Porcupine Quills

Virtual Classroom Extension

Objective

This activity is designed to help your at-home student(s) recognize themselves as scientists and think critically about problem-solving. The goal is to help students begin to understand how we can look to nature to help us solve problems. As with all lessons provided, please feel free to adapt them according to your students' abilities. Take these ideas, make them your own and your at-home students will have a greater chance at success.

Materials

Paper, writing utensils, computer or tablet with internet access.

Procedure

1. Review the Virtual Classroom video about prehensile-tailed porcupines (https://resourcelibrary.clemetzoo.com/Area/21). Ask your students what they learned about porcupines in that video
2. Discuss adaptations that prehensile-tailed porcupines have that help them to survive in their environments. Ask your students about adaptations that they observed and what those traits may be used for. Adaptations to discuss include:
    a. Prehensile tail: Prehensile refers to a body part that is capable of grasping or wrapping around an object. Prehensile-tailed porcupines are able to use their tail to grab onto tree branches. This allows them to climb easily.
    b. Long claws: Claws help the prehensile-tailed porcupine to climb and grab onto tree branches.
    c. Large, orange front teeth: These front teeth (incisors) will grow throughout the entire life of the porcupine. This allows the porcupine to gnaw on bark and trees. The teeth are orange because they have iron in them. This iron strengthens the teeth so that they won't break easily when porcupines gnaw on tough tree branches.
    d. Quills: Quills are about 2-4 inches long and semi-hollow. They have microscopic barbs on the ends of them that allow the quills to easily go into the skin of another animal, but not easily come back out.
3. Explain that biomimicry is when people look to nature to find solutions to problems. An example of biomimicry is how Velcro was invented by looking at how burrs stuck

to peoples clothing. Scientists think that they can make more effective needles for doctors by learning from porcupine quills. Ask your students if they can think of any other ways people can learn from prehensile-tailed porcupines. What are ways we can learn from their teeth, claws, quills, or prehensile tails? What are some problems that might be solved by learning from prehensile-tailed porcupine adaptations?

4. Tell your students that they are going to act as inventors. They are going to think of a problem that we need an invention for. It can be something that we don't have yet, or something that we already have, but needs to be improved.
5. Next, they need to think of something in nature that has a characteristic that will help to solve that problem. They can draw their inspiration from a the prehensile-tailed porcupine or from a different animal or plant. Students can use the internet to help them come up with ideas.
6. The students should create a model (either a drawing or a 3D model if you have supplies) of the invention that was inspired by nature.
7. Once their model is complete, discuss with them what they did and why. Questions to guide the discussion may include the following:
    a. What problem were you trying to solve?
    b. What animal or plant inspired your solution?
    c. What is your invention and what does it do?
    d. How does your invention help solve the problem?

Ohio's Learning Standards

Science Content Standards
Grade 3 Life Science Topic: Behavior, Growth, and Changes **3.LS.2:** Individuals of the same kind of organism differ in their inherited traits. These differences give some individuals an advantage in surviving and/or reproducing.

Learning Standards for Technology
Grade 3-5 Technology Strand: Design and Technology **3-5.DT.2.b:** Plan and implement a design process: identify a problem, think about ways to solve the problem, develop possible solutions, test and evaluate solution(s), present a possible solution, and redesign to improve the solution. **3-5.DT.3.b:** Explore and document connections between technology and other fields of study.