MACRO PROBLEMS:
AN INVESTIGATION OF MACROINVERTEBRATE ADAPTATIONS

GRADES: 1 - 4

TIME FRAME: 45-60 minutes

SETTING: Indoors

MATERIALS: Print-outs of the macroinvertebrates and human problems (located at the bottom of the document)

LEARNING OBJECTIVES:

- Students will demonstrate their understanding of adaptations
- Students will apply and match specific adaptations to different scenarios
- Students will explore Biomimicry: The process of copying the features or habits of plants or animals to solve human problems

OVERVIEW:

This lesson assumes that the students have conducted a stream assessment and have some familiarity with the macroinvertebrates that live in those habitats. See the StreamWatch Schools page on The Watershed Institute's website under "Education Programs" for more information on doing a stream assessment with your class.

Students will participate in macroinvertebrate sampling on a nearby stream, either by visiting the stream in-person, or by doing a leaf pack lesson. During this sampling session, students will observe the features of the macroinvertebrates and participate in discussions about what those features are used for. They will take

what they learned from that discussion to apply those adaptations to a new scenario that illustrates a human problem.

NJ SCIENCE STANDARDS:

1-LS1-1 Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs.

3-LS3-2 Use evidence to support the explanation that traits can be influenced by the environment.

3-LS4-2 Use evidence to construct an explanation for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing.

3-LS4-3 Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.

3-LS4-4 Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change.

4-LS1-1 Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.

Engage:

Start by asking the students if they can remember the names of any of the macroinvertebrates that they saw. What did the macroinvertebrates look like? Ask guiding questions to lead a discussion about the features or other adaptations the macroinvertebrates have. This can include “Did you see anything swimming? How did they swim?” “Did it look like any of them had a way to protect themselves?” etc. The students may point out the pincers of a crayfish or the tails that many of the macros have.

Next, briefly discuss how many of the tools that humans created may remind us of animal body parts/adaptations. A lot of the tools that we use as people reflect animals and how they interact with the world. An example would be that a helmet is like a turtle shell. We might use a nutcracker the same way a crab would use its claws.

Procedure:

Connect: Explain that today, we're going to think about some of the body parts of those macroinvertebrates we saw. We're going to get creative about how people might copy those body parts to solve a problem.

> "For example, if my problem was that I have a walnut and I want to crack it so I can eat what's on the inside, would I want to have strong claws like a crab, or would I want to use bird feathers to try to crack the nut?"
> "Do people actually have crab claws? No, but for today's activity, humans can have the same body parts as the animals."

Challenge: Listed below are problems that humans may face and descriptions of some of the macroinvertebrates that we see in our streams. Each human problem corresponds to one of the macroinvertebrates. Start with the macroinvertebrates. Read out to the class the names of the macroinvertebrate and the descriptions (found at the bottom of this document). After reading through all of them, it may help to display the pictures on the board or in a PowerPoint, with a couple of words to help the students remember the adaptation ("strong bite" for dobsonfly, "sticks to rocks" for the leech, "fast swimmer" for the crayfish, "long tails" for the mayfly, "safe case" for the caddisfly).

Read one human problem and ask the students which macroinvertebrate they may want to copy to solve the problem. To increase engagement, you can have the students stand up and place the picture representing the "human problem" next to the macroinvertebrate that it matches.

Taking it Further:

Once all the humans have gotten the correct match, ask the students to choose one human problem, and draw what that human would look like after copying the macroinvertebrate. For example, they can choose to draw a person with a crayfish tail, the small dog with three tails, etc. They may also choose to draw an adaptation not listed in this lesson plan.

Caddisfly Larva

I am a very small insect, and I can't hide from bigger animals very well. To protect myself, I build a case out of sand and small stones. This helps me look for food while also being able to hide and stay safe!

Dobsonfly Larva

I am a baby for most of my life. It can take *years* for me to get my wings. In the meantime, I use my strong pincers to deliver a strong bite. This helps me protect myself from big animals!

Water Penny

Living in a stream, sometimes the water moves too fast for me. I'm not strong enough to swim against the current. Instead, I use the claws on all six of my legs to stick to rocks. They keep me secure!

Crayfish

Many people know that I use my pinchers to defend myself. But there's something else you might not know. When I get scared, I can use my strong tail to quickly swim backwards. I can swim much faster than I can crawl.

Mayflies

I can't defend myself very well, but I do have three tails that help me look bigger. When I'm scared, I'll raise my tails to try to scare away bigger animals.

Ethan's Problem:

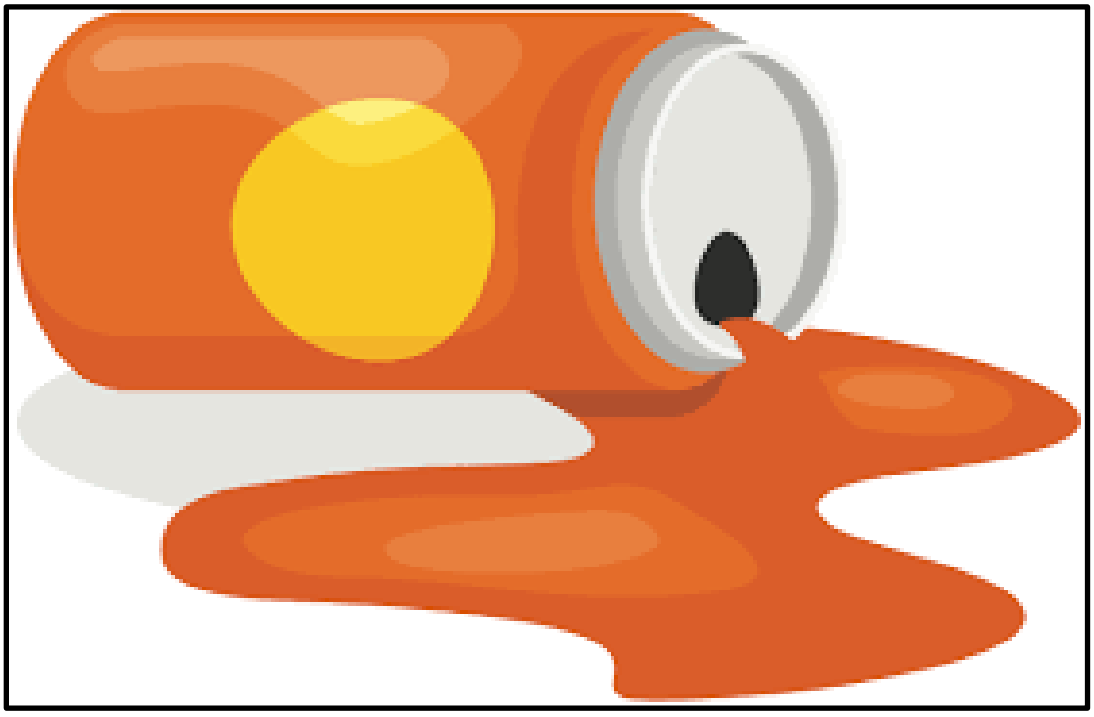
I love hiking, but it seems like mosquitoes come out of nowhere! I'm looking for something that I can hide in when I feel like I'm being attacked by the bugs.

Maria's Problem

I love nature and spending time outside. But I live in a place where there are so many animals that are bigger than me! I'm looking for a way to protect myself from bigger animals so I can enjoy the outdoors.

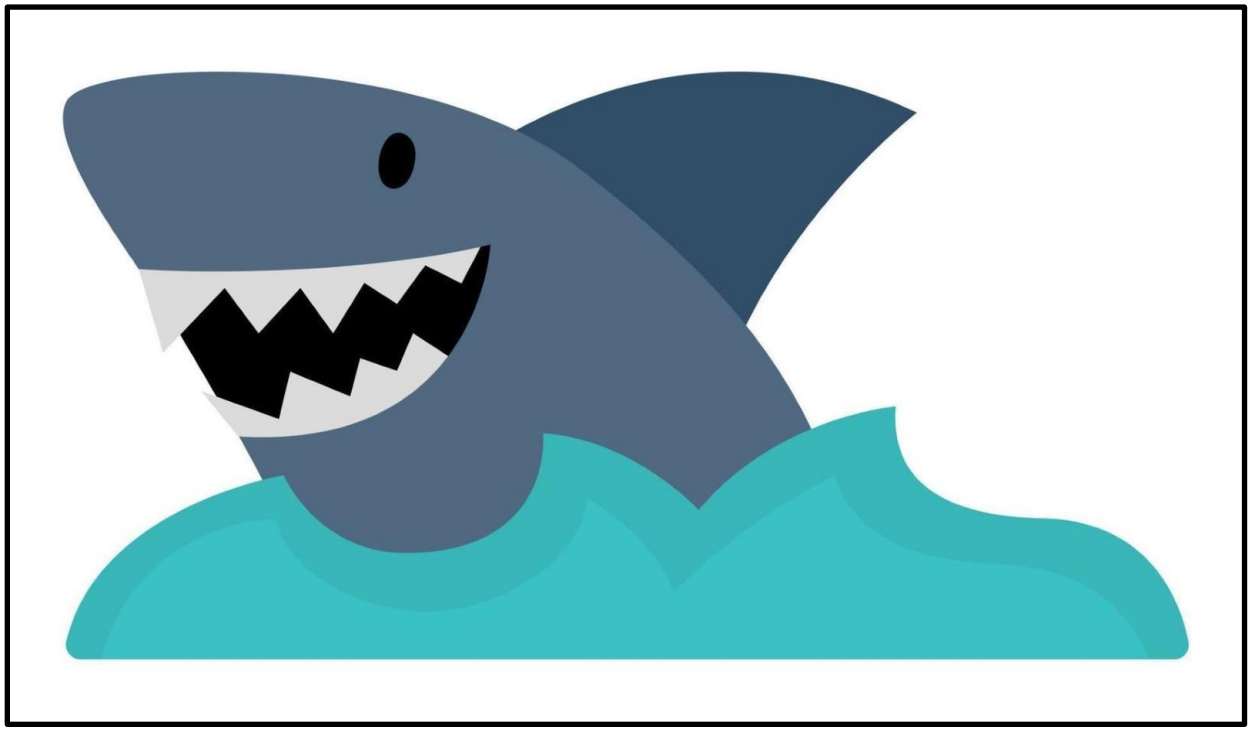
Keisha's problem:

Last week I was enjoying a snack in the park. But a strong wind came and blew over my drink! I'm looking for a way to keep my drink secure so this doesn't happen again.



Alex's Problem:

I love swimming in the ocean, but I'm scared of sharks. I'm not a very fast swimmer. I know sharks don't like to attack humans, but I wish I had a way to swim really fast just in case.



Melisa's Problem:

Sometimes I get nervous letting my dog outside. She's just so small, and we have hawks and coyotes around. I'm looking for a way to make my dog look bigger when she needs to go outside, so other animals will leave her alone.