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Raising Interest in Science Education

Teaching Units for High School Science Developed by

Duke University Graduate Students in Pharmacology 693/694

Master of Arts in Teaching (MAT)

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Daily Lesson Plan

Course Name: AP Environmental Science/AP Biology	⊛ Standard ⊛ Honors ● AP
Unit Title: Ecological Health of the Ellerbe Creek Watershed and its Environmental Implications	**Day/Date: Day 2 of 16**

Relevant NC Standard Course of Study Goal(s):

- **Bio.2.2** Understand the impact of human activities on the environment.
- **EEn.2.2** Understand how human influences impact the lithosphere.
- **EEn.2.4** Evaluate how humans use water.
- **EEn.2.7** Explain how the lithosphere, hydrosphere, and atmosphere individually and collectively affect the biosphere.
- **EEn.2.8** Evaluate human behaviors in terms of how likely they are to ensure the ability to live sustainably on Earth.

Specific Lesson Objectives

Students will understand:

1. Human activities (including population growth, urbanization, pollution, global warming, burning of fossil fuels, habitat destruction, and introduction of non-native species) may impact the environment from one generation to the next.
2. Sustainable agriculture and aquaculture practices have environmental impacts.
3. Ground water and surface water interact.
4. Humans influence freshwater availability and quality in North Carolina's river basins, wetlands, and tidal environments.

Students will know:

1. How to evaluate the quality of North Carolina streams (chemical & physical properties and biotic indices).
2. Non-point sources of pollution.
3. How traditional agricultural practices can produce runoff and sedimentation issues in adjacent streams.
4. How pollutants flow through a watershed.
5. How drinking water, stormwater, and wastewater systems impact the quantity and quality of water.
6. How humans and other species manipulate and impact freshwater ecosystems for use and consumption.
7. That urban development in the North Carolina Piedmont leads to habitat destruction and urban runoff.
8. The effects of pesticides, herbicides, and pharmaceuticals on freshwater ecosystem health.
9. The importance and biological implications of the water, carbon, nitrogen, and phosphorous cycles.
10. How humans modify ecosystems through population growth, technology, resource consumption, and production of waste.

Students will be able to:

1. Maintain field notes and accurate records in a field notebook
2. Develop a methodology for stream sampling
3. Mathematically calculate the flow rate of streams
4. Chemically test for pH, dissolved oxygen, and the presence of dissolved nitrogen, phosphorous, detergents, and pharmaceuticals

Key Vocabulary for this Lesson
• Toxicology, toxin, bioaccumulation, biomagnification, median lethal dose, poison, mutagen, teratogen, carcinogen, critical load
Materials
• PowerPoint on the topics of toxicology and aquatic chemical hazards • *Warm-Up – Stream Discharge Handout*, apples, meter stick, measuring tape, stopwatches • *Mini-lab* – Water Quality Testing Kit: pH, nitrates, phosphates, dissolved oxygen, alkalinity, turbidity, temperature, and detergents; Water Quality Handout
Technology Needs
• Laptop • Projector

LESSON ACTIVITIES

Opening (Hook, Warm-Up, Anticipatory Set, Review, etc.)

Describe activity to elicit active involvement of students or refer to previous learning:
Warm-Up: Students will learn how to calculate the flow rate and volumetric flow of a stream by developing a way to utilize the provided materials. Teacher will help to guide students to an effective methodology that corresponds to the *Stream Discharge Handout*.

Procedure: Include all sections that apply to this lesson; combine as necessary.

Section	Time	What the Teacher will do:	What the Students will do:
Statement of Objective & Purpose	5 minutes	1. Provide an overview of the day: Stream discharge warm-up, notes on stream toxicology, chemical testing mini-lab	1. Listen
Input, Modeling, & Check for Understanding	25 minutes	1. Teacher will provide PowerPoint and lecture covering toxicology, chemical hazards to freshwater, and the effects of agricultural runoff 2. Check for understanding throughout the lecture via "Cold Calling"	1. Take notes from the lecture 2. Participate and actively ask and answer the teacher's questions
Guided Practice	25 minutes	1. Teacher will assist students with the development of a way of measuring stream discharge by answering student questions and offering useful suggestions	1. Students will work in pre-determined lab groups to create the stream discharge component of their *Stream Sampling Plan*

			2. Using the provided materials: an apple, a meter stick, a tape measure, and a stopwatch, students will brainstorm an effective methodology to measure stream discharge 3. Students will compare their design to that in the *Stream Discharge Handout* and determine the pros and cons of their design
Independent Practice/ Homework	30 minutes	1. Teacher will answer questions and assist students with proper use of chemical testing equipment	1. Students will work in pre-determined lab groups to test samples of water for pH, nitrates, phosphates, dissolved oxygen, alkalinity, turbidity, temperature, and detergents 2. Students will complete the corresponding handout to determine what the results of their testing signifies (assigned for homework if not finished in class)
Closing/ Summary	5 minutes	1. Teacher will ensure laboratory stations are being cleaned 2. Teacher will answer any remaining questions in regards to the mini-lab worksheet and will assign it for homework for those who did not finish	1. Students will clean their laboratory areas 2. Ask questions in regards to homework

Assessment of Student Learning

How & when will you know that the students have learned this material?
Daily review questions, Lab Practical Exam, Unit Exam, Stream Sampling Plan, during the Ellerbe Creek Field Laboratory, during the analysis of collected field data

Differentiation Strategies*

How will you adjust aspects of the lesson to accommodate student READINESS?

Struggling Students:	Gifted/Advanced Students:	English Language Learners:
N/A	*N/A*	*N/A*

How will you adjust aspects of the lesson to accommodate students' LEARNING PROFILES?
This lesson provides visual, oral, and kinesthetic approaches to learning about the toxicology of freshwater ecosystems and how scientists chemically analyze these ecosystems and measure volumetric flow/discharge. The warm-up requires students to take provided materials and develop a way of testing the volumetric flow of a cross-sectional area of a stream. This will be implemented in their *Stream Sampling Plan.* The chemical testing is a kinesthetic and visual process that will be utilized again during the *Ellerbe Creek Field Laboratory*. The day will favor those who enjoy working in groups as the students will work in their assigned lab groups for the stream discharge and chemical testing activities.
How will you adjust aspects of the lesson to accommodate students' INTERESTS?
N/A