Title:

Understanding the Tree of Life: A Framework for Building Ecosystem Resilience

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Abstract:

This lesson plan explores biodiversity and its role in sustaining life on Earth. It begins by introducing students to the key concepts in ecology, biology, and environmental science at the root of speciation and natural selection, and leads them into engaging collaborative learning group activities on interdependence. Students will develop a conceptual understanding of this lesson by participating in a guided classroom discussion on *TreeTender*- a short film advocating eco-awareness and the significance of phylogenetic diversity and the environmental-societal factors threatening the health and balance of Earth's system. This type of open dialogue and debate over these topics will allow students to construct and share their knowledge of what they believe is contributing to the current state of our planet, and our planet's response to these conditions. To emphasize the importance of building ecosystem resilience, students will then move into an eco-survey of endangered species to demonstrate how human activity and the degradation of suitable habitats is interfering with the distribution and diversification of ecological communities.

Subject, Grade, Level:

Grade 6- Earth and Space Science *(on-level)*

Learning Objectives:

- ✓ Students will be able to explain the relationship between a species' adaptability and physical characteristics, and how they contribute to its survival within an ecosystem.
- ✓ Students will be able to explain how the flow of energy through Earth's system is central to homeostasis and interdependence.

- ✓ Students will formulate an argument on how phylogenic diversity is stimulated by the adaptation of species, but suppressed by the consequences of human actions.
- ✓ Students will be able to discuss ethical dilemmas through their social view of scientific research methods.
- ✓ Students will be able to debate how human activity impacts air and water quality, and has the potential to disrupt the basic needs of other species within the community.

Standards-Based Correlation:

SC.7.L.17.3: Describe and investigate various limiting factors in the local ecosystem and their impact on native populations, including food, shelter, water, space, disease, parasitism, predation, and nesting sites.

SC.6.L.14.3: Recognize and explore how cells of all organisms undergo similar processes to maintain homeostasis, including extracting energy from food, getting rid of waste, and reproducing.

SC.6.L.15.1: Analyze and describe how and why organisms are classified according to shared characteristics with emphasis on the Linnaean system combined with the concept of Domains.

SC.8.N.1.1: Define a problem from the eighth grade curriculum using appropriate reference materials to support scientific understanding, plan and carry out scientific investigations of various types, such as systematic observations or experiments, identify variables, collect and organize data, interpret data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions.

SC.7.E.6.6: Identify the impact that humans have had on Earth, such as deforestation, urbanization, desertification, erosion, air and water quality, changing the flow of water.

SC.8.N.1.5: Analyze the methods used to develop a scientific explanation as seen in different fields of science.

SC.8.N.1.6: Understand that scientific investigations involve the collection of relevant empirical evidence, the use of logical reasoning, and the application of imagination in devising hypotheses, predictions, explanations and models to make sense of the collected evidence.

Timeframe:

Day 1: Introduction to specified branches of science, TreeTender film discussion and guiding questions *(45 minutes or 1 class period)*

Day 2 and 3: Eco-Survey, geo-reference study using iDigBio.org, and QGis model interpretation of specific endangered species in Florida's ecosystem *(two 45-minute class periods)*

List of materials:

- ✓ Recordex
- ✓ Student Laptops
- ✓ Student Data Notebooks
- ✓ TreeTender Discussion Guiding Questions & Eco-Survey Worksheets
- ✓ QGis models for student groups to interpret species response to bioclimatic variables
- ✓ Summative Assessment: Final Product Handout

Procedure and general instructions (for instructor). REQUIRED.

Procedure and general instructions (for students).

TreeTender Discussion Guiding Questions:

1. Interdependence among Earth's ecosystems is central to maintaining homeostasis in that a species' ability to depend on other species while preserving its own autonomy enables the development of the overall system. Based on this type of co-operative, yet differentiated relationship, what do you believe is the driving force by which species exercise their power over the other?

2. How does an organism's behavioral adaptations and physical characteristics help it to thrive in its environment?

3. How does a species' environmental fitness influence affect the overall health of its environment?

4. Why are biotic and abiotic factors important life sustaining factors?

Summative Assessment & Final Project: Choose one of the following activities to connect and present your understanding of what you have learned about biodiversity and ecological responsibility. Students are to propose a scientifically sound recommendation for action to communicate in any of the following formats:

Comic Strip

Newscast

Skit/Play

Trivia Game

Letter to Congress