NCSE
National Center for Science Education

Activity Training Guide

Buzz Off!

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Overview

Mosquito populations are predicted to extend their ranges to new areas as a result of climate change. This brings about concerns for the spread of mosquito-borne diseases such as malaria, dengue, Zika, and West Nile.

In this activity, participants can explore changes in mosquito populations over several decades, correlated to changes in temperature. They also learn multiple ways to control mosquito populations in order to create their own hypothesis on the most effective methods for mosquito control.

Learning Goals

1. To expand the participant's knowledge on mosquito population growth and climate change.
2. To explore different mosquito control methods, realizing that no method is perfect in controlling populations. Complex problems require complex solutions.

Materials

Mosquito Populations and Climate Change Activity

- 2 tweezers
- 1 blue scoop
- 5 paddles
- 4 different colored cups pre-labeled with dates (1995, 2005, 2015, 2025)
- Black, green, and red mosquitos

Rising Temperatures in Orlando, Florida

- 1 laminated flyer of days over 90 degrees Fahrenheit graph
- Dry erase marker

Keychain Activity

- 1 Poster about beads/mosquito prevention techniques
- Plastic box containing:
- 8 bead types (~150 of each)
- Keychain rings (120)
- Crimp beads

- 2-3 example keychains
- Crimper tool
- Roll of keychain string

***NCSE does not provide a timer. You must find this on your own.

Set-up

Mosquito Populations and Climate Change Activity

	1995	2005	2015	2025
Regular Mosquitos	**24**	**22**	**20**	**18**
Zika Mosquitos	**0**	**6**	**8**	**12**
West Nile Mosquitos	**0**	**0**	**4**	**6**

- Make sure that you have the correct number of mosquitos in your different colored cups
- Make sure the cups are in the correct order by dates.

Rising Temperatures in Orlando, Florida

- Have your rising temperatures graph and dry erase marker ready.

Keychain Activity

- Double check that you have all the materials found on the list. Have the bead explanation poster in plain sight for participants to know what each bead means.
- Pre-tying the keychain rings with string can make this activity run more smoothly.

Procedure

Mosquito Populations and Climate Change Activity

1. When beginning this activity, start by explaining to the participants a brief overview of the topic of the game, then explain the rules.

   Rules:
   - The paddle is only for the black mosquitos.
   - The blue scoop is for the green Zika virus mosquitos.

- The tweezers are for the red West Nile virus mosquitos.
- No use of hands to pick up mosquitos.
- Participants must stop once the time is up.

2. Once this is done you can hand out tools. Be ready to have your timer ready for 15 seconds once you begin the game.
3. Begin by dumping out the flies onto your surface and allow the participants to try and pick up the mosquitos with their tools and put them back in the cup.
4. After the 15 seconds are up, tell everyone to drop their tools and see how many they were not able to pick up.
5. Then start the next round (4 rounds in total) and either at the end or in between rounds have questions ready (provided below) that you might ask to provoke thought about the relationship between mosquito populations and climate change. You can also give a small prize for completion of the game.

Note:

- Use your discretion with the 15 second time limit. If you are working with younger individuals, you may want to consider giving them more time to pick up the mosquitoes. Larger groups may require less time, and smaller groups playing may require more.

- Placement of mosquitoes can also be used to adjust the difficulty. Spreading the mosquitoes out on the table will make the game more difficult, while keeping them concentrated in one area will make it easier.

Definition of Success

All participants are successful in this game.The purpose is to start a conversation about why mosquito populations are rising with changes in climate, and how this might make population control more difficult. They will explore real mosquito control methods in the key chain activity.

Rising Temperatures in Orlando, Florida

1. Explain to participants that they are looking at a graph of temperature in Orlando, Florida, specifically the number of days over 90 degrees Fahrenheit over the past decades.
2. Ask them to guess how many days over 90 degrees there will be in 2025.
    a. They can either write the number on the flyer, or draw their own bar in for 2025.
3. Based on their answer, ask follow up questions to start discussion (see examples below).

Definition of Success

A participant is successful when they predict there will be more days over 90 degrees in 2025 than previous years, noticing the trend for an increase in temperature in that area. Success also occurs when they consider how this increase in temperature could affect mosquito populations in Florida.

Key Chain Activity

In this activity, participants will be making keychains using beads that represent different methods to control mosquito populations.

1. Before beginning this portion of Buzz Off, pre-tying the keychain rings with string can make the activity run more smoothly.
    a. If you will be producing many keychains (100+), use shorter string lengths (3-4 inches) to conserve the amount given in the kit. Each keychain string can be tied to the keychain ring with a simple knot.
2. For bead distribution, we recommend have participants ask whoever is managing the activity for the beads they want on their keychain. This not only controls the amount of beads each individual is using, but gives an opportunity for discussion on what method each bead represents.
3. For large groups, limit the amount of beads they can use (ex. 5 beads) to ensure you do not run out.
4. Once a participant has finished their keychain, tie the end with a knot.
5. Thread a crimp bead on after the knot, and use the crimping tool to compress the crimp bead.

Note:

- Some beads have large openings that are larger than both the knot and crimp bead. If a participant has placed a bead with a large opening at the end of the keychain, feel free to place a smaller bead before tying the keychain off to ensure their beads don't make it past the knot.

Definition of Success

Participants are able to take away a key chain with their different control methods on them and can explain them to you before they leave.

Modifications and Guiding Questions

Mosquito Populations and Climate Change Activity

This is not an exhaustive list. However, some potential discussion questions to prompt conversation can be used below:

- What do you see happening as the years go on?
- What has changed?
- Why do you think those changes are happening?
- Are there any ways to control mosquito populations that you know of?

Rising Temperatures in Orlando, Florida

- What do you notice about the amount of days over 90 degrees from the past to the present?
- Why do you think there have been more days over 90 degrees?
- How might this affect people in Orlando? How might it affect mosquito populations?

Keychain Activity

- What does that bead mean on the chart?
- Do you know any ways that we get rid of mosquitoes?
- Explore pros and cons of each method based on the chart.
    - Ex. Why is the removal of standing water a good way to get rid of mosquitoes? Follow-up: Do you think that is enough to get rid of them?
- Why do you think we are using multiple beads on your keychain?

Further Resources

- Where Disease-Carrying Mosquitoes Will Go In The Future
- How climate change will put billions more at risk of mosquito-borne diseases

NGSS Standards

3-LS4-4 Biological Evolution: Unity and Diversity

Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change.

MS-LS2-4 Ecosystems: Interactions, Energy, and Dynamics

Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.

HS-LS2-7 Ecosystems: Interactions, Energy, and Dynamics

Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.