Zika Zine: A Resource Promoting the Integration of STEAM and Literacy in the Classroom

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Opportunity, motivation and *enthusiasm* are all key to science learning and retention in students. You may not realize it, but you have an *opportunity* for students to experience firsthand the practices of science right in your schoolyard or their backyards by making and reporting mosquito observations. And talk about *motivation*! Students who report their data using the Mosquito Habitat Mapper on the GLOBE Observer mobile app are actively protecting themselves and their friends not only from nuisance mosquito bites, but also from potentially serious diseases that are transmitted by mosquitoes. The science that they are doing has immediate, real life importance. And while you may not find it easy to convey your *enthusiasm* about mosquito research, the newly released *Zika Zine* will do that for you!

In *Zika Zine*, students are introduced to Wanda, Hester and Maurice, three tiny mosquitoes with big personalities whose adventures explain mosquito biology, NASA science and how to prevent mosquito-borne disease. In the 9-panel storyline, students find out why female mosquitoes bite and how their bites can unintentionally transmit disease. Two of the protagonists, Hester and Maurice, see a student using the Mosquito Habitat Mapper on the GLOBE Observer mobile app to document and report immature mosquito larvae in a discarded tire: standing water is where mom mosquitoes lay their eggs (**Figure 1**). While reading about Hester, Maurice and Wanda's adventures, students learn about the role both citizen scientists like themselves and NASA satellite data play in helping scientists to predict future disease outbreaks, saving thousands of lives.

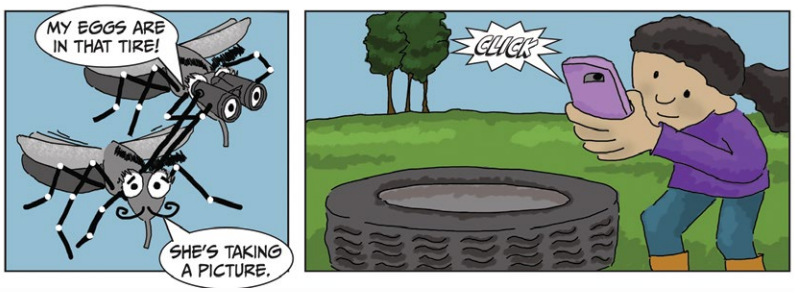

Figure 1. In *Zika Zine*, a citizen scientist takes a picture of a mosquito habitat.

After reading the zine, students can go outside and document mosquito habitats using Mosquito Habitat Mapper on the GLOBE Observer app. The GLOBE Observer mobile app is available at no cost in app stores. The Mosquito Habitat Mapper records the date, time and location of sampling automatically, and students identify the type of mosquito habitat they found and how many immature mosquitoes (larvae) they see in the water.

With simple water sampling equipment, such as a cup or turkey baster, young citizen scientists can take a specimen back to the classroom and look at it under a microscope. In the time of COVID-19, if you are teaching virtually, students can also use the zoom function in a phone to see the specimen more clearly or

use an inexpensive 60x-100x clip-on microscope to identify morphological features. Students take an image and can share it with classmates in addition to uploading it to Mosquito Habitat Mapper on the GLOBE Observer app. Using the built-in key in the app, students can determine whether the larval specimen is a kind of mosquito that could grow up to be a disease vector. **Note:** It is important to be aware that mosquito larvae are safe for students to observe, they do not bite and cannot transmit disease.

You might wonder how the study of mosquitoes fits in your Earth science classroom, but the connections are powerful (**Table 1**). In addition, GeoHealth is rapidly emerging as a transdisciplinary area of scientific research that connects human health, GIS and Earth system processes. Both mosquito population dynamics and vector-borne disease outbreaks respond to changes in environmental conditions such as temperature, precipitation and land cover, so both weather and extreme Earth events can be connected to mosquito science.

Table 1. Grade 5 NGSS Earth and Human Activity performance expectation, science and engineering practice, disciplinary core idea, and cross-cutting concept congruent with *Zika Zine*

Performance Expectation

5-ESS3-1. Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.

Science and Engineering Practices
• Obtain and combine information from books and/or other reliable media to explain phenomena or solutions to a design problem.
Disciplinary Core Idea
• **ESS3.C. Human Impacts on Earth Systems**. Human activities in agriculture, industry, and everyday life have had major effects on the land, vegetation, streams, ocean, air, and even outer space. But individuals and communities are doing things to help protect Earth's resources and environments.
Cross-Cutting Concepts
• **Systems and System Models.** A system can be described in terms of its components and their interactions.

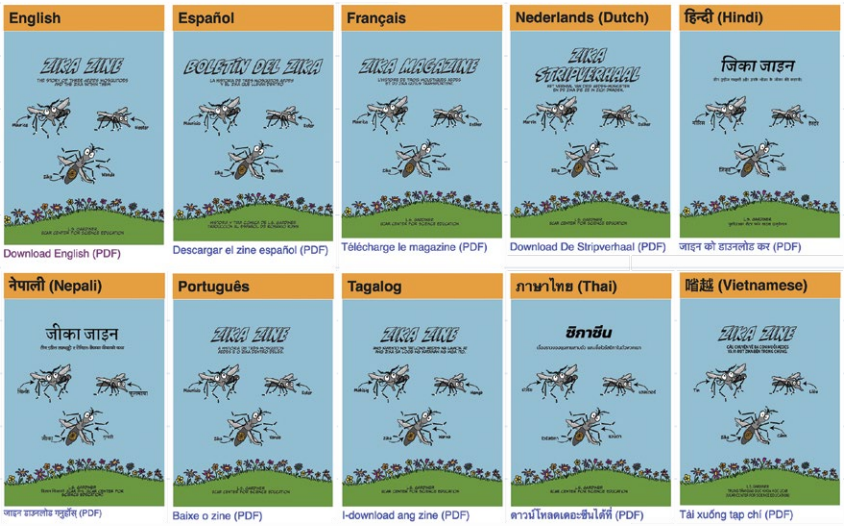

Figure 2. *Zika Zine* is available for download in 10 languages.

Zika Zine is freely available as PDFs online at scied.ucar.edu/zikazine (**Figure 2**). You can connect your science investigations to art through two STEAM activities that support *Zika Zine: How to Draw Wanda:* scied.ucar.edu/sites/default/files/images/video/drawwanda.pdf, and *Make your Own Comic:* scied.ucar.edu/sites/default/files/images/video/myzinecomic.pdf.

Zika Zine is authored by artist and scientist Dr. Lisa Gardiner, UCAR Center for Science Education and was produced in conjunction with the project, *Engaging Citizens in the Forecasting and Observation of Mosquito Threats*, an initiative of the GLOBE Implementation office funded by the U.S. Department of State.

Online resources for teaching about mosquitoes

Mission Mosquito Investigation Notebook

strategies.org/products/mosquito-investigation-notebook/

Using guided explorations, this resource introduces using scientific notebooks to collect observations and ask questions. It also includes discussion questions, further readings, and a companion guide for parents.

Mosquito Habitats and Hideouts

strategies.org/products/mosquito-habitats-and-hideouts/

This game can be played three different ways: Bingo, Name That Habitat, or Sketch That Habitat. Players learn about the variety of mosquito habitats, hideouts, and life cycle stages.

Mosquito Tellers

strategies.org/products/mosquito-tellers/

Taking inspiration from the popular children's fortune teller game, the Mosquito Tellers familiarize the players with the scientific concepts related to mosquito biology, prevention and protection, and diseases. A blank teller is included to write your own mosquito questions.

Get the app: observer.globe.gov/about/get-the-app

Get started: observer.globe.gov/do-globe-observer

About the Author

Rusty Low, Ph.D., is a senior scientist at the Institute for Global Environmental Strategies, Arlington VA, and the science lead for the NASA GLOBE Observer Mosquito Habitat Mapper citizen science app. She works at the forefront of citizen science and its application to combat vector-borne disease such as Zika. Working through NASA, NSF and USAID projects in the U.S. and overseas, she is demonstrating how educators, students, public health officials, citizens and even space scientists can work together to identify mosquito habitats and develop critical mitigation strategies to reduce outbreaks of mosquito-borne diseases. Find out more about the NASA GLOBE Observer app, the GLOBE Mission Mosquito campaign, and associated classroom activities and resources at these websites:

observer.globe.gov

globe.gov/web/mission-mosquito

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