beetles
Science and Teaching for Field Instructors

Student Activity Guide

Whacky Adapty

In this Adaptation Name Game, students sitting or standing in a circle play a version of tag, with one person in the center. When a person in the circle says another person's name, the person in the center of the circle tries to touch the person whose name was said, before they can say someone else's name. Later, students pause to brainstorm strategies to improve their performance, then play some more. Students learn that this was a representation of how certain structures and behaviors help organisms survive in their habitat, and that these are adaptations that species inherit over time. This game helps students learn each other's names, while "lightly" introducing them to what adaptations are. *Note*: This activity is only an introduction; to gain any meaningful understanding of the topic, students will need more adaptation-focused activities, such as *Adaptations Intro-Live!, Structures & Behaviors,* and *Related & Different*, which engage students more deeply in understanding the concept through interactions with real organisms.

Students will...

- Learn the names of group members.
- Understand that adaptations are inherited behaviors and structures that help an organism survive in its habitat.
- Recognize that inheritable adaptations and behavioral choices are different.

Grade Level:
Grades 3–8. Adaptable for younger or older students.

Timing:
About 10 minutes

Related Activities:
Adaptations Intro-Live!; Structures & Behaviors; and *Related & Different*

Materials:
For the group: Long feather, pool noodle, or 2 empty paper towel rolls duct-taped together; something small and ridiculous, like a tiny leaf

Tips:
To ensure a successful experience, review the teaching tips found on page 2 and throughout this guide.

Setting:
Choose an area large enough for the group to be in a seated or standing circle.

NEXT GENERATION SCIENCE STANDARDS

FEATURED PRACTICE | FEATURED CROSSCUTTING CONCEPT | DISCIPLINARY CORE IDEAS

Whacky Adapty is not a three-dimensional learning experience. It's a quick name-game to introduce students to some ideas that connect to the concepts of adaptations and structure and function. For more information on NGSS Standards, see other BEETLES Adaptations Activities.

THE LAWRENCE HALL OF SCIENCE
UNIVERSITY OF CALIFORNIA, BERKELEY

Whacky Adapty

ACTIVITY OVERVIEW

Whacky Adapty	Learning Cycle Stages	Estimated Time
Introducing the Activity	Invitation	3 minutes
Playing the Game		5 minutes
Wrapping Up		2 minutes
TOTAL		10 minutes

TEACHING TIPS

Field Card. On page 10 of this guide is a pocket-sized version of this lesson that you can use in the field.

Read the Instructor Support Section. Beginning on page 7, you'll find more information about pedagogy, student misconceptions, science background, and standards.

The game is not an accurate representation of how adaptations work. When you lead this activity, be sure to highlight the differences between strategies that students used in the game and adaptations inherited by species in nature. In the game, students choose to have a longer "arm" by using a tool; in nature, organisms don't choose their adaptations. In the game, students change strategies quickly; in nature, species evolve over many generations. Still, the game can be a helpful introduction to the idea that certain structures and behaviors are better than others at performing certain functions, which is important for students to understand in order to begin to "get" the concept of adaptations.

All materials created by BEETLES™ at The Lawrence Hall of Science.
Find the latest activities and information at http://beetlesproject.org.

Introducing the Activity

1. **Form a circle, then explain that knowing each other's names is important, so the group will play a name game.** Gather students in a tight toe-to-toe circle. Tell students it's important to know everyone else's name since they'll be working as a team during their time together, and that the group will play a name game together.

2. **Explain the role of the people sitting in the circle: When your name is said, say your own name, then say another person's name.** Explain that one person will start by saying their own name, then the name of one other person. The person who was just named says their own name, and then another name. That person then says their own name, and a second name...and so on. For example, it should sound like:

   a. Instructor (Kevin): Kevin to Hannah
   b. Student 1 (Hannah): Hannah to Valeria
   c. Student 2 (Valeria): Valeria to Gabriela
   d. Student 3 (Gabriela): Gabriela to Vincent

   Check to make sure everyone understands the procedure so far.

3. **Explain the role of the person in the center: The person in the center tries to tag the person whose name is said, before they say another person's name.** Ask a volunteer to stand in the center of the circle, then explain their role: the center person's job is to try to tag someone after their name has been said by the person before them, but before they can say a second person's name. In the example above, the person in the center would try to tag Hannah after the instructor first said, "Hannah," and before Hannah could say, "Valeria."

4. **Explain that if the person in the center succeeds, they shift to the outer circle, and the person they tagged takes their place in the center.**

5. **Get the group in a sitting (feet in) or standing circle (hands in) and in position to play the game, and tell students to ask for names they don't yet know now, before the game begins.** Show students how to position themselves for the game. You can either play with people sitting down with their feet pointed into the middle of the circle so the center person tags them by tapping their toes, or you can play standing up with hands out to the center so the center person tags them by tapping their hands. Suggest that students should try to learn as many names as they can now, to use them in the game.

6. **Play one round in slow motion to make sure everyone understands.**

TEACHING NOTES

Don't take too long explaining the game. Explaining this first part should be very quick. Spend just a few seconds on the procedure so students get a sense of the pattern. Students will catch on once the game begins.

TEACHING NOTES

Stashing your pointer. Using a long pool noodle to tag hands or toes is fun and gets good reactions from students. If you'll be hiking with the group, you might want to play near a cabin or lodge so you can leave the pool noodle or other pointer behind and don't have to carry it around all day.

Emphasizing Structure and Function. If you want to focus on the relationship between structure and function as a theme, you could adjust the wrap-up to emphasize how structures have particular functions. For example, you could discuss the function of the pool noodle in extending the center person's reach.

Point out the common use of "Adaptation." Students may be familiar with the common English usage of "adapt," e.g. "I moved to a new town and I adapted by making new friends." When you're teaching about adaptations of species, this common usage can be confusing. The biological definition is different. Organisms don't adapt during one lifetime; species adapt over generations. Point out the common usage of "adapt" to students, and explain they will be learning a scientific definition of the word.

Play the Game

1. **Play and have fun!** Play a few rounds until most or all students have had their name called.
2. **Stop the game, and Turn & Talk about strategies to be more successful in the game.** Ask students to turn and talk to the person next to them about their ideas of strategies that could be used to be more successful in the game.
3. **Meanwhile, privately ask the person in the middle about ideas to be more successful, then give them a long prop, like a pool noodle.** While other pairs in the circle are discussing strategies, pair up with the person in the center and ask them for their ideas of strategies to be more successful. After discussing, give that person a pool noodle, a long feather, or 2 empty paper towel rolls duct-taped together (any object that increases their reach).
4. **Whole group shares some ideas about strategies for success.** Ask students to share a few of their best ideas about successful game strategies.
5. **Ask the person in the middle to show off their new extended reach.**
6. **Tell students in the circle to pick a strategy to try in the next round.**
7. **Play and have fun!** Play a few more rounds so students get a sense of how the changes are affecting the game.
8. **For one round, give the person in center a prop that is not advantageous.** Give the person in the center something ridiculous and not useful for the objective of the game (like a tiny piece of a pine needle, a floppy feather, or a small piece of string) to use for one round.

Wrapping Up

1. **Ask for student suggestions of the absolute worst structures or behaviors for the person in the center to have.** These can be playful and ridiculous (other students have suggested things like, an anvil, the Sun, a paper clip, or a quark).
2. **Point out how certain "structures" and "behaviors" helped students "survive" in the game.** In this game, there were certain structures, like the pool noodle, that helped the person in the center do better. Students in the circle also came up with behaviors to be more successful so they were more likely to "survive."

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3. **Explain: In nature, organisms with the most successful structures and behaviors for surviving in their habitats are often those that survive.** Organisms have inherited behaviors that help them survive; they also have inherited structures that do the same.

4. **Define adaptations as inheritable behaviors and structures that help a group of organisms survive in their habitat.**

5. **Certain organisms are more successful (and survive) in certain habitats because of their adaptations.** They reproduce, and pass on those successful traits to their young.

6. **Let students know that adaptations will be a theme of the field experience.** Explain that during their field experience students will look at the structures and behaviors that help organisms survive.

7. **Explain the difference between structural and behavioral adaptations both in the game and in real organisms.**
   a. The extended arm of the person in the center of the circle represented adaptations that organisms have that work as structures to help them survive, such as long arms, claws, teeth, or fur.
   b. The things students did to play better represented adaptations that organisms have that are behaviors to help them survive, such as freezing or running.

8. **Point out that there were inaccuracies in the game, because real adaptations are inheritable, not chosen.** In the game, they got to choose to change their behaviors or structure to succeed in a given situation, but real adaptations aren't chosen and don't just appear. Adaptations are behaviors or structures that are inherited—which means they are passed down from parents to offspring.

9. **Explain that changes occur over many generations, not within one individual.**

10. **Explain an example of something that is not an adaptation, and one of something that is.**
    a. *Example of something that's NOT an adaptation:* If you live in an area with a lot of hunting and you decide to dye your hair orange so hunters will see you and not shoot at you when you're hiking, that is a choice, not an adaptation. And your children will not be born with protective orange hair.
    b. *Example of something that IS an adaptation:* If you are standing outside on a cold night, your body will begin to shiver. These little movements help increase your body temperature. This behavior is an inherited adaptation—if you have children they will also shiver when they are cold, without your teaching them to.

TEACHING NOTES

This game is not enough to teach adaptations. The concept of adaptations is complex. Students will need multiple learning experiences to develop their understanding of this concept. This game is also only a metaphor, and for understanding of how it plays out in the real world, they'll need experiences with *actual* adaptations on actual organisms. After this quick name game, move on to other adaptations activities to give students the opportunity to engage with nature as they build their understanding of this important concept.

TEACHING NOTES

11. **Ask which structures and behaviors helped in the game.**

12. **Explain that when organisms reproduce, a random mutation may show up in an individual, which leads to a different trait.**

13. **If a random mutation helps the organism survive in its habitat, that organism is more likely to reproduce and pass on the trait to its offspring.** Tie this into the helpful structures and behaviors the students just mentioned.

14. **Explain that a random mutation may also harm, or may be be neutral for survival in the habitat.** Depending on what the environment is like, that new trait could be harmful or could act neutrally on an organism's chance of survival.

15. **Ask for examples from the game for the "harmful" and "neutral" categories.** Ask students to list any structures or behaviors that were not helpful—either detrimental, or just neutral for "surviving" in the game.

16. ***Turn & Talk* or *Walk & Talk*: Ask students to discuss the following question:**

    ▶ *What are some helpful mutations you can think of that a (choose an animal) might be born with? Harmful mutations? Neutral?*

Leading *Walk & Talk* and *Turn & Talk*. For *Walk & Talk,* see the BEETLES student activity write-up: *Walk & Talk*. For Turn & Talk, see the handout, Discussion Routines, which is part of the *Promoting Discussion* professional learning session.

TEACHING NOTES

Instructor Support

Conceptual Knowledge

Adaptations are inheritable traits that improve the fitness of a population of organisms. In this case, fitness doesn't refer to whether or not an organism "works out," like in a gym. In evolution fitness refers to an organism's reproductive success. Evolution happens because some individuals in a population are more reproductively successful than others; they have more successful offspring. Evolution is the process of change that happens in populations over generations. Traits, like thicker fur, immunity to a disease, or the instinct to jump from danger, improve fitness, and will be passed on to more offspring than traits that do not improve an organism's fitness. Eventually these traits become more common in a population. This is how a population of organisms changes over time. If a population becomes so different from other members of the same species that it can no longer reproduce with them, then this population is considered a new species. This process is called speciation.

While we often think of evolution and adaptations in terms of observable external changes in a population (such as beak size), it's important to remember that inheritable traits are the result of genetics. It's through DNA that these traits are passed on from one generation to the next.

Many adaptations do not fit neatly into the categories of "behavioral" and "structural." Often an adaptation is a combination of both a structure and a behavior. For example, the behavior of a bird making a call can't happen without the structure that allows it to make that sound. But it's useful to think in terms of these two categories, because it helps students think more broadly about what can be considered adaptations.

It's often difficult (but useful) to try to identify which behaviors are adaptations. To be an adaptation, a trait must be inherited from one generation to the next. It can be tricky, but interesting, to try to figure out if a behavior is inherited or learned. For example, a student may say that the schooling behavior of a fish may be learned, and another student may argue that it's instinctual. What a wonderful scientific argument for students to engage in! If something like this comes up, encourage your students to discuss the question using evidence and reasoning. You might have them do a thought experiment, and to imagine designing a scientific investigation that could answer the question. For example, one might put some newly hatched fish in a tank without any adults around. If they swim in a school, that would be evidence that it's an instinctual behavior (i.e. there aren't any older fish to "teach" the behavior).

TEACHING NOTES

Misconceptions

Below are a few relevant misconceptions. For more information, see the Instructor Support sections for other BEETLES Adaptations-themed activities.

Common Relevant Misconceptions.

Misconception. An individual organism can adapt.

More accurate information. This is the most common misconception about adaptations. In common English, the word "adapt" means something an individual does, like "I moved to a new school and I adapted by making new friends." But in scientific usage, populations of organisms adapt over generations, but individuals don't. Adaptations are inherited structures or behaviors—they're not things an organism gets during its lifetime. If a person works out a lot and develops big muscles, that person's children will not inherit big muscles, so it's not an adaptation. If you dye your hair and it makes you superbly successful, this trait will not be passed on to your children. Thus your chic coif is not an adaptation. An adaptation must be something an organism is born with, like long legs. If longer legs help organisms run faster, survive, and have more offspring than those with shorter legs, then longer legs may eventually become an adaptation and spread through the population.

Misconception. All behaviors are adaptations.

More accurate information. Behavioral adaptations are only behaviors that are instinctual, like when mosquito larvae dive below the surface when a shadow passes over, or when ants follow a trail of formic acid. The organisms aren't thinking the situation through and choosing a behavior—they are instinctively reacting. That's why using humans as examples of behavioral adaptations is tricky, because with our complex brains, most of our behaviors are not adaptations. The ability to learn language to communicate is a human adaptation, but learning Spanish is not.

Misconception. All structures on organisms are adaptations.

More accurate information. Structural adaptations are beneficial structures inherited from one generation to the next. They are not traits that are the result of the environment or the way an organism has lived. Adaptations are only those characteristics that have evolved through the process of natural selection, because they provide a survival advantage to the population. Other characteristics exist just because they are carried over from past generations. For example the wings of flightless birds are not considered adaptations in those species, because they no longer help the animal survive, so they can't be "selected." But when introducing the concept of adaptation to youth, this level of detail is likely not be worth it.

Activity Connections

This activity is a great introduction for a longer lesson on adaptations. Consider following up with *Adaptations Intro-Live!*, *Structures & Behaviors*, *Related & Different*, and *Mating & Cloning*. See the BEETLES *Adaptations, Structure, and Function Theme Hike* for more on how to connect the activities to one another. If you choose to emphasize the "big idea" of structure and function, consider following up with any of the above activities or with either *Discovery Swap* or *Spider Exploration*.

TEACHING NOTES

Learning Cycle Phase. In a sequence of activities focused on adaptations, this activity fits in the Invitation phase of the learning cycle.

FIELD CARD

Cut out along outer lines and fold along the centerline. This makes a handy reference card that will fit in your pocket.

Whacky Adapty

Introducing the Activity

1. Form a circle, then explain that since knowing each other's names is important the group will play a name game.
2. Explain the role of people sitting in the circle: When your name is said, say your own name, then another person's name.
3. Person in center tries to tag the person whose name is said, before that person says another person's name.
4. Get group in a sitting or standing circle & in position to play the game, then tell students to ask for names they don't yet know, before game begins.
5. Play one round in slow motion so everyone understands.

Playing the Game

1. Play & have fun!
2. After a little while, stop the game, *Turn & Talk* about strategies to be more successful in the game.
3. Meanwhile, privately ask person in the middle about ideas to be more successful, then give them a long prop like a pool noodle.
4. Whole group shares ideas about strategies for success.
5. Tell students in the circle to pick a strategy to try in the next round.
6. Play & have fun!
7. For one round, give person in the center a prop that is not advantageous, like a tiny leaf.

Wrapping Up

1. Ask for suggestions of absolute worst/ridiculous structures or behaviors for person in the center to have.
2. Explain: certain "structures" & "behaviors" helped students "survive" in the game.
3. Explain: In nature, organisms with the most successful structures & behaviors for surviving in their habitats often survive.
4. Define adaptations as inheritable behaviors & structures that help a group of organisms survive in their habitat.
5. Explain: adaptations will be a theme of the field experience.
6. Explain differences between structural & behavioral adaptations both in the game & in real organisms.

▶ *The extended arm of the person in the middle represented adaptations organisms have that are structures that help them survive, such as long arms, claws, teeth, or fur.*

▶ *The things students did to play better represented adaptations organisms have that are behaviors that help them survive, such as freezing or running.*

7. Explain: there were inaccuracies in the game, because real adaptations are inheritable, not chosen.
8. Explain an example of something that is not an adaptation, & something that is.

▶ *NOT an adaptation: If you live in an area with a lot of hunting & you decide to dye your hair orange so hunters will see you & not shoot at you when you're hiking, that is a choice, not an adaptation. Your children will not be born with protective orange hair.*

▶ *IS an adaptation: If you are standing outside on a cold night, your body will begin to shiver. These little movements help increase your body temperature. This behavior is an inherited adaptation—if you have children they will also shiver when they are cold, without your teaching them to.*

9. Ask which structures & behaviors helped in the game.
10. Explain: when organisms reproduce, a random mutation may show up in an individual, which leads to a different trait.
11. If a random mutation helps the organism survive in its habitat, that organism is more likely to reproduce & pass on the trait to its offspring.
12. Explain that a random mutation may also harm, or may be neutral for survival in the habitat.
13. Ask for examples from the game for the "harmful" & "neutral" categories.
14. Use *Turn & Talk* or *Walk & Talk*:

▶ *What are some helpful mutations you can think of that a (choose an animal) might be born with? Harmful mutations? Neutral?*

ABOUT BEETLES™

BEETLES™ (Better Environmental Education Teaching, Learning, and Expertise Sharing) is a program of The Lawrence Hall of Science at the University of California, Berkeley, that provides professional learning sessions, student activities, and supporting resources for outdoor science program leaders and their staff. The goal is to infuse outdoor science programs everywhere with research-based approaches and tools to science teaching and learning that help them continually improve their programs.

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