

Helen Lowe – Trinity Catholic High School

Title: Mosquito Control in Marion County

Topic Overview

This course conforms to the standards instituted by the Public School Education Dept. of Florida. The primary emphasis of this course is on developing an understanding of concepts; a grasp of Science as a process; personal experience in scientific inquiry; recognition of unifying themes that integrate biological facts; and the application of biological knowledge.

Goals to be achieved

- Describe the body plan of a mosquito
- Transferring of diseases by mosquito
- Prevention and/or treatment to mosquito-borne diseases

Objectives

In order for this course to be successful, the following objectives will be accomplished:

- Students should demonstrate skills in using biological instrumentation and scientific techniques.
- Students should be able to form a hypothesis to a scientific problem given and be able to read and interpret research papers
- Students should be able to find possible conclusions and identify patterns.
- Students should be able to collect data to solve scientific problems
- Students should master the major principles of biology and be able to apply the knowledge to environmental and social issues of today.

Course Planning and Lecture Topics

The segments of this course may take up to two weeks of lectures and hands-on experiences.

Section 1: Mosquito Population in Florida

- Introduction to types of mosquitoes found in Florida
- Environmental descriptions in Marion County (Ocala) that makes this area susceptible to large mosquito population

Section 2: Mosquito borne diseases

- Recognize types of diseases that are carried and transferred by mosquitos
- What are the possible prevention and treatments we have today?

Section 3: Using Biotechnology to help identify the types of mosquitoes and their diseases.

- Understanding the principles of DNA
- Using genetic markers to identify the mosquitoes
- Introduce MicroArray testing, Gel Electrophoresis, and ELISA testing

Section 4: Florida's environment and our society

- Write up a report for Marion County residents to make them aware of possible risks of disease due to a large population of mosquitoes.
- Types of mosquito control that may be used to control the situation

Lab Components

- Students will study the structure of mosquitoes using the microscope and stereomicroscope
- Students will go out to the field to collect mosquito and larvae samples in any standing water available
- Students will attempt to breed mosquitoes and observe their life cycle
- Students will record their observations and graph their results for comparison
- Students will use the Micro Assay technique(simulation) to identify the different types of diseases mosquitoes can transfer
- Students will use gel-electrophoresis to identify the type of mosquitoes they have collected
- Students will do serology testing with the ELISA kit

Student Evaluation

The following grading system will be used:

Test = 45%

Quiz = 20%

Labs = 20%

Research Paper = 10%

Homework = 5%

Students will be given a deadline to turn in assignments and lab reports.

Teaching Strategies

- Lectures given on introduction to mosquito-borne diseases
- Discussion groups – How mosquitoes are affecting Marion County today
- Videos on mosquito-borne diseases
- Overhead-transparencies showing mosquito body plan and adaptations to their environment
- Field work – collecting samples around our campus and their homes
- Homework – Write up a research paper on one of the diseases we discussed
- Lab work – Hands-on experience in doing technology-based experiments

Reading Material

- Textbook: Biology by Raven and Johnson – Chapter dealing with insects
- Supplemental textbook: Biology by Starr and Staggart – Chapter dealing with insects
- Several internet sites dealing with mosquito control.

Research Report

Each student will be assigned a specific mosquito-borne disease to write about. The report must be 3-5 pages long. The bibliography must include at least 5 references. They are to include:

- Type of mosquito
- Location, environmental details (water, temp., etc)
- Type(s) of standing water or bodies of water present
- Susceptibility of host(s)
- Symptoms encountered with this disease
- Possible treatment and prevention

List of mosquito-borne diseases assigned

- Yellow fever
- Dog Heartworm
- Malaria
- Eastern Equine Encephalitis
- West Nile Encephalitis
- St. Louis Eastern Encephalitis
- Rift Valley Fever
- Denque Fever
- Enzootic vectors

Lesson Plans for Icore Proposal : Mosquito Control in Marion County

Day 1

-Lecture: Mosquito population in Ocala, Florida Ecology, and Interaction between humans and mosquitoes

Homework: Assign the individual diseases to each student and explain what they need

to research and how to write it up.

Day 2

- Video: Mosquito control
- Discuss prevention techniques we may apply around our homes and school

Homework: Check you home environment of any standing water and look for mosquito larvae

Day 3

- Discuss and compare mosquito body plan.
- Discuss differences between larvae and adult. What are their adaptations, and what are the advantages and disadvantages at these stages?

Day 4

- Field Work: Walk around school campus and collect any samples of standing water with mosquito larvae

Day 5

- Microscope lab: View samples of larvae and adults using the light microscope and the stereoscope.
- Make sketches and compare body structures and coloring
- Write up conclusions about their adaptations depending where the samples were found

Day 6

- Research Reports are due! Give presentation of reports and hand in reports.

Day 7

- Lab: Microarray (simulation) for identifying different mosquito-borne disease
- Discussion on Genetic Markers

Day 8

- Lecture: Using gel-electrophoresis and confirming serology by ELISA technique

Day 9

- Lab: Set-up and run gel-electrophoresis to identify the types of mosquitoes collected
- Confirm by serological testing with ELISA

Day 10

- Do write-up of conclusions and results obtained for newspaper article to be published in our school newspaper