

An illustration of a light blue house with a brown roof. A large crack runs down the roofline. Two green trees with brown trunks are on either side of the house. The background is a light green hill.

Learning from Nature--Earthquake Damage Prevention

Subject: Biomimicry

Grade Level: 6-10

Topic: Earthquake Damage Prevention

Time: 60-90 minutes

Learning Objectives

Students will:

- describe how natural systems survive or adapt to shaking or strong forces.
- understand the concept of biomimicry.
- apply nature-inspired design to build an earthquake-resistant model.

Materials

Video or images of natural and engineered structures, Internet access (optional), craft supplies such as straws, paper, tape rubber bands, string, cardboard, etc. [DIY shake table](#) (click for instructions) whiteboard and markers

Procedure

Engage: To promote student curiosity, ask students how nature deals with stress or shaking.

Here are possible videos to show. 🌐 [Secret of the Pagoda's Earthquake Resistant Design](#)

🌐 [Can You Build A House With Bamboo? - Civil Engineering Explained](#)

Explore: Help students build understanding by having students participate in an activity

where they learn about biomimicry. Assign groups of 2-4 students. Have students research to develop a working definition of biomimicry for their group. Once each group has a definition, a member of their group should write it on the board. Once all groups have contributed a definition, work together as a class to synthesize all definitions into one acceptable to the class. Next have student groups find at least 2 examples of bio-inspired inventions. Have a different member of each group write their examples on the board.

Explain: Have students begin to show what they have learned. Have each group explain about the biomimicry examples they found. Have a class discussion about the examples. Give students time to share any other ideas they have.

Elaborate: Have students use what they have learned by working in their groups to design a structure inspired by nature that can withstand an earthquake. After all structures are ready, test them on the DIY shake table. Students should comment on the following after testing their structure.

- What organism inspired their idea?
- How well did your structure survive?
- If you could rebuild, what would you do differently?

Assessment

Evaluate: Evaluate student learning by having each group present their models and explain their design inspiration and results.

- Which ideas are the most practical?
- What are the most creative?
- How might these ideas improve sustainability or safety?

Extension Activities

- Create a research project on real-world biomimicry in architecture or engineering.
- Develop a creative writing project regarding designing a house in an earthquake-prone area using natural inspiration.

NGSS Alignment

Middle School

MS-ETS1-1 - Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment.

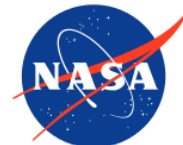
MS-ETS1-2 - Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.

MS-ETS1-3 - Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each.

High School Extensions

HS-ETS1-2 - Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems.

HS-LS4-4 - Construct an explanation based on evidence for how natural selection leads to adaptation of populations.



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