Classroom Lesson Development

Title of Lesson	**The Effect of Toxin at Varying Concentrations On Blackworms**
RET Project Connection	Toxicity Study of Neuroprosthetic Implant Materials. Department of Chemical Engineering: Biological Surface Modification and Microfluidics Laboratory, Northeastern University. Boston, MA. Summer 2007
RET Teacher	Kristina Unger
School	Malden High School
Town/District	City of Malden
Subject(s) taught	Biology and Introduction to Chemistry
Subjects covered in lesson	Biology and Chemistry
Grades appropriate	10-12
Lesson duration	Approximately 5 Classes
Goals/Objectives of lesson	1) Design an experiment testing the toxicity of various chemicals on Blackworms 2) Apply mathematical equations to determine the concentration of troxin solutions 3) Manipulate appropriate tools to create the necessary concentrations of toxins 3) Identify the relationship between a living system and changes to its environment 4) Discuss the need for multiple trials and concentrations in an experimental setting
Background information	This lesson was developed to help students gain an understanding of the relationship between a living organism and its environment. Additionally, the lesson will help students understand how various concentrations of toxins and chemicals can impact a living organism or system. Students will use Blackworms, which under a microscope have a easily identifiable circulatry system, to create an experiment that will determine the effect of varying toxin concentrations have on the heart rate of the worm. After completing the experiment, students will be introduced to the procedures of the Neuron Project and will have the opportunity to relate their findings to the procedures that were developed during the experiments.
Essential questions	How do changes in the environment effect living organisms? Do differences in concentration effect a living organism the same way? How would on design an experiment to determine the effect changes in environment have on a living system?

Links to Frameworks and Standards

National

THE BEHAVIOR OF ORGANISMS

- Multicellular animals have nervous systems that generate behavior. Nervous systems are formed from specialized cells that conduct signals rapidly through the long cell extensions that make up nerves. The nerve cells communicate with each other by secreting specific excitatory and inhibitory molecules. In sense organs, specialized cells detect light, sound, and specific chemicals and enable animals to monitor what is going on in the world around them.
- Organisms have behavioral responses to internal changes and to external stimuli. Responses to external stimuli can result from interactions with the organism's own species and others, as well as environmental changes; these responses either can be innate or learned. The broad patterns of behavior exhibited by animals have evolved to ensure reproductive success. Animals often live in unpredictable environments, and so their behavior must be flexible enough to deal with uncertainty and change. Plants also respond to stimuli.

State

4.4 Explain how the nervous system (brain, spinal cord, sensory neurons, motor neurons) mediates communication among different parts of the body and mediates the body's interactions with the environment. Identify the basic unit of the nervous system, the neuron, and explain generally how it works.

All Scientific Inquiry Stantdards are applicable (SIS1-SIS4)

Local

Meets the Massachusetts Framework Standards

Materials required

Blackworms (approximately 6-7 per group)
Epinephrine, Caffeine, Nicotene, Ethanol, Aspirin
Microscopes
Petri Dishes, Beakers, Test tubes, Pippettes

Lesson development

Day 1: Students will research blackworms, identifying their habitat, food sources, and their body compositions. Additionally, students will research their possible toxin and determine what their effect should be. Students will view a video on blackworms.
Day 2: Students will break into their assigned groups and choose their toxin. They will design their experiments and calculate use mathematical equations, the concentrations they will use. Students will create a data sheet for the next day.
Day 3: Students will carryout their experiments and record their data. If time, the groups will share what they expected to happen and what they say happen with the class.
Day4: Students will be introduced to the neuron project, the brian, the CNS and will relate their experiment procedures with the procedures done in the neuron project. Students will brainstorm uses for neural implants and determine what problems might lie ahead in the research.

References http://coep.pharmacy.arizona.edu/curriculum/blackworms/pdf/nic_bwrm.pdf
http://www.rsmas.miami.edu/groups/niehs/ambient/teacher/tox/c%20Bloodworm%20lab%20teacher%2
http://www.eeob.iastate.edu/faculty/DrewesC/htdocs/Lvfacts.PDF
http://www.epa.gov/superfund/students/clas_act/haz-ed/act05.htm
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