

SCIENCE·3D

HELLBENDERS: SAVING THE SNOT OTTER

In this packet, sample student answers are provided in **red** and notes to teachers are in **blue**.

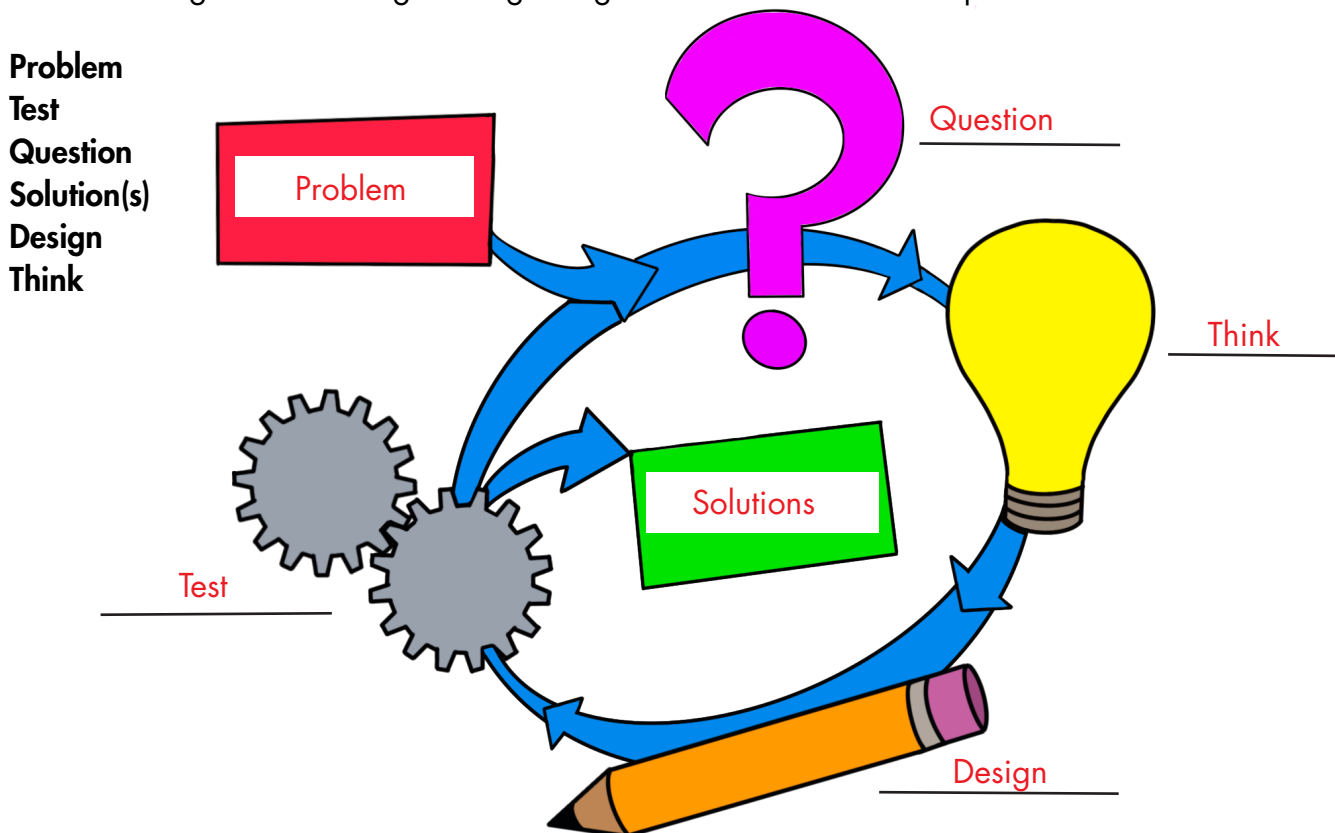
In this **STEM Project**, students will investigate the engineering design process and apply their understanding to design a possible engineering solution to help endangered Chinese giant salamanders survive.



Activity 1: Getting Started

Hellbender houses are important for keeping young hellbenders safe in the wild. Getting the design right is really important. Before embarking on designing engineering solutions, it is important to remember the Engineering Design Process.

Fill in the diagram of the Engineering Design Process below with the provided words.



Think about all the things the hellbender huts need to do. What does it need to do to last a long time in the wild? What does it need to do to keep hellbenders safe? Below, list the criteria for the design to be successful. Next, list the constraints, or the things that would prevent the design from working.

Criteria:

Possible answers include:

- must not be destroyed or swept away by fast-rushing water
- must be able to work in hot and cold water
- must allow hellbenders to get in and out

Constraints:

Possible answers include:

- cannot let predators in
- cannot be too heavy to move to a river
- cannot be too expensive

Activity 2: Defining the Problem

We recommend having students work in small groups. Once students have completed their work, have them report back to the entire class and update their own lists.

You got to see hellbender huts in action in the video! Now, we need you to design huts for Chinese giant salamanders. Chinese giant salamanders face some of the same threats that hellbenders do, but they can live in streams with even faster water and are much larger than hellbenders. We need you to design a home for them!

Here are some things about Chinese giant salamanders to remember:

- They can grow to 1.8 m (5 ft), but most are only 1.1 m (3.5 ft).
- They live in very fast-moving water.
- Their eggs need to be laid in areas where the water doesn't flow too fast.
- Eggs are at risk from predators and need to be guarded.
- People need to be able to carry the huts into the rivers.

Use the information above to **draw** a diagram of the hut you would build to protect Chinese giant salamanders. Be sure to include dimensions of different parts of the hut. Label each piece of your hut and provide one sentence for why you chose it. Also, **discuss** and explain what types of material you might use to make the hut.

Accept well-reasoned answers. Some considerations include: the weight of the hut for moving it, only one opening that can be defended, an opening downstream to keep it from being carried away or eggs being washed out, and that it is big enough for an adult to occupy. Students can choose different materials but should discuss the need for it to be light enough to carry but sturdy enough to be able to stay in the current.

Write a paragraph that includes: 1) any special design features you would add to the huts, 2) how you would put them in place, and 3) how you would test if they are working.

Accept well-reasoned answers

Extend the lesson: Have students make physical models of their Chinese giant salamander huts.

Activity 3: Design an Ecosystem

Now that you know all about the needs of hellbenders, it's time for you to be an environmental engineer. In the space below, **draw** an ecosystem that would be perfect for hellbenders. Label the different parts in your drawing. **Present** the drawing to your class. Talk about where hellbenders live and how your design would keep them safe. Be sure to include a **river** or **stream**, **riffle**, **pool**, **rocks**, **forest**, **farm**, and **wetland**.

Extend the lesson: Have students make a physical model of a habitat using construction paper and modeling clay. Have students make clay hellbenders to place in their habitat.

See example drawing. Good answers will include all the elements that are listed. In presentations, students should identify that hellbenders need riffles and rocks. Farms should not be near the river to avoid pollution. Forests and wetlands along the bank keep the water clean.

