Fishing for Conservation: Project Piaba

Virtual Classroom Extension

Objectives

These activities are designed to start your at-home students in recognizing themselves as scientists and in thinking critically about problem-solving. The goal is to teach concepts through discovery and to encourage using scientific thought processes. Feel free to adapt the lessons provided to better suit your students' abilities. Take these ideas, make them your own, and your at-home students will have a greater chance of success.

Materials

Three different types of tokens: six tokens to represent people, 10 tokens to represent trees, and 30 tokens to represent fish. Tokens can be whatever you have around the house. Suggestions include small pieces of paper, dice, poker chips, coins, etc.

Background Information

Ecosystems are communities of organisms that interact with each other and their surrounding environment. They consist of both biotic and abiotic components. Biotic means things that are living, such as animals, plants, fungi, and bacteria. Abiotic means things that are not living, such as water, rocks, soil, and even the climate. Because the biotic and abiotic components of an ecosystem interact with each other, this means that they also depend upon each other for the ecosystem to be healthy. If one component of the ecosystem, either biotic or abiotic, goes missing or changes, it can affect all other components.

Humans are also part of the ecosystem. We rely on the ecosystems we live in to provide food, shelter, clean water, and clean air. If something in the ecosystem changes, it can affect human health and livelihoods. Similarly, human actions can change the ecosystem in ways that affect other animals and plants living in it.

One example of a way humans coexist within their ecosystem is the people living near the Rio Negro, a river in the Amazon rain forest in Brazil. This river is home to 245 species of fish that people around the world like to have in their home aquariums. The families that live near Rio Negro make their livings by catching these fish to sell to people around the world. These fish reproduce very quickly, and the families that catch them do so in a sustainable way. This means that the families take the fish that they need, while ensuring that there are enough fish left to maintain a healthy ecosystem. The families also make sure to keep the fish that they catch healthy.

Because the people rely on the fish, they need to make sure that the river where the fish live is also healthy. The fish need clean water to live, and the surrounding rain forest keeps the water clean. This means that the people know that they need to maintain the rain forest so that they can have clean water. As a result, around 46,000 square miles of rain forest is preserved. That is about the size of Pennsylvania. The fish help the people, the people help the forest, and the forest helps the fish.

Procedure

1. This activity will simulate what a healthy ecosystem looks like, and what it looks like when that ecosystem is disrupted. For this situation, you will have tokens representing the people, tokens representing the rain forest, and tokens representing the fish. In each round, different situations will allow for the people to collect fish. If something happens and the people are not able to collect fish, they will have to collect from the forest instead.
    - Between each round, the fish and the forest will reproduce.
    - The fish reproduce quickly, so you will add two additional fish tokens for each fish token left on the table.
    - The rain forest trees reproduce and grow slowly, so add one tree for every three trees left on the board.
    - Finally, the remaining fish depend on a healthy forest. Each tree can keep three fish alive.
2. Begin by separating six tokens representing human families, six tokens representing the rain forest, and nine tokens representing fish. Explain that these tokens will represent a healthy relationship where the families who live in the rain forest are able to meet their needs by collecting fish from the river. Each family token represents one family that lives in the rain forest. Each fish token represents the amount of fish a family needs to collect to survive. Each rain forest token represents trees in the forest.
3. During round one, the fishing industry is doing well. The families are able to collect and sell enough fish to live comfortably and have enough food.
4. Each family token should take one fish token.
5. The families are happy and able to make ends meet this year, so set them and their fish aside.
6. The fish reproduce. Add two fish for every one fish on the board. (You should have three fish left, so add six more fish).
7. The trees reproduce. Add one tree for every three trees on the board. (You should have six trees on the board, so add two more trees).
8. Make sure you have enough trees to keep all your fish alive. Each tree can keep three fish alive. (After round one, you have plenty of trees to maintain your fish).
9. Round two: Bring the people back to the board to gather more fish for the next year. This year, an out-of-country aquaculture organization popped up. They started breeding fish in captivity to sell. Because of this competition, only five families were able to collect and sell fish.
10. Remove five fish for the five families that were able to collect them. Set the families and their fish aside.
11. You are left with one family that was not able to collect fish. Discuss with your students ways that the family could earn money. After they provide some ideas, explain that the family will have to use the forest to provide for themselves. They will need to cut down and sell trees.
12. Remove one tree.
13. Between rounds, the fish should reproduce. Have your student count the remaining fish (four) ask your student how many fish you should add if each fish makes two more fish (eight).
14. Next, your trees should reproduce. Every three trees make one more tree. If you have any leftover trees, they do not reproduce. In this round you have seven trees. This means that you only have two complete groups of three. Therefore, only two trees will be added.
15. Make sure you have enough trees to keep all your fish alive. Each tree can keep three fish alive. If you have older students, you can have them do the multiplication. With nine trees, how many fish can they keep alive? (They can keep 27 fish alive. You should only have 12 fish, so you have enough trees to keep your fish alive).
16. Round three: Bring your six families back to the board. This year, more people are buying captive bred fish and not buying fish from the rain forest. Only two families are able to sell fish. Remove two fish and set the two families with their fish aside.
17. You have four families that need to sell trees from the rain forest to survive. Remove four trees.

18. Between rounds, the fish reproduce. You have ten fish. Each fish makes two more fish. Ask your student how many fish you should add? (Add 20 fish).
19. Every three trees make one new tree. You only have five trees left. Ask your students how many trees they should add (Answer is one).
20. Every tree can keep three fish alive. You have six trees. Ask your students how many fish the trees can keep alive. (6 x 3 = 18, so the trees can keep 18 fish alive.) Do the math with your student to figure out how many fish you need to remove. (You now have 30 fish. 30 – 18 = 12. You should remove 12 fish).
21. Round four: Bring your six families back to the board. Again, only two families were able to sell fish. Remove two fish.
22. The other families had to take from the forest. Remove four trees.
23. Tell your student to look at the board. How many fish do they have left? (16). How many trees do they have left? (two).
24. Discuss with your student what they observe about this rain forest ecosystem. Some things to discuss include:
    - If you need three trees to make a new tree, would you be able to add any trees after the final round? (The answer is no because you only have three trees left.)
    - How many fish can those two trees keep alive? (The answer is six). Explain that even though the fish reproduce quickly, they need the surrounding rain forest to make the river healthy and clean enough to live in. Without the rain forest, there will not be many fish.
    - How do you think other rain forest animals are affected by the people using the trees instead of the fish?
    - How did situations outside of the ecosystem affect the ways the people used the ecosystem?
    - What does this activity tell you about how people interact with ecosystems?
25. Think back to round one. If you want a visual, set up the board again with nine fish, six families, and six trees. In round one, every family was able to get enough fish to make a living, enough fish were left to reproduce and bring their numbers back up to what they started with, and there were enough trees to keep all the fish alive. Round one demonstrated people using the ecosystem in a sustainable way. Ask your students what they think would happen if families took too many fish. Explain that sometimes people take too many resources from the ecosystem and it causes problems in the way you saw when the families needed to start taking trees instead of fish. But when we are smart and careful about how we use our resources, we can make sure everyone has enough both now, and in the future.
26. For more information about Project Piaba and the sustainable fisheries on the Rio Negro in Brazil, visit https://projectpiaba.org/.
27. If you want to help maintain this ecosystem and you have a freshwater, tropical aquarium at home, you can purchase Rio Negro fish and other environmentally friendly fish. When you buy your fish, ask where they came from.

Ohio's Learning Standards

Science Content Standards
Grade 2 Life Science Standards: Interactions Within Habitats **2.LS.1:** Living things cause changes on Earth. Grade 5 Life Science Standards: Interactions within Ecosystems **5.LS.1:** Organisms perform a variety of roles in an ecosystem.