Keystone Species: Tigers
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 students will have a greater chance of success.

Materials

Paper, plate, 3-4 straws (can use chopsticks or spoons as an alternative), 20-30 colorful candies like M&Ms or skittles – mix of 3 colors. For the sake of this activity, we will use red, orange, and green (can use beads, dried beans, dried pasta, or pennies as an alternative, but will need to be able to color them). This activity is designed for 3-4 players.

Background Information

The Amur tiger is the largest of the big cats, weighing between 400-675 lbs (males) and 220-370 lbs (females). This species is found almost exclusively in the Amur River Valley in the Russian Far East and their habitat includes deciduous and evergreen forests. They can tolerate a wide range of climates and habitats, only requiring adequate cover, water, and prey to survive. They are solitary and rarely overlap habitat with other tigers. They are carnivores and can eat as much as 88 pounds of meat at one time. In the wild, they eat elk, red deer, and wild pigs. In summer months, they will add grass, cedar nuts, fruits, and berries to their diet.

Tigers are considered a keystone species, one that has a large effect on the ecosystem in which they inhabit. Other species that share habitat with tigers rely on them to keep the ecosystem in balance. Named after a keystone found at the top of an arch, if this species were to be completely removed from the ecosystem, it would become unbalanced and be in jeopardy of collapsing.

Key concepts:

- Keystone species – a species on which other species in an ecosystem largely depend, such that if it were removed, the ecosystem would change drastically.
- Predator – an animal that naturally preys on other animals.
- Prey – an animal that is food for another animal.
- Ecosystem – a biological community of interacting organisms and their physical environment.
- Food web – all of the food chains within an ecosystem.
    - Producers – make their own food (plants and other vegetation)
    - Primary consumers – mostly herbivores that consume the producers (e.g. deer)
    - Secondary consumers – eat primary consumers (e.g. wild pigs)
    - Tertiary consumers – eat primary and secondary consumers (e.g. tigers)
    - Apex predator – a predator at the top of the food chain that is not preyed upon by any other animal (e.g. tigers).

- To learn more about Amur tigers – https://resourcelibrary.clemetzoo.com/Animal/223
- To learn more about what the Zoo is doing to secure a future for tigers – https://www.clevelandmetroparks.com/zoo/wildlife-we-protect/illegal-wildlife-trade

Procedures

1. Begin this activity by discussing ecosystems, food webs, and keystone species. Ensure your at-home students understand these concepts. Then discuss Amur tiger ecology – range, habitat, diet, behavior, etc. Explain that the game will help identify how important tigers are to their ecosystem as a keystone species.
2. Place 15 candies (5 red, 5 orange, and 5 green) on a plate and give each student a straw.
3. Assign each player a role to play – tiger, deer, or wild pig. Each player will be allowed to remove certain colors based on what they eat. Tigers eat deer (orange) and wild pigs (red), wild pigs eat deer (orange) and vegetation (green), and deer eat vegetation only (green).
4. Explain that the candies represent a healthy, balanced ecosystem full of producers and consumers. Because everything must eat to survive, they will compete with each other for food resources. Players will have 10 seconds to remove as many of their identified food items from the plate using only their straws.
5. At the end of each round, use the sheet below to record how many of each were left in the ecosystem. Once that number is recorded, double the amount that were left to account for "reproduction." For example, if 3 red, 2 orange, and 2 green were left after round #1, round #2 would start with 6 red, 4 orange, and 4 green. Play a total of 5 rounds or until all food resources have been removed.
6. After each round, take time to discuss the following:
    - What happened in this round?
    - How many food resources are left and what are they?
    - What does that mean for the health of the ecosystem?
    - What patterns are emerging, if any?
7. In Game #2, tigers (keystone species) will be removed. Assign each player a role, leaving out tigers. If an odd number of players, assign one more wild pig. Follow the same rules as Game #1. After each round, take time to discuss the talking points listed above.
8. After Game #2 is complete, take time to discuss the following:
    - What was the difference between the first and second game?
    - How do tigers effect the ecosystem?
    - Why are keystone species, like tigers, important to ecosystems?
    - How can we, as humans, help ecosystems where tigers live?

ADDITIONAL EXTENSION OF ACTIVITY USING SCIENTIFIC INQUIRY *(a worksheet has been provided at the end of this lesson plan for this extension)*: After you have played both games (with and without tigers present in the ecosystem), discuss what you found most interesting. Based on those findings, formulate a comparative question experimenting with different ratios of wild pig (red), deer (orange), and vegetation (green) and situations that could occur in the wild. A good comparative question compares two things and cannot be answered by simply doing one thing (e.g. "will there be more vegetation left in the ecosystem if more deer are present or more wild pigs?" is better than "how much vegetation will be left if there no wild pigs?"). Once you have your question, explore some predictions. What do you think the answer to your question will be and why? Next, make a plan for how you will collect your data and then implement it. Once you have collected your data, think hard about what you found. Consider creating a chart, graph, table, or diagram to analyze your findings. The last step of scientific inquiry is to share your findings. Who would be interested in seeing what you found? How can you prepare your findings to share with others?

Ohio's Learning Standards

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

Game #1 – tigers present in the ecosystem

	Wild pig (red)		Deer (orange)		Vegetation (green)	
	Started with	Ended with	Started with	Ended with	Started with	Ended with
Round #1	5		5		5	
Round #2						
Round #3						
Round #4						
Round #5						

Game #2 – tigers absent from the ecosystem

	Wild pig (red)		Deer (orange)		Vegetation (green)	
	Started with	Ended with	Started with	Ended with	Started with	Ended with
Round #1	5		5		5	
Round #2						
Round #3						
Round #4						
Round #5						

Scientific Inquiry Worksheet:

1. **In the space below, write down any observations you found interesting from Game #1 and Game #2.**

2. **Write your comparative question:**

3. **Write your predictions:**

4. **Use the back of this sheet to collect and analyze your data.**

5. **Does the data support your prediction? Why or why not?**

6. **Who do you want to share your findings with?**