severe rainstorms and flooding. People rushed to get personal belongings and leave their homes. Some evacuees were forced to leave without their pets and were unable to return to their homes for many days.

You are an engineer and you have been hired by an animal expert (ex: zoologist) to design a device that would allow animals to be protected from a future storm. Your model must include a way to keep the animals protected from the storm, including water, wind and debris. After you build your device, you must explain to the animal expert how it will protect animals during future floods.

B. Design Challenge

1. Introduce the idea of what a **zoologist** does (**studies and cares for animals**).
 - Review or brainstorm what animals need to survive. Ask students who have pets what kinds of care they need to provide, such as water, food, and shelter. If a class pet is available, have students observe the cage and identify what it contains to keep the animal alive and healthy.
 - Concepts of criteria and constraints are not introduced until Grade 3, therefore you may use similar words (such as “requirements” or “desired features”) for learners to understand. For this lesson we will use the term “desired features” for both criteria and constraints. Discuss with students how “desired features” help us know when we’ve designed a successful device (the term “device” leaves students’ imaginations open to consider creative solutions).
2. Introduce the engineering design challenge

Design Problem
Design and build a device that can keep an animal alive, safe, and dry for several days against the effects of a storm, including water, wind and debris.

K-2: Desired Features (Criteria)

- Device must not tip over during the test.
- Inside of the device must remain dry.
- Device must fit in test area.
- All teammates must work on the design.
- Use only the material provided (budget).
- 15 minutes to build (schedule).

Testing

- Measure the size of a device anytime on the sizing sheet.
- Pour 1 cup of water on the device to test if the design is water-tight.
- Place the device on the right side of the test rig. Slowly slide a binder under the right side of the bin of the water. This will mimic the device flowing downstream in the flood.
- Take device out of the water and check that the contents inside are dry.

3. Possible questions to facilitate materials choice and build time:
 - *What can you make that will help animals survive during a flood? (SEP)*
 - *How can you use these materials to protect animals in a flood? What materials could you use to keep the water out?*
 - *How can using materials with different shapes help your device protect the animal from the flood? (CCC)*
4. Questions to facilitate sharing solutions. See Tech Tip: [Sharing Solutions](#).
 - *How does your device keep animals safe?*
 - *What kind of shapes were useful in your device? Why? (CCC)*
 - *What happened when we poured water on your device?*
 - *What shapes were more successful in protecting the animals against the flood? (CCC)*
 - *What problems did your device have? Did other teams have that problem?*
 - *Which desired features does your design have? How might you change it next time? (DCI)*



C. Content Learning

1. Revisit the original scenario. If this activity is being used as an inquiry-based approach, this is the point at which to ask learners to make observations about what is similar and different about the needs of different types of living things. Make sure learners notice the patterns and similarities (all living things need water, air, etc.). If this activity is being used as an application of previously covered material, this is a time to review what living things are (people, animals, plants), the patterns of what they need to survive (food, water, air, shelter) and then ask students how they can use those patterns to design a successful device.
 - *What do all living things need to survive?* Possible answers include: Animals need food and water.
 - *What patterns do you notice in their needs?* Possible answers include: Animals need to eat every day, sometimes more than once a day.
2. Tie in knowledge from other content areas and the real world to increase critical thinking about the problem and the solutions.
 - For example, as a tie-in to math, learners could choose a population of animals in the local area to try to think about how many devices would be needed to help them.
 - Have learners consider how their designs would work in the real world:
 - *What parts of our designs helped the animals to survive?* Possible answers include: The roof kept the animal dry.
 - *What else should we add to our designs to make sure that our animals have everything they need to live?* Possible answers include: A place for the animal's food or a way to have water inside that won't spill.
 - Have learners brainstorm as a group or in pairs and share ideas for how to give the animal access to those things while in the device.

D. Iterate Design Solutions

1. Introduce additional desired features for iteration.
 - Learners will analyze the results of their tested device and verify that their device is able to keep their animal(s) alive. Introduce the new desired feature by explaining that learners must now find a way to include all of the elements (food, water, air, sunlight) needed for survival. All designs must now include a way for their animals to receive air and/or sunlight and access to food.
2. Remind students of the Design Problem they are working to solve, as well as the desired features their device needs to have. Make sure that students are aware of and understand the changes to the desired features list for the iteration of their designs.

Design Problem

Design and build a device that can keep animals safe and dry from the effects of a storm, including water, wind and debris.

K-2 Desired Features

- Device must not tip over during the test.
- Inside of the device must remain dry.
- Device must fit in test area.
- NEW: Device must also include access to air (e.g., air hole) and/or sunlight and food.
- Use only the materials provided (budget).
- 15 minutes to build (schedule).
- NEW: All teammates must work on the design.



Testing

- Measure the size of a device on the sizing sheet.
- Pour 1 cup of water on the device to test if the design is water-tight.
- Place the device on the right side of the test rig. Slowly slide a binder under the right side of the bin of water. This will mimic the device flowing downstream in the flood.
- Take device out of the water and check that the contents inside are dry.
- NEW: Ask students to explain verbally what they included to keep the animal alive during its time away from home.

3. Questions to facilitate reflection on design solutions and planned iteration:
 - *What problems did you find in your last test? What changes will you try first?*
 - *Are there any materials you used last time that you want to replace?*
 - *What changes are you going to make to help the animal survive? (SEP)*
4. Questions to facilitate sharing solutions. See Tech Tip: [Sharing Solutions](#) for ideas.
 - Tell me about your design.
 - How did your device support the needs of your animals? (SEP)
 - What shapes in your design worked well? (CCC)
 - If there was more time, what would your team want to do next?

E. Evaluation

Formative assessments are integrated throughout the lesson. This section summarizes suggestions for implementing summative evaluations, as well as creating authentic experiences for learners around the design challenges and their learning, by making work public. Note that rubrics and assessments are developed to meet NGSS engineering standards. This honors that content standards differ greatly at every grade level and allows educators to integrate additional mastery evidence in the final assessment and rubric specific to the content standard(s) each educator teaches. For additional guidance on facilitating authentic assessment, see Tech Tip: [Assessment](#).

1. Remind learners that they were “hired” by the zoologist to design this device. They will soon pitch their design to the zoologist who will potentially purchase these devices for future floods.
 - “Zoologists” can be members of a buddy class, other learner groups in the same class or classroom volunteers. If you can have a real-life animal expert come in, that would be awesome! If you choose to go this route, we recommend having learners practice their presentations to peers/older learners prior. The “What Animals Need” checklist can be used by the “zoologists” to analyze the devices.
2. Introduce and explain the final assessment project to learners:
 - Learners will keep their final device design intact to help them complete the two pages of written reflection (the Post Design Challenge Exit Ticket and “Letter to a Zoologist” page).
 - Give the Post Design Challenge Exit Ticket directly after the building and testing phases to assess whether learners have grasped the problem behind the design challenge. If you choose to simulate and test against another weather-related problem, your exit ticket should change accordingly.
 - When giving learners the “Letter to a Zoologist” page to complete, circulate and conference with learners individually about how the shape of the design helps protect the animal from the flood and what they included to support the animal’s survival. Learners can use the sentence frame to describe their design, independently or with help.
 - Learners can use their written assessment work to present to the zoologist/“animal expert.”
3. Questions the educator can ask to connect the design challenge to the assessment project:
 - *What problem is your device designed to solve? (SEP)*
 - *In looking at the project you made, how does the shape help protect the animal? Possible answers include: I used connectors to hold it shut. This keeps the water out. (CCC)*



- *Reflecting on what you've learned about animal needs, what did you include in your device to help your animal to survive?* Possible answers include: I included a window to let in sunlight to keep the animal warm. *(DCI)*
- *Think about your first and second designs. What changes did you make as an engineer?* Possible answers include: My first design let water in, so I added more materials to the roof. *(DCI)*



Appendix A – Grade Level Modifications

Modifications in general for all grade levels:

While this challenge was initially designed for kindergarten learners, people of all ages showed engagement in the task during our tests with guests at The Tech Interactive. To increase the difficulty, we suggest the following ideas for older students:

- Provide learners with a budget to spend on materials. Give a price for each item and allow learners to go “shopping” for supplies. As an additional challenge, learners can try to spend less than their peers.
- Give learners representations of the animals they have chosen to protect. Supply learners with representations of food and water needed for survival over an extended period of time.
- Have learners ponder the effects of taking on more passengers, and the associated cargo, and the effects this may place on their device’s buoyancy. Create a mini challenge to see which devices can hold the most people and supplies to survive a given timeframe.
- A possible extension to this challenge would be asking learners to think of a way to “anchor” their structure/device so that their animals are not swept away by the floor water.

Specific modifications for individual grade levels:

<p>2nd Grade Standard: 2-PS1-2 Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for the intended purpose.</p>
<p>A – Intro and Scenario</p> <ul style="list-style-type: none"> • Watch videos of floods in various areas, showing urban, suburban, and rural locations.
<p>B – Design Problem</p> <ul style="list-style-type: none"> • Use a larger variety of materials than suggested above, and provide opportunities to explore their properties, checking for reactions to water, prior to building their first device.
<p>C – Content Connections and Adaptations</p> <ul style="list-style-type: none"> • Focus questions on which materials were best suited to rainfall/water. Tie into real world applications by talking about real world building materials (metals, plastic, etc.).
<p>D – Iterating Design Solutions</p> <ul style="list-style-type: none"> • Provide additional materials, representative of the characteristics the class deemed “best suited to water.”
<p>E – Assessment</p> <ul style="list-style-type: none"> • Reflect on the materials used and their properties, rather than the shape of the design.



<p>3rd Grade Standard: 3-ESS3-1 Make a claim about the merit of a design that reduces the impacts of a weather-related hazard.</p>
<p>A – Intro and Scenario</p> <ul style="list-style-type: none"> • Watch videos of floods of various strengths. Discuss how different structures might hold up in different floods.
<p>B – Design Problem</p> <ul style="list-style-type: none"> • Draw a design of the device after testing. Include labels for features that reduced the effects of weather.
<p>C – Content Connections and Adaptations</p> <ul style="list-style-type: none"> • After each iteration, discuss the merits of their design and the merits of other group’s designs during the build process.
<p>D – Iterating Design Solutions</p> <ul style="list-style-type: none"> • Modify the drawing to reflect changes made during iteration.
<p>E – Assessment</p> <ul style="list-style-type: none"> • Present the device and how it functions to the class. Choose one device (not necessarily their own) to present the best design plan to a zoologist. Explain the design of choice, how it works, and why it is the optimal design.
<p>4th Grade Standard: 4-ESS3-2 Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.</p>
<p>A – Intro and Scenario</p> <ul style="list-style-type: none"> • Watch videos on the causes of floods.
<p>B – Design Problem</p> <ul style="list-style-type: none"> • Design a device to protect humans during a flood event.
<p>C – Content Connections and Adaptations</p> <ul style="list-style-type: none"> • After each iteration, have teams discuss their designs with one another. Share and brainstorm with the other teams.
<p>D – Iterating Design Solutions</p> <ul style="list-style-type: none"> • Make changes to the device that incorporate elements of another group’s design.
<p>E – Assessment</p> <ul style="list-style-type: none"> • Select two to three of the most viable designs and make a brochure or public service announcement video for each. Present the brochures to local first responders, in hopes of preparing for a future flood. Products should include a detailed, labeled sketch of the design, information about how it works, and the benefits of it over other solutions.



Middle School

Standard: MS-ESS3-2

Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.

A – Intro and Scenario

- Watch videos of floods of various strengths and in various areas, showing urban, suburban, and rural locations. Use these videos as a guide for researching flood prone areas.

B – Design Problem

- Build a device to withstand turbulent water. Testing should be modified to include stirring the water by dragging a spoon around the edge of the bin.

C – Content Connections and Adaptations

- Research areas prone to flooding and determine patterns that may make flooding more likely.

D – Iterating Design Solutions

- Iterate the design to maximize the number of people their device can protect.

E – Assessment

- Create a sales pitch to sell the product in one of the flood prone areas they researched. Include item cost, feasibility, benefits, amount of materials used, etc.
- Use real-world prices to estimate the cost of their device and decide how much to sell it for. Calculate their profit margin.

9th-12th Grade

Standard: HS-ETS1-3

Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.

A – Intro and Scenario

- Research floods worldwide. Select a flood prone area to consider as the location for the project.

B – Design Problem

- Use materials that will modify the aesthetics of the device to increase use within the culture in their selected location.
- Design a device for reliability. Test each device 3 times with a goal that it behaves the same way each time (motion, performance, etc.).

C – Content Connections and Adaptations

- After each iteration, discuss the merits of the design. Consider whether it withstood the flood, whether it is easy for the user to use, its cost, and the availability of materials within the culture.

D – Iterating Design Solutions

- Modify device to increase access to the device by the people in the selected culture, making it easier to use, cheaper, or changing to easier to access materials.

E – Assessment

- Present the device and how it functions to the class. Create a user guide for the end user. Consider cultural barriers that may need to be addressed.

**After School**

Standard: Quality Standards for Expanded Learning 16 - Continuous Quality Improvement:

Skill building:

As age-appropriate, participants are actively engaged in assessing strengths and weaknesses, and provide input for improvement based on quality standards

A – Intro and Scenario

- Watch videos of floods in various areas, showing urban, suburban, and rural locations. This may help guide learners as they research flood prone areas.

B – Design Problem

- Modify criteria and constraints to be age appropriate for different age groups AND/OR have mixed-age groups or partnerships work to create a team device.

C – Content Connections and Adaptations

- After each iteration, discuss the merits of their design and the merits of other designs. Brainstorm with the other teams the types of devices that could be created.

D – Iterating Design Solutions

- Make changes to the device that incorporate elements of another group's design.

E – Assessment

- Present the device and how it functions to the class. Choose one device (not necessarily their own project) to present the best design plan to a zoologist. Explain the design of choice, how it works, and why it is the optimal design.



Appendix B – Vocabulary

The following is a suggested list of words to discuss as you progress through this lesson with students. For more in-depth information about vocabulary, see Tech Tip: [The Language of Engineering](#).

Term	Learner-friendly Definition	Scientific Definition
debris	Pieces of litter, waste, rocks.	Loose collection of materials, especially broken pieces.
flood	A large amount of water covering a usually dry area.	An overflow of a large amount of water beyond its typical area.
living thing	A person, animal or plant, even bacteria (germs).	An organism that possesses characteristics of being alive.
survive	To remain alive.	To remain alive in spite of hardship.
zoologist	A person who studies animals.	An expert in the classification, behavior, and distribution of animals.



Appendix C – Resources and References

- Fox News. “At Least 14,000 People Evacuated from Flooding in San Jose.” YouTube, YouTube, 22 Feb. 2017, www.youtube.com/watch?v=0kUn5OLj1yY.
- Gomez, Mark, and Mark Gomez. “Bay Area Storm Rainfall Totals Monday.” The Mercury News, The Mercury News, 21 Feb. 2017, www.mercurynews.com/2017/02/21/bay-area-storm-rainfall-totals-monday/.
- Kindergarten 101. “Flood by Jackie French.” YouTube, YouTube, 31 July 2013, www.youtube.com/watch?v=lvIAEsRguQM.
- Lesli. “12 Interesting Drought and Flood Books for Learners.” This Crazy Homeschool Life, 5 Nov. 2018, crazyhomeschoollife.com/flood-books/.
- “Living and Non-Living Things.” Teaching With Kids’ Books, www.teachingkidsbooks.com/k-2nd-grade/living-and-non-living-things.
- Mercury News. “Dramatic Drone Footage Shows Impact of San Jose Flooding.” YouTube, YouTube, 24 Feb. 2017, www.youtube.com/watch?v=bo5xjHEKTvc&disable_polymer=true.



Appendix D – Lesson Handouts

Handout	Page(s)
Letter to a Zoologist	15
What Living Things Need Checklist	16
Exit Ticket	17
Assessment	18
Student Rubric	19



Letter to a Zoologist

Name: _____

Dear Zoologist,
Here is a drawing of my device. It helps animals stay safe in a flood because:





What Living Things Need Checklist:

Name: _____

Zoologist's Name: _____

Engineer's Group Name: _____

Add a check in the boxes, as learners share what living things need.

	Animals	Plants (optional)
Food	<input type="checkbox"/>	
Water	<input type="checkbox"/>	<input type="checkbox"/>
Air	<input type="checkbox"/>	<input type="checkbox"/>
Sunlight		<input type="checkbox"/>



Exit Ticket

Name: _____

1. Circle the problem you are solving.



2. How can the weather hurt living things? Draw or write.



Assessment

Name: _____

For Educator Use Only: When conferencing with students individually, record level of understanding and any important notes.

1. Tell how the shape of your design helps protect the animal.

- At least 2 reasonable ways 1 reasonable way Does not provide a way

2. Tell how your device incorporates items necessary for your animal's survival.

- 2 or more items for survival 1 item for survival No items for survival

<u>First Design</u> <ul style="list-style-type: none">• Device fit inside the test area• Device kept inside dry	<u>Second Design</u> <ul style="list-style-type: none">• Device fit inside the test area• Device kept inside dry• Animal has food• Animal has water• Animal has access to air
Comments:	



Student Rubric – Storm Shield: What Living Things Need

NGSS PE: K-2-ETS1-1. Ask questions, **make observations**, and gather information about a situation people want to change to **define a simple problem that can be solved through the development of a new or improved object** or tool

	Below Standard	Approaching Standard	Meeting Standard	Above Standard
<p>(NGSS DCI) Standard and Topic ETS1.A: Defining and Delimiting Engineering Problems</p> <p>A situation that people want to change or create can be approached as a problem to be solved through engineering.</p>	<p><i>Areas that individual students may need one-on-one support with:</i></p> <ul style="list-style-type: none"> Identifying which desired features a design is not meeting based on failure points. Identifying the cause of a design's failure/difficulty. Persevering and not giving up/ quitting too soon. Making design improvement decisions based on the cause of failure. 	<ul style="list-style-type: none"> Solution incorporates 1 element needed for the animal's survival. 1 or 2 solutions tried, changes were made to improve the design based on testing results. Explanation of solution includes at least 1 desired feature. 	<ul style="list-style-type: none"> Solution incorporates at least 2 elements needed for the animal's survival. 3 or more solutions were tried, changes were made to improve the design based on testing results. Explanations of how each component meets the desired features are supported with evidence and reasoning. 	<p><i>Areas where students may exceed:</i></p> <ul style="list-style-type: none"> More than 5 solutions tried, changes were made to improve the design based on testing results. Clear explanation of failure points and improvements made to address them is provided. Student design incorporates 3 or more elements needed for the animal's survival. <p><i>Ideas for next steps for growth:</i></p> <ul style="list-style-type: none"> Identify aspects of each design that best met each desired feature. Self-assess design decisions and specifically identify trade-offs.
<p>(NGSS SEP) Standard and Topic Asking Questions and Defining Problems</p> <p>(K-2-ETS1-1) Define a simple problem that can be solved through the development of a new or improved object or tool.</p>	<p><i>Areas that individual students may need one-on-one support with:</i></p> <ul style="list-style-type: none"> Defining the problem or how the device functions. Describing why floods are harmful to living things. 	<ul style="list-style-type: none"> A model is created that can explain what the problem is OR how the device solves it. One way floods are harmful to living things is identified; however, the explanation may be unclear or unrealistic 	<ul style="list-style-type: none"> The problem is defined (oral or written) and a description is provided to show how the model has been designed to include desired features. One way that floods are harmful to living things is identified. 	<p><i>Areas where students may exceed:</i></p> <ul style="list-style-type: none"> The problem is defined and a description for multiple ways in which the model solves the problem is provided. At least two reasons that that floods are harmful to living things are identified.
<p>(NGSS Crosscutting Concepts (CCC))</p> <p>6. Structure and Function The shape and stability of structures of natural and designed objects are related to their function(s).</p>	<p><i>Areas that individual students may need one-on-one support with:</i></p> <ul style="list-style-type: none"> Understanding the relationship between shape and function. Identifying problems in a design that result from the shapes of a material used. Distinguishing between the importance a component's shape and the material. 	<ul style="list-style-type: none"> One reasonable way that the shape of the design works to protect the animals is provided. 	<ul style="list-style-type: none"> Two reasonable ways that the shape of design works to protect the animals are provided. 	<p><i>Areas where students may exceed:</i></p> <ul style="list-style-type: none"> A description is provided of how the shape of design AND materials used in the device work to protect their animals. <p><i>Ideas for next steps for growth:</i></p> <ul style="list-style-type: none"> Choose to add humans/plants to the device and incorporate additional items to ensure their survival.