Teacher's Key: Bat vs. Bat Bot

Level 1

ease of implementation: easy

OVERVIEW

Students compare and contrast living bats and a robot "Bat Bot" or "Robo-Bat" that was directly modeled after the living creatures.

Why It's Easy for You

- Worksheets are ready to print
- No supplies besides writing materials and ability to show a video

Before You Begin

- Ensure students have familiarity with different aspects of bats
- Consider a brief discussion of how drones/flying machines are used in society

Conditions and Challenges

- This is not an introductory activity, make sure students have had previous instruction on bats and, if possible, a brief discussion about flying machines/drones
- You need access to internet and a way to show students two videos

NGSS alignment

1-LS1-1 Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs

Disciplinary Core Ideas

- Animals have differences in external parts.
- Different animals use their parts in different ways to interact with the world.

Crosscutting Concepts

- Structure and Function: Students can identify what aspects/structures of the bat were replicated and to what end, or for what function? The Bat Bot is a literal case of structures being imitated to imitate how an animal functions.

Scientific Practices

- Constructing Explanations and Designing Solutions: From NGSS - "Use materials to design a device that solves a specific problem or a solution to a specific problem." Students learn about one way people used the natural world as inspiration to solve a problem and compare the solution (Bat Bot) with the inspiration (living bats).

Influence of Science, Engineering and Technology on Society and the Natural World

- From NGSS - "Every human-made product is designed by applying some knowledge of the natural world and is built using materials derived from the natural world." In this case, scientists and engineers learned the exact mechanics of how bats fly and imitated it to build a robot!

Teaching the Lesson

1. Print the Bat vs. Bat Bot worksheet for students.
2. Show the class the two videos linked in the Powerpoint that accompanies this lesson. These are "Bats Take Flight" by Science Friday and "Robo-bat Flaps Like the Real Thing" by Scientific American.
3. Class Discussion! Potential topics: 1. How bats and the Bat Bot are similar and different 2. how the natural world can inspire creative inventions 3. how drones or "flying machines" are increasingly used to take aerial images, for search and rescue missions, or other uses and 4. how the Bat Bot could function as a better, safer drone.
4. Have students write down their observations on the accompanying worksheet.

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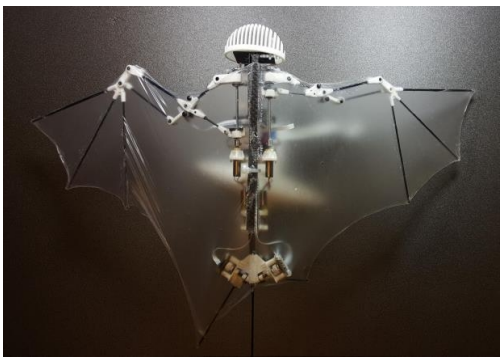
BAT VS. BAT BOT!

What is similar and different between real bats and the Bat Bot?



Write 2-3 things that are SIMILAR between real bats and the Bat Bot

1. Shape of wing 2. Skin or membrane around wing is thin. 3. Shape of animal generally (e.g. wings on side of body, "head" placement, etc.) 4. Metal "fingers" on robot mimic number, length and placement of those on the real bat 5. Students might uses similarities in movement see in the video

Write 2-3 things that are DIFFERENT between real bats and the Bat Bot

1. Bat is alive, Bat Bot is a robot 2. Real bat made out of biological materials, Bat Bot made of metal and man-made/synthetic materials. 3. Not all features are replicated exactly, e.g no ears, eyes on Bat Bot. No fur on Bat Bot, no guts on Bat Bot

Copyrights: BatBot: Associated Press; Flying Bat, face forward:Smithsonian Magazine https://www.smithsonianmag.com/science-nature/how-flesh-eating-fungus-helped-make-bats-cute-again-180966974/ ; Flying bat back up Jim Yates retrieved from https://www.marincountyparks.org/projectsplans/land-and-habitat-restoration/bat-monitoring. Images are cropped.

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