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Focus on Inquiry

Students will identify characteristics of invasive species and predict how an invasive species will affect the physical characteristics of an environment.

Lesson Summary

In this lesson on invasive species, students watch a Ted-Ed video about invasive species, completing a Post-Video Questionnaire that highlights surprising facts and examples, such as Kudzu Vines. Next, they engage in a Jigsaw activity, becoming “experts” on apple snails by reading assigned texts and sharing findings in their home groups. The lesson includes the Limpkin Game, where students observe the negative effects of introducing apple snails into a pond ecosystem, discussing potential solutions to mitigate these impacts. Finally, they apply their knowledge in an Invasive Species Scenario, modeling how the release of apple snails into a pond affects a nearby rice paddy. The lesson concludes with the teacher evaluating student understanding through their models, reinforcing the real-world implications of invasive species on ecosystems.

Lesson Content Overview

- Subject: Invasive Species
- Duration: 4 class periods
- Setting: Classroom
- Grouping: Whole Group/Small Groups
- Grade Level: 4th Grade

Louisiana Standards (Use the Louisiana Student Standards from the [Academic Standards Library](#). Identify the code and full verbiage for the standard(s) used).

| Standard | Description |
|-----------------|---|
| 4-ESS2-3 | Performance Standard: Ask questions that can be investigated and predict reasonable outcomes about how living things affect the physical characteristics of their environment. |

| | |
|-------------------|---|
| UE.ESS2E.a | <p>Asking questions and defining problems: Asking questions (science) and defining problems (engineering) in 3-5 builds on K-2 experiences and progresses to specifying qualitative relationships.</p> <ul style="list-style-type: none"> • Ask questions that can be investigated and predict reasonable outcomes based on patterns such as cause and effect relationships. <p>CAUSE AND EFFECT Cause and effect relationships are routinely identified, tested, and used to explain change.</p> <p>BIOGEOLOGY Living things affect the physical characteristics of their environment.</p> |
|-------------------|---|

Student Learning Objectives

1. Students will be able to define invasive species and identify their characteristics, including how they disrupt local ecosystems.
2. Students will analyze the effects of invasive species, specifically apple snails, on ecosystems through hands-on activities like the Limpkin Game and create models to demonstrate these impacts.
3. Students will work collaboratively in groups to research, share findings, and present information about invasive species, enhancing their communication and teamwork skills.

Prior Knowledge Needed by Students

Students should be familiar with life cycles, ecosystems, and food webs and the needs of organisms for survival. Students need knowledge about the various life cycles of different types of organisms to better understand how an invasive species may grow and populate quickly in a non-native area. Students need prior knowledge of how organisms in an ecosystem rely on a balance of various needs for survival. Students also need to recognize how different organisms' needs and food are acquired in a healthy environment. In third grade students study ecosystems and learn how some animals may form groups to help members survive. Students also learn that in a particular habitat, some organisms can survive well, some survive less well, and some cannot survive at all depending on how well their needs for survival are met.

Background Information for Teachers

In this engaging lesson, students will build upon their existing knowledge of invasive species by generating thought-provoking questions that aim to uncover any misconceptions and shed light on the problems associated with these species, particularly in the context of Louisiana. To illustrate the concept, apple snails, a specific invasive species wreaking havoc across the state by primarily utilizing

waterways, will be used as a prime example. Apple snails primarily consume aquatic plants, however, their presence has become increasingly prevalent in Louisiana's agricultural fields, signifying their invasive nature. The Louisiana Wildlife and Fisheries department has identified apple snails as a rapidly reproducing species that poses a threat to young rice plants. Moreover, the eggs of these snails may contain a neurotoxin that can potentially harm humans, emphasizing the need for caution when handling them. To further deepen their understanding, students will explore various resources such as videos, articles, and engage in both whole and small group discussions. Additionally, a hands-on activity will provide a practical experience, while the culmination of the lesson will involve the development of a model to summarize their newfound knowledge about how invasive species can alter the physical characteristics of their environment.

Materials Needed

- Sticky Notes - (3 to 4 per student)
- Chart Paper
- Computer/Whiteboard with Internet Access
 - [Ted-Ed: Invasive Species](#)
 - [National Geographic - Invasive Species](#)
 - [Control Methods](#)
 - [LSU AgCenter - Invasive Apple Snails](#)
 - [WLF - Apple Snail Brochure](#)
 - [Limpkins & Apple Snails](#)
 - [Invasive Species have a New Foe](#)
- Jigsaw [graphic organizer](#) (1 per student) (printed or digital access)
- Copy of [Apple Snails game](#) (1 per student; printed)
- 1 Set per Group of the Following:
 - 20 green beads
 - 10 pink beads
- [Invasive Species Scenario](#) (1 per student) (printed or digital access)
- Student-Generated Sticky Notes from Lesson Intro and Questions Generated by SS for WG Discussion

Detailed Lesson

1. Engage (Time: 10 minutes)

Materials

- Sticky notes
- Pencils
- Video about invasive species
- Post-video questionnaire

Directions

In this section, the teacher will lead students in a whole group discussion to identify prior knowledge and generate student questions while introducing the topic, "Invasive Species."

The students will use sticky notes to record thoughts and questions about Invasive Species. Students will view a video about invasive species and complete a Post-Video Questionnaire to apply their knowledge.

Students will participate in a whole-group discussion to revisit their initial thoughts and questions.

The Task:

1. The teacher will write on the board- Invasive species
2. In pairs students will write on a sticky note everything they know about invasive species. On separate sticky notes, students will generate questions they have about invasive species.
3. The teacher will pick up the sticky notes and lead a whole group discussion for grouping student-developed sticky notes according to topic (definition, examples, misconceptions)
4. The teacher will show students the video: [Ted-Ed: Invasive Species](#). While viewing the video, students will consider and identify answers to questions for the sticky notes at the beginning of class. Students will also receive the post-video questions to complete while and after watching the video.
5. Students will have about 5 minutes to finish completing the Post-Video Questions:
 - a. List two surprising facts discussed in the video.
Some invasive species were originally brought to the United States to solve a problem or for fun, but the problems did not arise until it was too late to slow down the growth of the organism.

Many invasive species become invasive when the new environment it is brought to, allows it to thrive and depletes the environment of native organisms over time.

- b. What is one example of an invasive species discussed in the video and the problems it caused in non-native areas?

The massive vines (Kudzu Vines) brought to the southern United States to stop soil erosion, feed cattle, and decorate porches were initially used to solve solutions, but due to the warm climate year around in the southeastern United States, it quickly became an invasive species.

- c. What factors allow invasive species to thrive in non-native areas?

Changes in climate, lack of predators.

6. Revisit sticky notes as a whole group to check understanding. Identify any potential questions that have been answered. Provide students an opportunity to generate additional questions.
7. Students will return to the board at the end of the lesson to check their understanding.

2. Explore (Time: 20-25 minutes)

Materials

- Informational texts about Apple Snails
- Graphic organizers
- Pencils

Directions

The Teacher Will (TTW) will introduce the Jigsaw Instructional Strategy, which involves having students read informational texts about apple snails and share their findings with their peers. The Student Will (TSW) will become "experts" in their assigned article and read it in small groups. Students will identify key takeaways and record their findings in a graphic organizer to share with peers from their home groups.

The Task: Adapted from LDOE WHOLE-CLASS INSTRUCTIONAL STRATEGY Title: Jigsaw

1. TTW will choose four or more separate texts for students to read.
2. TTW Introduce students to "home" groups. The home group consists of 3-4 students who will become experts in the assigned texts.
3. Assign each student from a home group to a different expert group.
4. In each expert group, provide students with the same text or section of a

text.

5. Establish a purpose for reading and prompt students to use the provided Jigsaw Graphic Organizer. Allow time for students to independently read and analyze their assigned text in their expert groups.
6. After reading, allow time for the expert groups to determine the content to share and the best way to share the content with their home group.
7. Then ask each student to return to their home group and provide structured time for the students to present the information they received from the text in their expert group with the home group.
8. Finally, have the home groups summarize the information they learned through whole-class discussion and revisiting the sticky notes from the lesson introduction.

3. Explain (Time: 30-35 minutes)

Materials

All per group

- Pond template
- 20 green beads
- 10 pink beads
- 5 brown beads

Directions

TTW guide students to play the Limpkin Game in order to observe how an ecosystem changes with the introduction of an invasive species. The Student Will (TSW) participate in a hands-on learning experience, using visual data to observe these changes.

The Task: Have students play the Limpkin Game by following the instructions and responding to the questions embedded within the game.

[Limpkin game](#) - (**See document for instructions and student questions**)

Scenario: Imagine that you work for the Department of Wildlife and Fisheries and are in charge of monitoring a pond to examine how the ecosystem is altering. Complete the following steps with your teammates to record

observations and discuss possible solutions to this dilemma.

Directions:

1. Place the pond template in the middle of the table.
2. Place 10 green beads in the pond. What do you think the green beads represent?
3. In a healthy pond the vegetation multiplies.
4. Double the green beads. How many green beads do you have now?
5. Why is it important to have vegetation in a pond?
6. If the plant population were to decrease, how would it affect other species? Give some examples.
7. Place two pink beads in the pond. Pink beads represent the invasive apple snail.
8. How do you think they got in the pond?
9. What do you think will happen to the pond's ecosystem?
10. Apple snails eat plants and have a hearty appetite. For every snail in the pond remove two plants.
11. Apple snails also multiply fast. For every two apple snails place four beads in the pond.
12. As the snails multiply, they eat more plants. Take away two plants for every snail that is in the pond.
13. How many snails are in the pond?
14. What is happening to the vegetation?
15. If this trend continues, what do you think will happen to the existing ecosystem?
16. Discuss with your group what happened to the pond
17. What are some possible solutions for this problem?

Questions (Embedded within the Limpkin Game.)

Question 1: Why is it important to have vegetation in a pond? *All organisms within an ecosystem rely on vegetation in a pond for food, nutrients, and shelter whether directly or indirectly. Vegetation can keep the balance of the environment in check and slow down the rate of soil erosion on the banks of the pond.*

Question 2: If the plant population were to decrease, how would it affect other species? Give some examples. *Organisms that rely on plants for food and shelter would starve or leave the area in search of other plants to meet their needs. The water in the pond may become unhealthy for the fish and water organisms.*

Question 3: If this trend (of apple snails eating vegetation) continues what do you think will happen to the existing ecosystem? *The ecosystem would change drastically in a negative manner that would result in the loss of many native species.*

Question 4: What are some possible solutions for this problem (apple snail invasion)? *Remove eggs as soon as they are spotted by humans to reduce the population problem. Plant additional vegetation to increase the plant population.*

Question 5: Why are invasive species, like apple snails, a problem? *Invasive species create an imbalance in the ecosystem of areas where they are introduced and can rapidly deplete the vegetation of an area.*

Question 6: How were apple snails introduced to Louisiana? *They originally were introduced as pets.*

Question 7: How have apple snails traveled to new areas around Louisiana? *The eggs can become attached to the bottom of boats that travel to new waterways, the eggs hatch, and reproduce on plants in new environments.*

4. **Expand** (Time: TBD)

Materials

- Models
- Pencils

Directions

TTW introduce the Invasive Species Scenario to students. The Student Will (TSW) apply knowledge gained through the Jigsaw Investigation and Limpkin Game to generate a model of how apple snails will change the environment of a rice paddy field.

The Task: The Teacher will introduce the Invasive Species Scenario to students

- Invasive Species Scenario: Your ten-year-old neighbor received a fish tank with two apple snails for his birthday. After two months of not properly caring for the snails, his parents made him get rid of them. With no luck in finding a new home, your neighbor decided to dump the snails in the neighborhood pond. This pond is located near a rice paddy field.
 - How will the introduction of the apple snails to the pond affect the nearby rice paddy field?

Develop and label a model of how the apple snails will affect the pond and nearby rice paddy field based on your knowledge of invasive species and apple snails.

5. Evaluate (Time: 5 minutes)

Materials: Invasive Species Scenario and Model

Directions

The Teacher Will (TTW) assess students' understanding by reviewing student models generated by The Invasive Species Scenario. The Student Will (TSW) assess their learning through the completion of the Invasive Species models.

Check for Understanding: Describe how you will check for understanding (CFU) for the lesson. (How will you measure learning throughout the lesson)?

| Rubric: Check for Understanding of Invasive Species Scenario Model | | | |
|---|---|---|---|
| | Basic | Mastery | Advanced |
| Construction, creativity, neatness | The model is constructed with little neatness and creativity. | The model is carefully constructed, but does not showcase student's creativity. | The model is carefully constructed with materials that showcase student's creativity and are appropriate. |
| Model related to Science Concepts | Scientific concepts and connections to real world applications are unclear in the model. | Model represents scientific concepts with minor errors and shares connections for real world applications. | Model clearly represents scientific concepts and is scientifically correct, having connections to real world applications. |
| Explanation of Concepts | Explanation shows evidence of understanding of what an invasive species is, but does not show how apple snails change the physical characteristics of their environment, and facts and concepts are not accurate. | Explanation shows a partial understanding of what an invasive species is and/or how apple snails change the physical characteristics of their environment. There are some facts and concepts that are not accurate. | Explanation of an invasive species is clear and shows complete understanding of how apple snails change the physical characteristics of their environment. Concepts and facts are accurate. |

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Appendix

Jigsaw Activity Recording Sheet

| My "Expert" Group | My "Home" Group |
|--|--|
| Subtopic Title: Central ideas I am an Expert on: | Central ideas shared by my Home Group. |
| Two of the most important things I learned that I want to share with my Home Group: 1. 2. | At least two things I learned in my Home Group: 1. 2. |
| Something new that I learned from my Expert group: <i>(Write or draw an idea.)</i> | How does each topic from my Home group connect to my Expert group/topic? 1. 2. 3. |
| Additional Questions I have: | |



Apple Snails Game

Scenario: Imagine that you work for the Department of Wildlife and Fisheries and are in charge of monitoring a pond to examine how the ecosystem is altering. Complete the following steps with your teammates to record observations and discuss possible solutions to this dilemma.

Materials: Blank Sheet of Paper, blue, brown, and green colors (colored pencil, markers, etc), 20 green beads, 10 pink beads

Directions:

- 1. Draw a pond using the provided colors on the blank paper and place your picture in the middle of the table.** This will represent your pond template to play the game.
- 2. Place ten green beads in the pond.**
What do you think the green beads represent?
- In a healthy pond the vegetation multiplies. **Double the green beads.**
How many green beads do you have now?

Why might vegetation be important to have in a pond?

If the plant population were to decrease, how would it affect other species? Give some examples.

4. **Place two pink beads in the pond.** Pink beads represent the invasive apple snail. *Based on your knowledge of apple snails, what are some ways apple snails could have entered the pond?*

What do you think will happen to the pond's ecosystem after the apple snails invaded?

5. Apple snails eat plants and have a hearty appetite. **For every snail in the pond remove two plants (green beads).**
6. Apple snails also multiply fast. **For every two apple snails place four pink beads in the pond.**
7. As the snails multiply they eat more plants. **Remove two plants (green beads) for every snail that is in the pond.**
How many snails are in the pond?

What is happening to the vegetation?

If this trend continues, what do you think will happen to the existing ecosystem?

8. Discuss your observations about what happened to the pond with your group.

What are some possible solutions for this problem?