Lesson by Meghan O'Leary

Maintaining Diversity With Keystone Species

Content Standards: C.3: develop an understanding that all organisms are linked to each other and their physical environments through the transfer and transformation of matter and energy

Cultural Standard: E. 1. encourages students to consider the inter-relationship between their local circumstances and the global community

Purpose/Objectives/Outcomes:

Students will understand the indirect impact certain species have on maintaining the diversity of ecosystems. Students will also understand that these impacts can have an effect on a broader scale.

The Student will be able to:

Students will be able to identify sea otters as a local keystone species and how their existence in the area maintains biodiversity, effects local fisheries and even climate change.

Begin class with biodiversity game:

Each group of 3-4 students needs:

- 20 red, green, and yellow, M&Ms,
- 4-5 drinking straws,
- record keeping tables.
- 1 paper plate

Assign each student in a group the role of Urchin, Otter or Fish (if groups of 4 assign 2 students as fish). Students will remove certain color M&Ms based on which predator they are. Otters may remove urchins and fish (yellow and red M&Ms), Urchins may only remove kelp (green M&Ms), Fish may remove both kelp and other fish (green and red M&Ms). Create a mini 'ecosystem' with 5 of each color M&M on the paper plate. Using only a straw, students will have 30 seconds to attempt to remove their designated prey from the 'ecosystem'. After each round students will record the current numbers of each prey in the system then allow for reproduction (double the remaining numbers of each species), record the new numbers for the beginning of the next round, repeat 4 times. Notice any patterns? In game 2, reassign the predators as only fish or urchins, with same rules.

Game with Sea Otters

Round	Fish	Kelp	Urchins
Initial Numbers	5	5	5
1			
2			
3			
4			
5			

Game Without Sea Otters

Round	Fish	Kelp	Urchins
Initial Numbers	5	5	5
1			
2			
3			
4			
5			

Assessment of student outcomes:

Class or group discussion at the conclusion of the games.

Explore questions:

- What patterns did you notice when playing the games?
- What was different between the first and second game?
- How does a sea otter effect the system as a whole?
- A single species that maintains the diversity of ecosystem is called a “keystone species”. What does “keystone” mean?
- Sea otters indirectly maintain kelp forests by controlling urchin populations. The Russians forced the Alaskan Natives to hunt the sea otters and by the 1900s less than 2000 otters. Can you think of any implications that would have happened if sea otters had been hunted to extinction? (climate and fisheries?)
- Can you think of any other keystone species?
- How can humans still affect the system?

Homework or Expansion Activity:

Have students watch the provided video to learn more about keystone species. Then research another example of a keystone species and present its ecosystem and food web in a manner of their choosing (e.g through art, poetry, narrative, or model).

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- What was different between the first and second game?
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Homework or Expansion Activity:

https://www.youtube.com/watch?v=hRGg5it5FMI

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