Little Changes, Big Impact: Integrating Evolution in Science and ELA

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Goal and Objectives

Goal: Use fiction to make complex topics like evolution, heredity, and natural selection accessible and meaningful for elementary students.

Objectives:

- Elucidate opportunities to integrate science and ELA
- Demonstrate the use of fiction to engage students in science
- Expound on how inquiry and hands-on activities scaffold learning
Demonstrate: Your Inner Scientist

As we read* the book, think about what you notice or see and write these observations on the sticky-notes.

One piece of information per sticky note! This will be your “evidence” from the story...

*Use your preferred reading and literacy strategies established in your own class (predictions, probing, etc.)
Sift and Sort

• Pair with another “student”. Observe and discuss the information on each others’ sticky notes.

• Work with your partner to organize these into labeled categories (you create the categories and label them).

• Use the large sheet of paper as a place for you to organize your sticky notes.
What did you and your partner notice about the story, or the characters in the story?

What were your categories?

Why did you choose these categories and how does the evidence (the observations on your sticky notes) fit within them?
Debrief Activity

• What tools did we use to engage you as a student?

• What content areas were introduced?

• What science/processing skills were being developed?
Some Categories with Associated NGSS Standards*

**Heredity and Traits**
LS-3: Heredity: Inheritance and Variation of Traits
Grades 1, 3, MS, HS

**Structure/Function**
LS-1: From Molecules to Organisms: Structures and Processes
Grades 1, 4, HS

**Evolution and Natural Selection**
LS-4: Biological Evolution: Unity and Diversity
Grades 3, MS, HS

*Not an exhaustive list*
Elaborate using Inquiry

Spring off the book and explore the concepts further by becoming the characters!
Who are these guys, again?

Trait Cards - Three traits:
1. Tail (swim vs. spring)
2. Teeth (sharp vs. smooth)
3. Body (round vs. oval)

Each card comes with 2 candies

“Swimmy Tail”
- Eats Runglesnips (river)
- Tougher fruit

“Springy Tail”
- Eats Grubblegobs (trees)
- Softer fruit
“Musical Traits” Game

Secure the Traits Card to front of your shirt (so that it is visible)

1. Walk around the squares as the music plays. When it stops, stand on the nearest square. Note the color of the square you are standing on.

2. Roll a die; highest roller controls the round. Choose a card from deck that corresponds to the color of the square you are on. Read the card to your group.

3. Discuss as a group which traits would be most helpful for surviving the scenario on the card. Take two minutes as a group to determine who is more likely to survive the round – also identify who is not more likely to survive the round (decisions/discussion is based on the traits on each student’s trait card).

4. If you are out, you become the deciding judge(s) for who survives the round and who doesn’t in the following rounds. *NOTE: nature vs. model*

5. Repeat for 3 more rounds. Each round represents what the population might look like after 100 years following the scenario on the card.
You’re OUT! Now what…

Serve as a judge

Validate dice rolls

Be ready to join back in the highest roller/s can return.

Being “brought back” into the population: Those who are out roll the dice and the highest roller (or rollers) get/s to return to the game. Those who return to the game assume the traits of the person they join, and then walk around the squares with them.
Evaluate: Then and Now!

- What did your population look like at the beginning of the game?
- What did your population look like at the end of the game?
- Unless you were born back into the game (thereby being a different Rinkidink), were your traits different?
- Each round was 100 years in time. What does this imply about changes in the traits of a population?
Analyze This!

The NGSS Performance Expectation we focused on:

3-LS4-2 Biological Evolution: Unity and Diversity

Students who demonstrate understanding can:
3-LS4-2. Use evidence to construct an explanation for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing. [Clarification Statement: Examples of cause and effect relationships could be plants that have larger thorns than other plants may be less likely to be eaten by predators; and, animals that have better camouflage coloration than other animals may be more likely to survive and therefore more likely to leave offspring.]

In the activity, where might you find evidence to demonstrate the concepts listed?
In 2006, a team of scientists unveiled the discovery of Tiktaalik roseae, a fossil fish known as the 'fishapod'.

http://tiktaalik.uchicago.edu/

https://www.nature.com/nature/journal/v440/n7085/full/nature04639.html
Scaffolding Learning

HS-LS4-2

Students who demonstrate understanding can:

HS-LS4-2. Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment. [Clarification Statement: Emphasis is on using evidence to explain the influence each of the four factors has on the number of organisms, behaviors, morphology, or physiology in terms of ability to compete for limited resources and subsequent survival of individuals and adaptation of species. Examples of evidence could include mathematical models such as simple distribution graphs and proportional reasoning.] [Assessment Boundary: Assessment does not include other mechanisms of evolution, such as genetic drift, gene flow through migration, and co-evolution.]

The Giant Camels of the Prehistoric High Arctic

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The shards of the Ellesmere camel tibia. Photo © Martin Lipman, via the Canadian Museum of Nature.
http://phenomena.nationalgeographic.com/2013/03/05/the-giant-camels-of-the-prehistoric-high-arctic/
Scaffolding Learning

Article | OPEN

Mid-Pliocene warm-period deposits in the High Arctic yield insight into camel evolution

Natalia Rybczynski, John C. Gosse, C. Richard Harington, Roy A. Wogelius, Alan J. Hidy & Mike Buckley

Figure 3: Fossil remains of Arctic giant camelines.

Figure 4: Collagen spectra of modern and fossil Camelini.

https://www.nature.com/articles/ncomms2516
More Fiction Linked to STEM
Summary

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