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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)

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

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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 10 of 16**

Relevant NC Standard Course of Study Goal(s):

- **Bio.2.1** Analyze the interdependence of living organisms with their environment.
- **Bio.2.2** Understand the impact of human activities on the environment.

College Board AP Course Standards

- ***Biology* - Big Idea 4** Biological systems interact and these systems and their interactions possess 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:

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. Biodiversity is important to the biosphere.
3. The diversity of species within an ecosystem may influence the stability of the ecosystem.
4. Interactions between and within populations influence patterns of species distribution and abundance.

Students will know:

1. How humans modify ecosystems through population growth, technology, resource consumption, and production of waste
2. How to interpret data regarding the historical and predicted impact on ecosystems and global climate change
3. The effects of pesticides, herbicides, and pharmaceuticals on freshwater ecosystem health
4. How humans and other species manipulate and impact freshwater ecosystems for use and consumption
5. How pollutants flow through a watershed
6. How to evaluate the quality of North Carolina streams (chemical & physical properties and biotic indices)
7. How biotic and abiotic factors affect biodiversity

Students will be able to:

1. Maintain field notes and accurate records in a field notebook
2. Chemically test for phosphorous, detergents, and pharmaceuticals
3. Identify common freshwater macroinvertebrates and what their presence or absence means for ecosystem health
4. Read and interpret a primary, scientific journal article through the lens of the scientific method

5. Analyze collected scientific data

Key Vocabulary for this Lesson
• Primary literature; secondary literature; academic scientific journal - abstract, introduction, materials & methods, results, discussion, acknowledgements, literature cited
Materials
• Sources of primary, secondary, and tertiary literature • Scientific literature handout • Academic journal article
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 be given an academic, scientific journal article and will learn of its basic structure and how it corresponds to the scientific method and conducting research.

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. Teacher will provide an overview of the day: scientific literature activity and compiling the data from the field laboratory	1. Listen
Input, Modeling, & Check for Understanding	0 minutes	*N/A*	*N/A*
Guided Practice	55 minutes	1. Provide instructions through each of the 4 parts of the scientific literature activity 2. Provide information on different types of scientific literature, parts of the scientific method, and how scientists publish their research in academic journals 3. Work with the students to create	1. Take notes from the teacher's information on forms of literature, parts of the scientific method, and parts of academic journals 2. Participate and actively ask and answer the teacher's questions 3. Work under the guidance

		a consistent and composited set of data from the field laboratory *NOTE: The authors recommend that the teacher use his/her discretion when having students compile data. This can be done digitally or manually, but ideally will be displayed in a number of ways (graphically, numerically, verbally). Students can also be recruited to help prepare samples for delivery to a testing institute. The preparation will depend on the requirements of the institute. Requirements of these labs vary widely; contact a lab well ahead of time to ensure protocols are followed.* *Tests for nitrogen and detergents will depend on your schools' supplies and facilities; therefore, we have left the design of this lab up to the teacher.*	of the teacher to compile the entire class' collected data from the three field sites during the field laboratory
Independent Practice/ Homework	25 minutes	1. Ensure students are on task in completing the scientific literature activity 2. Answer questions about the activity *NOTE: In addition to being used to treat seizures, carbamazapine is used to treat neuralgia, mania, depression, and bipolar disorder. It normalizes electrical activity in the brain. NIH Drug Information*	1. Actively work on completing the scientific literature activity in assigned groups
Closing/ Summary	5 minutes	1. Ensure that all collected data from the previous day's field trip is compiled for the groups use for writing the research paper	1. Ensure other students have successfully obtained all of the collected data from the field laboratory

Assessment of Student Learning
How & when will you know that the students have learned this material? Daily review questions, Unit Exam, Student Research Paper

Differentiation Strategies*		
How will you adjust aspects of the lesson to accommodate student READINESS?		
Struggling Students:	**Gifted/Advanced Students:**	**English Language Learners:**
During the scientific literature activity, students will be broken into groups based upon academic levels.	During the scientific literature activity, students were broken into groups based upon academic levels. In Part B,	*N/A*

In Part B, struggling students are called upon to examine a source of tertiary literature, a *Wikipedia* article, and explain its content and what may qualify it as a "good" or "bad" source. In Part D, when comparing the scientific method to parts of a scientific primary literature article, these students are responsible for deducing what part of the scientific method the *Materials and Methods* section of an article corresponds to. By assigning this group easier aspects of this activity, they will be able to still actively participate and bring valuable knowledge to the table, while providing them with a feeling of success.	gifted students are called upon to examine a source of primary literature and explain its content and what may qualify it as a "good" or "bad" source. In Part D, when comparing the scientific method to parts of a scientific primary literature article, these students are responsible for deducing what parts of the scientific method the *Introduction* and *Discussion* sections of an article correspond to. By assigning this group the more difficult aspects of this activity, we are able to challenge this group and keep them engaged.	

How will you adjust aspects of the lesson to accommodate students' LEARNING PROFILES?
The scientific literature activity was designed with several purposes in mind. The activity first and foremost ties together previous knowledge in regards to the scientific method with new knowledge on how scientific advancements and discoveries are disseminated through various forms of literature. The format of the activity favors those who prefer group oriented learning, and the multiple parts of this activity ensure those with short attention spans are being reengaged frequently
How will you adjust aspects of the lesson to accommodate students' INTERESTS?
N/A