beetles
Science and Teaching for Field Instructors

Student Activity Guide

Adaptation Intro-Live!

This activity is a brief introduction to adaptations as the group observes a live organism together. Adaptations are inheritable structures and behaviors that help a group of organisms survive in their habitat. Students start out observing an organisms' structures, trying to figure which might help it survive in its habitat and which are inheritable. Then, they do the same with behaviors: attempting to figure out which ones are behavioral adaptations. To build understanding of a complex concept like adaptations, students need multiple exposures to it, which is why this activity should be followed by other adaptations-focused activities.

Students will...

- **Observe an organism's structures and behaviors.**
- **Consider how structures and behaviors might help an organism survive in its habitat.**
- **Learn the definition of an adaptation: an inheritable structure or behavior that helps a group of organisms survive in their habitat.**

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

Timing:
About 20 minutes

Related Activities:
Structures & Behaviors
Whacky Adapty
Related & Different
Mating & Cloning

Materials:
For the group:
Many of the same organisms such as isopods collected from a compost bin, in one container for each pair of students,or, one large organism that everyone can observe, such as a snake, tethered hawk, or farm animal. As a last resort, use a taxidermied organism.

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

Setting:
Choose a setting where everyone can observe the same large organism or where there are many of the same type of organism.

NEXT GENERATION SCIENCE STANDARDS

FEATURED PRACTICE
Constructing Explanations

FEATURED CROSSCUTTING CONCEPT
Structure and Function

DISCIPLINARY CORE IDEAS
Structure and Function
Interdependent Relationships in Ecosystems
Adaptation

For additional information about NGSS, go to page 8 of this guide.

THE LAWRENCE HALL OF SCIENCE
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Adaptation Intro-Live!

ACTIVITY OVERVIEW

Adaptation Intro-Live!	Learning Cycle Stages	Estimated Time
Introducing the Activity	Invitation	3-5 mins.
Discussing Possible Benefits of Structures	Exploration	3-5 mins.
Discussing Possible Benefits of Behaviors	Exploration	3-5 mins.
Wrapping Up	Reflection	3-5 mins.
TOTAL		**12-20 minutes**

TEACHING TIPS

Field Card. On page 11 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 6, you'll find more information about pedagogy, student misconceptions, science background, and standards.

A starting point. Use this activity to introduce the concept of adaptations to your students, to get a sense of their current understanding of the concept, and to gently correct misconceptions that surface as the discussion unfolds. Many students arrive with misconceptions about the concept of adaptations. This activity will help you to know more about your group's understanding of the concept, but it's not a comprehensive learning experience for students. "Adaptation" is a complex concept. Students will need multiple exposures to the definition and lots of practice applying that definition to really"get" it. Don't use only this activity to teach the concept. For information on related activities, see the Instructor Support Section.

Using museum non-living specimens. If you are using a museum specimen or taxidermied animal because no live organisms are readily available, try to choose one that students have seen in the wild or on film so they will be able to share prior knowledge about its behaviors.

Animals rather than plants. It's best to start with animals, not plants, because students are more familiar with the function of animals' structures than with plants' structures. And behavior is tougher with plants.

Introducing the Activity

1. **Focus group on a live organism.** Gather your group around an organism that is abundant enough that every student or pair can put one in a cup and observe it closely, such as isopods from a compost bin, earthworms, beetles, or ants. Or, use a captive organism your program has, such as a hawk, snake, or farm animal. Tell students they're going to think about the structures (body parts) and behaviors of this organism.

2. **Think about the organism's habitat and environmental factors.** Explain that when observing an organism, it's important to think about where it lives and what it's like in its habitat. Briefly mention to the students or have them share a few environmental factors that may affect the organism you chose (e.g. access to water, food sources, etc.).

3. **Ask students to make observations about the organism's structures.** Ask students to share observations about the organism's structures. Use hand-raising or do this popcorn style depending on the dynamic of the group.

Discussing Possible Benefits of Structures

1. **Focus on one structure and ask students for different ideas about how the structure might help the organism survive in its habitat.** After a few students share observations of different structures, choose one structure and ask students how it might help the organism survive in it habitat. Accept each idea as a possibility, then ask for other ideas.

2. **Introduce the term "adaptation."**

   ▶ *Adaptations are inheritable structures that help a group of organisms survive in their habitat.*

3. **Observe other structures and discuss whether or not they are inheritable, and therefore, possible adaptations.** Find another structure on the organism and ask students again what possible benefits it could provide the organism in its environment. This time, though, challenge students to think about whether the organism inherited that structure. Gently correct any misconceptions. Do the same with other possible adaptations the organism has.

   ▶ *What are some possible adaptations, or inheritable structures, that might help this kind of organism survive in its habitat?*

   Example responses to possible students' statements:

   ▶ *Okay, so remember, adaptations are inheritable structures that help a group of organisms survive. This beetle has a broken leg. That's not inheritable, so it's not an adaptation.*

   ▶ *Jenn noticed the structure of sharp teeth and said those teeth might help the organism defend itself. Those teeth are inherited, so they are an adaptation.*

TEACHING NOTES

Think carefully if you use animals that have been intentionally bred. Because animals like livestock or domestic dogs have been selectively bred to have certain structures, they're not ideal for teaching adaptations. Their structures and behaviors have less of a connection to survival in their habitat, both because humans have bred them to have certain traits, and because animals that have been cared for by humans over multiple generations don't have the force of natural selection acting on them to "survive." This process of selective breeding for particular traits is called "artificial selection". You may want to point this out to older students.

Captive animal habitat. If you chose a captive animal, tell students the animal is not in its native habitat. Have them think about what the animal's native habitat is and which factors of that habitat might affect the animal.

Use a visual. When introducing a definition, write it out on a whiteboard or large piece of paper to show students; this supports all learners, but especially English Language Learners.

Defining observations. If you haven't yet done an activity like *I Notice, I Wonder, It Reminds Me Of* or *NSI: Nature Scene Investigators*, give a few examples of observations here, such as, "I notice this hawk's eyes are round and yellow," or "I notice this isopod has two antennae."

I Notice, I Wonder, It Reminds Me Of. If you have done this BEETLES activity, have students share observations using "I notice…" statements. When discussing structures of organisms,"It reminds me of…" can be very useful to help students start connecting form to function. E.g. "The segments on the worm remind me of an accordion, I wonder if they help the worm move like an accordion does."

Discussing Possible Benefits of Behaviors

1. **Ask students to observe the organism's behaviors.** Once the group has had the chance to discuss a few possible structural adaptations, ask them to focus on observing the organism's behavior, and to share their observations out loud.

2. **Choose a behavior and ask students to make possible explanations for how it might help the organism to survive in its habitat.** Pick one behavior and ask students to make possible explanations for how that behavior might help the organism survive in its habitat. Encourage different ideas.

3. **Introduce the concept of behavioral adaptations and adjust the definition of adaptations.** Tell students that inherited behaviors that help a group of organisms to survive in their habitat are also adaptations.

   ▶ *Inherited behaviors that help a group of organisms survive in their habitat are also adaptations.*

   ▶ *So, adaptations are inheritable structures and behaviors that help a group of organisms to survive in their habitat.*

4. **Explain: It's hard to know whether a behavior is inheritable or not because it's hard to know if an animal is acting on instinct or whether it has learned a behavior.** The simpler an animal's brain is, the more likely its behaviors are instinctual.

5. **Give a few examples of uninherited behaviors and a few examples of inherited behaviors.**

   - Examples of uninherited behaviors could include: a domestic animal learning to run to the door when it hears keys jingling; a group of squirrels hanging out in an area where they're fed by humans; seagulls showing up at a certain time of day when food is often left by people. These behaviors might benefit the organism in some way, but were not inherited.
   - Examples of inherited behaviors are behaviors an organism doesn't choose to do. Examples could include: breathing; reacting to a quick motion by flinching or running away.

6. **Ask the group to discuss whether or not they think the organism's behaviors are possible adaptations based on whether those behaviors are inherited.** Gently correct students if they share learned behaviors instead of instinctual ones. Ask students to use the term "possible adaptation" when they refer to behaviors that might help the organism.

Wrapping Up

1. **Point out to students that observing organisms' structures and making possible explanations about how those structures function is one way scientists learn about the natural world.** Explain to students that in observing organisms' structures and discussing how those structures

TEACHING NOTES

Address misconceptions, here and throughout the field experience. If you ask students what adaptations may help an organism survive, you may get answers like "the water" or "its body." Use the opportunity to clarify for students what is an adaptation (specific inheritable traits that help populations of organisms survive in their environment) and what isn't, then continue to reinforce this during the rest of your field experience. For more information about common misconceptions about adaptations, read the Instructor Support section.

It's useful to discuss behaviors. Although behaviors are tricky, and it's hard to know whether a particular behavior is or isn't an adaptation, it's interesting to discuss them. It also helps students continue to develop their understanding of adaptations. Even if students misidentify a behavior as an adaptation, thinking about the adaptations in terms of inheritable behaviors will deepen their understanding of the concept.

might function, they're looking at the world in one way that a scientist might.

2. **Tell students they will keep discussing possible adaptations of organisms throughout their field experience.** Explain to students that throughout the field experience they'll be searching for organisms and coming up with different explanations for their adaptations, both structural and behavioral. Address any misconceptions students may still have about adaptations, or shift into another adaptation activity to continue to help students understand the concept.

3. ***Walk & Talk.*** Ask the following questions as you move on in your field experience:

   - *What are some possible structural adaptations you can think of in other organisms?*
   - *What are some possible behavioral adaptations in other organisms?*
   - *What are some human structures or behaviors that you don't think are adaptations (inherited and help it survive in its habitat)?*

TEACHING NOTES

Informal assessment opportunity. Pay attention to what students say, and use this information to plan what other activities to use with them that will help them grow their understanding.

"This activity really helped me understand what my students didn't know." - Sean Hoppes, Walker Creek Ranch

TEACHING NOTES

Instructor Support

Teaching Knowledge

Assessing students' prior knowledge. If you plan on teaching the concept of adaptations during a field experience, *Adaptation Intro-Live!* is a good way to get a sense of your students' current understanding of the concept. Often, students arrive already harboring misconceptions about the idea of adaptations. Get a sense of the level of understanding of your group and use this information to make decisions about what aspects of the concept of adaptations to focus on through other activities.

Science Language. Using precise scientific language is important when teaching about adaptations. Your students may arrive thinking that they already know what it means to "adapt" because the word is often used in common language to refer to adjusting to a new situation. But that's not what it means in science. Understanding the difference between the biological and common uses of the term is essential if students are to understand the scientific ideas behind evolution. It can sometimes be helpful to explicitly contrast the science meaning with the everyday meaning of "adapt," so students can see the differences. Read the common misconceptions listed below to help reinforce a more accurate view of how populations of organisms change over time.

Conceptual Knowledge

Adaptations are inheritable traits that improve the fitness of a population of organisms. Fitness refers to an organism's reproductive success. Evolution happens because some individuals in a population are more reproductively successful than others. Evolution is the process of change that occurs in populations over generations. Traits that improve fitness will be passed on to more offspring than traits that do not improve an organism's fitness, and these traits become more abundant in a population. This is how a population of organisms changes over time. While we often think of evolution and adaptations in terms of observable external changes in a population (like 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.

Speciation. 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*.

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 exist without the structure that allows it to make that sound. However, discussing behavioral adaptations helps students think more broadly about observable traits that can be considered as adaptations.

It's often difficult to identify which behaviors qualify as adaptations. To be considered 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

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Find the latest activities and information at http://beetlesproject.org.

inherited or learned. For example, one 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 imagine designing a scientific investigation that could answer the question. For example, you could put newly born fish in a tank without any adults around. If they swim in a school, that would be evidence that it's an instinctual behavior, since there wouldn't be any older fish to teach the behavior.

Common Relevant Misconceptions

Misconception. An individual organism can adapt.

More accurate information. This is the most prevalent misconception about adaptations. In common English usage, the word "adapt" can refer to something an individual does, e.g. "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 aren't acquired during an organism's lifetime. If a person works out a lot and develops big muscles, that person's children will not inherit big muscles, so big muscles are 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 throughout the population.

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. For example, 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.

Misconception. All behaviors are adaptations.

More accurate information. Behavioral adaptations are beneficial behaviors inherited from one generation to the next. They are instinctual behaviors, like when mosquito larvae dive below the surface in response to a shadow passing over, or when ants follow a trail of formic acid. The organisms aren't thinking about the situation and choosing a behavior, and they didn't learn it from parents or other individuals. They are instinctively reacting. It's a little harder to think of human behaviors that are adaptations, since our brains are complex and most of our behaviors are acquired. Shivering in response to cold is an adaptation, but putting on a jacket is a learned response.

Misconception. If a population or organism *tries* hard enough, it will adapt to its environment.

More accurate information. Adaptations originate in random genetic mutations. While most genetic mutations are harmful to organisms, every once and a while, a mutation will help an organism have a survival advantage and thus produce more offspring. The offspring who inherit the beneficial trait will also have more offspring. Evolution does not occur because an organism "wants" an adaptation. It works through random trial and error. Genetic mutations randomly occur, and beneficial ones are passed on to the next generation.

TEACHING NOTES

About the Next Generation Science Standards (NGSS): The development of the Next Generation Science Standards followed closely on the movement to adopt nationwide English language arts and mathematics Common Core standards. In the case of the science standards, the National Research Council (NRC) first wrote a Framework for K-12 Science Education that beautifully describes an updated and comprehensive vision for proficiency in science across our nation. The Framework–validated by science researchers, educators and cognitive scientists–was then the basis for the development of the NGSS. As our understanding of how children learn has grown dramatically since the last science standards were published, the NGSS has pushed the science education community further towards engaging students in the practices used by scientists and engineers, and using the "big ideas" of science to actively learn about the natural world. Research shows that teaching science as a process of inquiry and explanation helps students to form a deeper understanding of science concepts and better recognize how science applies to everyday life.
In order to emphasize these important aspects of science, the NGSS are organized into three dimensions of learning: Science and Engineering Practices, Crosscutting Concepts and Disciplinary Core Ideas (DCI's). The DCI's are divided into four disciplines: Life Science (LS), Physical Science (PS), Earth and Space Science (ESS) and Engineering, Technology and Applied Science (ETS).

Read more About the Next Generation Science Standards at http://www.nextgenscience.org/ and http://ngss.nsta.org/

Connections to Next Generation Science Standards (NGSS)

BEETLES student activities are designed to provide opportunities for the "three-dimensional" learning that is called for in the NGSS. To experience three-dimensional learning, students need to engage in scientific practices to learn important science concepts (Disciplinary Core Ideas) and make connections to the big ideas in science (Crosscutting Concepts). In simple terms, students should be using the tools of science to explore and investigate rich phenomena, trying to figure out how the natural world works.

In *Adaptation Intro-Live!*, students engage in some basic skills related to the practice of *Constructing Explanations* to build a foundation for understanding disciplinary core ideas related to *Structure and Function*, *Interdependent Relationships in Ecosystems, and Adaptation*. Students briefly connect those ideas to the crosscutting concept *Structure and Function*. (Note: "Structure and Function" is a crosscutting concept; it is also the title of a category of Disciplinary Core Ideas within the Life Sciences.)

Featured Science and Engineering Practices

Engaging students in Constructing Explanations. According to the *NRC's Framework for K-12 Science Education*, a major goal of science is to deepen human understanding of the world through making explanations about it, and students should develop their understanding of science concepts through making their own explanations about natural phenomena. In *Adaptation Intro-Live!*, when students observe an organism, then describe how its structures and behaviors might help the organism survive in its habitat, they are constructing their own explanations. For example, a student who says, "I think the hawk uses its sharp beak to catch animals," has constructed a possible explanation for how the structure of a hawk's beak helps the organism survive.

However, students do not fully engage in the practice of constructing explanations in this activity. In order for students to be fully engaged in this practice, they need to go beyond just making explanations as described above. They also need to consciously use tentative language ("I think that..."), to base their explanations on evidence and to consider alternate explanations based on that evidence. Students also need to consciously recognize making explanations as a scientific way of thinking about the natural world. Continue to develop students' capacity for making explanations by using other activities that feature the practice.

Featured Crosscutting Concepts

Learning science through the lens of structure and function. The idea that structure and function complement each other is a useful tool for explaining things in science. In the designed world and in any natural system, the shape and material of a structure is related to what it does, and vice versa. In *Adaptation Intro-Live!*, students observe an organism's structures and make possible explanations for how each one helps the organism survive in a specific environment. In other words, students look at structures and think about how they might function. Yet, students aren't introduced to the specific language and scientific application of "structure and function" in this activity. To help students connect the concept of adaptations and organisms, continue to give them experience applying the idea in other activities, and explain the scientific application of the crosscutting concept. If students don't get the chance to consider how the idea of structure and function connects to the explanations they are making, they won't recognize the idea of structure and function as an important way of looking at the natural world.

Featured Disciplinary Core Ideas

Building a foundation for understanding Disciplinary Core Ideas. The *NGSS* make it clear that students need multiple learning experiences to build their understanding of disciplinary core ideas. *Adaptation Intro-Live!* provides students with an opportunity to begin developing understanding of some disciplinary core ideas related to LS1.A *Structure and Function*, LS2.A *Interdependent Relationships in Ecosystems*, and LS4.C *Adaptation*.

Specifically, when students are making explanations of how particular structures of an organism might help that organism survive, they develop some understanding of the core idea that organisms have characteristic structures that serve functions in growth, survival, behavior, and reproduction (LS1.A). When students focus on how an organism's structures and behaviors help it to survive within the context of its habitat, they are building some foundational knowledge of how organisms are dependent on, and interact with, the living and nonliving parts of the environment (LS2.A). By using a working definition of the term "adaptation" as they consider which inherited characteristics could be critical to an organism's survival in an environment, students develop a foundational understanding of adaptation as a process that results in the combination of traits that appear in populations of organisms (LS4.C). This activity gives students the opportunity to begin understanding these concepts. To deepen their understanding, keep giving students opportunities to apply these concepts in different activities throughout your field experience.

Performance Expectations to Work Towards

The NGSS represent complex knowledge and multi-faceted thinking abilities for students. No single activity can adequately prepare someone for an NGSS performance expectation. Performance expectations are examples of things students should be able to do after engaging in multiple learning experiences or long-term instructional units to demonstrate their understanding of important core ideas and science practices, as well as their ability to apply the crosscutting concepts. They do not represent a "curriculum" to be taught to students. Below are some of the performance expectations that this activity can help students work towards.

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.

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

TEACHING NOTES

Importance of teaching science practices: "Engaging in the practices of science helps students understand how scientific knowledge develops… It can also pique students' curiosity, capture their interest, and motivate their continued study…" -National Research Council, A Framework for K-12 Science Education. Focus on these science practices will help to ensure a more scientifically literate public who will be better able to make thoughtful decisions.

About Crosscutting Concepts in the NGSS: Crosscutting concepts are considered powerful thinking tools for how scientists make sense of the natural world. The seven "big ideas" listed as crosscutting concepts are: Patterns; Cause & Effect; Scale, Proportion & Quantity; Systems and System Models; Energy & Matter: Flows, Cycles and Conservation; Structure & Function; and Stability & Change. These concepts may sound familiar, as they are quite similar to the themes referred to in science literacy documents as being important ideas that unify all disciplines of science and engineering.

Translating the codes used in the NGSS: Each standard in the NGSS is organized as a collection of performance expectations (PE) for a particular science topic. Each PE has a specific code, provided here so that they can be easily referenced in the NGSS documents. The first number or initial refers to the grade level: K - kindergarten, 1 - first, 2 - second,etc...MS - middle school, and HS - high school. The next letters in the code refer to the science discipline for the standard: LS, PS, ESS, ETS. The number following the discipline denotes the specific core idea within the discipline that is addressed by the PE, and the last digit identifies the number of the PE itself.

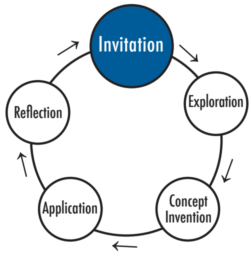
TEACHING NOTES

MS-LS1-4. Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively.

Activity Connections

Lead into the theme of adaptations with *Whacky Adapty* or start right away with *Adaptation Intro-Live!* After this activity, follow-up with *Structures & Behaviors*, *Related & Different* and/or *Mating & Cloning* to extend students' understanding of adaptations, species and diversity.

Structures & Behaviors will also further develop students' engagement in the practice of constructing explanations, as will activities like *NSI: Nature Scene Investigators*. Other activities in which students could apply the crosscutting concept of structure and function include *Structures & Behaviors, Discovery Swap*, and *Interview an Organism*.



***Adaptations Intro-Live!* and the Learning Cycle.** Within a sequence of adaptations-focused activities, *Adaptations Intro-Live!* is an invitation to future learning experiences.

FIELD CARD

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

Adaptation Intro-Live!

Introducing the Activity

1. Focus group on a live organism.
2. Think about its habitat & environmental factors.
3. Ask students to make observations about its structures.

Discussing Possible Benefits of Structures

1. Focus on one structure and ask for ideas about how it might help the organism survive in its habitat.
2. Introduce the term "adaptation."

▶ *Adaptations are inheritable structures that help a group of organisms survive in their habitat.*

3. Observe other structures and discuss whether or not they are inheritable, & therefore, possible adaptations.
   - ▶ *What are some possible adaptations, or inheritable structures that might help this kind of organism survive in its habitat?*

Discussing Possible Benefits of Behaviors

1. Observe the organism's behaviors.
2. Ask for possible explanations for how a particular behavior might help the organism survive in its habitat.
3. Introduce the concept of behavioral adaptations and adjust the definition of adaptations.
   - ▶ *Inherited behaviors that help a group of organisms to survive in their habitat are also adaptations.*
   - ▶ *So, adaptations are inheritable structures and behaviors that help a group of organisms to survive in their habitat.*
4. Explain: It's hard to know whether a behavior is inheritable or not (instinct vs. learned behaviors).
5. Give examples of uninherited (learned) behaviors and inherited behaviors (instinctual).
6. Ask the group to observe behaviors and discuss whether they are possible adaptations.

Wrapping Up

1. Point out how making possible explanations for how an organisms' structures function is one way scientists learn about the natural world.2.
2. Continue discussing different possible adaptations.
3. Walk & Talk:
   - ▶ *What are some possible structural adaptations you can think of in other organisms?*
   - ▶ *What are some possible behavioral adaptations in other organisms?*
   - ▶ *What are some human structures or behaviors that you don't think are adaptations (inherited and help it survive in its habitat)?*

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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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UNIVERSITY OF CALIFORNIA, BERKELEY

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Principal Investigator and Articulate Beetle: Craig Strang
Project Director, Lead Curriculum & Professional Learning Developer, and Idea Beetle: Kevin Beals
Project Manager, Professional Learning & Curriculum Developer, and Beetle Herder: Jedda Foreman
Curriculum & Professional Learning Developer and Head Fireball: Lynn Barakos
Curriculum & Professional Learning Developer and Champion-Of-All-The-Things: Emilie Lygren
Research and Evaluation Team: Bernadette Chi, Juna Snow, and Valeria Romero
Collaborator, Super Naturalist, Chief Scalawag and Brother-from-Another-Mother: John (Jack) Muir Laws
Project Consultants: Catherine Halversen, Mark Thomas, and Penny Sirota
Advisory Board: Nicole Ardoin, Kathy DiRanna, Bora Simmons, Kathryn Hayes, April Landale, John Muir Laws, Celeste Royer, Jack Shea (emeritus), Drew Talley, & Art Sussman.
Editor: Lincoln Bergman
Designer: Barbara Clinton

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California: YMCA Camp Campbell, Rancho El Chorro Outdoor School, Blue Sky Meadow of Los Angeles County Outdoor Science School, YMCA Point Bonita, Walker Creek Ranch, Santa Cruz County Outdoor Science School, Foothill Horizons Outdoor School, Exploring New Horizons Outdoor Schools, Sierra Nevada Journey's School, San Joaquin Outdoor Education, YMCA Camp Arroyo, Shady Creek Outdoor School, San Mateo Outdoor Education, Walden West Outdoor School, Westminster Woods.

Other locations: Balarat Outdoor Education, CO; Barrier Island Environmental Education Center, SC; Chincoteague Bay Field Station, VA; Eagle Bluff Environmental Learning Center, MN; Great Smokey Mountain Institute at Tremont, TN; Wellfleet Bay Wildlife Sanctuary-Mass Audubon, MA; Mountain Trail Outdoor School, NC; NatureBridge, multiple locations; Nature's Classroom, multiple locations; North Cascade Institute Mountain School, WA; Northbay, MD; Outdoor Education Center at Camp Olympia, TX; The Ecology School, ME; UWSP Treehaven, WI; Wolf Ridge Environmental Learning Center, MN; YMCA Camp Mason Outdoor Center, NJ; and YMCA Erdman, HI.

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To contact BEETLES™, email beetles@berkeley.edu