



# PART ONE. PROBLEM TASK LIST

This is the list of tasks for Part One. Problem Check them off as you complete them.

	1-1	Mapping Your Identity
	1-2	Thinking About Decisions
S	1-3	Pre-Surveying Team
$\mathbf{\mathbf{Y}}$	1-4	Introducing Mosquitoes
S	1-5	Building Team Identity
4	1-6	Defining the Research Problem
F	1-7	Understanding Community Action Plan
	1-8	Exploring Research Perspectives
	1-9	Building Claims from Evidence
	1-10	Mapping Questions

In this part, the team will begin defining the research problem and setting up your local research plans. To do this the team will need to learn more about the team members, different perspectives, and questions you will work to answer during your research.





# Mapping Your Identity

Welcome to the team and Task 1-1. As you heard, you will be making many decisions as a team during your research about mosquitoes. Many of the decisions you will make in your research may be influenced by your identity. Since your team will be making many decisions together, it is good to learn more about the different identities of your team. In future tasks, you will use this identity map to see if parts of your identity are causing you to think in one way or the other. So keep your identity map in a safe place.

Objective

In this task, each team member will make an identity map about themself.

- Go to the Task 1-1 folder to get the identity map instructions, Think, Pair, Share instructions, and discussion questions. This task has only one version for everyone.
- Discuss using Think, Pair, Share instructions to develop categories for the question, "Who am I?" or, "What different things about me make up me?"
- 3. Add your list of extra identity map categories to the Task 1-1 folder.



<u>profile/</u> ScienceForGlobalGoals

- 4. Look at the identity map example in the instructions to see how they look.
- 5. Use this list of categories; plus the ones you added, to create an identity map for yourself.
- Team members should keep their identity maps safe for future tasks.
- 6. Pick one thing from your identity map you can share with the team. Circle it!

Hooray! You completed Task 1-1. Check it off the task list. Go to Task 1-2!

# 2 Thinking About Decisions

Welcome to the team and Task 1-2. As you heard, you will be making many decisions as a team during your research about mosquitoes. Before you begin your research, the team must think about how each team member makes decisions. You will also need to use your identity map from Task 1-1 to see if any parts of your identity are affecting the decisions you make.

#### Objective

- In this task, the team will learn how to work and talk together about decisionmaking and how it may be influenced by the identity map you made in Task 1-1. This will be especially important when we all do not agree.
- 1. Go over these team norms together:
  - Recognize the benefit of listening to different ideas from people on your team.
  - Be open to new ideas and perspectives that challenge your own.
- 2. Go to the Task 1-2 folder and get the Thinking About Decisions activity and discussion questions.
- 3. Choose the Mosquito A or Mosquito B activity from the task folder. You can also do both versions of the task if you want. Or half of the team can do Mosquito A and half can do Mosquito B. You decide!
- 4. Do the activity according to the instructions in the folder and discuss the questions.

Remember, when engaging in meaningful discussion as a team, we must respect our team. For example, use these sentence starters:

- I agree with \_\_\_\_\_because ...
- I disagree with \_\_\_\_\_because ...
- I'd like to go back to what \_\_\_\_\_said about ...
- I'd like to add \_\_\_\_\_\_

Hooray! You completed Task 1-2. Check it off the task list. Go to Task 1-3!

15

Part One. Problem

Task 1- 2

# 1-3

# **Pre-Surveying Team**

As you discussed in Task 1-2, the team will be making many decisions during your research. Before your research on mosquitoes begins, the team must document what people on your team currently think about mosquitoes.



In this task, you will survey the team to document what they currently think. In later tasks you will look at your answers from this survey to see if your thoughts have changed over time. Do not worry if you are not sure about mosquitoes. This is normal. This is not a test.

1. Go to the Task 1-2 folder and get the survey questions and methods.



- Choose the Mosquito A or Mosquito B survey from the task folder.
- Talk as a team about the difference between a survey and a test. Talk about why it is important to be honest when taking a survey.
- 3. Decide which survey option works best for the team. If you have a better option, do that.
  - The team leader will help the team make the decision.
  - Do not worry if you do not understand the questions. Simply mark "Not Sure."



The team will use these survey results in future tasks. Keep the results in a safe place so everyone can easily access them later.

- 4. Do the survey and save the team results in a safe place.
  - The team will look at the survey results later in our research, during Task 2-2, so keep them safe.

Hooray! You completed Task 1-3. Check it off the task list. Go to Task 1-4!

Part One. Problem

Mosquito!

© 2018 Smithsonian Institution

Objective

# **Introducing Mosquitoes**

Before we start our research, we need to learn more about what the team already knows about mosquitoes.

In this task, the team will uncover what they already know about mosquitoes
and add this to their identity maps created in Task 1-1.

- 1. In the Task 1-4 folder, get the images related to mosquitoes.
  - You will also see a document of other mosquito resources (videos), if someone on the team has the resources or technology to view them.
  - You will also see instructions for collecting live samples to observe. Go outside and complete the collection and observation, if you have the resources. See what you can find!
- 2. As a team, view the images and other resources (video + live samples), if you can.
- 3. Quietly think about anything you know about mosquitoes.
- 4. On your identity map from Task 1-1, mark an area around your identity categories called "What I know about mosquitoes." Write or draw in that area all the things you thought about mosquitoes.
- 5. See the example in the Task 1-4 folder for guidance.
- 6. Pick one mosquito thought, story, or drawing from your identity map that you can share with the team. Circle it!



**Research Tip** 

The team will use the identity maps in future tasks. Keep them in a safe place so everyone can easily access them later.



Part One. Problem

lask



Hooray! You completed Task 1-4. Check it off the task list. Go to Task 1-5!



# **Building Team Identity**

In Task 1-1 and Task 1-4, you mapped what you know about mosquitoes. This is your personal identity when it comes to mosquitoes. As a team, you also have a team identity and know things as a group. This is your team's identity. Each person might have similarities and differences between their personal and team identities. This is okay and normal. It is important to understand how these similarities and differences between your personal and team identities may affect the decisions you or the team make during your research.



In this task, we will share our work from Tasks 1-1 and 1-4 to help build a team identity map. This map can then be used during your research to see if any part of your identities may be affecting your personal or team decisions.

1. Go to the Task 1-5 folder to get the Building Team Identity instructions, examples, and questions.



- 2. Follow the instructions to play Round One- Team Identity.
- Look at the Team Identity example in the Task 1-5 folder for guidance during both rounds.
- 4. As a team, discuss the Round One Discussion Questions.
- 5. Follow the instructions to play Round Two- Team Mosquito Knowledge.
- 6. After everyone has shared, stand up as a team. Continue to hold onto the string.
- 7. As a team, discuss the Round Two Discussion Questions.
- 8. Talk about the goal of creating an identity map as a team to help build relationships and break down stereotypes, before we begin our research.
- 9. Talk about how identity maps are helpful for having discussions and for effective team community-building.
- 10. Why is it important to let everyone share their ideas?

Hooray! You completed Task 1-5. Check it off the task list. Go to Task 1-6!

**Research** Tip

The team will use this team identity map in future tasks. Keep it in a safe place so the team can easily access it later.

Mosquito!

# **1-6** Defining the Research Problem

You now have a better understanding of your personal and team's identity and knowledge about mosquitoes. That information will be useful as you begin to define the mosquito problem in your local community. So keep those identity maps safe for later use.

## Objective

- In this task, the team will meet some researchers who study the mosquito problem to learn more about different parts of the problem. These researchers will give the team some ideas about the things you should consider when doing research in your local community.
- 1. Go to the Task 1-6 folder to get the instructions and readings.
- 2. Watch the videos if you can. Do not worry if you are not able to.
- 3. As a team, read the Problem Introduction together.
  - During the reading, circle or underline all the words you do not understand.
  - Do not worry, there are many big words in science.
- 4. As a team, make a list of all the words people circled or underlined so we can start to help each other better understand them all.
- 5. Make a plan for how we could learn more about what these words mean.
  - Where could we search or whom could we ask to learn more about these words?
- 6. Go back and identify a Very Important Part (VIP) from the reading.
- 7. Share these VIP's as a team.
- 8. Follow the instructions for the Meet the Team Jigsaw Part One.
- 9. Have each group present their researcher to the team, including:
  - Name, job title, organization
  - Most interesting thing from their identity map



Part One. Problem



- One VIP from each of the three questions
- Make a list of the VIPs from all groups

Follow the instructions for the Meet the Team - Jigsaw Part Two.

- 10. Have each group present their researcher to the team, including:
  - VIP for each perspective (ethical, economic, social, environmental)
  - VIP for why it is important to consider perspectives when making decisions about this problem
  - Make a list of the VIPs from all groups

To help your local community, we will need your team to create a research site and develop a variety of suggestions for solutions to this question:

How can we ensure health for all from mosquito-borne diseases?

Just remember, research is not always easy. There is not one right answer.

There are many possible solutions. So, you might get confused.

You might get frustrated. Things might not always work out the way you thought.

This is normal. All you can do is try again, start over, ask a different question, talk to a different person, or create a new pathway.

Just remember, there are many questions to consider. There are many decisions to make. There are many possible solutions.

Hooray! You completed Task 1-6. Check it off the task list. Go to Task 1-7!

# 7 Understanding Community Action Plan

As you learned in Task 1-6, the team will be focused on creating solutions to the problem question: How can we ensure health for all from mosquito-borne diseases?

There are many possible solutions to this question. This is why we must conduct research to learn more about the problem in our community. Then we can suggest decisions and actions we think people should take. At the end of your research, the team will need to create and communicate a community action plan. All of the team research will help you create the community action plan.



In this task, the team will learn more about the community action plan you will make in the future.

- 1. Go to the Task 1-7 folder to read the details of the community action plan.
- 2. There is only one version of the community action plan.
- Read through the details of the action plan as a team. Ask questions about any parts that are not clear. Remember not to worry. Research is not easy. Sometimes things might not work out the way you planned. Learning how to work through the problem is part of the challenge and fun.
- 4. Read the Meet the Team Reading, with stories about when things did not work out during research projects and action plans. Think about how your team can work together when things do not work out as planned to reach your research and action plan goals.





Community Research Guide is all about creating your community action plan. Remember that all of your research is leading to the creation of this plan.



Hooray! You completed Task 1-7. Check it off the task list. Go to Task 1-8!

21

Task 1- 7

# -8 Exploring Research Perspectives

As you learned in Task 1-6 and 1-7, the team will be presented with various perspectives of the problem throughout your research: social, ethical, environmental, and economic.



## In this task, the team will explore these perspectives to understand them better.

This task only requires space for a continuous line (real or imagined ) from one side of the room to the other.

- 1. Post one sign stating STRONGLY AGREE and one sign stating STRONGLY DISAGREE on opposite walls or corners of the room. The space between these two signs is the continuum. Put a sign in the middle of these two signs that states NOT SURE.
- 2. The team will hear a variety of statements.
- 3. After each statement, each team member should place themselves along the continuum based on how much they agree or disagree.
- Go to the Task 1-8 folder to get the statements, further instructions, discussion questions and Meet the Team Reading. Choose the Mosquito A or Mosquito B version of this task.
- 5. Go over the team norms together in the task folder.
- 6. Follow the instructions to play the warm-up round.
- 7. As a team, discuss the Warm-Up Discussion Questions.
- 8. Follow the instructions to play four Perspectives rounds and questions.
- 9. As a team, discuss the Task 1-8 Discussion Questions.
- 10. Read the Meet the Team Reading on what to do when the team does not agree?. Learn about and discuss the ways their teams work through disagreements. Think about how your team can best work together to respect everyone's ideas.



**Research** Tip

use during discussions. These norms are helpful to have

respectful conversations,

especially when you don't

agree.

Display a set of talking norms team members can

Hooray! You completed Task 1-8. Check it off the task list. Go to Task 1-9!

**Mosquito!** 

© 2018 Smithsonian Institution



# 1-9 Building Claims from Evidence

Throughout your research you will be collecting and working with many different types of evidence. You will be using this evidence to make claims based on scientific arguments. A claim is a suggested answer to a scientific question. Evidence is the information we use to build claims. In our research, the team will use many different types of evidence to build claims concerning the parts of the problem question: How can we ensure health for all from mosquito-borne diseases?

# Objective

In this task, we are going to learn how to use evidence to support claims. This will help the team explain how we know what we know.

- Go to the Task 1-9 folder to get the Building Claims from Evidence activity.
- 2. Choose the Mosquito A or Mosquito B version from the task folder, or do both.
- 3. This task involves making a claim about a bite from an unknown animal.
- 4. The scientific question the team must consider is: What kind of animal bit me?
- 5. Follow the directions in the task to support the claims about this question.
- 6. Use the data sheet to document your results.
- 7. As a team, discuss the questions in the task.
- 8. Why is it important to always support your claims with evidence?
- 9. Why is it important to support decisions you make in your life with evidence?
- 10. Why is it important to listen to people, even when you do not agree?
- 11. Why is it important to respect people, even when you do not agree?

Remember, in your research, the team will use many different types of evidence to build claims concerning the parts of the problem question: How can we ensure health for all from mosquito-borne diseases?

Hooray! You completed Task 1-9. Check it off the task list. Go to Task 1-10!

# **Mapping Questions**

In Part two, you will start your local research. Before you start, it is good to know all of the team's questions. This will help you organize your research.

$\sim$					
()	h	P	C	t١	N
$\sim$	~J	L, C	c	u	v



In this task, we will learn about and organize our questions for research in later parts.

- 1. Each team member should think about what more they would like to know about mosquitoes and mosquito-borne diseases.
- 2. Make a list of all the questions you have or would like to explore about mosquitoes and mosquito-borne diseases. Remember, they should be written as questions.
- 3. Think, Pair, Share the questions you developed.
- 4. As a team, make a list of these questions.
- 5. Go to the Task 1-8 folder to get the question map.
- 6. Look at the question map.
- 7. This map already has some boxes filled with questions.
- 8. The top question in the dark blue box is the problem question around which we are trying to create solutions: How can we ensure health for all from mosquito-borne diseases?
- 9. The five greeen boxes under the problem question create five columns.
- 10. These columns are the four perspectives we will be exploring, plus one where we can put questions that don't seem to fit under any of the perspectives right now.
- 11. The light blue boxes are some different questions we will need to explore to help us develop our solutions to the main problem question.
- 12. As a team, using this question map, take the list of questions created by the entire team and start placing them under one of the five columns.
- 13. Discuss as a team where you think each question best belongs.
- 14. Remember, you can always move the questions later in your research. So, put them in column five for now if you are not sure.
- 15. Remove any repeat questions. Each question only needs to be on the map once.
- 16. Combine any questions that go together.
- 17. This question map will help quide your research in the following parts.
- 18. So whenever you are discussing questions at the bottom of the map, think about how they might help us answer the problem question at the top: How can we ensure health for all from mosquito-borne diseases?





# **Research** Tip

The question map will help guide the team research. Your team will work to research, investigate, and explore as many of these questions as you can. You will need to come back to this question map many times. So, keep it somewhere safe and easy to access as a team.



# Part One. Problem

**Mosquito!** 

# Part One Debrief

Congratulations!

You have completed Part One of your research.

Give yourself a pat on the back.

The team should now have a better understanding of the team and the mosquito problem.

But, do not worry if you are confused or not sure about anything.

Things will become clearer as we research more.



As you see in your question map from Task 1-10, there are many questions we still need to explore.

These questions will guide our exploration of our local community.

This exploration will help us understand the problem better in our local community.

This will also help us develop solutions we think are the best for our community.

Just remember, every community is different.

The answer is not always the same for every place in the world.

But remember, all of this work is focused around our problem question:

How can we ensure health for all from mosquito-borne diseases?



The next part of your research will focus on mapping the team research site(s). Then you will survey people in your research site to see what they know. Then you will use this information to start developing ideas for solutions.

This may be confusing.

But do not worry.

It will all make sense as you complete the tasks. Just remember, the team is here to help.

Continue to Part 2: Community

Smithsonian Science for Global Goals
Notes:

\*





# Task 1-1. Mapping Your Identity

#### **Identity Map Instructions**

Identity maps are a graphic tool that can help people better understand the many things that shape who they are as individuals. These are also things that can influence a person's thoughts or the decisions they make in different situations. Each team member will create an identity map to deepen their understanding of themselves and their team members.

- 1. **Think, Pair, Share** how you would answer the question, "Who am I?" or, "What different things about me make up me?"
- 2. After the Think, Pair, Share conversation, brainstorm a list of categories you might use to describe someone's identity or who they are.
- 3. Add the extra categories to your list that will be used when creating your identity maps.
- 4. Look at a sample identity map.
- 5. Write your name in the middle of a piece of paper.
- 6. Have each team member create an identity map for themselves using the list of categories.
- 7. As a team, answer the discussion questions.

#### Think, Pair, Share Instructions

**T**hink: On your own, have the team quietly think to themselves about the question or topic that has been presented. Take a few minutes to let each team member make notes or a list of ideas on their own.

**P**air: Each team member should be paired with another team member or a small group. As a pair or small group, share your list of ideas with one another.

**S**hare: Students share their thinking with their partner. Team leaders expand the sharing into a whole-class share or discussion.

### **Identity Map Categories**

Age School/class Race Gender Nationality Family background/origin

Role in family (sister, brother, cousin . . .)





Ethnicity

Interests

Hobbies

Religion

Things you like to do

Personality traits (shy, loud, talkative, quiet, funny, sad...)

Physical traits (tall, short, brown hair, black hair, blue eyes, brown eyes...)

## **Discussion Questions**

Which item on your identity map is most essential to your sense of self? Circle it!

Are certain aspects of your identity more influential than other aspects? Why?

How might your identity map change over time?

How much control do you have over the things on your identity map?

How might things on your identity map affect decisions you make in your life?

## Example





Go back to Research Guide now

Smithsonian

**SCIENCE** for Global Goals



# Task 1-2 Thinking About Decisions — Mosquito A

Materials: Paper and pens or pencils, Task 1-1 identity maps

Description: Ask each team member to write on a piece of paper all of the decisions that they can remember making so far today. (Examples: what to wear, what to eat, how to spend free time, etc.) Include all types of decisions on your list.

Allow about three minutes for team members to write. Now, ask each team member to go back through their list and rate their decisions on a scale from 1 to 10, with 1 meaning an automatic decision you made without much thought, and 10 meaning a decision that required careful studying and much thought before you made the decision.

# **Task 1-2 Thinking About Decisions Discussion Questions**

- 1. As a group, share different types of decisions you rated as 1 that are automatic and do not require much thought. Which decisions did you rate at 10 that require much thought before making the decision?
- 2. Did any of your decisions affect another person? If so, how?
- 3. Look at the identity map you created in Task 1-1. Were your decisions influenced by any things on your identity map, such as your values? Attitudes? Biases?
- 4. Which aspects of your identity map do you think are most influential when making decisions?
- 5. What is the worst decision you ever made? (Team members can write or discuss these.)
- 6. Do you consider it the worst because of the decision, or was it a reasonable decision with a bad outcome?
- 7. Does a good decision guarantee a good outcome?
- 8. Do you have control over the decision, the outcome, neither, or both?
- 9. What does this exercise tell you about how you make most of your decisions?

Modified from: "More About Decisions" from <u>Helping Teens Reach Their Dreams</u> by Schilling & Palomares, 1993.



Go back to Research Guide now

🕽 Smithsonian

**SCIENCE** for Global Goals



## Task 1-2 Thinking About Decisions — Mosquito B

**Materials**: Writing Materials (Such as poster board, paper, chalkboard with the Patient Waiting List (from below) written on it, Task 1-1 identity maps

Form groups of five to seven people.

In your group, you will be making a decision about an imaginary situation.

The situation is:

You are doctors at a large hospital. Your committee must make a very important decision. Seven patients are sick with a disease they got from a mosquito bite. They all need medicine to help them survive. There is only enough medicine to help one of the patients at this time. All of the patients would be saved by the medicine. The patients who do not receive the medicine will not automatically die. Some (not all) will, hopefully, survive until more medicine arrives at the hospital. Which patient would you choose to receive the medicine? Why? Your committee must agree on the choice.

## **Patient Waiting List**

(Select one of the following patients to receive the medicine.)

- 31-year-old male; Black, brain surgeon; no children
- 12-year-old female; Asian; accomplished violinist; blind
- 40-year-old male; Hispanic, teacher, two children
- 15-year-old female; White, unmarried, six months pregnant
- 35-year-old male; Hispanic; Roman Catholic priest
- 17-year-old female; White; waitress; high school dropout; supports and cares for a brother who is severely disabled
- 38-year-old female; Black; AIDS researcher; no children

Allow at least 10 minutes for each group to make their decision about who should receive the medicine (20 minutes is recommended).

Then meet up as the whole team.



**Smithsonian** 

**SCIENCE** for Global Goals Mosquito!

Have each group share its decision and decision-making process.

- 1. What was your decision?
- 2. How did you arrive at your decision?
- 3. What are the potential effects or consequences of your decision?

# **Task 1-2 Thinking About Decisions Discussion Questions**

- How did your group come to a decision? Did you use a specific technique (consensus, voting, etc.)?
- How were disagreements and conflicts handled? What strategies could you use in future situations to better handle these?
- Look at your identity map you created in Task 1-1. Which aspects of your identity map most influenced your decision? How was your decision influenced by the things on your identity map, such as your values? Attitudes? Biases?
- Was there anyone who felt their voice was not heard? How could we ensure their voice is heard equally in the future?
- Did anyone change their mind after hearing another group's explanation?

**Modified from:** 

"More About Decisions" from Helping Teens Reach Their Dreams by Schilling & Palomares, 1993











## Task 1-3 Surveying Team—Mosquito A

#### How to Do the Survey

A survey is a method of gathering information from individuals or a group. The information gathered gives the research team a better understanding of the general view or opinion of a group of people. A survey is a tool for learning about a group's thoughts or opinions. It is not a test with right or wrong answers. The results of a survey will help the research team make decisions about their work.

The purpose of a survey is to understand a person or group's thoughts. That means for the research to be helpful, it is important that people are honest when taking the survey. When people are honest on a survey, it will help the research team make better decisions about work they are doing.

Just remember, there are no right or wrong answers. The purpose is to help the research team, so be honest.

Here are some options for completing the survey.

- 1. Print a paper copy of the survey for each team member and the team leader. Have each person complete a written version on their own and submit this to the team leader. Answers can be written directly on the survey or on another piece of paper.
- 2. Post or project the survey questions so everyone can see them.
  - a. Each team member can write down the answers to the survey questions on a piece of paper and submit this to the team leader.
  - b. The team can read each question together, and then each team member can pick their answer. Then everyone votes on the preferred answer—preferably with heads down so the vote is anonymous. The team leader tallies votes.
- 3. The team leader asks the questions out loud, the team votes (preferably a heads down vote), and the team leader tallies the votes
- 4. Create a digital version of the survey using Survey Monkey, Google Forms/Documents, or another digital method. Use that!
- 5. As always, pick the option that is easiest for you to do.
- 6. If you have a survey method not listed here that you prefer, do that!









## Task 1-3 Surveying Team—Mosquito B

#### How to Do the Survey

A survey is a method of gathering information from individuals or a group. The information gathered gives the research team a better understanding of the general view or opinion of a group of people. A survey is a tool for learning about a group's thoughts or opinions. It is not a test with right or wrong answers. The results of a survey will help the research team make decisions about their work.

The purpose of a survey is to understand a person or group's thoughts. That means for the research to be helpful, it is important that people are honest when taking the survey. When people are honest on a survey, it will help the research team make better decisions about work they are doing.

Here are some options for completing the survey.

- 1. Print a paper copy of the survey for each team member and the team leader. Have each person complete a written version on their own and submit this to the team leader. Answers can be written directly on the survey or on another piece of paper.
- 2. Post or project the survey questions so everyone can see them.
  - a. Each team member can write down the answers to the survey questions on a piece of paper and submit this to the team leader.
  - b. The team can read each question together, and then each team member can pick their answer. Then everyone votes on the preferred answer—preferably with heads down so the vote is anonymous. The team leader tallies votes.
- 3. The team leader asks the questions out loud, the team votes (preferably a heads down vote), and the team leader tallies the votes
- 4. Create a digital version of the survey using Survey Monkey, Google Forms/Documents, or another digital method. Use that!
- 5. As always, pick the option that is easiest for you to do.
- 6. If you have a survey method not listed here that you prefer, do that!







# Task 1-3: Team Mosquito Survey B

# Name:

# Part 1: Background Information

Age					
0-10	11-20	21-40	41-64	65+	

Gender						
Male	Female	Non-binary/third gender	Prefer to self-describe:	Prefer not to say		

What town do you live in?		

Is your home in the city, village, or rural?				
City	Village	Rural	Other	

Availability of communications media in the house (check all that apply)					
Television	Newspaper	Radio	Computer		
Tablet	Internet	Telephone	Mobile phone		
SMS	Social media	Mobile phone with	Other		
		Internet			











# Part 2: Community

Is this the first time someone has surveyed you about mosquitoes?				
Yes	No	Not sure		

How well do you understand mosquitoes?					
1. Not at all	2. Hardly	3. Somewhat	4. Well	5. Very well	

How concerned are you about mosquitoes in your community today?					
1. Not at all	2. Hardly	3. Somewhat	4. Concerned	5. Very concerned	

How concerned are you about mosquito-borne diseases in your community in the future?					
1. Not at all	2. Hardly	3. Somewhat	4. Concerned	5. Very concerned	

During the worst times of the year, how severe are the mosquitoes around your home?						
1. Not severe	2. Minimal	3. Average	4. Fairly severe	5. Extremely		
				severe		

During the worst times of the year, how many times do you get bitten by mosquitoes in a day?						
0 bites	1-5 bites	5-10 bites	10-20 bites	20-50 bites	50+ bites	

What impact do mosquitoes have on your quality of life?					
Health risk	Nuisance	No impact	Other		





## Part 3: Life

Are there different types of mosquitoes in the world, or are they all the same?					
There are different types of mosquitoes.	They are all the same.	Not sure			

Are male, female, or both male and female mosquitoes able to transmit diseases to humans?						
Only male mosquitoes are able to transmit diseases to humans.	Only female mosquitoes are able to transmit diseases to humans.	Both male and female mosquitoes can transmit diseases to humans.	Not sure			

What time of the da				
Morning	Afternoon	Evening	Night time	Not sure

Where do mosquitoes get their food from? (check all that apply)					
Flowers	Sap from plants	Garbage			
Blood from animals and humans	Other	Not sure			

Do mosquitoes lay eggs or give birth to fully developed mosquitoes?					
Lay eggs	Give birth to developed	Not sure			
mosquitoes					





## Part 4: Transmission

Can mosquito-borne diseases be transmitted simply by being near people who are sick?						
Yes, mosquito-borne diseases can be transmitted by being near people who are sick.	No, mosquito-borne diseases cannot be transmitted by simply being near people who are sick.	Not sure				

Can some mosquito-borne diseases be transmitted to other animals (birds, horses, dogs)?					
Yes, some mosquito-borne	No, mosquito-borne diseases	Not sure			
diseases can be transmitted to	cannot be transmitted to				
other animals.					

## Part 5: Habitats

Where do mosquitoes breed? (check all that apply)						
Still, stagnant water	Moving water	Drains	Water storage containers	Garbage		
Trash containers	Old tires	Old cars	Old boats	Holes in trees		
Animal shells	Other	Not sure				

Do you have any containers holding water, or low areas with standing water around your home?					
Yes	No Not sure				





# Part 6: Management

Where do you receive information on mosquitoes in the community? (check all that apply)					
Personal	Family/friends	School/university	Television	Radio	
experience/observation					
Print/newspaper	Social media	Internet	Mobile phone	Doctors/health workers	
Government	Other	Not sure			

Which source(s) do you most trust for accurate information about mosquito-borne diseases? (check all that apply)						
Personal experience/observation	Family/friends	School/university	Television	Radio		
Print/newspaper	Social media	Internet	Mobile phone	Doctors/health workers		
Government	Other	Not sure				

Are you aware of the mosquito control services in your community?						
Yes	No	Not sure				
If yes, please describe which serv	ices.					

Do you currently take any action to protect yourself or others in your community from getting a mosquito-borne disease?					
Yes	Νο	Not sure			
If yes, please describe your action.					

Go back to Research Guide now









# Task 1-3: Team Mosquito Survey A

# Name:\_\_

# Part 1: Background Information

Age						
0-10	11-20	21-40	41-64	65+		

Gender				
Male	Female	Non-binary/third gender	Prefer to self-describe:	Prefer not to say

What town do you live in?		

Is your home in the city, village, or rural?						
City	Village	Rural	Other			

Availability of communications media in the house (check all that apply)					
Television	Newspaper	Radio	Computer		
Tablet	Internet	Telephone	Mobile phone		
SMS	Social media	Mobile phone with Internet	Other		

## Part 2: Community

How well do you understand mosquitoes?						
1. Not at all2. Hardly3. Somewhat4. Well5. Very well						

How concerned are you about mosquitoes in your community?					
1. Not at all	2. Hardly	3. Somewhat	4. Concerned	5. Very concerned	





## Part 3: Life

Are both male and female mosquitoes able to transmit diseases to humans?				
Only male mosquitoes are able to transmit diseases to humans.	Only female mosquitoes are able to transmit diseases to humans.	Both male and female mosquitoes can transmit diseases to humans.	Not sure	

What time of the day do mosquitoes bite? (check all that apply)			
Day time	Night time	Morning	Not sure

## Part 4: Transmission

Can mosquito-borne diseases be transmitted simply by being near people who are sick?				
Yes, mosquito-borne diseases	No, mosquito-borne diseases	Not sure		
can be transmitted by being	cannot be transmitted by simply			
near people who are sick	being near people who are sick.			

Can some mosquito-borne diseases be transmitted to other animals (birds, horses, dogs)?				
Yes, some mosquito-borne	No, mosquito-borne diseases	Not sure		
diseases can be transmitted to	cannot be transmitted to			
other animals.	animals.			





## Part 5: Habitats

Where do mosquitoes breed? (check all that apply)				
Still, stagnant water	Moving water	Drains	Water storage containers	Garbage
Trash containers	Old tires	Old cars	Old boats	Holes in trees
Animal shells	Other	Not sure		

Do you have any containers holding water, or low areas with standing water around your home?			
Yes	No	Not sure	

# Part 6: Management

Where do you receive information on mosquitoes in the community? (check all that apply)				
Personal	Family/friends	School/university	Television	Radio
experience/observation				
Print/newspaper	Social media	Internet	Mobile phone	Doctors/health workers
Government	Other	Not sure		

Do you currently take any action to protect yourself from getting a mosquito-borne disease?				
Yes	No	Not sure		
If yes, please describe your action.				



Go back to Research Guide now









## **Task 1-4 Introducing Mosquitoes**

#### Additional Video, Photo, and Live Capture Resources—Learning Lab Collection

Throughout this module, some tasks will have additional collections of resources in the Smithsonian Learning Lab Task 1-4 Collection. Use these additional collections to help your team during the tasks. But do not worry if you don't have the resources to access this information. You can still do the task without these resources. Based on what the team has access to, use these resources if you can. These collections include additional photos, videos, and information for collecting live mosquito larvae around your school or house. View the videos and photos in the Learning Lab Task 1-4 Collection, if you have the technology to do so. Follow the guidance and techniques in the videos and documents to help you collect live samples for observation.

#### Additional Live Mosquito Egg, Larvae, Pupae, and Adult Resources

It is always best to look at the real thing and engage in hands-on learning. We are aware that some teams might not feel comfortable capturing, observing, or being around live adult mosquitoes or eggs, larvae, and pupae. But just remember, they are probably already around you. Also, mosquitoes in the egg, larval, and pupal stages of life are not able to transmit diseases to humans.

#### Two Options for Observing Live Larvae and Pupae

Option 1: Collect live samples

- 1. Go outside where your team meets or around your house and look for live mosquito larvae and pupae in puddles, water-filled containers, and anywhere that water naturally pools.
- 2. Look for things that wiggle around when the water or container is disturbed.
- 3. Use a net, spoon, eye dropper, turkey baster, or other device to catch and transfer the larvae to a container for observation.
- 4. Observation containers can be plastic bags, clear plastic bottles, or glass jars.
- 5. If you're taking the containers with live larvae or pupae inside a building, make sure you cover them with a mesh, so they cannot escape if they turn into adult mosquitoes.
- 6. If you are able to view the collected larvae or pupae under a microscope, do it! Describe what you see.

Use the instructional videos and documents to capture live samples in the field.

#### Option 2: Make and Set out Collection Traps

If you are not able to find any samples in naturally pooled water, you can make and set out traps to try to collect mosquito eggs, larvae, and pupae. Making the traps is not required to complete the task. However, for teams that are interested in experimenting with capturing adult mosquitoes and mosquito larvae in their local environment for this and future tasks in Part Three, we are providing the information on how to do this yourself to get started now. Do note that it may take a few hours, days, or weeks to collect eggs or larvae, depending on the time of year. The probability of getting eggs quickly in a container also depends on the mosquito population size. If they are abundant in your area, containers may have eggs continuously.





**SCIENCE** for Global Goals

Mosquito!

The materials needed are fairly basic and cheap. Look in the trash to find old plastic bottles or cups you can make into a trap to observe and study mosquitoes in your area. Make sure to take proper precautions when searching for containers in the trash pile, as some of them may be contaminated. Review the safety documents in the Research Guide to learn more about taking precautions when in the field.

#### See the PowerPoint in the Learning Lab collection for Egg Collection Trap instructions.

#### Task 1-4 Identity Map Example





Go back to Research Guide now



# Task 1-4 Mosquito Egg Collection Traps



# Materials and Procedure







Mosquito! © 2018 Smithsonian Institution

# General Materials



- Scissors
- Pliers or other sharp object
- Permanent marker
- Scotch tape
- Water







# **Oviposition Cups**



You will need TWO cups. Any material will work.

The interior of the cups must be a dark color.

If you do not have dark cups, you can use tape, fabric, or another material to make the inside of the cups dark.





Mosquito! Part 1. Problem: Task 1-4

# Oviposition Surface/Substrate



You will need a surface for the mosquito eggs to cling to.

Here are some examples of materials that can be used:

- Paper towel
- Wooden tongue depressor
- Popsicle stick
- Cotton fabric







Mosquito! © 2018 Smithsonian Institution

# Step 1: Prepare Oviposition Cups

Label each cup with:

- Its name (A or B)
- Its location (sun or shade)
- Today's date



Use the pliers (or other sharp object) to poke 2-3 small holes in each cup.

The holes should be about 2/3 of the way up from the bottom of the cup.

The holes will drain excess water.











Mosquito! © 2018 Smithsonian Institution
Mosquito! Part 1. Problem: Task 1-4

# Step 2: Prepare Oviposition Surface/Substrate

## **Option 1: Paper towel or fabric**



Bishede 7.18.17 Air and 7.18.17 Measure and cut 2 strips of material.

They should be about 2/3 of the height of the cup.

Label the corner of each strip the same way you labeled the cups.

## **Option 2: Popsicle stick or tongue depressor**



You will need two sticks.

Label the tips of each stick the same way you labeled the cups.







Mosquito! Part 1. Problem: Task 1-4

# Step 3: Assemble Collection Device

## **Option 1: Paper towel or fabric**



Smithsonian

Cross section

Roll each strip so that the label is on the inside and place it inside the corresponding cup.

The material should sit about 1/3 of the way from the bottom of the cup. Secure with tape if necessary.

SCIENCE

for Global Goals

## **Option 2: Popsicle stick or tongue depressor**



Place each stick inside the corresponding cup.

# Step 4: Placing the Trapping Cups (Sun vs. Shade)



Fill the cups about 2/3 of the way up with water. Excess water will drain out of the holes.

Place Cup A in a sunny location and Cup B in a shady location.

Mark the location of your cups on your research map you created in Task 2-1.

Using the Egg Collection form, document:

The presence of plants within a 5 foot radius of cup.







Mosquito! Part 1. Problem: Task 1-4

# Step 4: Collecting Eggs



Tip: If you live in a windy area, you can place a washer, rock, or other heavy object in the bottom of the cup to weigh it down.







Mosquito! © 2018 Smithsonian Institution

# Step 5: Experiment Notes

- In this experiment, you will collect data on whether eggs are found in a particular container or not (sun vs. shade).
- The Response variable is the presence of eggs in a particular container or not.
- The Explanatory variable is the location (sun vs. shade)
- Create a hypothesis about which container you think will capture more eggs.





# Step 4: Collecting Eggs

- Leave the cups out for 7 days, refilling to 2/3 level as necessary. Check daily.
- After 7 days, take the germination surface out of the cup to collect your eggs. Check the water in the cup for any larva moving around.
- If you find larva in the water, move them to a container, such as the setup option for an Emergence Chamber described in Task 3-4.
- Use one of those setups so you can safely observe them over the next few weeks.
- Complete the rest of the collection form.
- If you are participating in the Invasive Mosquito Project, mail your eggs according to the directions in the egg collection procedure.
- Even if you are participating in the Invasive Mosquito Project, save some of the eggs and place them into either the Adult mosquito trap in the Emergence Chamber setup described in task 3-4. This will allow you to safely observe first instar larvae hatching from eggs and further develop into fully mature larvae and pupae inside of the container.





## Variables- Conducting additional Experiments

You can test different variables of the egg collector to see which features make for the most effective design.







Suggestion 1: Change the coverage of the germination paper in the cup. But, keep the amount of water, size of cup, and color inside all constant.

#### Suggestion 2:

Change the color of the inside of the cup. But, keep the amount of water, size of cup, and color inside all constant.

### Suggestion 3:

Change the size of the cup. But, keep the amount of water, the color inside, and the coverage of the germination paper all constant. These are a few suggestions, but feel free to get creative and think about what other variables can be changed. Remember to only change one variable at a time when conducting more tests. Keep all other variables constant. This way you can determine what variables are making certain traps more effective in collecting eggs.

- Cup material
- Cup Opacity
- Water color (add food coloring or organic matter)
- Hole placement
- Interior material composition (paper/cotton/polyester/plastic)
- Amount of cup that is covered or open







Mosquito! Part 1. Problem: Task 1-4

# Others ways to collect mosquito larvae

You can use any vessel that holds standing water to collect mosquito larvae. Here is a list of some ideas:

• Empty food containers

😌 Smithsonian

- Buckets
- Bird baths
- Tires
- Tarps
- Wheelbarrows
- Toys
- \*\*\*Just make sure if you place a collection vessel outside to check it regularly so eggs are not given enough time to grow into adults.











Mosquito! © 2018 Smithsonian Institution

## Active Surveillance - Others ways to collect mosquito larvae

#### **Collect live samples**

- 1. Go outside where your team meets or around your house and look for live mosquito larva + pupae in puddles, water filled containers, and anywhere that water naturally pools.
- 2. Look for things that wiggle around when the water or container is disturbed.

3. Use a net, spoon, eye dropper, turkey baster, or other device to move the larva into a container for observation. Observation containers can be plastic bags, clear plastic bottles or glass jars.

4. If taking the containers with live larva or pupae inside a building, make sure they cannot escape if they turn into adult mosquitoes.

5. If you are able to view the collected larva or pupae under a microscope, do it! Describe what you see.

 \*\*\*Just make sure if you place a collection vessel outside to check it regularly so eggs are not given enough time to grow into adults.





## 1-4 Introducing Mosquitoes



























Smithsonian Center for Learning and Digital Access

# Mosquitoes

• To be used in a close-looking, compare and contrast activity. Three specimens of mosquitoes are presented, along with macrophotographs of their heads, wings, hindleg, and thorax. Two of the specimens are vectors for Zika transmission, and the third is a vector for malaria.

Images used are from the Smithsonian's NMNH Walter Reed Biosystematics Unit Museum Support Center, Suitland, MD. Photo credits: Judith A. Stoffer



A. aegypi mosquito (Zika vector)



A. albopictus mosquito (Zika vector)



Anopheles mosquito (Malaria vector)





































#### Video Links for Task 1-4

PBS Deeplook at Mosquitoes Description: PBS Deeplook - Mosquitoes https://youtu.be/rD8SmacBUcU

#### Why You Should Avoid the Arctic in Summer

Description:

There's one thing most Arctic wildlife have in common during the summer: a shared hatred for the mosquitoes and black flies that swarm the region. From: POLAR BEAR SUMMER http://bit.ly/1liEYFU

https://www.youtube.com/watch?v=mYT7y46D1Ak&feature=youtube\_gdata\_pla yer

#### **Collecting Mosquito Larva Techniques**

Description: Information that would be helpful if you want to look for and collect live mosquito larva for this task https://youtu.be/Pach69UNsDc

#### **Collecting Live Larva Techniques**

Description: This video has information on how to collect live larva around your school, house, or in the field.Mosquito Larva Collection Techniques https://youtu.be/-z1Z4-alQHQ







#### **Safety Documents**

#### Field Safety—Mosquitoes

When working in the field, it is important to consider what measures you need to take to keep yourself safe. This is especially important when you're doing mosquito-related research because, as you have learned, mosquitoes can be a vector for serious diseases. The following is a list of recommended safety precautions to take before entering the field.

- Wear a long-sleeve shirt, long pants, and high socks.
- Tuck your shirt into your pants and tuck your pants into your socks.
- Wear closed-toe, closed-heel shoes. Boots are best, but sneakers are acceptable. Avoid wearing footwear that exposes any part of your feet, such as open-toe shoes, flip flops, sandals, or clogs.
- Cover your head. If possible, wear a head net, especially when exploring areas with high mosquito activity. Baseball caps and other hats are acceptable. For added protection you can cover your head with a T-shirt, towel, or cloth.
- Apply EPA-approved insect repellent to exposed skin. Repellent or permethrin (an insecticide) may also be applied to clothing for additional protection. If you're out for an extended period, reapply repellent. Be sure to follow the product instructions carefully.

You can find more recommendations on how to remain safe when studying mosquito habitats by visiting your local, state, or federal government website.

#### **Additional Resources**

https://wwwnc.cdc.gov/travel/yellowbook/2018/the-pre-travel-consultation/protectionagainst-mosquitoes-ticks-other-arthropods

http://www.health.nsw.gov.au/Infectious/factsheets/Pages/mosquito.aspx

https://www.epa.gov/insect-repellents/tips-prevent-mosquito\_bites

http://npic.orst.edu/factsheets/PermGen.html

#### Field Safety—Survey (Community Interview)

When working in the field, it is important to consider what measures you need to take to keep yourself. This is especially important when you're conducting a community survey, such as the one students will be administering as part of the Mosquito project. Interviewing people in your local community is an integral part of this curriculum module. Information obtained will help students better understand what people in their community know about mosquitoes and the diseases they cause. Students will also gain information that will help them complete their final



project and answer the question: How can we ensure health for our local community from mosquito-borne diseases?

The following is a list of recommended safety precautions for conducting community survey interviews.

- Do not conduct interviews alone. A responsible adult over the age of 18 should accompany minors at all time. (Note that age may vary, depending on the region and culture of the community where the interviews are conducted.)
- Walk with purpose. Keep your head up and eyes forward.
- Be aware of your surroundings. Avoid using electronic devices like cell phones, which can distract you from your surroundings.
- Know the area surrounding the community where you will be conducting interviews.
- Always be polite. Introduce yourself and explain the project you are working on.
- Ask the individual if you may have permission to interview them for your project.
- Never enter a home or residence without permission and an adult chaperone, parent, or guardian present.

#### **Additional Resources**

http://www.ucd.ie/t4cms/Home%20Visits%20-%20Face%20To%20Face%20Interviews%20Safety %20Guidelines.pdf

https://www.le.ac.uk/emoha/training/no6.pdf

#### Laboratory Safety\*

When working in the lab, it is important to follow all laboratory safety rules and guidelines. Depending on the kind of lab you are working in, these rules and guidelines may differ. Even if you do not have a traditional laboratory, wherever lab work is conducted, basic laboratory rules and guidelines should be established. The following is a list of recommended safety guidelines.

- No eating food, drinking of any kind, or gum chewing in the lab.
- Personal protective equipment (PPE) should be worn at all times. Gloves, goggles, and lab coats are examples of PPE worn in most laboratories. You always want to protect your hands, eyes, and clothes. The appropriate PPE depends on the work you are doing and the kind of laboratory you are working in.
- Wear closed-toe shoes with rubber soles. Avoid wearing high heels, flip-flops, sandals, open-toe, or open-heel shoes.
- Wash your hands before and after doing lab work. This prevents contamination and cross-contamination, and ensures you do not bring anything unwanted into or take anything unwanted out of the lab.



#### **SCIENCE** for Global Goals

Mosquito!

- When wearing gloves, take care not to tear them or get anything inside them. If your glove tears, remove it, wash your hands, and put on a new one. If anything gets into your gloves, chances are they are too big. Remove your gloves, wash your hands, and put on a new pair. If different sizes are available, use a smaller size.
- No running or playing in the laboratory.
- Follow all instructions, written and verbal, for whatever you are working on. If you are unsure about what to do, ask for help.
- Keep your lab area clean.
- Always be alert. If something is out of place, spilled, or broken, let your teacher, parent, guardian, or lab technician know. Report any unsafe conditions.

\*For the Mosquito! curriculum module, the outdoors will become your laboratory. Care should be taken to ensure safety for all citizen scientists. The laboratory safety recommendations may be changed to include the mosquito field safety recommendations.

#### **Additional Resources**

https://www.thermofisher.com/us/en/home/references/gibco-cell-culture-basics/cell-culture-laboratory-safety/guidelines-for-safe-laboratory-practices.html

https://www.ors.od.nih.gov/sr/dohs/safety/laboratory/Pages/student\_goodlab.aspx

http://nobel.scas.bcit.ca/debeck\_pt/science/safety.htm

#### **Internet Safety**

Having access to the Internet opens doors to information that was once impossible to access. Today students can learn just about anything on the Internet. Interactions with people from across the globe enable students to stay connected with family members, friends, and fellow citizen scientists. Thanks to the Internet, collaboration has been made easier.

It is very important to protect yourself and your identity when using the Internet; this is especially important for children under the age of 13. For this reason, the United States federal government passed the Children's Online Privacy Protection Act (COPPA) in 1998. This act prevents websites from obtaining information from children without parental consent. Even with act in place, though, there are still many dangers out there in cyberspace.

The following is a list of recommended Internet safety precautions.

- Always follow your classroom and home Internet rules.
- Only visit websites you have permission to visit.
- Use a screen name to protect your identity, and never give out personal information such as your birthday, phone number, address, social security number, or any other



SCIENCE for Global Goals

Mosquito!

identification number. Screen names should not include personal information. If a website is asking for this information, get your teacher, parent, or guardian.

- Do not share your log-in information with anyone, not even your best friend.
- Although selfies are popular, avoid sharing personal photos and videos. Once your image is on the Internet, it is out there for all to see, not just the person you shared it with.
- Avoid opening emails from unknown senders or email addresses you don't recognize. If you are not sure about an email, check with your teacher, parent, or guardian. If you are still not sure the email is safe, when in doubt, throw it out.
- Never agree to meet anyone in person that you met on the Internet. If someone is asking to meet with you, get your teacher, parent, or guardian.
- Do not buy anything or sign up for anything online before getting permission from your teacher, parent, or guardian.
- Always get permission from your teacher, parent, or guardian before downloading and opening email attachments.
- Avoid cyber bullying by not sending or replying to anything mean, nasty, offensive, insulting, or malicious.
- If you ever receive an inappropriate email or message, or one that makes you feel uncomfortable, tell your teacher, parent, or guardian.
- Know which websites are safe and which ones are not. Never visit inappropriate or unsafe websites. If you are not sure which sites are safe and which ones are not, check with your teacher, parent, or guardian.

#### **Additional Resources**

https://kidshealth.org/en/kids/internet-safety.html?ref=search&WT.ac=msh-k-dtop-en-searchclk

https://kidshealth.org/en/kids/online-id.html?ref=search&WT.ac=msh-k-dtop-en-search-clk#

https://kidshealth.org/en/teens/internet-safety.html?ref=search&WT.ac=msh-t-dtop-ensearch-clk

https://www.nypl.org/help/about-nypl/legal-notices/internet-safety-tips

https://www.nypl.org/sites/default/files/safekidslist.pdf

СОРРА

http://www.coppa.org/coppa.htm

https://www.epic.org/privacy/kids/

Go back to Research Guide now









#### Task 1-5 Building Team Identity

Materials: Large ball of yarn, string, rope, or fishing line Paper Pen, pencil, or marker

- Gather students in a circle sitting on the floor or in chairs.
- Hold a large ball of yarn, string, rope, or fishing line.
- You will play two rounds.

#### **Round One: Team Identity**

Remind the team about the following norms:

- Recognize the benefits of listening to a range of different perspectives and viewpoints.
- Be open to new ideas and perspectives that challenge your own.
- Be willing to cooperate with others to change things for the better.
- Use active listening skills:
  - Face the person talking.
  - $\circ$  Look them in the eye.
  - Be attentive.
- 1. The team leader will start by sharing the one thing they circled about their identity from Task 1-2.
- 2. They will also share why this aspect is more influential than others.
- 3. Using the round one team identity map example as a guide, the team leader will add this aspect of their identity to the team identity map.
- 4. Then the team leader will roll the ball of yarn, string, or rope to another team member without letting go of the end of the yarn.
- 5. The team member who gets the ball of yarn tells his or her name and shares one thing they circled about their identity from Task 1-2.
- 6. They will also share why this aspect is more influential than others.
- 7. The team will add this aspect to the team identity map.
- 8. Then the team member will hold onto the yarn at that spot and roll the ball of yarn, string, or rope to another team member without letting go.
- 9. Repeat until all members of the team have shared and added one aspect to the team identity map.
- 10. The team should have created a giant web.
- 11. Hold on to the string for round two.



Remind the team that you will now engage in a discussion. When engaging in any type of meaningful discussion as a team, we must respect our team. Use these meaningful conversation starters in your discussion to respect your other team members.

- I agree with \_\_\_\_\_ because ...
- I disagree with \_\_\_\_\_because ...
- I'd like to go back to what \_\_\_\_\_\_ said about ...
- I'd like to add \_\_\_\_\_\_
- I noticed that ...
- Another example is ...
- So, what you are saying is ...

#### Round One Discussion Questions (while holding string)

- 1. When one person pulls on the string, do other people feel it?
- 2. How does the web of string relate to the idea of teamwork?
- 3. Compare and contrast your personal identity map with the team map.
- 4. Why is it important to understand the identity of other people on your team?

#### Round Two: Team Mosquito Knowledge

Continue holding onto the string or yarn. Round two follows the same norms as round one, but we will now be focusing on sharing what we know about mosquitoes.

- Start round two by having the team leader share the one thing they circled regarding what they know about mosquitoes from Task 1-4.
- Repeat until all members of the team have shared and added one thing they know about mosquitoes to the team identity map.

#### **Round Two Discussion Questions**

- 1. If some team members drop the string, what effect does it have on the strength of the web?
- Compare and contrast your personal identity map with the team map for the question, "What do you know about mosquitoes?"
- 3. Why is it important to understand what the entire team knows and thinks about mosquitoes before we start our research?





SCIENCE for Global Goals

## Mosquito!

#### Task 1-5 Team Identity Map Example











#### Task 1-6 Defining the Research Problem

#### **Introduction Videos**

If the team is able to watch a video, start with one of the videos in the Learning Lab Task 1-6 folder. Do not worry if you are not able to watch videos. You can go straight to the reading.

#### **Problem Introduction**

Mosquitoes are all around us. Mainly during the warmer season, their constant buzzing follows you when you step outside. They leave itchy red bumps on your skin. They buzz in your ear when you sleep. They are unavoidable and annoying.

In addition to being annoying, some female mosquitos feast on your blood—most of the time without you noticing. In some places, a sleeping human can be bitten many times in a night without noticing. Female mosquitos need the blood to make eggs. These eggs grow into more mosquitoes. More mosquitoes mean more buzzing and more blood sucking. These mosquitoes are good at surviving around humans.

However, itchy bumps and annoying buzzing are not the only problems. Mosquitoes are very good at carrying and transmitting some diseases. Sometimes, when mosquitoes suck on your blood, they also inject a pathogen that transmits disease to your body. The diseases they carry are called mosquito-borne diseases. You may have heard of these diseases. They include malaria, dengue fever, Zika, West Nile virus, yellow fever, chikungunya, and encephalitis.

There are many people interested in studying and learning more about mosquitoes and the diseases they spread to humans. Let us meet some of these people to learn more about the mosquito problem.

#### Meet the Researchers: Jigsaw Part One Instructions

- 1. Divide the group into six groups.
- Assign each group one of the team member profiles from the Meet the Team reading. The profiles are Rusty Low, Meera Venkatesan, David Pecor, Kelly Bennett, Bridget Giles, and Lee Cohnstaedt.
- 3. Each group is responsible for reading about one researcher.
- 4. When reading, complete the following in each group.
  - a. Each group member should read the first page about their researcher to themselves.
  - b. Have one group member read the entire reading out loud to the rest of the group.
  - c. Each group member should go back and identify a Very Important Part (VIP) from each section of the first page.

- i. Identify one thing on the researcher's identity map you find most interesting.
- ii. Why is the mosquito problem such an important issue for people to understand?
- iii. Briefly describe the researcher's work on mosquito-borne diseases.
- iv. How much is still not known about mosquitoes and mosquito-borne diseases?
- d. Circle or place a sticky note on what each group member thinks is the most important part of the reading.
- e. In your group, have each person share their VIPs with the group and their reasons for selecting them and the item on the researcher's identity map.
- f. As a group, summarize the VIPs from your group and your thoughts on the identity map.
- g. Make sure each group member is ready to share their VIPs with the rest of the team.

#### Meet the Researchers: Jigsaw Part Two Instructions

- 1. Each group is responsible for reading the second page about their researcher.
- 2. When reading, complete the following in each group.
  - a. Each team member should read the second page about their researcher to themselves.
  - b. In each group, have one group member read the entire reading out loud to the rest of the group.
  - c. Each group member should go back and identify a Very Important Part (VIP) from each section of the second page.
    - i. Identify one VIP from each perspective (Ethical, Economic, Social, Environmental)
    - ii. Why is it important to consider various perspectives when making decisions on the problem question: How can we ensure health for all from mosquito-borne diseases?
  - d. Circle or place a sticky note on what each group member thinks is the most important part of the reading.
  - e. In your group, have each person share their VIPs with the group and their reasons for selecting them.
  - f. As a group, summarize the VIPs from your group and your thoughts on the four perspectives.
  - g. Make sure each group member is ready to share their VIPs with the rest of the team.

Go back to Research Guide now






## Meet the Team



Organization: Institute for Global Environmental Strategies

### What is on Rusty's identity map?

LIKES TO SLEEP OUTSIDE. SPEAKS FIVE LANGUAGES. LIVED IN SIX COUNTRIES. LIKES BIG DOGS. PLAYS MANDOLIN. FASCINATED WITH OLD THINGS. LIVES IN THE MOUNTAINS. ENJOYS LOOKING IN A MICROSCOPE. WENT TO SCHOOL IN CANADA, GERMANY, AND U.S. ENJOYS KAYAKING AND CROSS-COUNTRY SKIING. NAMED AFTER GRANDPARENTS. **Compare it** with yours!

## Mosquito! Task 1-6 Defining the Problem

# RUSTY LOW

### SENIOR EARTH SCIENTIST

## Why is the mosquito problem such an important issue around the world?

Mosquitoes are the most dangerous animal on the planet for humans! Mosquito-borne diseases affect half a billion people every year. Mosquito borne diseases kill up to a million people every year. Climate change is now affecting where some mosquitoes can live. These changes mean some mosquitoes and diseases move into new places. Many of these places have not had mosquito or disease problems recently. We have learned that all places must be prepared for this problem in the future.

#### Provide a brief description of your work on mosquito-borne diseases.

I have been working on developing the GLOBE Observer Mosquito Habitat Mapper. It is an app for smartphones and mobile devices. The app allows kids and adults to locate sites in their community that mosquitoes might like. People can share this information with one another. Then they can find out if the mosquitoes are the type that transmit diseases. The data is shared with the science community to help make decisions around the world. It is a fun way to use science to make a difference locally!

## How much is still not known about mosquitoes and diseases in your field of work?

We still do not know many things about mosquitoes. That means there are many opportunities for citizen scientists like you. We need your help to conduct local research. This research will help us all better understand mosquitoes. It will also help us know where they live. Most of our understanding of mosquitoes comes from laboratory research. This is why we need the help of teams like yours. We need teams around the world to come together. We must share information about what is happening outside of the laboratory. We must share what is happening in our local communities. This will help us all learn more about this problem.

#### Why is it important to look at the mosquito problem from different perspectives?

## Ethical

We must think about the ethical parts of the mosquito problem. "Ethical" means the fairness of something. Is it okay that some people are at greater risk from mosquitoes than others? Is it okay that because of factors out of their control, they are at more risk? These are all questions we must ask.

### Есономіс

We must think about the economic parts of the problem. "Economic" is concerned with money, income, and use of wealth. Citizen scientists like you can provide economic support in your community. Many communities do not have the money to have good mosquito surveillance. The data from citizen scientists like you can help authorities make tough decisions - for example, decisions about where to spray expensive insecticides to keep mosquitoes away.

### Social

It is important to consider the social part of the problem. "Social" is concerned with the interaction of people in a community. People must work together to create and maintain protection from mosquitoborne diseases in the community. Do some people have a greater risk of disease? Why or why not? These are questions we must ask.

### ENVIRONMENTAL

It is important to understand the environmental parts of the problem. "Environmental" is concerned with the natural world. It is also concerned with human impacts on the natural world. What things can help mosquitoes reproduce? How can we identify these things? How can we use this information to reduce disease risk in the community? These are questions we must ask.

## Why is it important to consider a problem from various perspectives (social, ethical, environmental, economic) when making decisions and developing solutions to problems?

I was trained as an Earth system scientist. System science looks at the connections between different parts of a larger system. For example, climate change is a large system. It cannot be understood without looking at how the changing climate affects the different parts. Some of the parts are the ocean, living things, the land, and ice. You must look at the connections of these parts to have a better picture of the whole system.

We also live not only in our physical environment, but in our social one. When considering a problem, we need to think about the social and environmental parts of the problem. It is very hard to predict the outcomes of changes in either part. This is why models are so useful to scientists and social scientists. When you are trying to solve problems, you need to think about each part and how the parts all work together.





Organization: President's Malaria Initiative, United States Agency for International Development (USAID)

### What is on Meera's identity map?

SISTER. FAMILY FROM INDIA. FRIEND. VEGETARIAN. CHOCOLATE LOVER. STUDENT. SCIENTIST. LOVE TO READ. FROM CALIFORNIA. LOVE TO COOK. WIFE. CURIOUS. AUNT. TRAVELER. EMPATHIC.

Compare it with yours!



Meet the Team

# MEERA VENKATESAN

## MALARIA TECHNICAL ADVISOR

SCIENCE

for Global Goals

## Why is the mosquito problem such an important issue for people to understand around the world?

The mosquito is the most dangerous creature on the planet. It causes thousands of deaths. It also makes people, often children, very sick. Even if it is not a problem where you live, it can still have a huge effect on people. One thing we have learned recently is that mosquito-borne diseases can occur anywhere. They also move quickly across the world - even into places we did not think mosquitoes could survive. Sometimes, diseases like Zika or chikungunya emerge in places they were not seen before. So, we all must prepare for the future.

#### Provide a brief description of your work on mosquito-borne diseases.

I work on improving the control of malaria. Malaria is the most deadly mosquito-borne disease. Malaria kills around 500,000 people per year. Most of these deaths are kids living in Africa. Luckily, we have many tools to fight malaria that work. The task now is getting them to people in need. We also need them to be used by people at risk. These tools include:

- Tests to know when you have malaria
- Treatments that help sick people
- Bed nets to sleep under

• Spraying insecticides on the walls of homes to keep mosquitoes away I work at USAID for the President's Malaria Initiative. My work helps countries in Africa and Asia. My work helps these countries with their own local malaria control programs.

## How much is still not known about mosquitoes and mosquito-borne diseases in your field of work?

Many mosquito control projects are growing in Africa and Asia. However, there is still a problem of the "left over" spread of disease. Mosquitoes that still live in a place can cause problems. Mosquitoes that are resting and biting outdoors where people are not protected can cause problems. The malaria research community is working hard to figure out how to target these mosquitoes. They are also working hard to learn how to protect people from being exposed to infected bites. Exposure can happen when working, sleeping, or spending time outside. This is where we need the help of teams like yours. When teams come together, we can learn more about this problem. This will help us create solutions that work better for different communities. Why is it important to look at the mosquito problem from different perspectives?

アベアベ

## ETHICAL

 $\sim Ar_{2} / \sim Ar_{2} / c$ 

 $> Ar_{2} < c$ 

> V

We must think about the ethical parts of the mosquito problem. "Ethical" means the fairness of something. First, we must not ignore the people who are at great risk from mosquito-borne diseases. These people may be the hardest to reach or get involved. We have a duty to be fair. We must make sure they are not forgotten. We must be fair to all people. We must provide all people the safety and medical help the rest of the population enjoys.

## Social

It is important to consider the social part of the problem. "Social" is concerned with the interaction of people in a community. People must work together to create and maintain protection from mosquito-borne diseases within the community. The community includes leaders, parents, and children. The community needs to understand the importance of fighting these diseases. The community is needed to successfully implement solutions at the local level. If the people in a community are not involved, you will not get very far with any solutions or changes.

#### ECONOMIC

We must think about the economic parts of the problem. "Economic" is concerned with money, income, and use of wealth. Getting sick from mosquito borne diseases costs people large amounts of money. This is felt at the household, community, and industry level. It is important to show people how much can be gained economically by reducing the problem of mosquito-borne diseases. We must also convince people that there are more than just health benefits. A country may grow faster and improve the economic status of its people by reducing malaria. People can save money when they are no longer spending money getting care from doctors. They can save money by not missing days of work and school due to malaria illness.

### Environmental

It is important to understand the environmental parts of the problem. "Environmental" is concerned with the natural world. It is also concerned with human impacts on the natural world. For example, any insecticide that is used to fight mosquitoes first must go through rigorous tests. The tests should determine potential environmental effects on all parts of the natural world. These tests should ensure the insecticides are safe to use. Plans must make sure that exposure of the environment to chemicals is reduced.

Why is it important to consider a problem from various perspectives (social, ethical, environmental, economic) when making decisions and developing solutions to problems?

You must make sure you can get participation from all parts of a community or country. Mosquito-borne diseases should not be seen just as a health issue. They are also an economic issue. You can engage with the finance and private sectors to get involved and increase your impact. In addition, you must work on environmental issues with the agricultural sectors of your community. This will ensure that everyone has the same goals. It will also help make progress on health, food, nutrition, and environmental protections.





Organization: The Walter Reed Biosystematics Unit (WRBU)

### What is on David's identity map?

LOVE DOGS. LOVE PUNK ROCK MUSIC. BIG BROTHER. FATHER. WRITER. BALD. LOVE TO HIKE. FRIENDLY. COFFEE FANATIC. FAVORITE PLACE: GLACIER NATIONAL PARK, MONTANA.

# Compare it with yours!

## Mosquito! Task 1-6 Defining the Problem

Meet the Team

# DAVID PECOR

SCIENCE

for Global Goals

## RESEARCH TECHNICIAN

## Why is the mosquito problem such an important issue for people to understand around the world?

There are almost no places you will not experience some impact from mosquitoes, besides Antarctica. In many places they are just annoying biters. In other places, they carry diseases. There is no escaping them. Although mosquitoes are found nearly everywhere, individual species distributions can change dramatically over time. Humans spread mosquitoes around the world via travel and trade. Climate change may also cause mosquitoes to move into new areas. Many places are currently free of mosquito-borne diseases. This does not mean they are completely safe in the future. If an infected person is exposed to the local mosquitoes, the diseases can be spread to people who are not aware of these diseases.

#### Provide a brief description of your work on mosquito-borne diseases.

I primarily work on the VectorMap project. This is an online source for mosquito collection data. It also includes information about the places mosquitoes like to live. It is designed to permanently store data associated with mosquito observations. This is similar to a museum that is tasked with permanently protecting samples. The goal is to determine the risk of mosquito-borne diseases in different places. It also helps us monitor how the problem may be changing over time. It is important to capture as much detailed observation data as possible.

## How much is still not known about mosquitoes and mosquito-borne diseases in your field of work?

There are many things to discover in this field. There are more than 3,600 known types of mosquitoes. Many of these and more have not yet been described. The impact of many of these mosquitoes on humans is also unknown. Another thing we do not know is the number and nature of the diseases that have not been described. Diseases in nature could spill over into humans via mosquitoes. One of the biggest challenges in this work is providing access to the tools to combat mosquito-borne diseases, mainly for the people who need it most. Mosquito-borne diseases unfairly affect people living in the developing world. This is because many of these diseases are common to tropical and sub-tropical climates (Africa, South America, Southeast Asia). For this reason, access to tools, education, and training must be provided to people with the greatest risk.

Why is it important to look at the mosquito problem from different perspectives?

## ETHICAL

We must think about the ethical parts of the mosquito problem. "Ethical" means the fairness of something. I believe countries with technology and education related to mosquitoes have an ethical duty. These people must share that knowledge with the developing world. This is because the disease problem is much greater for people living in developing countries. We must help them solve the biggest issues surrounding mosquito control.

### ECONOMIC

We must think about the economic parts of the problem. "Economic" is concerned with money, income, and use of wealth. No other animal has affected human economics more than the mosquito. Mosquitoes have been responsible for countless lives lost over our history. Even now, mosquito control strategies are expensive (for example, pesticide development, spraying insecticides, digital mosquito monitoring tools, etc.).

## Social

It is important to consider the social part of the problem. "Social" is concerned with the interaction of people in a community. Community participation is a big part of mosquito reduction. The community must understand that mosquitoes can use human products left outside. Therefore, making it socially unacceptable to leave out trash is one step in addressing the problem.

#### Environmental

It is important to understand the environmental parts of the problem. "Environmental" is concerned with the natural world. It is also concerned with human impacts on the natural world. Mosquitoes play many important roles in the places they live. Mosquitoes help many plants survive. They are also food for other animals, such as birds, bats, and fish. In many communities, mosquitoes are all considered bad. However, there is growing evidence that they have more value in nature than we typically give them credit for.

Why is it important to consider a problem from various perspectives (social, ethical, environmental, economic) when making decisions and developing solutions to problems?

Solutions that only address single or limited perspectives are unlikely to be successful. I believe an integrated approach to problem-solving is essential, especially when dealing with hard problems like mosquitoes and mosquito-borne disease. This problem is universal and affects everyone. We must consider multiple perspectives to ensure solutions help everyone involved.





## Meet the Team



Organization: Smithsonian Tropical Research Institute (STRI)

### What is on Kelly's identity map?

FEMALE. SISTER. WHITE BRITISH. SPEAK SPANISH. BROWN EYES. YOGA. LOVE READING AND ART. LOVE READING AND ART. LOVE TO HIKE AND TRAVEL. QUIET. LIVE IN A SMALL TOWN IN THE JUNGLE. LOVE MUSIC. LOVE TO SWIM. BROWN CURLY HAIR. SHORT.

Compare it with yours!

## Mosquito! Task 1-6 Defining the Problem

# KELLY BENNETT

## BIOLOGIST

## Why is the mosquito problem such an important issue for people to understand around the world?

The problem of mosquito-borne disease has been greatly affected by increased human movement and trade around the world. This human movement has allowing these mosquitoes to travel and establish new places to live. In addition, people are having increased contact with forests. As humans urbanize their surroundings, diseases can switch from using animals to using humans as a host. This worldwide network of invasion and increasing urbanization is a big part of the problem. It means we must work together as one to reduce the introduction of mosquitoes into new places. Mosquitoes tend to be highly adaptive. New diseases are also emerging and spreading rapidly. A recent example is Zika virus. This disease has been around for a long time. Yet only recently has it become a world-wide problem. This is likely due to the mosquitoes adapting to their surroundings. These mosquitoes are adapting to take better advantage of humans.

#### Provide a brief description of your work on mosquito-borne diseases.

I am currently working on two projects focusing on the *Aedes* mosquito in Panama. These mosquitoes can transmit dengue, chikungunya and Zika virus. The first goal of my work is to identify whether mosquito populations in Panama are adapting to their local environments. We also are trying to learn how these populations are connected. This is important to understand when thinking about mosquito control efforts in Panama. In the second project, Iam investigating the natural strains of *Wolbachia* bacteria. Infection with this bacteria can affect disease transmission in mosquitoes. However, whether the bacteria effectively reduces transmission depends on the interaction of *Wolbachia* strains. Therefore, it is important to understand which strains are naturally present. This is helpful to determine whether such control methods would work in Panama.

## How much is still not known about mosquitoes and mosquito-borne diseases in your field of work?

Relatively little is known about even basic life and behaviors. We must learn more about things that contribute to disease risk and how mosquitoes transmit diseases. We need to acquire information about many mosquito life history traits. These traits include mating behavior, egg-laying behavior, preferred habitats, seasonal differences in amount of mosquitoes, distribution, host preferences, development, and competition between and within species. All of these factors contribute to disease risk. The greatest challenge is to bring all the expertise together to understand how to control mosquito-borne diseases.

#### Why is it important to look at the mosquito problem from different perspectives?

×

×

### ETHICAL

We must think about the ethical parts of the mosquito problem. "Ethical" means the fairness of something. There are many new and alternative mosquito control methods currently being researched. Many of these new methods raise ethical concerns. For example, releasing genetically modified mosquitoes into the wild. Should we do this? We must think about the ethical side of all decisions we make.

### ECONOMIC

We must think about the economic parts of the problem. "Economic" is concerned with money, income, and use of wealth. Many countries suffer from a large economic burden due to mosquito-borne disease. This burden puts pressure on medical facilities and health workers. It also requires large amounts of money to support these facilities and sick people. Many of these places must also spend money on mosquito monitoring and control.

### SOCIAL

It is important to consider the social part of the problem. "Social" is concerned with the interaction of people in a community. For example, people in many areas of the world do not have a piped water supply to their home. This means people without access to a reliable water source must store drinking water, providing habitats in which mosquitoes breed. Furthermore, poor housing and garbage disposal means lower income areas have greater exposure to biting mosquitoes. Many of these areas also do not have as much access to medical facilities. This can increase the number of fatalities from mosquito-borne diseases.

#### ENVIRONMENTAL

It is important to understand the environmental parts of the problem. "Environmental" is concerned with the natural world. It is also concerned with human impacts on the natural world. Spraying insecticides is an environmental part of the problem. These methods can possibly contaminate water sources and kill other non-mosquito species. These environmental parts of the problem must be considered when making decisions.

Why is it important to consider a problem from various perspectives (social, ethical, environmental, economic) when making decisions and developing solutions to problems?

Without taking into account all perspectives, an approach is likely to fail. For example, imagine there is an effective way to control mosquitoes that requires the active participation of the local community. Without the community support, the method is unlikely to succeed. Similarly, if this hypothetical approach successfully reduces the mosquitoes but is too expensive to maintain, the approach will not be successful into the future.





Organization: Virginia Modeling Analysis & Simulation Center at Old Dominion University (VMASC)

### What is on Bridget's identity map?

FEMALE. MOTHER. AFRICAN AMERICAN. WIFE. LOVE TO READ. LOVE MOVIES. LOVE TO DANCE. **BELIEVES IN EQUALITY FOR** EVERYONE. LIKES GOSPEL AND R&B. BELIEVES IN GOD. BORN IN VIRGINIA. LOVE SPENDING TIME WITH MY SONS. Compare it with yours!

## Mosquito! Task 1-6 Defining the Problem

Meet the Team

# BRIDGET GILES

SCIENCE

for Global Goals

## RESEARCH ASSISTANT PROFESSOR

# Why is the mosquito problem such an important issue for people to understand around the world?

Mosquitoes are the most dangerous animals in the world. They cause millions of deaths each year. Recent changes in the climate and longer warm-weather seasons are creating more problems. These warmer temperatures create more mosquitofriendly habitats around the world. This will potentially lead to more mosquito-borne diseases including Zika, malaria, dengue fever, yellow fever and West Nile virus.

## Provide a brief description of your work on mosquito borne diseases.

I lead a team of researchers. Together we developed a video game to educate families about their ability to stop the mosquito-borne disease Zika. The video game is call ZAP. ZAP stands for Zika Awareness and Prevention. The 3D simulations provide interactive education exercises about individual-level protection practices. This includes how to remove mosquito breeding sites around your home, correct use of larvicide, placement of screens on windows and doors, and how to dress to defend yourself against mosquito bites. The video game also addresses symptoms of Zika virus infection. It gives special precaution recommendations for pregnant women. Videos are included in the game. In addition, Zika trivia and matching games are provided to test knowledge.

#### How much is still not known about mosquitoes and mosquitoborne diseases in your field of work?

One challenge people are currently working on is a safe and effective Zika vaccine. Although pregnant women are usually excluded from vaccine research, pregnant women are at the center of the Zika epidemic. So, bioethics groups have to consider the pros and cons of including pregnant women in Zika vaccine research. Why is it important to look at the mosquito problem from different perspectives?



Why is it important to consider a problem from various perspectives (social, ethical, environmental, economic) when making decisions and developing solutions to problems?

That is the only way to consider the whole picture of the problem. Considering the problem from various perspectives is the only way to come up with an effective solution.





Organization: United States Department of Agriculture (USDA)

### What is on Lees's identity map?

LOVE ANIMALS. THESPIAN. SPANISH SPEAKER. RUNNER. WRESTLER. NERD. COMMUNITY SERVICE. BACKPACKER. GERMAN SPEAKER. TRAVELER. LIKE STRATEGY GAMES. HARD WORKER. LOYAL. INVENTOR. LIKE CHESS. TEAM PLAYER. SCIENTIST. LIKE TO HELP PEOPLE. **Compare it** with yours!

## Mosquito! Task 1-6 Defining the Problem

# LEE COHNSTAEDT

## RESEARCH ENTOMOLOGIST

SCIENCE

for Global Goals

## Why is the mosquito problem such an important issue for people to understand around the world?

Mosquitoes are a nuisance at best and at worst the most dangerous animals in the world. Billions of people are at risk of mosquito-borne diseases every day. Globally, mosquitoes can change the landscape by influencing where animals and people live. Mosquitoes influence global production in most of the developing world. Furthermore, mosquito-borne diseases can always be introduced to a country where they were not before. This was the case with West Nile, Zika, and chikungunya viruses. Even if mosquitoes are not as abundant or a problem in the developed world, this does not mean they are not for the rest of the world or in the future.

#### Provide a brief description of your work on mosquito-borne diseases.

Two, four, six, eight: The USDA works to protect two-legged and four-legged animals from six- and eight-legged ones (insects and ticks). Specifically, I try to prevent outbreaks of diseases that will affect humans or animals in the United States. I do this by looking at various ways to monitor, control, or treat disease related insects such as mosquitoes or their associated diseases. The main focus of my work is zoonotic diseases, or animal diseases that may result in human illness.

## How much is still not known about mosquitoes and mosquito borne diseases in your field of work?

The more we know, the more we realize we don't know. Research always advances understanding and creates more questions. Currently there is a large amount of research on sterile mosquitoes. Other research is on genetic changes that can make mosquitoes not blood feed. However, mosquito research can also be used to address big ecological questions such as global climate change. In 2001, mosquitoes were one of the first organisms to show genetic shifts in as short as five years. Similarly, genetic flexibility allows exotic mosquitoes to adapt rapidly to new environments. There is no limit to what we need to learn or what we can learn about mosquitoes.

© 2018 Smithsonian Institution

Why is it important to look at the mosquito problem from different perspectives?

## ETHICAL

We must think about the ethical parts of the mosquito problem. "Ethical" means the fairness of something. There are many ethical questions to consider about mosquitoes. Such as, should humans intentionally kill off a species of mosquito? Or how do we protect the more than 2 billion people making less than \$2 a day who are at risk of mosquito-borne diseases?

SOCIAL

It is important to consider the social part

of the problem. "Social" is concerned with

the interaction of people in a community.

Mosquitoes are not restricted by boarders

or property lines. They will move and live

where the blood is. Therefore, we must all

work together to eliminate mosquitoes from

the others, to take up the work because the

the entire community will suffer.

our communities. If one of us fails, it is up to

mosquitoes will live where they can and then

## Économic

We must think about the economic parts of the problem. "Economic" is concerned with money, income, and use of wealth. However, the brunt of mosquito-borne illness is suffered by the poorest individuals worldwide. Providing low-cost, easy-touse materials and methods for mosquito control is an effective way to quickly help alleviate some of the disease burden. However, this is not a sustainable plan. Only by changing the economic status of people and providing them with permanent, stable housing with screeens, running water, and other basic amenities can mosquito-transmitted diseases be reliably controlled.

### Environmental

It is important to understand the environmental parts of the problem. "Environmental" is concerned with the natural world. It is also concerned with human impacts on the natural world. Mosquitoes are clearly an environmental problem. If the larval habitats are removed, the mosquitoes will be eliminated. However, removing the environmental problem means addressing the need for the water containers. Providing clean, reliable drinking water eliminates the need to store water in containers, where mosquitoes like to breed. Environmental change alone will not solve the problem, though. That change can only happen with simultaneous social and economic change.

## Why is it important to consider a problem from various perspectives (social, ethical, environmental, economic) when making decisions and developing solutions to problems?

We are humans and many things influence our lives every day. These include work, life, community, the environment, family, and friends. If we make decisions based only on one of these perspectives, the solution will only address one of these areas. Our world is complicated and consists of many parts and perspectives. Without addressing all of the parts, the solution is not likely to work with the other parts. Simple questions tend to have simple answers. However, a simple single perspective answer will likely only address the symptoms of an issue and not the problem. It can then leave other people with different perspectives answerless. For example, we may ask people to empty water containers around their houses, which is a simple task. But it takes time and effort over the other many individual needs that must be done daily. Most people do not have or do not make the time to monitor their property even weekly for mosquito larval habitat. This is likely for many social, environmental, or economic reasons. For a solution to be universally acceptable, it must address most, if not all the problems and perspectives, not just the symptoms.





#### Video Links for Task 1-6

#### The Loathsome, Lethal Mosquito

Mosquito Problem Overview

Description: Good overview of mosquitoes and the mosquito borne disease problem.

https://youtu.be/lkmjCmvfeFl

Mosquito Hunter - Frontline Video Description: Good video to present overview of mosquito problem and community involvement. https://youtu.be/0n6VtSam9To







#### Zika Awareness and Prevention (ZAP) Game

The Zika Awareness and Prevention (ZAP) Game was developed to strengthen students and communities in their ability to stop Zika virus disease. Zika virus is a mosquito-borne virus, spread primarily by the bite of an infected *Aedes* species mosquito. Through simulation, this game educates students about Zika virus, common mosquito breeding sites, Zika virus disease symptoms, and pregnancy risks associated with Zika. Practices that help to prevent mosquito bites are also covered such as using an EPA registered insect repellent with DEET, the importance of wearing long sleeved shirts and long pants when outdoors, and treating clothing with permethrin. Multiple choice and matching games are provided to gauge how much you learned about Zika.

Use the following link to access the game, and have fun! http://zika.vmasc.odu.edu/zap/

Computer WebGL Compatibility: Chrome 64 bit Version 57 and newer, Microsoft Edge version 16 or newer, Safari version 11 or newer, and Firefox version 52 or newer. Firefox users check your privacy settings.

For more information about the ZAP Game or for any other concerns please email us at Zapzika@odu.edu or contact:

Bridget Giles PhD Virginia Modeling Analysis and Simulation Center Old Dominion University 1030 University Blvd. Suffolk, VA 23435 Email: bgiles@odu.edu Phone: 757-638-4436







#### Team News Article Links for Task 1-6

Zika ZAP Game Bridget Giles News Article https://www.odu.edu/news/2017/6/zika\_game#.WzE7aadKiUk

Rusty Low Institute for Global Env. Strategies News Article <u>https://medium.com/usaid-2030/arming-citizen-scientists-with-an-app-to-identify-zika-carriers-f8af4ff7391d</u>

Lee Cohnstaedt USDA News Article http://www.fox5dc.com/news/local-news/md-students-taking-part-in-researchproject-to-help-track-mosquitos-that-may-carry-zika

Kelly Bennett STRI News Article https://newsdesk.si.edu/releases/smithsonian-scientists-track-aedes-mosquitoinvasions

David Pecor WRBU News Article https://insider.si.edu/2016/06/smithsonians-mosquito-collection-weapon-battlezika/



🗦 Smithsonian



Mosquito!

#### Task 1-7 Understanding Community Action Plan

This document details the Community Action Plan that the team will create at the end of your research. The team will not be creating this plan now. However, understanding what you will be working toward completing at the end of your research is helpful even before you begin your research. Read through this plan, so the team understands everything they will need to complete by the end of your work. Then, as you are doing your research, think about how the information you are gathering could be useful for this final action plan and to address the problem question: How can we ensure health for all from mosquito-borne diseases?

The Community Action Plan will have three parts.

- 1. Research area background, evidence collected, integrated management plan developed (this part involves organizing what you will have already completed during your research)
- 2. Action goals (this part involves figuring out what you will do after you finish your research)
- 3. **Communication strategy** (this part involves telling people about your research, action goals, and plan)

#### **Research Area Background**

Provide a brief overview of your location and research site. This will help other people who are looking at your plan now and in the future. This section involves organizing what you did during your research. Include the following.

- 1. **Research location physical description:** Provide a brief description of your physical location. Include your position within your community, country, and the world.
- Team and local culture description: Provide a brief description of your team and any local culture your team identified during your research. Include your team's identity map from Task 1-5 as part of this description.
- 3. **Map of research site:** Provide a map of your research site and any important information you collected concerning the site that would be useful to understand your plan. If possible, include pictures of your research site.
- 4. **Evidence and claims:** Organize and share all of the evidence you collected during your research and any claims you developed.
- 5. Local integrated management plan: An integrated management plan outlines all of the different management strategies you think your community should consider to address the problem question: How can we ensure health for all from mosquitoes? Tasks 6-1 and 6-3 will help you outline an integrated management plan for your community.





Mosquito!

#### **Action Goals**

It is one thing to have an integrated management plan and another to set local goals to help people act on that plan. For example, part of your plan could be to empty the standing water from all containers in an area. Another part of the plan could be to educate various people in your community about the problem. Setting local action goals will help you determine what actions need to be taken now and in the future, who is responsible for taking them, and how the actions will be monitored to determine their effectiveness over time.

- Develop a list of action goals that could be carried out by various people in your community to work toward different parts of your integrated management plan. Consider the following when creating your action goals: What type of action is needed and what is the action meant to address? Provide a description of the action. Some examples include:
  - Education action goals: Create and hand out brochures to educate the community about mosquitoes. This action will increase local knowledge and spark actions of community members concerning mosquitoes and mosquito management.
  - Advocacy action goals: Create posters to advocate for a group of people at risk from mosquitoes. Write letters to local officials and community leaders concerning mosquitoes and their effect on different groups of people in your community.
  - Physical action goals: Monitor your research site weekly for standing water where mosquitoes could breed. This action will reduce the number of possible breeding sites mosquitoes can use in the community. Document and remove any standing water found in the site every week throughout year.
  - Be creative and develop your own goals for your community!
- **2.** Who is responsible for the action: self, team member, team, specific community member(s), all community members
- **3.** Action schedule or timeline: When and how often does the action need to take place?
- **4.** Action monitoring: How will the action goals be documented or monitored over time to determine their effectiveness? How will your team determine whether the action is working effectively? Create a strategy to monitor these goals over time.
- 5. Put the actions in order: If you have a list of action goals, which ones would you recommend be done first, second, and third? Create an order for all of your actions so the team knows where to start.





**SCIENCE** for Global Goals



#### **Communication Strategy**

If no one outside of your research team knows about your plan, can it make an impact? Next, you will need to develop a plan to creatively communicate parts of your action plan to your community. Make sure you include the social, ethical, economic, and environmental parts of the problem. How will you educate others about your evidence, claims, decisions, and action goals?

Be creative! This plan can include:

- Making posters or art projects to communicate parts of your plan
- Writing a song or a one-act play to communicate parts of your plan
- Writing and recording a public service announcement (audio or video) to communicate parts of your plan
- Creating a social media campaign to communicate parts of your plan
- Be creative; come up with your own ideas!

After you have developed your communication strategy, you will need to share and present this information with your community. This can include parents, educators, administrators, local community members, and other team members.

Each group should include the following when communicating with community members.

- Present social, ethical, environmental and economic considerations for the community.
- Support all claims with evidence (data and statistics, expert opinion, personal and secondhand experience) within the plan.
- Support all suggested actions using claims and evidence.
- Clearly explain, demonstrate, and illustrate parts of your integrated management plan.
- Clearly explain, demonstrate, and show all aspects of your action goals.
- Clearly outline how the plan will be monitored for effectiveness over time. Discuss how the plan can be adjusted if it is not working or needs to be improved.









Meet the Team

## Mosquito!: Task 1-7 Understanding Final Action Plan

Tell us about a time when a research project did not work out as planned?



#### David Pecor - Research Technician - Walter Reed Biosystematics Unit (WRBU)

Recently our team developed a big plan for a project to reduce malaria in three countries. We developed the project plan for over a year. We also spent many months working with new partners for three teams. After nearly a year of work, our project was rejected by the group providing the money. Although it is common for at least some projects to be rejected, we did not expect it. It was somewhat disappointing. However, that rejection taught me to except failure as part of any learning process. Instead of giving up, we went back to the drawing board with the failed project. We listed all of the issues we thought were behind the failure. Since that time, this project has seen new life as parts in several other

new projects. We submitted these new projects and have been awarded funds to make them happen. This lesson taught me that rejection is not failure. It is only failure if you do not take the time to learn from it and work to improve. Think about how your team can work together when things do not work out as planned to reach your goals. It is important to be creative!



#### Meera Venkatesan - Malaria Technical Advisor - President's Malaria Initiative -United States Agency for International Development (USAID)

When I went to school, I wanted to work on a research project about mosquitoes and malaria. I also wanted to get experience working in different parts of the world. I picked my project with that expectation. Unfortunately, by the time I chose my research project, there were not opportunities to work on malaria mosquitoes in Africa, as I had planned. I was very disappointed. Luckily, I found a lab that was working on West Nile virus mosquitoes in the United States. This was a time when the disease was spreading across the country. I got to learn a lot

of the same science working on West Nile virus. I also spent some time in Zambia using these new skills. Eventually I was able to transfer my knowledge and experience to malaria in Asia and Africa. I learned some important lessons along the way: 1) Getting a good background in any field is more important than the specific topic you work on; and 2) The exact opportunity you want may not always present itself. But with a little hard work, you can use it to get closer to your goals. Think about how your team can work together when things do not work out as planned to reach your goals.



#### Rusty Low - Senior Earth Scientist - Institute for Global Environmental Strategies

When I was a student, I had a research project looking at remains in the ground of an ancient cave. I was doing research about ancient flower grains on the floor of the cave. I had 60 samples to process. My goal was to develop a story about the past environment of the cave. What was there 10,000 years ago? Was it a forest? Was it a meadow? It was very time consuming work. I worked all summer. At the end of the summer, 58 of the 60 samples did not have anything in them. I was very disappointed. I thought I was going to have to quit the project. But my advisor Charlie said, "Great! Now you have an interesting research problem! Why did only those two samples have preserved plant fossils

and the other 58 didn't?" He was right! Ever since, I think about this when I have a problem where things do not work out. I think about what my advisor Charlie said. It was a great life lesson when doing research projects. Think about how your team can work together when things do not work out as planned. Sometimes you just need to think about it from a different perspective!





### Mosquito!: Task 1-7 Understanding Final Action Plan

Tell us about a time when a research project did not work out as planned?



#### Kelly Bennett - Biologist - Smithsonian Tropical Research Institute (STRI)

Experiments fail in the area of science frequently. However, perseverance and a positive attitude is the key to success. You can learn just as much from a failure as a success. In science, failures can lead you to a new path you may not have seen before. This is why you must stay positive when your research fails and try again.



#### Lee Cohnstaedt - Research Entomologist - United States Department of Agriculture (USDA)

We learn from our success, but we learn more from our failures. I make mistakes daily. That is why it is called research. If it worked the first time, it would just be called search. My lab motto is, "If you are going to be stupid, you have to be tough." Which means if we don't plan something out or if we mess something up, or if things

do not go as planned (which always happens), we learn, adapt, and continue with the modifications, and try again. This is true for all aspects of life, and we cannot let mistakes stop us from accomplishing our goals. Lastly, we learn much more from our mistakes than from our successes. So make mistakes, take calculated risks, learn, keep going, and never suffer the same failure twice.



#### Bridget Giles - Research Assistant Professor - Virginia Modeling Analysis & Simulation Center at Old Dominion University

Recently I applied to several grants to make improvements to the ZAP game. These improvements would make the tool more accessible to many people via Web, tablet, and app. Although I have not been successful, I have decided to keep trying to get funded to make improvements to ZAP. However, I am very

fortunate to have met team members at the Smithsonian Science Education Center, who sees the value of this work, and through this partnership ZAP can reach learners throughout the world.







#### Team News Article Links for Task 1-7

David Pecor WRBU News Article https://insider.si.edu/2016/06/smithsonians-mosquito-collection-weaponbattle-zika/

Kelly Bennett STRI News Article https://newsdesk.si.edu/releases/smithsonian-scientists-track-aedesmosquito-invasions

Lee Cohnstaedt USDA News Article 1 http://www.fox5dc.com/news/local-news/md-students-taking-part-inresearch-project-to-help-track-mosquitos-that-may-carry-zika

Rusty Low News Article -USAID https://medium.com/usaid-2030/arming-citizen-scientists-with-an-app-toidentify-zika-carriers-f8af4ff7391d

Zika ZAP Game News Article https://www.odu.edu/news/2017/6/zika\_game#.WzE7aadKiUk







#### Zika Awareness and Prevention (ZAP) Game

The Zika Awareness and Prevention (ZAP) Game was developed to strengthen students and communities in their ability to stop Zika virus disease. Zika virus is a mosquito-borne virus, spread primarily by the bite of an infected *Aedes* species mosquito. Through simulation, this game educates students about Zika virus, common mosquito breeding sites, Zika virus disease symptoms, and pregnancy risks associated with Zika. Practices that help to prevent mosquito bites are also covered such as using an EPA registered insect repellent with DEET, the importance of wearing long sleeved shirts and long pants when outdoors, and treating clothing with permethrin. Multiple choice and matching games are provided to gauge how much you learned about Zika.

Use the following link to access the game, and have fun! http://zika.vmasc.odu.edu/zap/

Computer WebGL Compatibility: Chrome 64 bit Version 57 and newer, Microsoft Edge version 16 or newer, Safari version 11 or newer, and Firefox version 52 or newer. Firefox users check your privacy settings.

For more information about the ZAP Game or for any other concerns please email us at Zapzika@odu.edu or contact:

Bridget Giles PhD Virginia Modeling Analysis and Simulation Center Old Dominion University 1030 University Blvd. Suffolk, VA 23435 Email: bgiles@odu.edu Phone: 757-638-4436









#### Task 1-8 Exploring Research Perspectives—Mosquito A

#### Team Norms

- Recognize the benefits of listening to a range of different perspectives and viewpoints.
- Be open to new ideas and perspectives that challenge your own.
- Be willing to cooperate with others to change things for the better.
- Use active listening skills.
  - Face the person talking.
  - Look them in the eye.
  - Be attentive.
  - Keep an open mind.
  - Don't interrupt.
  - Ask questions if you are confused.

#### Warm-Up Round Instructions

**1.** Here is the warm-up round statement.

#### Bananas are the best-tasting fruit.

2. There are not necessarily any right or wrong answers, and everyone's view will fall somewhere along the continuum, from strongly agree to strongly disagree.

3. Take a minute and let each team member think about their position on that statement. Explain the next step, so team members can choose where to stand along the continuum.

• Explain that relative location is also important; that is, standing closer to the strongly agree or disagree side of the room means you feel very strongly about this statement.

4. Once each team member is located along the continuum, direct the team members to begin explaining to those standing near them why they placed themselves as they did. Students should explain their reasoning for their location.

5. Based on these discussions with the people near them, they should be "recalibrating" with each other. This is the process of listening to other team members near them and determining whether they really are more or less extreme in their thoughts and feelings on the topic. Encourage team members to move as necessary to accurately represent the continuum of opinion on the team.

#### Warm-Up Round Discussion Questions

- Can individual team members explain to the team the reasons for their position on the continuum?
- How many team members changed their positions after talking to other team members around them on the continuum?
- How many team members changed their positions after hearing people talk during the whole team discussion?
- What led you to change your mind?



Smithsonian

Mosquito!

• Conclude the discussion by asking team members on both sides of the issue to identify what they believe to be the strongest arguments and reasons they heard from the *opposing* side.

#### Four Perspectives Rounds Instructions and Questions

- 1. The line continuum setup for the next four rounds stays the same. The main difference is the team is now divided into groups of three to four team members.
- 2. Each group will negotiate their position along the continuum, based on the following statement.

#### Ethical perspective: It is okay to kill all of the mosquitoes on the planet.

- 3. Each group must determine where they are located on the continuum as a group.
- 4. Each group will send one representative to identify the place on the continuum line that best represents the group's view.
- 5. Now the representatives from each group will explain to the whole team the reasons for their group's position on the continuum. Members of the group speaking can support the representative at any time.
  - 6. After each group has had a chance to share, each group should have a brief discussion about whether they would like to move their location on the continuum, based on the team discussion.
  - How many groups changed their positions after hearing people talk during the whole team discussion?
  - What led you to change your mind or not change your mind?
  - Conclude the discussion by asking team members on both sides of the issue to identify what they believe to be the strongest arguments and reasons they heard from the *opposing* side.
  - 7. Repeat steps two through six for *one* statement from each of the following three perspectives categories.

#### **Social Perspective**

- 1. People who live in places with mosquito-borne diseases should not be able to travel to other places to visit family.
- 2. People who get mosquito-borne diseases engage in some type of risky behavior.

#### **Environmental Perspective**

- 1. All mosquitoes are dangerous to humans.
- 2. Spraying potentially harmful chemicals to control mosquitoes around children and pregnant women is okay.

#### **Economic Perspective**

- 1. Mosquito bed nets protect you from mosquito bites when you are sleeping. It is okay that people who cannot afford to buy a bed net get sick more often from mosquito-borne diseases.
- 2. Every person should be required by the government to pay some tax money to help people who cannot afford to protect themselves from mosquito-borne diseases.





SCIENCE for Global Goals Mosquito!

#### Task 1-8 Discussion Questions

As an entire team, discuss the following questions.

Remind the team that you will now engage in a discussion. When engaging in any type of meaningful discussion as a team, you must respect your team. Use the meaningful conversation starters in your discussion to respect your other team members.

Meaningful conversation starters used in the language of argumentation:

- I agree with \_\_\_\_\_ because ...
- I disagree with \_\_\_\_\_because ...
- I'd like to go back to what \_\_\_\_\_\_ said about ...
- I'd like to add \_\_\_\_\_
- I noticed that ...
- Another example is ...
- So, what you are saying is ...
- Do you think that ...?
- Couldn't it also be that ...?
- Why do you think that?
- Can you explain what you mean?
- Can you tell me more?
- Can you give me an example of that?
- 1. How did your group arrive at your decisions?
- 2. What decision-making methods did your group use (consensus, voting, etc.)?
- 3. How were your decisions influenced by the values? Attitudes? Prejudices? Aspects of identity of people in your group?
- 4. How were disagreements and conflicts handled?
- 5. What are some benefits to listening to a range of different perspectives and viewpoints on the team?
- 6. Is it helpful to be open to new ideas and perspectives that challenge your own? Why or why not?
- 7. Is there anything you learned in this task that would be useful when thinking about the problem question: How can we ensure health for all from mosquito-borne diseases?



Go back to Research Guide now









#### Task 1-8 Exploring Research Perspectives—Mosquito B

#### Team Norms

- Recognize the benefits of listening to a range of different perspectives and viewpoints.
- Be open to new ideas and perspectives that challenge your own.
- Be willing to cooperate with others to change things for the better.
- Use active listening skills.
  - Face the person talking.
  - Look them in the eye.
  - Be attentive.
  - Keep an open mind.
  - Don't interrupt.
  - Ask questions if you are confused.

#### Warm-Up Round Instructions

**1.** Here is the warm-up round statement.

#### Bananas are the best-tasting fruit.

2. There are not necessarily any right or wrong answers, and everyone's view will fall somewhere along the continuum, from strongly agree to strongly disagree.

3. Take a minute and let each team member think about their position on that statement. Explain the next step so team members can choose where to stand along the continuum.

• Explain that relative location is also important; that is, standing closer to the strongly agree or disagree side of the room means you feel very strongly about this statement.

4. Once each team member is located along the continuum, direct the team members to begin explaining to those standing near them why they placed themselves as they did. Students should explain their reasoning for their location.

5. Based on these discussions with the people near them, they should be "recalibrating" with each other. This is the process of listening to other team members near them and determining whether they really are more or less extreme in their thoughts and feelings on the topic. Encourage team members to move as necessary to accurately represent the continuum of opinion on the team.

#### Warm-Up Round Discussion Questions

- Can individual team members explain to the team the reasons for their position on the continuum.
- How many team members changed their positions after talking to other team members around them on the continuum?
- How many team members changed their positions after hearing people talk during the whole team discussion?
- What led you to change your mind?



Smithsonian

SCIENCE for Global Goals

Mosquito!

• Conclude the discussion by asking team members on both sides of the issue to identify what they believe to be the strongest arguments and reasons they heard from the *opposing* side.

#### Four Perspectives Rounds Instructions and Questions

- 1. The line continuum setup of the next four rounds stays basically the same—but with some differences that are described in the step three.
- 2. Present the following statement to the entire team.

#### Ethical perspective: It is okay to kill all of the mosquitoes on the planet.

- 3. Have each person individually place themselves along the continuum.
- 4. Next, create groups of three to four team members with the team members that are nearest you on the continuum.
- 5. Have each group work together to develop an explanation of the reasons for their group's position on the continuum. Share these explanations with the entire team.
- 6. After each group has had a chance to share, each group should have a brief discussion about whether they would like to move their location on the continuum, based on the team discussion.
  - How many groups changed their positions after hearing people talk during the whole team discussion?
  - What led you to change your mind or not change your mind?
  - Conclude the discussion by asking team members on both sides of the issue to identify what they believe to be the strongest arguments and reasons they heard from the *opposing* side.
  - 7. Repeat steps two through six for *one* statement from each of the following three perspectives categories.

#### Social perspective

- 1. People who live in places with mosquito-borne diseases should not be able to travel to other places to visit family.
- 2. People who get mosquito-borne diseases engage in some type of risky behavior.

#### **Environmental Perspective**

- 1. All mosquitoes are dangerous to humans.
- 2. Spraying potentially harmful chemicals to control mosquitoes around children and pregnant women is okay.

#### **Economic Perspective**

- 1. Mosquito bed nets protect you from mosquitoes when you are sleeping. It is okay that people who cannot afford to buy a bed net get sick more often from mosquito-borne diseases.
- 2. Every person should be required by the government to pay some tax money to help people who cannot afford to protect themselves from mosquito-borne diseases.



👶 Smithsonian

SCIENCE for Global Goals

Mosquito!

#### Task 1-8 Discussion Questions

As an entire team, discuss the following questions.

Remind the team that you will now engage in a discussion. When engaging in any type of meaningful discussion as a team, you must respect your team. Use the meaningful conversation starters in your discussion to respect your other team members.

Meaningful conversation starters used in the language of argumentation:

- a. I agree with \_\_\_\_\_ because ...
- b. I disagree with \_\_\_\_\_because ...
- c. I'd like to go back to what \_\_\_\_\_\_ said about ...
- d. I'd like to add \_\_\_\_\_
- e. I noticed that ...
- f. Another example is ...
- g. So, what you are saying is ...
- h. Do you think that ...?
- i. Couldn't it also be that ...?
- j. Why do you think that?
- k. Can you explain what you mean?
- I. Can you tell me more?
- m. Can you give me an example of that?
- 1. How did your group arrive at your decisions?
- 2. What decision-making methods did your group use (consensus, voting, etc.)?
- 3. How were your decisions influenced by the values? Attitudes? Prejudices? Aspects of identity of people in your group?
- 4. How were disagreements and conflicts handled?
- 5. What are some benefits to listening to a range of different perspectives and viewpoints on the team?
- 6. Is it helpful to be open to new ideas and perspectives that challenge your own? Why or why not?

Is there anything you learned in this task that would be useful when thinking about the problem question: How can we ensure health for all from mosquito-borne diseases?



Go back to Research Guide now







### Mosquito!: Task 1-8 Exploring Research Perspectives

What do you do when the team does not agree?



#### David Pecor - Walter Reed Biosystematics Unit (WRBU)

Sometimes people on our team do not agree. When the team does not agree, we make sure to treat each other with respect. It is important to not bring your personal feelings or opinions into the argument. Just as in science, the best evidence will determine which path to take. Sometimes there is not enough evidence to decide the argument. This means the solution is to gather more information. The team will gather information until enough exists to support one side or the other. Sometimes the solution is to

discuss issues or generate new ideas. Brainstorming sessions are needed for our team. We start by focusing the group around a single issue. Then we freely explore all possible (and even some impossible) solutions together via discussion. We begin to build ideas that will eventually become real solutions. Think about how your team can work together to respect everyone's ideas.



#### Meera Venkatesan - President's Malaria Initiative - United States Agency for International Development (USAID)

Sometimes people on our team do not agree. When this happens I try to understand where the other side is coming from. I try to put myself in their shoes. Even if we do not agree, I can at least see the discussion from their perspective. This helps me approach the discussion with humility and openness. It also helps the team come

to a decision we all can support. Think about how your team can work together to respect everyone's ideas.



#### **Russane Low - Institute for Global Environmental Strategies**

Sometimes people on our team do not agree. However, it is important to see the value of listening to each member of the team. Listening deeply is not easy. It is actually very hard work. I try and see an issue from each person's point of view. Sometimes I do not completely know where they are coming from. In these cases I try and imagine what their story might be. It is a useful way to help me talk with people I do not agree with. Being a good leader means being a good listener. Think about how your team can work

together to respect everyone's ideas.





## Mosquito!: Task 1-8 Exploring Research Perspectives

What do you do when the team does not agree?



#### Kelly Bennett - Biologist - Smithsonian Tropical Research Institute (STRI)

Sometimes people on our team do not agree. This is an important part of science. Conferences, meetings, and networking events are invaluable to present our work to the scientific community. Public outreach events are also important to raise awareness of our findings to the nonscientific community. These events provide opportunities to engage the thoughts and concerns of all people involved.



## Lee Cohnstaedt - Research Entomologist - United States Department of Agriculture (USDA)

Sometimes people on our team do not agree. Respect and empathy for others, perspectives are essential to effectively defending and presenting one's arguments. This is especially helpful when people do not agree. Bruce Lee, the famed martial artist, had a philosophy for his martial art (Jeet Kune Do), which

was understanding other martial arts and incorporating their key pieces to make your own style. Another way to say this is: Understand what others are trying to do so you can defend yourself, and learn from them so you can use their moves, if it fits your style. When this philosophy is applied to life, it becomes: Learn about others, their motivations, drive, and perspective. Then, when you debate or communicate with them, be able to use the best tools - theirs, yours, or others, - to maximum effectiveness. Be true to oneself, but keep learning about others, so as to continue growth and

development while maintaining an understanding of others and oneself.



#### Bridget Giles - Research Assistant Professor - Virginia Modeling Analysis & Simulation Center at Old Dominion University

Sometimes people on our team do not agree. Here at the Virginia Modeling Analysis and Simulation Center we build models, simulations, and visualizations to understand problems and make decisions. We investigate complex problems, design experiments, analyze data, and interpret results to help people

begin to agree when at first they might not.

Smithsonian

**SCIENCE** for Global Goals



#### Task 1-9 Making Claims from Evidence—Mosquito A

- 1. Break the team into smaller groups of three to five people.
- 2. Each group will be provided a set of Mosquito Card Sort Activity A Cards.
- 3. Read the scenario as a team.

Natasha was asleep at night in her house when she suddenly felt something bite her hand. By the time she could get near a light to see what it was, the animal was gone. Therefore, she did not see what it was. The next morning she noticed a red, itchy, raised bump on her hand. She was concerned about what it might be and was wondering what kind of animal had bitten her.

- 4. One card has the problem question on it: What kind of animal bit Natasha?
- 5. Cut out all of the cards.
- 6. Put the claim card on the table underneath the question card. Claim: A mosquito bit Natasha.
- 7. There are three evidence support category cards.
  - Evidence you think supports the claim
  - Evidence you think does not support the claim
  - Evidence you think might support the claim, but are still not sure
- 8. Find these and lay them on the table under the claim card.
- 9. Cards A through H contain pieces of evidence.
- 10. In your group, place the pieces of evidence into one of the three evidence support categories where you think they belong.
  - Evidence you think supports the claim
  - Evidence you think does not support the claim
  - Evidence you think might support the claim, but are still not sure
- 11. When placing each card in a category, think of at least one reason why you placed into that category. You'll use these reasons in the discussion.
- 12. Complete the activity sheet to document where you placed each piece of evidence and why.

#### Whole Team Discussion

- 1. Set expectations. Disagreement is normal during these types of discussions. Arguments and discussion help move science forward. This means not everyone will view the evidence in the same way.
- 2. Use the following sentence starters during the discussion
  - a. I think this piece of evidence supports this claim because ....
  - b. I do not think this piece of evidence supports this claim because ....
  - c. I agree because ....
  - d. I disagree because ....
  - e. Why do you think that?
- 3. Discuss where each group placed each piece of evidence and why.
- 4. Discuss whether you think a certain type of evidence was more useful or persuasive when developing your reasons.
- 5. Do you find that some pieces of evidence are related to one another?
- 6. Do you find any pieces of evidence that are stronger when they are combined or closely related?
- 7. Based only on the evidence provided, do you think the claim is well supported?
- 8. Why is it important to support all claims with evidence?





Mosquito!

#### Task 1-9 Data Sheet A

Problem Question: What kind of animal bit Natasha?

#### Claim: A mosquito bit Natasha.

Evidence	Evidence support	Reasons why the evidence
	category (supports,	supports, does not support,
	does not support, might	or might support the claim
	support the claim)	
A. Natasha was inside her house		
when she was bitten by the animal.		
B. Natasha's friend Ariel got a		
similar bite outside their house last		
week from a mosquito.		
C Spider bites typically leave red		
itchy, and sometimes painful		
bumps on your skin.		
,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		
D. Mosquito bites typically leave		
red, itchy, and sometimes painful		
bumps on your skin.		
E. All of the windows and doors to		
Natasha's house have screens to		
try to keep the bugs out.		
E Natasha's brother thinks it looks		
similar to when he was stung by a		
scornion But scornions don't		
typically live in the region around		
their house.		
G. Some mosquitoes are known to		
prefer to bite humans specifically		
at night.		
H. Natasha has seen spiders inside		
her house in the past.		





**SCIENCE** for Global Goals

Mosquito!

#### Task 1-9 Mosquito A Cards

Problem Question: What kind of animal bit Natasha?				
Claim: A mosquito bit Natasha.				
Evidence you think <b>supports</b> the claim	Evidence you think <b>does not</b> support the claim	Evidence you think <b>might</b> support the claim, but are still not sure		
A. Natasha was inside her house when she was bit by the animal.				
B. Natasha's friend Ariel got a similar bite outside their house last week from a mosquito.				
C. Spider bites typically leave red, itchy, and sometimes painful bumps on your skin.				
D. Mosquito bites typically leave red, itchy, and sometimes painful bumps on your skin.				
E. All of the windows and doors to Natasha's house have screens to try to keep the bugs out.				
F. Natasha's brother thinks it looks similar to when he was stung by a scorpion. But scorpions don't typically live in the region around their house.				
G. Some mosquitoes are known to prefer to bite humans specifically at night.				
H. Natasha has seen spiders inside her house in the past.				











#### Task 1-9 Making Claims from Evidence—Mosquito B

When scientists make claims based on evidence, they often end up with more than one possible claim to answer a question. Scientists also evaluate which claims are best supported by the evidence. They may also explain and discuss why the evidence supports one claim over another.

#### Round One

- 1. Break the team into smaller groups three to five people.
- 2. Each group will be provided a set of Mosquito Card Sort Activity B Cards.
- 3. Read the scenario as a team.
  - Scenario:

Natasha was asleep at night in her house when she suddenly felt something bite her hand. By the time she could get near a light to see what it was, the animal was gone. Therefore, she did not see what it was. The next morning she noticed it left a red, itchy, raised bump on her hand. She was concerned about what it might be and was wondering what kind of animal had bitten her.

- 4. Cut out all of the cards.
- 5. One card has the problem question on it: What kind of animal bit Natasha?
- 6. Find and put the three claim cards on the table underneath the question.
  - a. Claim 1: A mosquito bit Natasha.
  - b. Claim 2: A spider bit Natasha.
  - c. **Claim 3:** Other—neither claim 1 nor 2 have enough support. She was bitten by something else (in that case, create your own claim).
- 7. You will be selecting one of these claims to support with evidence and reasoning. Place them under the problem question for now.
- 8. Cards A through E contain pieces of evidence.
- 9. In your group, your goal is to sort and discuss the evidence to determine which of the three competing claims is strongest.
- 10. Complete the Round One column on your data sheet.
  - Which claim is best supported?
  - What evidence best supports this claim?
  - Why does this evidence best support this claim?
- 11. Explain that groups may not come to a consensus about which claim is best supported. This is normal and to be expected. This is why there is the category Other Claim.
- 12. If you have questions or are unsure about both claims, select Other Claim and provide your reasons, using evidence for support.
- 13. Have the groups or the whole team share and discuss which claim they think is best supported by the existing evidence.
  - Use the following sentence starters during the discussion
    - a. I think this claim is best supported because ....
    - b. I do not think this claim is best supported because ....
    - c. I agree because ....
    - d. I disagree because ....
    - e. Why do you think that?

**S**mithsonian

**SCIENCE** for Global Goals



#### Round Two

- 1. Discuss how scientists are constantly making observations and gathering data, which can become new evidence.
- 2. Provide each group with the round two evidence (F through J). Add this to the evidence from round one.
- 3. Use this new evidence, along with the evidence from round one, to determine which claim the team thinks is best supported by the existing evidence.
- 4. Complete the Round Two column in the data table.
- 5. Engage in team discussion. Have groups or the whole team share and discuss which claim they think is best supported by the existing evidence.
- Use the following sentence starters during the discussion
  - o I think this claim is best supported because ....
  - $\circ$  ~ I do not think this claim is best supported because ....
  - I agree because ....
  - I disagree because ....
  - Why do you think that?
- How were your discussions similar or different when you sorted the cards with multiple claims and when you sorted evidence cards for one claim?
- What did you talk about when you were discussing the evidence?
- Did your conversations about which claim is best supported change from round one when you received the new evidence cards in round two?
- Remember:
  - Often scientists develop competing claims about a particular phenomenon.
    They use evidence to decide which claim is stronger.
  - As new evidence emerges, scientists must reevaluate the strength of their claims.

#### Round Three

- 1. Discuss how scientists are constantly making observations and gathering data, which can become new evidence.
- 2. Provide each group with the round three evidence (K through Q). Add this to the evidence from rounds one and two.
- 3. Use this new evidence, along with the evidence from previous rounds, to determine which claim your team thinks is best supported given the existing evidence.
- 4. Complete the Round Three column in the data table.
- 5. Engage in team discussion. Have groups or the whole team share and discuss which claim they think is best supported by the existing evidence.
- Use the following sentence starters during the discussion
  - I think this claim is best supported because ....
  - $\circ$  ~ I do not think this claim is best supported because ....
  - o I agree because ....
  - I disagree because ....
  - Why do you think that?

Smithsonian



- How were your discussions similar or different when you sorted the cards with multiple claims and when you sorted evidence cards for one claim?
- What did you talk about when you were discussing the evidence?
- Did your conversations about which claim is best supported change from rounds one and two when you received the new evidence cards in round three?
- Remember:
  - Often scientists develop competing claims about a particular phenomenon. They use evidence to decide which claim is stronger.
  - As new evidence emerges, scientists must reevaluate the strength of their claims.

#### Whole Team Discussion

Remind the team that you will now engage in a discussion. When engaging in any type of meaningful discussion as a team, you must respect your team. Use these meaningful conversation starters in your discussion to respect your other team members.

- I agree with \_\_\_\_\_ because...
- I disagree with \_\_\_\_\_\_because...
- I'd like to go back to what \_\_\_\_\_\_ said about ...
- I'd like to add \_\_\_\_\_
- I noticed that ...
- Another example is ...

Why is it important to support all claims with evidence?

Why is it important to reevaluate all claims when new evidence is collected?

Why is it important to engage in discussion when there are multiple claims for the same question?






Mosquito!

## Task 1-9 Data Sheet B

Problem Question: What kind of animal bit Natasha?

**Claim 1:** A mosquito bit Natasha.

Claim 2: A spider bit Natasha.

**Claim 3:** Other—neither claim 1 nor 2 have enough support. She was bitten by something else. (Create your own claim here.)

Which claim do you think is best supported by the available evidence? Document below the claim, evidence, and reasoning to support your decision.

	Round One	Round Two	Round Three
Claim you			
think is best			
supported (1,			
2, or 3)			
Evidence that			
supports this			
claim			
Reasons why			
the evidence			
supports the			
claim			







Mosquito!

## Task 1-9 Building Claims from Evidence Card Sort Activity B Cards

Natasha created the following claim the next day when she woke up.

Claim 1: A mosquito bit me.

Claim 2: A spider bit me.

Claim 3: Something other than a mosquito or spider bit me. (Create your own claim here.)

Question: What kind of animal bit Natasha?					
Claim 1: A mosquito bit me.					
Claim 2: A spider bit me.					
<b>Claim 3:</b> Neither Claim 1 or 2 have enough support. I was bitten by something else. (Create your own claim here.)					
Evidence you think <b>supports</b> the claim	Evidence you think <b>does not</b> support the claim	Evidence you think <b>might</b> support the claim, but you're still not sure			
Round One					
A. Natasha was inside her house when she was bitten by the animal.					
B. Natasha's friend Ariel got a similar bite outside their house last week from a mosquito.					
C. Spider bites typically leave red, itchy, and sometimes painful bumps on your skin.					
D. Mosquito bites typically leave red, itchy, and sometimes painful bumps on your skin.					
E. All of the windows and doors to Natasha's house have screens to try to keep the bugs out.					
Round Two					
F. Natasha has seen spiders inside her house in the past.					







G. When mosquitoes bite humans, they make one hole in the skin. They inject saliva into the hole, so you don't feel the bite as much as you might, while they drink the blood from under your skin using their proboscis.

H. Spiders typically only bite in self defense.

I. Some mosquitoes are known to prefer to bite humans specifically at night.

J. Some spiders are nocturnal hunters, meaning they search and hunt for food at night.

## **Round Three**

K. Some spider bites can cause pain to spread from near the bite site into your abdomen, back, or chest.

L. Natasha has only noticed pain and itchiness at the bite site, although she noticed fluid coming out of the bite after she was scratching it a lot.

M. Mosquito and spider bites are generally dry, meaning fluid does not come out of them when you leave them undisturbed.

N. Natasha's father said it does not look like the spider bite he had in the past.

O. Natasha's brother thinks it looks kind of like when he was stung by a scorpion. But scorpions don't typically live in the region around their house.

P. Spiders inject venom from one or two fangs when they bite humans.

Q. Some spider bites leave flat or sunken marks in the skin, rather than raised bumps.





Go back to Research Guide now

How can we ensure health for all from mosquito borne diseases?

