

Why Are Invasive Species Successful: An Investigation

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Lesson Overview: Students learn plant structures and animal behaviors that lead to reproduction through dissection and reading. They compare the structures and strategies that lead to reproduction and discuss why they are successful. They then apply this to a local national park, nature center, or park by looking at native plants and invasive plants and how successful they are at reproducing.

Background Knowledge: Teachers need to know basic structures of plants, especially the plant parts. Prereading the two student readings should provide the knowledge needed.

Plant link - http://www.biology4kids.com/files/plants_structure.html

Animal Reproduction - <https://www.nature.com/scitable/knowledge/library/mating-systems-in-sexualanimals-83033427>

Target Grade & Subject - 7th or 8th Grade Science

Duration: 6 to 8 Class Periods (assuming 50-minute periods)

Instructional Setting: classroom, computer lab with Internet, laboratory, and outdoors

Advance Preparation: Need to buy seeds and have dissecting equipment including magnifying glass.

Learning Objectives

At the end of this lesson, students will be able to:

1. Identify basic parts of a flower and how they are part of reproduction.
2. List animal behaviors and specialized plant structures that affect reproductive successful.
3. Identify which animal behaviors and specialized plant structures improve chances of reproduction.
4. Explain how animal behaviors and specialized plant structures impact chances of reproduction.

Michigan Science Standards Addressed

MS-LS1-4 - Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively.

SEP: Science & Engineering Practices

Engaging in Argument from Evidence

Use an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem.

DCI: Disciplinary Core Ideas

LS1.B: Growth and Development of Organisms

Animals engage in characteristic behaviors that increase the odds of reproduction.

Plants reproduce in a variety of ways, sometimes depending on animal behavior and specialized features for reproduction.

CCC: Cross-Cutting Concepts

Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability.

Materials & Quantities Needed Per

student group:

Easy to dissect seed and flower (Bean or similar)

Tweezers

Magnifying glass

Access to computers

Guiding Question(s):

How do plant structures and animal behaviors impact successful reproduction in animals? How do invasive species use these strategies to be more successful?

THIS LESSON HAS TWO LOOPS OF 5E'S. **5E**

Model #1

ENGAGE: *Expected prior knowledge: What are key concepts students should know before engaging in the lesson?*

Students compare an acorn with a full grown tree and explain how the tree grows from an acorn. They also dissect a seed and flower and make observations on parts and predict how each part of seed and flower contribute to reproduction. [Guiding Worksheet](#)

EXPLORE: *How will the teacher facilitate the students' exploration of the question(s) and collection of data?*

Students use online textbook to read and watch videos explaining the parts of plants, how they lead to reproduction, and how animals influence this process. As evidence is collected by students, create a class list of evidence. [Guiding Worksheet](#) with Online Textbook link.

Supporting students during exploration: *Questions that the teacher could ask to guide the exploration. What are the different parts of the flower?*

How this parts similar and different than humans?

How do these parts lead to new plants?

What is the strategy this plant is using?

EXPLAIN: *How will the students be expected to explain their data or evidence?*

Students will be given an assigned structure or strategy and write an explanation answering the question: "How are plant structures adapted for reproduction?" using the evidence collected in **Explore**.

ELABORATE: *How will the teacher facilitate the sharing of student explanations?*

After students share their explanations, other students write down strengths and weakness of each structure or strategy. A whole class discussion takes place after each presentation and teacher writes down the strengths and weaknesses.

Supporting students during elaboration: *Questions that the teacher could ask to clarify student thinking.*

Questions to lead discussion:

What are the structures or strategies used by each plant?
How do the structures or strategies support reproduction? How
is one structure or strategy more successful?

EVALUATE: *How will the teacher connect the student explanations and bring out the big scientific idea?*

Students research two **plants** found in a nearby nature center or park. One must be a native plant and one must be an invasive species. Students compare reproductive strategies and present to class why one strategy is better for reproduction.

Supporting students during evaluation: *Questions the teacher could ask to tie student ideas to big idea.*

How did the native and invasive species reproduce?
What structures and strategies were most successful?
How are these similar and different from the ones we studied.

New Vocabulary

Stamen - male reproductive organ of a flower that produces pollen
Pollen - a yellow powder produced by the stamen of a flower; pollen fertilizes the pistil of another flower (related word: pollinate)
Pistil - the female reproductive organ of a flower that can be fertilized by pollen
Stigma - the part of a flower that receives pollen during pollination and on which the pollen grain germinates
Fruit - a plant structure that contains seeds and grows from a flowering plant
Flowering plant - a plant that uses flowers to reproduce
Asexual reproduction - reproduction not requiring fertilization; only involves one parent
Budding - a form of asexual reproduction in which a new individual organisms develop from one parent organism

5E Model #2

ENGAGE: *Expected prior knowledge: What are key concepts students should know before engaging in the lesson?*

What behaviors do humans use to attract mates? BE APPROPRIATE

EXPLORE: *How will the teacher facilitate the students' exploration of the question(s) and collection of data?*

Students read and watch videos from CK12 using this [Guiding Worksheet](#).

Supporting students during exploration: *Questions that the teacher could ask to guide the exploration.*

Where in the reading or video did you find that answer?
Do humans do any of these behaviors?
How do you know that is a key idea?

EXPLAIN: *How will the students be expected to explain their data or evidence?*

Students will be given an assigned behavior and write an explanation answering the question: "How do the behaviors that animals use for choosing a mate benefit producing healthy children?" using this [Guiding Worksheet](#) adapted from Discovery Education.

ELABORATE: *How will the teacher facilitate the sharing of student explanations?*

After students share their explanations, other students write down strengths and weakness of each strategy. A whole class discussion takes place after each presentation and teacher writes down the strengths and weaknesses.

Supporting students during elaboration: *Questions that the teacher could ask to clarify student thinking.*

Why do you think these strategies are effective?

How do these strategies help improve chances of reproduction and reaching maturity?

EVALUATE: *How will the teacher connect the student explanations and bring out the big scientific idea?*

Students research two **animals** found in a nearby nature center or park. One must be a native plant and one must be an invasive species. Students compare reproductive strategies and present to class why one strategy is better for reproduction.

Supporting students during evaluation: *Questions the teacher could ask to tie student ideas to big idea.*

How did the native and invasive species reproduce?

What strategies were most successful?

How are these similar and different from the ones we studied.

New Vocabulary

Courtship behaviors - Special behaviors that help attract a mate.

Competition - Relationship between organisms when they strive for limited resources.

Display behavior - Fixed set of actions that carries a specific message Territorial -

Defending a particular area.

Mating - Pairing of an adult male and female to produce young.

Reproductive age - age at which animals can begin to reproduce.

Safety Considerations

When dissecting seeds, sharp objects should be monitored and accounted for.

Sources

CK12 free online textbook:

<https://www.ck12.org/biology/Reproductive-Behavior/lesson/Reproductive-Behavior-of-Animals-BIO/>

Discovery Education: <https://grps.discoveryeducation.com/learn/techbook/units/444bd28f-9fc5-47b6-a126-70bf28ce1ee1/concepts/ba053484-c129-4a12-960f-9045b37409d1/tabs/759da9a7-2edf-4cde-9515-7081ca990764/pages/b30a94d6-cda5-478b-b6b4-b70d25071e42> - Accessed 4/26/2018

Appendix

Supporting Materials

Worksheets are embedded in Lesson Plan.

We would greatly appreciate your feedback using this lesson plan! Please visit <https://www.biaquariumstem.org/survey.html> to complete a short survey about your experience.