

From 1 – Populations, Connections, Systems

Rationale

Students often look at the world one animal or plant at a time, not considering that in order for life to exist there must be intraspecific relationships between animals or plants of the same species and interspecific relationships between animals and plants within an ecosystem. All of these interrelationships also include relationships with the abiotic aspects of the system. All of these pieces must come together for the student to develop a robust understanding of ecosystems. This lesson series seeks to help students develop this multidimensional understanding of ecosystems starting with their preconception of one and working outward to include the entire ecosystem.

MI GLCE

- L.OL.06.51 Classify producers, consumers, and decomposers based on their source of food.
- L.EC.06.11 Identify and describe examples of populations, communities and ecosystems including the Great Lakes region.
- L.EC.06.21 Describe common patterns of relationships between and among populations.
- L.EC.06.23 Predict and describe how changes in one population might affect other populations based upon their relationships in the food web.
- L.EC.06.31 Identify the living (biotic) and non-living (abiotic) components of an ecosystem.
- L.EC.06.32 Identify the factors in an ecosystem that influence changes in population size.

Objectives

1. Students will define the concepts of population and community.
2. Students will develop a model depicting changes in populations and communities.
3. Students will model the interrelationships between various producers and consumers within a community.
4. Students will research an endangered species and create a presentation (paper, poster, mobile, concept map, etc) to show the connections between various biotic and abiotic factors in an ecosystem.

Key Concepts

Species	Abiotic	Producer
Population	Biotic	Consumer
Community	Predator	
Ecosystem	Prey	

Materials (for each group):

From 1 Game Board Land Maps (available at owlcorner.net)

10 frogs

100 green bingo chips to represent ground plants

25 dowel pieces to represent trees

100 ants (each ant represents 100 ground insects/spiders)

40 flies (each fly represents 100 flying insects)

Data sheets

Index cards

Strategies

Engage (10 min)

Introduce an endangered species and ask students to share why they think that this species is endangered. What does it mean to be endangered? Do they think that this species will recover? Why? Why not?

The goal of the engage is to assess student preconceptions on populations, communities, and abiotic factors needed to promote the survival of a species.

Question for Today: What does an animal need in order to survive?

Explore #1 (10 min)

This exploration will probably be fairly short and may be somewhat frustrating to the students.

Split the class into groups of three and pass out the From 1 Game Board to each group. Explain that this represents the area in which their animal lives. Now pass out one (1) frog to each group and the data sheet. Explain that their job is to keep the frog alive.

Teacher Notes: As students think about keeping their frog alive they may mention that it is eating bugs and living in the water. As the teacher you need to ask them where the bugs are? You don't see any on their game board? If it's not there can the frog survive? What is there? Will their frog survive? Why or why not? What resources do they have right now. Are those needed?

Explain #1 (10 min)

Have the students explain why they were not able to keep their frog alive. What kinds of things will it need to survive?

Teacher: Building off the student ideas explain that one frog cannot survive on its own. As they noted it requires other living (abiotic) things. It also needs non-living (abiotic) parts too. What were some of those?

Explore #2 (25 min)

Now have the students go back to their data sheet and determine what your frog will need to survive.

When students think that they have the necessary ingredients to keep the frog alive, have them order their list starting with 1 as most important to ____ as least important.

END OF FIRST ONE HOUR CLASS PERIOD

NEXT CLASS PERIOD (OR CONTINUE IF ON BLOCK SCHEDULE)

With their list ordered, they may send a representative to the Ecosystem store to get their most important ingredient.

Be ready with answers to student lists. The system must be built first in order to support the life of the frog. When students do get an item, it must be recorded on an index card.

First round answers: Needed item is in grey

Students should continue to try until they get ground plants

Student Request	Answer
Plants	What kind of plants?
Ground Plants	How many ground plants would you like? Give green bingo chips
Trees/Shrubs	I'm sorry, but your island cannot support trees right now
Food	What kind of food do you want?
insects	What kind of insects do you want?
flying insect	I'm sorry, but your island cannot support flying insects right now.
ground insect	I'm sorry, but your island cannot support ground insects right now.

Second Round Answers:

Cannot add insects until 30 plants cover the board

Student Request	Answer
Plants	What kind of plants?
Ground Plants	How many ground plants would you like? Give green bingo chips
Trees/Shrubs	I'm sorry, but your island cannot support trees right now
Food	What kind of food do you want?
insects	What kind of insects do you want?
flying insect	I'm sorry, but your island cannot support flying insects right now.
ground insect	How many ground insects would you like? Give 1 ant for every 50 requested. (If the student requests less than 4 (200 insects), the next time they come up inform them that their frog has died from starvation – 200 insects only lasted 5 days. The insects did not have time to reproduce. Please try again.

Third Round Answers:

Student Request	Answer
Plants	What kind of plants?
Ground Plants	How many ground plants would you like? Give green bingo chips
Trees/Shrubs	How many trees would you like to add to your island?
Food	What kind of food do you want?
insects	What kind of insects do you want?
flying insect	I'm sorry, but your island cannot support flying insects right now.
ground insect	Don't you have enough ground insects to support your frog?

When students finish their request for the third round and they now have trees and shrubs, inform them that they may now ask for combinations of items.

Fourth Round Answers:

Cannot add flying insects until there are 15 trees on the map.
Flying insects have to be in the combination for this round

Student Request	Answer
Plants	What kind of plants?
Ground Plants	How many ground plants would you like? Give green bingo chips
Trees/Shrubs	I'm sorry, but your island cannot support trees right now
Food	What kind of food do you want?
insects	What kind of insects do you want?
flying insect	How many flying insects would you like? Give 1 fly for every 100 requested. Students must request more than 2 (200 flying insects) in order to have a reproducing population.
ground insect	How many ground insects would you like? Give 1 ant for every 100 requested. (If the student requests less than 2 (200 insects), the next time they come up inform them that their frog has died from starvation – 200 insects only lasted 5 days. Please try again.

Fifth Round Answers:

At this point, the life span of the frog has just about finished. If they do not request another frog to create a reproducing population, give the following answer:

While I can fulfill your request, I'm sorry to inform you that unless measures are taken, your frog will not survive to the next round.

This will create a flurry of questions, but continue to repeat the answer above. Students must figure out that in order to survive, their frog must reproduce.

The only item given in this round is another frog (must specify male or female – each frog is marked).

Sixth - Tenth Round Answers:

If no plants (ground plants or trees) are in the water of the students' map, answer:

I'm sorry, but your young did not survive, please try again. They cannot reproduce until plants are in the water to hold on to the eggs.

When the frogs begin to have young, give students 1 frog to represent 5 new frogs. At this point, students must maintain 200 insects (ground or flying) for each frog. Anything less will result in the loss of 1 frog (5 frogs) for every portion short.

After the tenth round, have students complete the **Frog Survival** sheet.

Explain

Have students share their observations from the exploration. What was the greatest obstacle to their frog's survival? Could just one frog make it on its own? Why not?

Introduce the idea of population – that animals cannot live on their own. In order to survive, they must be part of a population that allows for the reproduction of the species.

Introduce the concept of community – that the frog population could not live by itself, it was also dependent on other populations both for its food and for their food.

Introduce the concept of ecosystem – the combination of the community and all of the abiotic factors required for the survival of the community's biotic species.

Given these ideas, what factors might make it hard for an endangered species to survive?

- Limited available partners
- Limited or specialized food supply
- Not enough geographical location

Evaluation

Have students complete a research project on an endangered species to determine what its population is like and what its ecosystem requirements are (other members of its community, abiotic factors necessary, etc). Evaluate projects based on the completeness of the use of concepts of population, community, biotic, and abiotic and the connections between all of these pieces

Presentations of research could take the form of a paper, poster, mobile, concept map, or other creative presentation of the research.

Frog Island

Name _____

Jumping In!

Why do you think endangered species become endangered? _____

Frog on an Island – Part 1

How will you keep your frog alive? _____

Frog on an Island – Part 2

What will your frog need to stay alive? List all the things that you think your frog will need to remain alive. _____

Staying Alive

Record your efforts to keep your frog alive:

1. Trip 1
 - a. Asked for _____
 - b. Received _____
 - c. Status of frog: Dead Alive and Weak Alive and Healthy
2. Trip 2
 - a. Asked for _____
 - b. Received _____
 - c. Status of frog: Dead Alive and Weak Alive and Healthy
3. Trip 3
 - a. Asked for _____
 - b. Received _____
 - c. Status of frog: Dead Alive and Weak Alive and Healthy
4. Trip 4
 - a. Asked for _____
 - b. Received _____
 - c. Status of frog: Dead Alive and Weak Alive and Healthy
5. Trip 5
 - a. Asked for _____
 - b. Received _____
 - c. Status of frog: Dead Alive and Weak Alive and Healthy
6. Trip 6
 - a. Asked for _____
 - b. Received _____
 - c. Status of frog: Dead Alive and Weak Alive and Healthy
7. Trip 7
 - a. Asked for _____
 - b. Received _____
 - c. Status of frog: Dead Alive and Weak Alive and Healthy
8. Trip 8
 - a. Asked for _____
 - b. Received _____
 - c. Status of frog: Dead Alive and Weak Alive and Healthy
9. Trip 9
 - a. Asked for _____
 - b. Received _____
 - c. Status of frog: Dead Alive and Weak Alive and Healthy
10. Trip 10
 - a. Asked for _____
 - b. Received _____
 - c. Status of frog: Dead Alive and Weak Alive and Healthy

Frog Survival:

Did your frogs survive? What was needed in order for your frog to survive? _____

Why did your frogs need so many things? Were all of the things biotic? _____

How many frogs did you end up with at the end of the tenth round? _____

Write about the endangered animal from the beginning of this lesson. What kinds of things do you think are making it endangered?

