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:	● **Standard** ○ **Honors** ● **AP**
Unit Title: Ecological Health of the Ellerbe Creek Watershed and its Environmental Implications	**Day: 9 of 16**

Relevant NC Standard Course of Study Goal(s):

NC SCOS

- **Bio.2.1** Analyze the interdependence of living organisms with their environment.

- **EEn.2.3** Explain the structure and processes within the hydrosphere.
- **EEn.2.7** Explain how the lithosphere, hydrosphere, and atmosphere individually and collectively affect the biosphere.

CollegeBoard AP Standards

- **4.A** Interactions within biological systems lead to complex properties.
- **4.C** Naturally occurring diversity among and between components within biological systems affects interactions with the environment.

Specific Lesson Objectives

Students will understand:

- 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.
- Sustainable agriculture and aquaculture practices have environmental impacts.
- The development and implementation of environmental policy is a complex issue.
- Humans influence freshwater availability and quality in North Carolina's river basins, wetlands, and tidal environments.

Students will know:

- How humans modify ecosystems through population growth, technology, resource consumption, and production of waste
- That urban development in the North Carolina Piedmont leads to habitat destruction and urban runoff
- Local environmental policies and organizations striving for effective conservation methods and stewardship
- How humans and other species manipulate and impact freshwater ecosystems for use and consumption
- How to evaluate the quality of North Carolina streams (chemical & physical properties and biotic indices)
- Non-point sources of pollution

Students will be able to:

- Develop a methodology for stream sampling

Key Vocabulary for this Lesson

• Macroinvertebrates	• Biotic Index	• Stream buffer	• Stream profile
• Dissolved oxygen	• Nitrogen	• Turbidity	• Debris
• Phosphorous	• Pharmaceuticals	• Detergent	• pH

Materials

- Lab notebooks
- Kick nets
- White bowls
- Tweezers
- Writing utensils
- Collection vials for water
- Cameras*
- Field measuring tapes
- Secchi disc
- Meter sticks
- Rubber waders*
- Biotic index cards
- Macroinvertebrate foldable*
- Digital multi-meters (or other tools for measure DO, temp, pH, nitrogen, phosphorous)

**Not required*

LESSON ACTIVITIES

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

Remind students to grab their backpacks with lab notebooks and a writing utensil.

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	2	Ensure all students are present	Gather things and board bus
Input, Modeling, & Check for Understanding	90-180	Take students to sampling site(s) Hand out checklists to groups for what samples to take at each site	Ask questions and take note of interesting and particularly relevant things.
Guided Practice		At the first set of sites, walk students through the process of kicknetting, determining stream profile, and gathering water samples. After the first few attempts, groups will be more independent and can operate more independently at the later sampling sites. *Note: It is suggested to designate each member of the group as an expert on one of the techniques. Encourage students to seek help from other groups before asking the teacher.*	Gather samples, count macroinvertebrates, calculate BI values, document findings in lab notebooks and with pictures
Independent Practice/ Homework		Assist students as needed	Independently sample at next group of sample sites.
Closing/ Summary	15	Direct clean-up If time allows, ask students to think for a minute about what they observed and springboard into a conversation on their observations and the science they did	Students help restock dry equipment and lay wet equipment out to dry Participate in discussion

Assessment of Student Learning

Reports

Contents of lab notebook Observation of an interaction with students during sampling
Differentiation Strategies*
How will you adjust aspects of the lesson to accommodate student READINESS?

Struggling Students:	**Gifted/Advanced Students:**	**English Language Learners:**
Students can be in charge of the simpler tasks at early sites, and assist with more complex tasks like stream profile calculations	Should be expected and encouraged to ask more challenging questions of the labs. Receive more in-depth feedback on lab notebook and report	Students can submit an explanation of the lab, without being required to write a formal lab report

How will you adjust aspects of the lesson to accommodate students' LEARNING PROFILES?
Interpersonal → working in groups Visual/spatial → Macroinvertebrate ID, camera documentation of stream banks and buffer characteristics Mathematical → BI and stream profile calculations Verbal → Wrap-up discussion and report Kinesthetic → lots of movement and activity inherent in this lab