RISE at DUKE
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)

http://sites.duke.edu/rise/duke-courses/pharm-693694/

Prepared by Chris Hewitt and Kevin Lloyd, Duke University MAT,

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: 3 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.2.3** Explain the structure and processes within the hydrosphere.
- **EEn.2.4** Evaluate how humans use water.
- **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. The development and implementation of environmental policy is a complex issue.
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 humans modify ecosystems through population growth, technology, resource consumption, and production of waste.
2. That urban development in the North Carolina Piedmont leads to habitat destruction and urban runoff.
3. The effects of pesticides, herbicides, and pharmaceuticals on freshwater ecosystem health.
4. Local environmental policies and organizations striving for effective conservation methods and stewardship.
5. How humans and other species manipulate and impact freshwater ecosystems for use and consumption.
6. How pollutants flow through a watershed.
7. How drinking water, stormwater, and wastewater systems impact the quantity and quality of water.
8. Non-point sources of pollution.

Students will be able to:

1. Maintain field notes and accurate records in a field notebook
2. Develop a methodology for stream sampling

Key Vocabulary for this Lesson
• Biogeochemical cycle, carbon cycle, nitrogen cycle, phosphorous cycle, water cycle, surface water, ground water, water table, aquifer, recharge, desiccation, water stress
Materials
• PowerPoint outlining human use of water resources: the water cycle, water supply renewal and use, human use of dams and reservoirs, and stormwater runoff. • *Stormwater Science Case Study* – "Losing the Farm: How Changes in Land Surface Affect Storm Runoff."
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 create a qualitative profile of a stream by examining a drainage canal on campus. They will draw a representation of the stream and take photographs in addition to making note of buffer width, surrounding vegetation, and the terrain and topography the stream flows through.

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	3 minutes	1. Provide an overview of the day: Stream profiling warm-up, notes on biogeochemical cycling and water supply, Stormwater case study	1. Listen 2. Students will hand in their homework from the chemical testing
Input, Modeling, & Check for Understanding	20 minutes	1. Teacher will provide PowerPoint and lecture covering biogeochemical cycles, water supply, and methods for water conservation 2. Check for understanding throughout the lecture via "Cold Calling" and having students brainstorm ideas in table groups	1. Take notes from the lecture 2. Participate and actively ask and answer the teacher's questions

Guided Practice	20 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 profile component of their *Stream Sampling Plan*
Independent Practice/ Homework	45 minutes	1. Teacher will guide the students through the *Stormwater Science Case Study* 2. Teacher will ensure that the calculations for runoff during different storm events and over different surfaces are being done correctly.	1. Students will work in small reading groups to formulate answers and discuss issues as the teacher guides them through the case study. 2. Students will complete the runoff calculations for homework.
Closing/ Summary	2 minutes	1. Teacher will answer any remaining questions on the topics of the day	1. Students will ask questions in regards to the day's topics

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 field trip to Ellerbe Creek, 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, analytical, and kinesthetic approaches to learning about the profiling of streams and their buffer areas. The warm-up requires students to analyze stream health as more than just the stream itself. Students will work in groups to qualify the importance of surrounding vegetation and landscape features on overall stream health. This will be implemented in their *Stream Sampling Plan.* The day will favor those who enjoy working in groups, as the students will work in their assigned lab groups for the stream profiling and during the case study. Doing science is a collaborative process, and students will be exposed to both the challenges and benefits to working with other scientists.

How will you adjust aspects of the lesson to accommodate students' INTERESTS?

N/A