

TGC Fellow Unit Template	
Prepared By Thomas Harten, CHESPAX, Calvert County Public Schools	
Grade 7: Unit Title: Mosquito Ecology	Time needed: Four weeks
<p>Unit Summary: Students will be learning about the ecology of mosquitoes and their impact upon humans throughout the world. Students will apply their knowledge of mosquito ecology to reduce their populations locally.</p> <p>Students will develop Global Competencies by: Investigating the World Students will investigate the impact of mosquitoes around the world. Students will learn about mosquito-borne diseases and the strategies being used to control these insects. Students will also learn how these diseases are spread globally.</p> <p>Understanding Perspectives Students will evaluate mosquito control strategies used in different countries and at different points in history. Students will identify unexpected consequences resulting from some mosquito control methods (e.g. draining wetlands, use of pesticides, introduction of non-native species).</p> <p>Communicate Ideas Students will develop informational materials to share their knowledge about mosquitoes and their control. For example, students may create mosquito “forecasts” based upon recent rainfall and temperatures that will be read on the morning announcements.</p> <p>Take Action Students will apply what they have learned during the unit. Students will conduct neighborhood surveys to identify mosquito hotspots. Classes will rear native <i>Gambusia</i>, a fish that feeds upon mosquito larvae, to be used by the local mosquito control department to reduce mosquito populations. Students will conduct a penny drive to raise funds for Nothing but Nets, an organization that provides mosquito netting to countries in need.</p>	
Stage One: Desired Results	
<p>Established Goals from the Next Generation Science Standards (NGSS) adopted by CCPS Disciplinary Core Idea Interdependent Relationships in Ecosystems</p> <p>G.1 Students will learn that organisms and populations of organisms are dependents upon their environmental interactions both with other living things and with non-living factors.</p> <p>G.2 Students will learn that in any ecosystem, organisms and populations with similar requirements for food,</p>	<p>Transfer Students will be able to use their knowledge about the ecological needs of mosquitoes to take action to reduce their populations.</p> <p>T.1 Students will develop an understanding of insect life cycles.</p> <p>T.2 Students will recognize that all living things have basic needs for survival.</p> <p>T.3 Students will develop their ability to use their knowledge of science to solve real world problems.</p>

water, oxygen, and shelter will compete with one another for these resources.

G.3 Growth of organisms and populations are limited by access to resources.

Science and Engineering Practices

Analyze and interpret data to provide evidence for phenomenon.

Cross Cutting Concepts

Cause and effect relationships may be used to predict phenomenon in natural and designed systems.

Social Studies Standards (from MSDE website)

Indicator

2. Analyze the importance of civic participation as a citizen of the world.

Objectives

2. Analyze the concept of a global citizen and how awareness and responsibilities have changed during the information age.

Technology Standards (from MSDE website)

Indicator

Develop an understanding of the effects of technology on the environment.

Explain that decisions to develop and use technologies often put environmental and economic concerns in direct competition with one another.

Recognize and explain that technological changes and advances have consequences for the immediate environment as well as for other place and future times.

	Meaning	
	Understandings	Essential Questions
	<p>Students will understand that:</p> <p>U.1 Mosquitoes are the most dangerous animal across the globe; causing nearly one million deaths annually.</p> <p>U.2 Outbreaks of disease from mosquitoes follow predictable patterns connected to rainfall and temperature.</p> <p>U.3 Knowledge of the life cycle of the mosquito can be an effective tool in their control.</p>	<p>E.1 What patterns can be observed in outbreaks of Malaria and seasonal rainfall in Zimbabwe?</p> <p>E.2 What patterns can be observed in mosquito populations in Calvert County, MD as found in data reported by Calvert County Dept. of Mosquito control and rainfall data.</p> <p>E.3 How can we apply this knowledge to reduce mosquitoes locally and across the globe?</p>
	Acquisition	
Performance Expectations (from NGSS LS2.A Interdependent Relationships in Ecosystems)	<p>Student will know (content)</p> <p>K.1 That mosquito reproduction requires standing water and occurs within a specific temperature range.</p> <p>K.2 That the life cycle patterns of mosquitoes around the world are similar and that associated disease outbreaks are predictable.</p>	<p>Students will be able to (skills):</p> <p>S.1 Make and record their observations of the development of mosquito larvae.</p> <p>S.2 Analyze and interpret data regarding rainfall patterns and mosquito outbreaks.</p> <p>S.3 Identify cause and effect relationships between mosquito outbreaks and disease.</p>

Stage Two-Evidence	
Evaluative Criteria (Performance Expectations from NGSS)	Assessment Evidence
<p>1. Organizing data</p> <p>a. Students organize the given data (e.g. using tables, graphs, and charts) to allow for analysis and interpretation of relationships between resource availability and organisms in an ecosystem, including:</p> <p>Populations (e.g. sizes, reproduction rates, growth information) of organisms as a function of resource availability.</p> <p>Growth of individual organisms as a function of resource availability.</p> <p>2. Identifying Relationships</p> <p>a. Students analyze the organized data to determine the relationships between the size of a population, the growth and survival of individual organisms, and resource availability.</p> <p>b. Students determine whether the relationships provide evidence of a causal link between these two factors.</p> <p>3. Interpreting data</p> <p>a. Students analyze and interpret the organized data to make predictions based on evidence of causal relationships between resource availability, organisms, and organism populations. Students make relevant predictions, including:</p> <p>Changes in the availability and amount of a given resource (e.g. less food) may result in changes in the population of organisms (e.g. less food results in fewer organisms).</p> <p>Changes in the amount or availability of a resource (e.g. more food) may result in changes in the growth of individual organisms (e.g. more food means faster growth).Resource availability drives competition among organisms, both within</p>	<p>1. Students will interpret temperature and rainfall data and malaria outbreaks in Hwange, Zimbabwe. Students will use Padlet to make predictions to the question “what is the relationship between rainfall and malaria outbreaks in Hwange?”</p> <p>2. Students will use <i>Create a Graph</i> (http://nces.ed.gov/nceskids/createAgraph/) to analyze rainfall, temperature, and mosquito trapping data from the Calvert County Mosquito Control program to visualize relationships between rainfall, temperature, and peak mosquito abundance. Students will compare these results with the data from Hwange to look for patterns in the data. Students will add information to their Padlet.</p> <p>3. Students will work in teams of 3 or 4 to observe the development of mosquito larvae in a pupator or growth chamber (http://www.bioquip.com/search/DispProduct.asp?pid=1425) Students will make daily observations of the development of the larvae into pupae and finally into adult mosquitoes. Students will observe behavior of the larvae and measure variables such as temperature and light level. Students will record the progress of the observations in their Science Journal and may post photos or video on an Edmodo page dedicated to the project.</p> <p>4. Students will return to their Padlet posts to revise their predictions as to the relationship between rainfall and malaria in Zimbabwe and rainfall/temperature and mosquito abundance in Calvert County.</p> <p>5. Students will watch the 1943 Disney film, <i>Winged Scourge</i>, (https://www.youtube.com/watch?v=y68F8YwLWdg) which was produced as a part of a public information campaign to fight malaria. Many of the suggestions that were in the film would be considered bad environmental practice today. Students have a choice to create a 2016 version of the film focused on fighting the Zika virus or use www.makebeliefscomix.com to create an</p>

<p>a population as well as between populations.</p> <p>Resource availability may have effects on a population's rate of reproduction.</p>	<p>informative comic strip to convey the information. Students should apply their knowledge of the resource needs of mosquitoes as a tool in their control.</p> <ol style="list-style-type: none"> 6. Students will conduct a Mosquito Patrol in their backyard/neighborhood (http://www.clemson.edu/psapublishing/PAGE S/4H/4HMan165.pdf) pp. 13-25. Students will identify mosquito breeding hotspots and inform their community about strategies for mosquito control. 7. Students will use Science and Engineering skills to design a simple mosquito trap. Students will apply their knowledge of the resource needs of mosquitoes in their designs. An example can be seen: https://www.youtube.com/watch?v=pNjyLRQu tXs 8. Students will have choices for action/extension projects to apply knowledge. These may include: <ul style="list-style-type: none"> ● Developing flyers to raise community awareness of the issue of mosquitoes and mosquito-borne disease. ● Presenting mosquito "forecasts" for the morning announcements based on recent temperatures and precipitation levels. ● Conducting a penny drive or other fundraiser for the purchase of mosquito nets for people in need. http://www.nothingbutnets.net/ ● Development of other forms of PSAs regarding mosquitoes and mosquito-borne disease.
---	---

Stage 3-Learning Plan

Week One:

Students are introduced to the impact of mosquitoes to humans and wildlife species both locally and on a global scale. Students use a case study of West Nile Virus to investigate the cycle of the disease between mosquitoes, birds, and humans. Students will develop their own case study of the 2015-2016 outbreak of Zika. Students examine data sets of rainfall and mosquito captures by local mosquito control program. Students examine rainfall patterns and disease outbreaks in Hwange, Zimbabwe to connect rainfall and mosquito population changes over time.

Week Two:

Students will rear mosquito larvae in growth chambers and observe the changes over time. Students will measure the impacts of temperature and light on the mortality rate of the larval mosquitoes. Students will build an understanding that standing water is an essential component of the mosquito

life cycle. Students will begin to generate ideas as to how this information can be used to control mosquito populations.

Week Three:

Students will investigate the role of mosquitoes in the ecosystem. Students will learn about trophic levels and the predator/prey interactions that involve mosquitoes. Students will also learn about the role of mosquitoes as pollinators through readings and online study.

Week Four:

Students will learn about strategies for mosquito control. Students will explore the consequences of previous mosquito campaigns (e.g. DDT application, use of oil in waterways, wetlands destruction) and develop their own action plan for local mosquito control. Students will explore the use of genetic engineering to control mosquitoes in parts of Brazil and other countries. Students will conduct backyard surveys to identify mosquito hotspots and develop PSA messages to share with their school and residential communities.

*adapted from Understanding by Design Model

TGC FELLOWS UBD Lesson Plan

Lesson Title: Most Dangerous Subject: Environmental Science Prepared by: Tom Harten
Materials Needed: SmartBoard file, science journals, graphic organizers, computer work stations, or BYOD loaded with Google Earth.

Global Competency: Investigating the World

<p>Where is the lesson going? (Learning Target or SWBAT)</p>	<p>Students will learn that mosquitoes pose a threat to human health worldwide. Study will examine the impact of globalization on mosquito population and disease transmission.</p>
<p>Hook: Most Dangerous</p>	<p>Tailored Differentiation:</p>
<p>Students will watch the video clip, Most Dangerous. The clip challenges the students to make a prediction as to the most dangerous animal in the world. https://www.youtube.com/watch?v=ATSS_WK7bJk</p>	<p>Use pauses in the video to discuss and check for understanding.</p> <p>Modify texts as needed for readability and appropriate text features.</p> <p>Utilize flexible grouping as a strategy for differentiated instruction.</p>
<p>Equip:</p>	
<p>Students will read a case study and watch associated video clips about the discovery of West Nile Virus (WNV) and its spread in the US. (http://www.hhmi.org/biointeractive/birds-people-west-nile-virus-story)</p>	

<u>Rethink and revise:</u>	
Students will conduct online research to develop a case study of the spread of Zika virus in the US, using the WNV case study as a model. Case study may include written components, video clips, or podcasts, ThingLink pages, or other features.	
<u>Evaluate:</u>	
Students will give feedback on the components of the case study developed by their peers.	
<u>Notes:</u>	<u>Organization:</u> Assign students to cooperative groups. Ensure that required software is loaded and login privileges are secured.

