



Professional Learning Materials

Making Observations

Making focused observations in nature brings us into the moment and into relationship with whatever it is that we are observing. Making observations is also a key foundation for all the methods scientists of all disciplines use to explain and understand the natural world. Offering the opportunities for learners to make observations in nature has numerous benefits—from building a connection to nature and the outdoors, to supporting deep learning, to engaging learners directly in science practices and critical thinking. As outdoor science educators and instructors, we can share strategies that build on learners' existing observation skills and invite learners to make deep observations and form meaningful connections during the course of a program. Learners can carry away and apply these skills in the outdoors, in future academic or learning settings, and in other areas of their lives.

The session is designed to explore different methods and model activities that can strengthen learners' skills in making observations. Participants discuss the benefits of the model activities and approaches and the ways in which they can be used to support an equitable and inclusive learning experience for learners. Participants also reflect on how instructional decisions such as naming organisms and anthropomorphism can influence learners' observations. The session also includes opportunities for instructors to reflect on how they can incorporate universal Indigenous values related to being in relationship and reciprocity with nature. Many field instructors cite the model activity from this session as their most effective teaching tool because it offers an approach for shifting from an instructor-centered teaching approach to a learner-centered and nature-centered learning experience. Many program leaders use *Making Observations* first when facilitating professional learning sessions with instructors.

Goals for the session:

- **To reflect on practices that support making accurate and detailed observations.**
- **To consider how to integrate universal Indigenous values within science education.**
- **To model student activities that can be used to deepen learners' observation skills and nurture engagement, curiosity, wonder, and emotional connections in nature.**
- **To consider how focusing on making observations, asking questions, and making connections can support an equitable and inclusive learning experience.**
- **To provide a forum for discussion of how and when anthropomorphism and identifying organisms affect learners' observations and interactions with nature.**
- **To reflect on how instructional decisions can impact learners' experiences.**
- **To offer opportunities for participants to practice making observations themselves.**

Special Acknowledgments: See pages 2 and 3 for information about our collaboration with Youth Outside and the Center for Native Peoples and the Environment.



ABOUT BEETLES™

BEETLES™ (Better Environmental Education Teaching, Learning, and Expertise Sharing) provides environmental education programs nationally with research-based approaches and tools to continually improve their programs.

www.beetlesproject.org

Lawrence Hall of Science is the public science center of the University of California, Berkeley. www.lawrencehallofscience.org

Special Acknowledgements:

We want to acknowledge Youth Outside (youthoutside.org) for reviewing this session and supporting us to develop more equitable, inclusive, and culturally relevant instructional materials. To learn more about our collaboration with Youth Outside: <http://beetlesproject.org/partnering-to-develop-equitable-activities/>.

We are also grateful for Annie Sorrell and the Center for Native Peoples and the Environment at State University of New York, College of Environmental Science and Forestry for supporting us to incorporate Indigenous perspectives on science and connection to the outdoors into this session and BEETLES approaches generally. To learn more about the Center for Native Peoples and the Environment: <https://www.esf.edu/nativepeoples/>.

BEETLES Team: Craig Strang, Kevin Beals, Jedda Foreman, and Emilie Lygren

Additional Contributors: Emily Arnold, Lynn Barakos, José González, Catherine

Halversen, Valeria Romero, and Emily Weiss

Research Team: Mathew Cannady, Melissa Collins, Rena Dorph, Aparajita Pande, Valeria Romero, and Aujanee Young.

Emeritus: Bernadette Chi, Juna Snow

Project Consultants: John (Jack) Muir Laws, Penny Sirota, and Mark Thomas

Advisory Board: Nicole Ardoin, Kevin Crowley, José González, Maggie Johnston, Celeste Royer, Bora Simmons, and Art Sussman. **Emeritus:** Kathy DiRanna, Kathryn Hayes, April Landale, John (Jack) Muir Laws, Jack Shea, Penny Sirota, Drew Talley, and Mark Thomas

Editor: Trudihope Schlomowitz

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 Journeys, 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 Smoky Mountains Institute at Tremont, TN; Wellfleet Bay Wildlife Sanctuary Mass Audubon, MA; Mountain Trail Outdoor School, NC; NatureBridge (CA, WA, VA); Nature's Classroom (CT, MA, ME, NH, NY, RI); North Cascades 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.

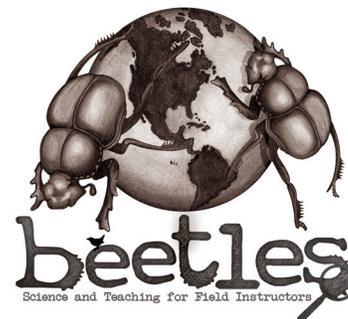
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To contact BEETLES™, email beetles@berkeley.edu



**THE LAWRENCE
HALL OF SCIENCE**
UNIVERSITY OF CALIFORNIA, BERKELEY

Making Observations

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TEACHING ABOUT TEACHING



The presentations in this guide have been designed to “practice what we preach.” This session reflects a learner-centered approach to instruction as participants experience a version of an effective instructional model while they learn about making observations. It’s important to maintain the structure of the session so participants experience observation methods for themselves—before discussing the implications for instructing students. Resist the temptation to provide a lot of information too early in the session. Simply *telling* instructors about observations goes against the whole idea—participants will gain much more from a meaning-making experience where they engage in, discuss, and process this important pedagogical topic for themselves.

PRESENTATION OPTION



Want to spend more time outdoors than in? This whole session can be done outdoors. Some slides can be skipped outdoors, but other text is important. You and your co-presenter can take turns writing text from slides on whiteboards and/or printing some out, using black font on white background on as large sheets as possible. You may want to put the sheets in plastic page protectors.

TIMING TIP



Keep things moving. The prompts provided in the session are purposefully designed to generate productive and interesting conversations, but interesting discussions can make it challenging to stay within the estimated time frame. You may need to gently limit some of the discussion, then pick up on the topic at another time, perhaps after staff has had some experience applying the teaching strategies.

SESSION OVERVIEW

	Making Observations	Activity Locations	Estimated Time
Invitation	<p>Introducing Making Observations The theme for the session is established with the guiding question: <i>How can we help learners make careful observations while encouraging wonder and curiosity?</i> The idea that making observations is a <i>skill</i> that can be developed is emphasized.</p>		10 minutes
Exploration	<p>Modeling Sensory Activities Participants reflect on their relationship with and impacts on the outdoors and then take part in a series of quick sensory activities involving sound, touch, smell, vision, different perspectives, getting down low, and hand lenses.</p>		30 minutes
Concept Invention	<p>Modeling I Notice, I Wonder, It Reminds Me Of Participants are engaged in this key model student activity that helps build “minds-on” observation skills.</p>		40 minutes
	<p>Debriefing I Notice, I Wonder, It Reminds Me Of The group thoroughly discusses the many benefits of the model activity, including why it is important for learning and how it can be used to support an equitable and inclusive experience for learners.</p>		35 minutes
	<p>Discussing Choices for Encouraging Learner Observations Participants discuss how and when anthropomorphism and identifying organisms can be beneficial or detrimental to learners’ observations and interactions with nature.</p>		45 minutes
Application/Reflection	<p>Wrapping Up and Reflecting Using a handout of activities and ideas from the session, participants plan how they might integrate them into their instructional practice. Participants conclude by writing in their journals about observation strategies to use with learners and the benefits of teaching observation skills.</p>		20 minutes
	TOTAL:		3+ hours (180+ minutes)

PREPARATION

Before the day of the session:

- 1. Prepare to present.** Choose who will present each part of the session (see Step 3 below for information about model student activities). Consider including staff who have already experienced the session. To prepare to present, read through the session write-up, slides, handouts, sidebars, and Background Information for Presenters (page 45). The more each presenter is able to “own” the session, the better the presentation will be. Write notes on a printed version of the session or however you prefer. If you choose to present the whole session outdoors, make large copies of slides and/or print half-page copies for yourself to refer to the information on them or write it on whiteboards.
- 2. Set up a projection system/review multimedia.** Set up and test the projection system to be sure participants will be able to see items projected during the session.
- 3. Read and familiarize yourself with the *I Notice, I Wonder, It Reminds Me Of* student activity guide; assess your ability to lead the activity.** Choose the staff member who is most experienced in successfully leading this activity with learners to lead this part. The main body of that write-up is embedded in this *Making Observations* write-up. If you will be teaching the activity using the embedded write-up, we suggest you read through the separate BEETLES activity write-up for *I Notice, I Wonder, It Reminds Me Of*, particularly the Instructor Support section, and take notes on the embedded write-up included here.
- 4. Identify outdoor areas for model activities.** Any kind of outdoor area that is nearby will work. Consider local hazards and make adjustments as needed. An area with a lot of leaves from one kind of tree works well for introducing the prompts “I notice...,” “I wonder...,” “It reminds me of...” (bring leaves inside in case of severe weather). For the “Applying the Practice and Inquiry Fever” phase of the activity (beginning on page 18), choose an area rich with intriguing stuff to find quickly such as insects, spiders, lichen, acorns, etc. In the case of severe weather, use a collection of natural objects inside.
- 5. Make sure participants are prepared.** Make sure participants bring the gear they need to be comfortable outdoors. Tell them to bring their journals and something to write with.
- 6. Make copies of handouts.** See list at right.
- 7. Plan when you might include a break in the schedule.** We recommend after modeling *I Notice, I Wonder, It Reminds Me Of*.
- 8. (Optional) Make Session Overview to post on wall.** You may choose to make a Session Overview to post on the wall during this session. Some presenters and participants prefer having it so they can see the trajectory of the session.

MATERIALS

For the group:

- projection system and computer
- slides
- a few index cards
- optional: Session Overview to post on wall
- optional: small nets and cups for participants to use to catch organisms

For each participant:

- 1 hand lens (optional, but *highly* recommended)
- journal and pen/pencil

Handouts:

- Choices for Encouraging Learner Observations*, 1 per participant (page 39)
- The Benefits of I Notice, I Wonder, It Reminds Me Of*, 1 per participant (to distribute at the end of the session) (page 40)
- Activities and Main Ideas*, 1 per participant (page 41)
- optional: *A Whole Bunch of Quotes Related to Making Observations*, 1 per participant (pages 42–44)
- optional: *I Notice, I Wonder, It Reminds Me Of* student activity guide (available at beetlesproject.org)

YOU ARE HERE:



10 minutes



TEACHING NOTES

← Introducing Making Observations

1. **Gather participants in a circle outdoors in view of a tree and introduce the session.**
 - a. Gather participants in a circle.
 - b. Welcome participants. Make sure everyone is ready to begin and has the gear they need to be comfortable during the outdoor experiences.
 - c. Share: The session is titled *Making Observations*.
 - d. Share: Anyone can make observations, using any senses.
2. **Point out a nearby tree and ask participants how they think their learners might respond if asked, “What do you notice about that tree?”**
 - Invite a few participants to share their ideas and listen to responses.
3. **Share that making observations is a set of skills that everyone has and a set of skills everyone can improve on and develop.**
 - a. Everyone has observation skills—and everyone can also practice, deepen, and improve their observation skills.
 - b. As field instructors, we can always improve our own observation skills, too.
4. **Invite participants to *Pair-Share* the session’s guiding question for ~2 minutes: *How can we help learners make careful observations while encouraging wonder and curiosity?***
 - a. Share: This will be our guiding question for the session.
 - b. Ask pairs to discuss the guiding question for ~2 minutes.
 - c. Ask two or three volunteers to share out with the whole group.
5. **Share that coaching and scaffolding can invite learners to make deep observations:**
 - a. When you ask learners to share what they notice about a tree, you may get a range of answers from specific observations to: *It looks like a tree.*
 - b. In this session, we’ll be looking at how to offer specific scaffolding and strategies that learners (and ourselves!) can call on to make more careful, accurate, detailed, and respectful observations.
6. **Share that offering learners specific strategies for making observations can enhance the way they experience the world:**
 - a. Telling people to “look carefully” or “look hard” is generally too vague to be helpful.
 - b. We can offer specific strategies that learners can use to learn *how* to observe more deeply that build on their existing observation skills.
 - c. A field activity with learners can be a perfect opportunity to learn and practice observation skills
 - d. Developing this skill can affect the way you and your learners experience the world.

7. Briefly share the session overview:

- a. In a minute, we'll consider our own individual relationships with and impacts on nature.
- b. Then, we'll take part in and compare two different types of observation activities: sensory focused and thinking focused.
- c. We'll discuss the benefits of the thinking-focused activity and how the activity can be used to support an equitable and inclusive learning experience.
- d. Later, we'll discuss how our instructional choices about anthropomorphism and naming and identifying organisms influence learner curiosity and observations.

8. Share two aspects of making observations: sensory focused and thinking focused:

- a. There are two important aspects of observing that we can encourage:
 - What our bodies are doing (sensory).
 - What our minds are doing (thinking).
- b. First, we'll explore how to invite learners to fully engage their senses in observation. Then, we'll look at how to actively engage their minds in observation.

Modeling Sensory Activities**1. Say that the group will be moving pretty quickly through a smörgåsbord of commonly used sensory activities:**

- a. There are many sensory-focused observation activities.
- b. In a moment, we will move through a quick smörgåsbord of some of them.

2. Invite participants to think about how experiencing each activity affects them as learners:

- a. As field instructors, you might be familiar with some of these activities.
- b. Try to notice how experiencing them affects you as a learner.

3. Ask participants to behave as adults during the activity:

- a. You'll be participating as adults, following your own curiosity, and discussing discoveries and ideas at your own level.
- b. The leader will be modeling how to lead the activities with learners.
- c. Please support the leader and don't take discussions too far off topic.
- d. Imagining how your learners might respond is helpful. Acting out imagined disruptive learner behaviors is not helpful.
- e. There will be some questions that might seem obvious to you that are designed for learners.

TEACHING NOTES**YOU ARE HERE:**

30 minutes



How should participants behave during model activities? Some leaders ask participants to behave like children during model activities. We've found this often leads to exaggerated parodies of learner behavior, and the modeling suffers (or is ruined). Instead, invite them to participate as adults, but to imagine how learners would respond.

TEACHING NOTES

Collaboration with the Center for Native Peoples and the Environment. Annie Sorrell and the Center for Native Peoples and the Environment (at the State University of New York, College of Environmental Science and Forestry) supported us to incorporate Indigenous perspectives on science and connection to the outdoors into this session and to BEETLES approaches generally. To learn more about the Center for Native Peoples and the Environment (<https://www.esf.edu/nativepeoples/>).

Cultural appropriation. “The unacknowledged or inappropriate adoption of the customs, practices, ideas, etc. of one people or society by members of another and typically more dominant people or society.” —Lexico, US Dictionary (See page 53 for more on this topic.)

Acknowledging the impacts of colonialism. Many outdoor programs begin their activities with a land acknowledgement as a way of recognizing the Indigenous people from whom the land they are on was taken. In a land acknowledgment, recognize that the Indigenous people were forcibly removed. Include present-tense language to recognize that Indigenous communities continue to exist and have a relationship with the land and waters in your area. This is one way of combating the invisibility many Indigenous people continue to experience and acknowledging the legacy and impact of colonialism on their people—and is only a starting point. A land acknowledgment alone is not enough. We invite you to consider how your organization can build authentic relationships with local Indigenous communities, form mutually beneficial partnerships, and take action in support of Indigenous communities. This website (<https://native-land.ca/territory-acknowledgement/>) and the resources referenced in Background Information for Presenters offer more guidance on crafting a land acknowledgment.

4. **Invite participants to consider their role as educators in relationship with the place they are in.**
 - a. Before we begin our sensory activities, we want to take a moment to reflect on our role as educators and our relationship with this place.
 - b. As environmental and outdoor science educators, we have the opportunity to engage youth with nature and the outdoors in meaningful ways.
 - c. This opportunity comes with a responsibility to examine our relationship to the world in which we live and to learn from the local Indigenous communities who live and have lived here long before us.
5. **Share that the session will include Indigenous perspectives and knowledge about being in relationship with the outdoors:**
 - a. It is a complex and worthy instructional goal to incorporate Indigenous perspectives alongside scientific perspectives while respecting learners’ own spiritual beliefs and without engaging in cultural appropriation.
 - b. We can invite our learners to develop meaningful relationships with living beings (human and nonhuman), with one another, and with the environment.
 - c. Deepening our awareness of Indigenous perspectives can enrich our observations and interactions with gratitude and reciprocity.
 - d. Indigenous knowledge can also enhance scientific perspectives.
 - e. This session incorporates some universal Indigenous values and perspectives that enhance observation skills and offer ways for learners to build a thoughtful and holistic relationship with nature.
6. **Invite participants to consider how they can infuse the values of gratitude, reciprocity, and relationship while making their observations. Share:**
 - a. I invite you to face outward from the circle and look at, listen to, smell, or touch the land (and/or water) around us.
 - b. There’s so much we can learn about our surroundings through careful observation.
 - c. Our observations can be enhanced if we consider the universal Indigenous values of respect, responsibility, and reciprocity as we observe.
 - d. As we make observations, we’re going to be interacting with the land, air, water, and living things here.
 - e. It’s important to think about how we treat nature and the outdoors as we are making observations.
 - f. Think for a moment about how you might express gratitude and reciprocity as you make your observations.



7. Invite participants to think about the kind of relationship and interactions they'd like to have with this place. Share:

- a. Let's try to be respectful as we observe and interact with this place. Being respectful is a way of giving back.
- b. Consider how your actions may affect this place.
- c. Think about practices your culture, family, or ancestors have or had for interacting with the outdoors in respectful ways and if there are any of those practices you would like to call on today.
- d. Think to yourself in silence for a moment about what kind of relationship and interactions you want to have with this place while you're here and in your future.

8. Share that the group will now begin sensory activities:

- a. We'll now begin our sensory activities.
- b. With learners, you would probably spend more time on each of these activities and spread them out, doing just one or two at a time.
- c. To be efficient, right now we'll do the activities pretty quickly, one after the other.
- d. These sensory activities are not written up as a BEETLES student activity. They are collected from various sources. Some may be familiar to you.

9. Share Mary Oliver and Robin Wall Kimmerer quotes about our "work" during the activities:

- a. Here's a quote from the North American poet Mary Oliver to help us focus during these activities:

"Instructions for live a life:

Pay attention.

Be astonished.

Tell about it."

- b. Robin Wall Kimmerer, a botanist, professor, and author, also says about giving back to nature: *"The least we can do in return is to pay attention."*

10. Ask participants to focus on listening:

- a. Okay, you know what your work is now. Let's pay attention, be awake, utterly conscious, and prepare to be astonished!
- b. Close your eyes and be silent (or keep them open, if that is more comfortable for you).
- c. Hold up a finger for each different sound you hear.
- d. Focus on each sound, one at a time. What do you notice about each sound? Is it high? Low? Loud? Long? Short? Is it one sound or a combination of sounds?

TEACHING NOTES

Thinking about impacts on one another. You can also invite participants to think about how their actions may impact people in the group and about the kind of relationship they'd like to have with the group.

These sensory activities are not written up as a BEETLES student activity. Rather, they are culled from various sources. Many of them may be familiar to you already. The steps in the blue boxes on this page through page 13 indicate where the model student activities begin and end.

Sources of the activity. The sensory activities in this section are inspired by a variety of influences that can be found on pages 59–61 of Background Information for Presenters.

TEACHING NOTES

Timing. These sensory activities could be done for hours, but to get to other important parts of the session, use the prompts in quick succession and don't spend too much time taking in participant feedback. These activities are just to give participants a quick taste of some of the possibilities they can look into later.

- e. Now try listening as a musician would. Listen to the sounds as if they were music. Notice the blend of sounds, the spaces between sounds, and the patterns they form. Notice the beauty of the sounds together.
- f. Open your eyes. Next is a strategy that copies what mammals with big ears do to listen.
- g. Cup your hands behind your ears and push them forward in the direction of sounds you want to focus on. Cup your hands in front of your ears to focus on sounds behind you.

11. Give the following directions to help participants focus on touch:

- a. Close your eyes again (if that is comfortable for you).
- b. Notice what you feel in your feet. Legs. Arms. Head.
- c. What does the air feel like against your skin? In your nostrils as you breathe?
- d. Can you feel the sun? If so, where do you feel it?
- e. How does the ground feel beneath your feet? Soft or hard?
- f. Open your eyes and pick up something nearby. Notice its texture, temperature, smoothness or roughness—notice everything you can through touch.
- g. What does it feel like against your arm, neck, cheek?
- h. Choose a very different object and do the same, comparing it with the feel of the first object.

12. Now ask participants to focus on smell:

- a. Can you smell anything in the air?
- b. Does the smell bring up any memories?
- c. Can you notice temperature and humidity differences by smelling?
- d. Check out the smells of some nearby objects. You may choose to crush part of a leaf to smell it.
- e. If you choose to do this, just pick one leaf from each type of plant and only if there are many other leaves of this type in the area.

13. Give the following directions to help participants focus on vision:

- a. Focus on just the colors around you. Notice all the different variations in browns, greens, etc.
- b. Now, try to ignore the colors and focus on the shadows and light around you, like in a black-and-white photo.
- c. Next is another strategy used by people to spot other animals and used by many animals to spot danger. Some call it Owl Eyes.
- d. Don't focus on anything. Instead, try to look at everything in front of you at the same time.
- e. Once you notice motion, then focus on the moving object.

14. Ask for a few additional prompts from participants.

- Ask if a couple of participants want to add any brief sensory/ observation prompts.

15. Share that by intentionally using your senses in different ways, you tend to notice more:

- You notice much more in nature if you intentionally use senses in different ways.
- You can do this by focusing on one particular sense or by using multiple senses.

16. Share that you can also improve your observations by shifting perspectives, or looking at something from a different point of view.**17. Share the following directions to have participants observe a tree from as many different perspectives as possible:**

- Notice that tree. Looking at a tree from a distance is one perspective to observe a tree.
- Look down at the ground and take a few paces or move toward the tree. Now, lift your head and look at the tree again. Keep repeating this until you arrive at the trunk.
- Look up closely at the bark for an “ant’s-eye view.”
- You can expand the amount of things that you notice by trying out different perspectives.
- Now, try to observe this tree from as many different perspectives as possible.
- If you are inspired by different perspectives you notice other folks using, try them out for yourself.

18. Distribute hand lenses. (If you don’t have hand lenses, skip Steps 18–24.)

- Ask participants to hang the hand lenses around their necks until the field experience is over.
- While the hand lenses are being distributed, invite participants to look at their fingerprints through the hand lens and compare them with others’ fingerprints.

19. Participants practice finding the sweet spot with their hand lenses, focusing on their fingerprints. Share:

- To use a hand lens, put the lens up against your eye and get close to whatever you are looking at.
- Practice finding the sweet spot—the position of the lens between your eye and the object where the object comes into perfect focus. (You might tell them to say, “Whoa!” when they find the sweet spot.)
- Don’t try to use a hand lens by holding it out at arm’s length (demonstrate) or trying to look at something on the ground while standing—hand lenses don’t work well that way.
- Find the sweet spot while looking at your hands, fingertips, hair, etc.

Hand Lens Introduction write-up and video. See the BEETLES student activity *Hand Lens Introduction* for more guidance on introducing and using hand lenses with learners.

20. Model how to share hand lens fire safety rules:

- a. I'm going to model how to do a hand lens fire safety introduction, with a serious tone, as I would do with learners.
- b. You are never to use the hand lenses to focus sunlight.
- c. Using a hand lens to focus sunlight is dangerous and can result in wildfires that can damage property, forests, animals, and people.
- d. If anyone does this, they will immediately lose their opportunity to use a hand lens.

21. Model how to use a hand lens to look at something small in nature: hold lens up to eye and move head until object is in focus.

- a. With something small and interesting from nature, such as a leaf or piece of lichen, model putting the lens close to your eye and then slowly moving your head and the lens close to the object until it's in focus.
- b. Show some excitement when the object comes into focus for you. For example: "Dang, that looks cool! I can see the veins on this leaf. They look like tiny streams running into each other!"

22. Invite participants to make observations of natural objects out loud with hand lenses for ~1 minute:

- a. Use your hand lenses to check out different things in nature right here.
- b. Say out loud what you are noticing as you look closely at something. (It should sound like a cacophony of "I notice this!" "I notice that!")

23. Get participants' attention and share the following Todd Newberry quote and why it's important to slow down, get down, and observe closely:

- a. Todd Newberry is a former University of California, Santa Cruz professor known for his ability to teach observation skills.
- b. Once, after observing a class of elementary school learners on an intertidal field trip who were all standing upright in the intertidal, he said:

"They drove 150 miles to the intertidal, but they didn't go the last four feet. In order to observe anything in the tidepools, you have to put your feet in the lowest place they can go, and then put your face down where your feet are." —Todd Newberry

- c. We can remind ourselves and our learners to [leader model this] slow down, get down, and look closely.
- d. This can lead to observations we may not have made otherwise. It can open up some surprising and wild worlds! [Leader model saying some up-close observations out loud.]
- e. One of the great things about hand lenses is that to use them, you've got to get down or up close. They inspire learners to get down close.
- f. They are a technology that brings people closer to nature. They open up worlds that you cannot enter any other way!



24. Share that participants will have an opportunity to wander and observe whatever they're drawn to in the area:

- a. You'll have a few minutes to wander around this area, using your senses to explore wherever and whatever your body feels drawn to explore.
- b. You might notice something with your eyes and then feel it's texture. Then, maybe you will get inspired to feel other things around you.
- c. Follow your impulses and check out whatever you find interesting.
- d. Feel free to use your hand lens.

25. Lead a short debrief discussion about the sensory activities.

- a. Gather everyone in a circle.
- b. For ~1 minute, tell people to turn and talk to a person next to them about specific interesting things they observed during the sensory activities.
- c. Get the whole group's attention and ask:
 - ▶ *What is the value in doing sensory activities like these with learners?*
- d. Listen to their ideas and ask follow-up questions, as appropriate.
- e. If no one brings it up, share that these types of sensory activities represent practices that have been used for hundreds or thousands of years by Indigenous people, western scientists and naturalists, and animals to understand the natural world.

26. Lead a short debrief discussion about participants' ideas about their relationship with the land.

- a. Ask:
 - ▶ *Would anybody like to share anything about how they were choosing to interact with the land (and/or water) around us during these exercises?*
- b. Listen to participants' ideas and ask follow-up questions, as appropriate.
- c. Mention any of the following suggestions, if the group doesn't bring them up:
 - As much as possible, show respect and leave things as we found them.
 - Never take the first. Never take the last.
 - Only use what we need to help us learn.
 - Leave some for others.
 - Be appreciative of the opportunity to learn from nature and do our best not to damage the land as we learn.
 - We'll be learning from nature and the outdoors. What can we do to give back?

Honorable Harvest. These suggestions include some elements from the Honorable Harvest, shared by Robin Wall Kimmerer. Learn more about the Honorable Harvest in the "Picking Sweetgrass" chapter of Robin's book *Braiding Sweetgrass: Indigenous Wisdom, Scientific Knowledge and the Teaching of Plants*.

TEACHING NOTES

YOU ARE HERE:



40 minutes



Asking “What will you miss about this place?” Annie Sorrell from the Center for Native Peoples and the Environment asks participants to reflect on the question *What will you miss about this place?* Participants typically share different answers. Listening to one another’s responses can deepen appreciation for the place. This question can also be a way to build connection to a place and begin conversations about the impacts of colonization on the landscape. Another question Annie offers to Indigenous participants is *What do you miss about the old scene?* This offers participants the opportunity to reflect on their connection to their ancestral homelands.

More about “Appreciation Breaks.” Emilie Lygren, naturalist, instructor, author, and BEETLES team member likes to use “Appreciation Breaks” (aka “Beauty Breaks”) to remind her learners to slow down and appreciate the moment. During field experiences, she has learners call out “Stop sign!” or “Beauty Break!” to signal the group to pause for a moment, look around, and find something that is beautiful to them. Others have since adopted the practice, sometimes using the callout of “Appreciation Break.” It can be used for one person to point out something they find beautiful for the whole group or as a signal for everyone in the group to then find something beautiful to share with someone else.

27. Share that there are many great sensory activities and segue to the next activity.

- a. There are many great sensory activities and prompts out there, and we’ve only experienced a few.
- b. We’ll spend more time focusing on a different aspect of observation in this next activity.

Modeling *I Notice, I Wonder, It Reminds Me Of*

1. Pairs share how they might invite learners into doing sensory activities as the group moves to the next location.

- a. Move the group to a different nearby area for a change of scene.
- b. As participants move to the next location, invite them to share with a partner strategies for how they might invite learners into doing sensory activities.

2. Pause for an “Appreciation Break.”

- a. Along the way, pause the group briefly for an “Appreciation Break.”
- b. Ask partners to stop and point out or share something around them that they find beautiful.
- c. Offer the idea that aesthetic appreciation is another way to observe and interact with nature and the outdoors.
- d. Continue with the group to your location for *I Notice, I Wonder, It Reminds Me Of* and invite participants to continue discussing how they would engage learners in sensory activities.

3. Introduce John Muir Laws:

- a. John Muir Laws is a naturalist, artist, and author of innovative field guides who also teaches about observation skills.
- b. The following activity, designed to encourage deep observations, is the backbone of both his field work and his teaching—and one that he has shared with BEETLES (and with you).
- c. The earlier activities were sensory focused. This activity is a strategy for engaging learners in observations in a different way than the activities shown so far, a way that is more thinking focused.

4. Lead the student activity *I Notice, I Wonder, It Reminds Me Of*:

- Use the student activity lesson embedded here—starting with “Why Observe?”—to model this routine with your participants, as closely as possible to the way it would be done with learners.



Why Observe?

1. Ask learners: “Who are some amazing observers and what makes them good observers?”

- Ask learners if they have ever known or heard of individuals or jobs in books, movies, other media, or in their lives who were really good at noticing things and making observations.
- Examples might include a peer, a family member, people with a certain kind of job (e.g., coaches, engineers, detectives, trackers, writers), or historical figures such as Helen Keller or Harriet Tubman.
- Ask learners to share why they think these individuals are good observers.
- Listen to their responses and encourage discussion.

2. Share one or both of the quotes below and invite learners to share or explain what the quote means to them.

- Read out loud or give a learner a card and have them read:

▶ *“I see no more than you, but I have trained myself to notice what I see.”*
—Sherlock Holmes, as written by Sir Arthur Conan Doyle, from *The Adventure of the Blanched Soldier*

Or:

▶ *“She knew because she looked.”* —Zora Neale Hurston, author and filmmaker

3. Share that you will offer some tools that learners can use to improve or build on their observation skills.

- During this activity, you will focus on improving or building on your observation skills.
- You will learn strategies that can change the way you experience the world. You can learn to be better observers.

Making Observations (I notice...)

1. Invite learners to find a natural object, such as leaves of the same type, and then sit or stand in a circle.

2. Offer a definition for *observation* and introduce the first prompt: “I notice...”

- Share that learners will practice making observations first.
- Offer a definition for *observation* and clarify what kinds of statements are not observations.
 - ▶ *An observation is something we notice with our senses of sight, touch, smell, hearing, or taste—(but don’t taste anything unless you are told it’s okay!).*
 - ▶ *I know I’m making an observation when I begin a sentence with the words “I notice” and then say something that describes what I see, touch, smell, hear, or taste.*

TEACHING NOTES

The student activity *I Notice, I Wonder, It Reminds Me Of* has been embedded in this professional learning session for your convenience. In this section, session participants are referred to as learners in order to help you identify the parts that are taken directly from the student activity. The blue boxes (on this page through page 20) differentiate the student activity from the rest of the write-up. View the full student activity write-up at: <http://beetlesproject.org/resources/for-field-instructors/notice-wonder-reminds/>.

Keep it interesting. Pay attention to the mood of your group and don’t allow your introduction to the activity to become a chore. The main purpose of the activity is for learners to engage with nature, and some groups will need to go at a faster pace. The main goal should be to find something that is interesting and support learners in their curiosity about exploring it. Listen to learners’ ideas and pursue interesting threads of conversation. Avoid sharing information during this process, unless it’s something that will lead learners to more observations and questions. Try to keep the experience focused on discovery through direct learner–nature interactions or learner interactions.

TEACHING NOTES

Why use leaves? Even though leaves might sound like a boring object to observe, leaves have lots of interesting variations in shape and structure, color, and evidence of organisms eating them. Focusing learners on common objects such as leaves also centers the learning on a part of nature that learners will continue to have contact with in their lives. This contrasts the exclusionary narrative that nature is only found in pristine wilderness or is something learners must go to, as opposed to something that is always around them.

Why use leaves of the same type? When all learners observe leaves from the same type of tree, the group sharing can be more collaborative and interesting as learners make comparisons between what they've observed. Still, almost any natural object will work for this activity.

Listening and responding to learners. How you respond to learners' observations and comments matters. Create a culture in which learners feel safe sharing ideas by frequently asking broad questions that have multiple acceptable responses and by giving all learners neutral, accepting responses to your questions. When we react to learners' responses to broad questions by showing a preference for some responses over others (e.g., *Yes, that's right.* Or *No, but keep thinking.*), we're sending the message that only some learners' thinking is acceptable. When we give neutral, accepting responses (e.g., *Hmm . . . interesting. Can you say more?* Or *Thank you for sharing. What do others have to say?*), we encourage a group culture of participation and sharing.

- ▶ *Observations are what you notice in the moment, not what you already know. Saying, "I notice it's a leaf" is identification—not an observation.*
- ▶ *Saying, "It looks awesome" or "I notice it's gross" is your opinion—not an observation.*
- ▶ *Saying, "I notice the leaf has been eaten by bugs" isn't an observation because I didn't see any bugs eating the leaf. I just observed the holes. Saying, "The leaf has been eaten by bugs" is a possible explanation for how the holes got there, not an observation.*

3. Offer some examples of observations:

- ▶ *Here are some examples of observations: "I notice this is yellowish-green in color, oval-shaped, and about the size of my thumb; it's rough in some places and smooth in others."*
- ▶ *If you run out of things to say, try saying, "I notice..." and see what comes out of your mouth. Try observing your object from different perspectives or using different senses. Listen to what others are saying and see if that helps you notice different things.*

4. Explain that learners will be sharing observations out loud and taking turns with a partner. Offer suggestions for what learners can do if they feel stuck.

- a. Give learners a moment to partner up with someone standing near them in a circle.
- b. Share that if learners feel stuck and run out of observations, they can try observing their object in a new way, like flipping it over, putting it next to something else, or using different senses.
- c. Share that learners can also listen to what their partner says and see if that helps them notice different things.

5. Give learners ~1 minute to make observations about their objects out loud with their partners and then call for everyone's attention.

6. Invite pairs to share their observations with a neighboring pair and then with the whole group.

- a. Ask pairs of learners to share a few observations with a neighboring pair.
- b. Then, call on a few individual learners to share with the whole group what they noticed.
- c. If learners are stating opinions or making identifications, gently remind them that they shared an opinion or identified something they already know. Remind them to focus on observations and, as it seems appropriate, help them reframe/create a new observation.

7. Instructor role: Monitor learners' energy and keep things moving.

- a. Keep the energy up when learners are sharing in the large group. You don't need to hear from every learner or follow up on every idea shared.



- b. While many learners may want to share their ideas, they'll get a lot of practice using the language by themselves and with partners.
- c. The group will stay engaged and excited if you move on before they get restless.

Asking Questions (I wonder...)

1. **Offer the second prompt—"I wonder..."—as a tool for asking questions.**
 - a. Share that now learners will ask questions out loud about their objects.
 - b. Share that learners will use the sentence starter "I wonder..." to ask questions.
 - c. Offer the idea that learners can ask a question about one of their observations if they feel stuck.
2. **Learners ask questions out loud in pairs for ~1 minute.**
 - a. Give learners about 1 minute to ask questions in pairs.
 - b. Then, call for the group's attention.
3. **Invite a few learners to share questions with the whole group.**
 - a. Invite a few learners to share some of their most interesting questions with the whole group.
 - b. If it makes sense for your group, you can first invite pairs to share a few questions with a neighboring pair before they share with the whole group.

Making Connections (It reminds me of...)

1. **Offer the last prompt—"It reminds me of..."—and share that learners can use it to describe what the object looks like, connect to an experience or memory, or share information they already know.**
 - a. Share that learners have one more tool to practice that helps make connections to things they already know: "It reminds me of..."
 - b. The object can remind them of something it looks like, an experience they have had, or information they already know.
 - c. Share that it can be useful to focus on one part of the object, such as the edge of a leaf, the petal of a flower, the shaft of a feather, or the bottom of an insect's abdomen.
 - d. Offer examples of different kinds of "It reminds me of..." statements so learners get the idea. For example:
 - ▶ *The veins on this leaf remind me of the lines on my palm.*
 - ▶ *This leaf reminds me of the time I collected leaves at my grandmother's house.*
 - ▶ *My leaf reminds me of a TV show about uses for native plants.*

Don't be too strict about the format. Learners may come up with "I notice..." statements during the "I wonder..." time because they noticed something new or their question inspired an observation. That's good stuff! Don't be strict about the categories. Engaged learner observation is always a good thing.

TEACHING NOTES

What does this remind you of? This question asks learners to make connections between what they are observing and their own lived experiences, and it brings their voices into the learning conversation. It's also an opportunity for the instructor to hear learners' thoughts and perspectives, to build a deeper understanding of learners' thoughts, and to become more responsive. This also supports learners' social and emotional learning by offering opportunities to share, listen to, and understand one another's perspectives and see the value in listening to one another's perspectives.

Creating "inquiry fever." Inquiry fever happens when a group of learners is enthusiastically investigating nature and feeding off one another's discoveries, ideas, and excitement. *I Notice, I Wonder, It Reminds Me Of* is designed to set up learners with an inquiry mindset and skills. Add two other ingredients and your learners can catch the fever. The three ingredients for inquiry fever are: inquiry mindset and skills, permission and encouragement, and interesting stuff or ideas to explore.

2. **Invite learners to say "It reminds me of..." statements out loud for ~1 minute.**
 - a. Challenge learners to come up with and say out loud in pairs as many "It reminds me of..." statements about their objects as possible.
 - b. After about 1 minute, get the group's attention.
3. **Invite a few learners to share with the whole group.**
 - a. Invite learners to share some interesting connections, first with a neighbor (if time permits) and then with the whole group.

Applying the Practice and Inquiry Fever

1. **Invite learners to think about how much they can discover in nature.**
 - a. Ask learners to look at their leaves/objects.
 - b. Invite learners to notice how much they learned in a short time about one leaf. Then, invite them to look around at how much more there is to discover in nature.
2. **Share the George Washington Carver quote:**
 - ▶ *"Reading about nature is fine, but if a [person] walks in the woods and listens carefully, they learn more than what is in books."* —George Washington Carver, plant scientist, farmer, and inventor
3. **Learners search for anything they find interesting in nature and then make observations, ask questions, and make connections out loud.**
 - a. Encourage learners to hold onto the mindset they now have and to get ready to use it some more.
 - b. Let them know they will have the opportunity to look for anything they find interesting and then use the observation routine they just practiced to learn about what they are interested in.
4. **Share the boundaries for "inquiry fever" (optional: share materials such as cups and nets) and then invite learners to practice skills in the area in pairs or in small groups.**
 - a. Ask learners if they are excited about having these strategies for exploring nature and if they think they can use these methods to learn about living things and other parts of nature.
 - b. Take learners to a nearby area rich for exploration, establish boundaries, and send them out to explore.
 - c. Share that learners can explore in pairs or in small groups.
 - d. Encourage learners to use these tools and talk to and learn from one another.
 - e. Give learners at least 5–10 minutes so they can find and engage with something that interests them.
 - f. (Optional) Offer tools such as cups, bug boxes, nets, or hand lenses to enrich their exploration experiences.



5. **Give learners at least 5–10 minutes to explore. Circulate and model the strategies. Help learners engage with their discoveries and with other learners.**
 - a. Help learners who may be disengaged by temporarily partnering with them or drawing their attention to something interesting.
 - b. Try to engage learners with one another's discoveries.
 - c. Model how to make discoveries and use observational and questioning language as you explore and connect with the environment.
6. **Facilitate the whole group to practice the strategies together with something interesting.**
 - a. At the site of something particularly cool or easy to see, call the whole group over.
 - b. Give learners the opportunity to make observations, ask questions, and come up with connections out loud—but one at a time instead of all at once.
 - c. Challenge learners to find out as much as possible as a group—and keep the discussion moving.

Wrapping Up

1. **Ask learners to *Turn & Share* about one or two of the following questions:**
 - ▶ *What surprised you?*
 - ▶ *Are there any skills you got better at during this activity? What did you do to develop these skills?*
 - ▶ *Is there anywhere near your home or school where you would be excited to use your observation skills to learn and explore?*
 - ▶ *How is your connection to this land now, after these activities?*
2. **Invite learners to reflect on how they've learned to be better observers, all they noticed, and how there are interesting things everywhere.**
 - a. Do they feel like better observers now? Why or why not?
 - b. Offer the idea that even the simplest parts of nature, like a leaf, can become exciting if they take the time to really observe it.
 - c. Invite learners to notice that everything in the ecosystem has a sophisticated role, and everything—living and nonliving—has a part to play.
3. **Share Okute Sica quote.**
 - a. Share a quote from Okute Sica, a historian of Lakota culture:
 - ▶ *"From my boyhood, I have observed leaves, trees, and grass, and I have never found two alike. They may have a general likeness, but on examination, I have found that they differ slightly. It is the same with animals... it is the same with human beings..."*

TEACHING NOTES

Internalizing the process. Encouraging learners to use the prompts "I notice...", "I wonder...", "It reminds me of..." to explore things they find in nature throughout your field experience will help them internalize the language and routine. This practice with exploring independently helps learners build their investigation skills so they're more likely to keep exploring when they're on their own without an instructor inviting them to engage with nature.

Observing as if it's the first or last time. You may need to encourage learners to observe more deeply. Ask them to imagine that they've never seen an object or organism like this, or that this is the last time they'll ever see it. They will need to take in as much as they can (this is a technique the author and environmentalist Rachel Carson used). Or, challenge learners to come up with an observation no one else in the group has made. If it's something they are familiar with, challenge learners to come up with something they've never noticed before.

MAKING OBSERVATIONS

TEACHING NOTES

4. **Encourage learners to approach nature with curiosity and humility. Share:**
 - a. We are surrounded by leaves, twigs, and rocks, and each is interesting.
 - b. I'd like to invite you to approach everything in nature with a similar curiosity and humility.
 - c. We can't spend quality time with every leaf, but we can do it now and then with things that we find interesting we might not notice or pay attention to otherwise.
5. **Invite learners to think about how to use these strategies in the future and offer some ideas about how the group can continue to learn together:**
 - a. Ask the group how they can use these skills in nature, here at this site or at home.
 - b. Share that whenever the group finds anything cool, they can all observe, ask questions, and make connections so they can learn as a group.
 - c. You might want to come up with a phrase or code word you or a learner can use to signal that there's something to check out. When anyone hears the code word, they know they can use these observation tools.
 - d. Share that even if there's only a brief sighting of an organism, such as a snake slithering away or a hawk flying by, saying observations out loud will help the whole group notice more and remember the experience.

YOU ARE HERE:



35 minutes



← Debriefing *I Notice, I Wonder, It Reminds Me Of*

1. **As you move to where you will do the rest of the session, ask pairs to discuss benefits of the *I Notice, I Wonder, It Reminds Me Of* activity and compare it with the sensory activities.**
 - a. Now, we'll take some time to reflect on the model student activities we just took part in.
 - b. Find a partner to engage in discussion with as we move back inside.
 - c. Discuss the following with your partner:
 - What are some benefits of using an activity like *I Notice, I Wonder, It Reminds Me Of* with learners?
 - How do the effects of this activity compare with the effects of the earlier sensory/observation activities?
 - How does the activity *I Notice, I Wonder, It Reminds Me Of* support equitable and inclusive learning experiences for learners?
2. **Return inside.**
3. **Show slide 1: *Making Observations*. Lead a whole-group discussion about using the *I Notice, I Wonder, It Reminds Me Of* activity with learners.**



slide 1



- a. Ask:
 - ▶ *Let's share out with the whole group some of the benefits you discussed about using the I Notice, I Wonder, It Reminds Me Of activity.*
 - b. Listen to participants' responses and be sure to give enough time for a variety of ideas to be brought up by the group.
 - c. Refrain from sharing any benefits yourself until the group has fully expressed their thoughts.
4. **Ask: "How does the structure of this activity support an equitable and inclusive learning experience for learners?"**
- a. Listen to their responses. Give enough time for a variety of ideas to be brought up by the group.
 - b. Refrain from sharing any benefits yourself until the group has fully expressed their thoughts.

5. **Show Slide 2: I Notice, I Wonder, It Reminds Me Of. Mention some or all of the following points that have not already been brought up by your group:**



slide 2

Learner-centered and nature-centered, not instructor-centered:

- Invites learners to slow down and make detailed observations of common objects in nature that they are likely to continue to encounter.
- Balances providing structure and increasing autonomy. First, learners choose which leaf to observe, and the instructor offers structure and guidance through the three specific prompts. Then, learners choose what to observe, applying the prompts to their explorations.
- Offers a mindset for approaching nature with curiosity and humility that can be used anywhere, anytime.
- Engages learners with nature through science practices.
- Provides a routine that instructors and learners can use in future lessons/activities, in nature, in science, and in other disciplines.

Promotes inclusion and agency:

- Can be done in a broad range of settings wherever learners find nature—schoolyards, neighborhoods, urban areas, in the wilderness, in a virtual learning session, or inside.
- Centering learning on observations that learners make in the moment helps create inclusive learning by focusing on experiences shared by the entire group. Participation does not require prior knowledge about science ideas or prior experience outdoors, which levels the playing field among learners who have had varying exposure to science and nature.

Promotes cultural relevance:

- While the activity does not require prior experience outdoors or knowledge about science ideas, the "It reminds me of..." prompt encourages learners to relate what they are observing to their own

Choose a few key points to highlight. There is more information summarized in Step 5 than you'll want to share with participants in the moment. In advance of teaching this session, make some decisions about which points to share. Be selective and choose to highlight the points that are most significant for your instructors and relevant to your program. If you don't often work with emerging multilingual learners, skip the section on language acquisition. If your staff has been reflecting recently on how to make their instruction culturally relevant, be sure to emphasize the learner-centered ideas. If you have a goal of encouraging instructors to move away from a lecture-based teaching format, emphasize the nature-centered connections. These connections are valuable to consider and reflect on, and the ideas from this section are summarized on a handout (*The Benefits of I Notice, I Wonder, It Reminds Me Of* on page 40) that you can share with participants at the end of this session.

Make connections to what participants have said. To increase the sense of relevance for your staff, and to show that you've heard and value their contributions, make connections between the talking points in Steps 5–19 to participants' previous responses, if possible.

TEACHING NOTES

Some important terms. The following terms are often used interchangeably. Although they are all interconnected, each has its own distinct meaning. (Excerpted from *Youth Outside's Guide to Cultural Relevancy*):

- **equity:** The guarantee of fair treatment, access, opportunity, and advancement while at the same time striving to identify and eliminate barriers that have prevented the full participation of certain groups. The principle of equity acknowledges that there are historically underserved and underrepresented populations and that fairness regarding these unbalanced conditions is needed to assist equality in the provision of effective opportunities to all groups. (UC Berkeley Initiative for Equity, Inclusion, and Diversity)
- **inclusion:** The act of creating environments in which any individual or group can be and feel welcomed, respected, supported, and valued to fully participate. An inclusive and welcoming climate embraces differences and offers respect in words and actions for all people. (UC Berkeley Initiative for Equity, Inclusion, and Diversity)
- **cultural relevancy:** Effectively reaching and engaging communities and their youth in a manner that is consistent with the cultural context and values of that community, while effectively addressing the disparities of diversity and inclusion within an organization's entire structure. (From Youth Outside)

Diving into the research. If participants are interested in learning more about research about learning and the brain, direct them to the References section (beginning on page 63).

lived experiences, to share these experiences with the group, and to imbue the learning experience with their own cultural relevance.

- Offers opportunities for learners to hear and value one another's different perspectives and for the instructor to learn about the lives of learners.
- Sets up a collaborative learning context in which learners' ideas and observations drive the learning experience, and learners recognize themselves and one another as sources of expertise.

Supports engagement and equitable participation:

- The prompts "I notice...", "I wonder...", and "It reminds me of..." invite a wide range of divergent responses, with no wrong answers.
- Ensures that learners get time to explore and observe with a partner so everyone can share their ideas in a low-stakes setting. Thinking through ideas in a low-stakes setting benefits all learners, especially emerging multilingual learners and learners who need more processing time.
- Learners build social connections through discussion and exploration that help them be more successful in learning experiences. This is especially true for learners who have experienced trauma.

Supports language acquisition:

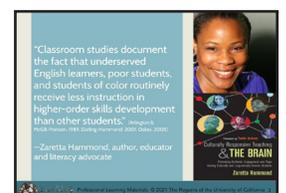
- Authentic discussions about engaging topics promote language development.
- Emerging multilingual learners benefit from developing discipline-specific vocabulary and literacy in all the languages they speak.
- Learners can use their preferred language in partner discussions.

Scaffolds transferable learning behaviors:

- Learners develop critical thinking skills and learning strategies they can apply in many contexts.
- Supports learners to become more independent with skills and thinking tools they can use, regardless of the support available from a teacher or instructor.

6. Show slide 3: "Classroom studies document..." Share the Zaretta Hammond quote:

- ▶ "Classroom studies document the fact that underserved English learners, poor students, and students of color routinely receive less instruction in higher order skills development than other students." (Allington and McGill-Franzen, 1989; Darling-Hammond, 2001; Oakes, 2005) —from *Culturally Responsive Teaching & the Brain* (p. 12)



slide 3

- a. In her book *Culturally Responsive Teaching & the Brain*, Zaretta Hammond shares research about how learners from schools that have historically been under-resourced due to racist school funding policies, redlining, income inequality, and police profiling have fewer opportunities to develop higher order thinking skills and learning behaviors.

Zaretta Hammond on dependent learners and independent learners.

“On his own, a dependent learner is not able to do complex, school-oriented learning tasks such as synthesizing and analyzing informational text without continuous support. Let’s not misunderstand the point—dependent doesn’t mean deficit. As children enter school, we expect that they are dependent learners. One of our key jobs in the early school years is to help students become independent learners. We expect students to be well on their way to becoming independent learners by third grade, but we still find a good number of students who struggle with rigorous content well into high school, mostly students of color.” —Zaretta Hammond in *Culturally Responsive Teaching & the Brain*

Using the *I Notice, I Wonder, It Reminds Me Of* activity to become more aware of unconscious biases. By focusing our observations, asking questions, and noticing what we are reminded of in relation to self and others, we can also become more aware of our unconscious biases and how they may impact others. For example: *I notice that I give more attention to learners who are this identity and less attention to learners who are that identity. I wonder why I do that. It reminds me of patterns I’ve read about before. I wonder if I can reverse that pattern during the next activity I lead. I wonder specifically what I could change to do that.*

- b. Specifically ensuring that learners in these kinds of schools have opportunities to develop as independent learners is an issue of equity.

7. Show slide 4: *The ultimate goal... Share that I Notice, I Wonder, It Reminds Me Of* is one way to support learners to become more independent learners.



slide 4

- a. When we encourage curiosity and offer strategies for learning (which is a focus of *I Notice, I Wonder, It Reminds Me Of*), we are supporting learners to build the skills of independent learners.
- b. Repeated opportunities to own these curiosity tools and apply them in a variety of settings makes it more likely that learners will use those tools in future learning settings and other situations in their lives.
- c. The goal is to support learners to take over the reins of their own learning.

8. Show slide 5: *I notice...* Share how the prompt “I notice...” can help us direct the focus of our observations:



slide 5

- a. We’ll now be looking at some research about the brain and teaching and learning. We’ll be considering how this relates to *I Notice, I Wonder, It Reminds Me Of* and to making observations in general.
- b. We are constantly surrounded by a huge amount of information in the form of colors, shapes, patterns, organisms, etc.
- c. It would be overwhelming to process every bit of available information all the time.
- d. Our brains make unconscious decisions about what to pay attention to and the level of detail to notice.
- e. By using the “I notice...” prompt, we can direct the focus of our observations to things our brains might normally filter out.
- f. This supports learning and memory.

9. Show slide 6: *I wonder...* Share that questions lead to deeper observations.



slide 6

- a. Read the quote:
 - ▶ “Every observation is the answer to a question. Our job is to find the right questions.” —Todd Newberry
- b. Focusing on asking questions can lead us to make more and deeper observations.
- c. Intentionally asking questions can also be one way to increase our curiosity, which supports learning.

TEACHING NOTES

Awe and curiosity. Read more about awe and curiosity in Background Information for Presenters (page 46).

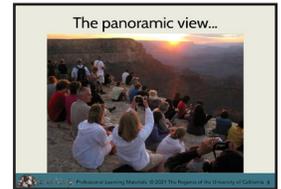
10. Show slide 7: *It reminds me of...* Share that the “It reminds me of...” prompt helps us make connections, metaphors, and analogies that help build conceptual frameworks (NRC, 2000; Hammond, Z. 2015; Duit, R. 1991):



slide 7

- a. Cognitive scientists describe the process of learning as forming conceptual frameworks as we make connections between ideas and understandings.
- b. Random disconnected bits of information do not as readily “stick to” or become part of our retrievable knowledge bank.
- c. Saying, “It reminds me of...” helps create connections in our brains, enriching our conceptual frameworks and helping us make sense of and remember what we are observing.
- d. Metaphors and analogies are examples of these types of connections. By evoking comparisons, they also help us come up with more interesting questions.

11. Show slide 8: *The panoramic view...* Share that people often are drawn toward the panoramic view more than to the details of nature:



slide 8

- a. Appreciating nature and the outdoors can sometimes be framed as visiting dramatic panoramic features in national parks.
- b. Have you ever watched tourists at one of these spots? There’s initial excitement and appreciation, but folks often take photos, their excitement wanes, and they move on.
- c. An activity such as *I Notice, I Wonder, It Reminds Me Of* can function as a set of curiosity tools that learners can use to ask questions, make observations, and use anywhere to engage with nature.

12. Show slide 9: *Slow down. Get down. Look around.* Share that *I Notice, I Wonder, It Reminds Me Of* is a mindset that learners can call on to engage with the outdoors and find awe anywhere.



slide 9

- a. Having a set of practices to engage with the natural world means that awe is accessible anywhere, not just at the Grand Canyon or where there is a panoramic view.
- b. Shifting the focus to slowing down, getting down, and looking around is one way to be present with breathtaking natural beauty and awe-inspiring discoveries that are always around us.
- c. This mindset can be a powerful gift we offer to learners, one we hope they will take away from an outdoor science experience and continue to apply wherever they live and throughout their lives.



- d. This is also a way to counter the narrative that nature only exists in pristine wilderness areas, requires a panoramic view or unique geographic feature to be engaging, or is otherwise a place learners need to “go to” as opposed to something they are always surrounded by.

13. Show slide 10: *I had been fooling myself...*

- ▶ “I had been fooling myself that I was the only teacher. The land is the real teacher. All we need as students is mindfulness. Paying attention is a form of reciprocity with the living world, receiving the gifts with open eyes and open hearts. My job was just to lead them into the presence and ready them to hear.”



slide 10

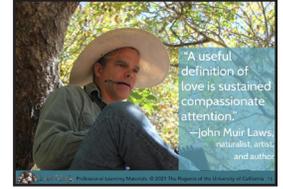
Share:

- a. *Mindfulness* is a term used to describe being present, aware, and engaged in the moment.
 - b. *I Notice, I Wonder, It Reminds Me Of* is kind of a way of applying mindfulness to nature observations.
 - c. It’s one way for instructors to offer a set of skills that learners can use to observe, wonder, and make connections.
 - d. The activity can also be applied to many different topics, such as reading a text, looking at art, self-reflection, or social and emotional learning.
- 14. Share that focusing on “right” answers can stifle curiosity; but focusing on observations, questions, and connections encourages it.**
- a. We are all born curious, but our learners aren’t always encouraged to let their curiosity flourish.
 - b. Narrow questions and “right” answers have their place and purpose, but focusing on them too much can stifle curiosity and thinking.
 - c. Routines that encourage learners to make close observations, ask questions, and make connections can encourage them to be more curious and actively engaged with their surroundings.
 - d. Giving learners permission and the space to be curious allows them to let go of the pressure of knowing or not knowing a “right” answer. This helps their natural curiosity blossom.
- 15. Share that time spent focusing on one thing in nature encourages emotional connections with nature:**
- a. Spending time observing one thing can also encourage an emotional connection with nature.
 - b. Imagine if I were to take the leaf (or whatever object participants were examining) that you were observing during *I Notice, I Wonder, It Reminds Me Of* and crumple it.
 - c. It’s just a leaf! But learners often become attached to the single leaf they focused on (even though they might have passed by leaves all day without realizing it).

Mindfulness and brain growth.
 “...activities that promote mindfulness and focused attention...cause the brain to rewire itself and grow....” —Zaretta Hammond

Using *I Notice, I Wonder, It Reminds Me Of* for social and emotional learning (SEL). Mindfulness also includes being nonjudgmentally aware of your own feelings. Some outdoor groups have used *I Notice, I Wonder, It Reminds Me Of* as a tool for learners to pay attention to their feelings and interactions with others and to connect to SEL. For more on this, see the activity write-up for *I Notice, I Wonder, It Reminds Me Of* (<http://beetlesproject.org/resources/for-field-instructors/notice-wonder-reminds/>).

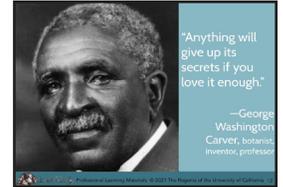
16. Show slide 11: *A useful definition of love...* Share the John Muir Laws quote and offer the idea that when learners have multiple experiences falling in love with aspects of nature, they develop a relationship with nature.



slide 11

- a. Share John Muir Laws quote:
 - ▶ *"A useful definition of love is sustained compassionate attention."*
- b. By spending time paying close attention to something even as seemingly trivial as a leaf, we can develop an emotional connection and fall in love with it a little bit.
- c. If we give learners multiple opportunities to spend time focusing on different specific aspects of nature, it helps them forge emotional connections with the natural world in general.
- d. Developing emotional connections to nature is an important component of environmental literacy.

17. Show slide 12: *"Anything will give..."* Share the George Washington Carver quote.



slide 12

- a. Let the group read the quote: "Anything will give up its secrets if you love it enough."
- b. This George Washington Carver quote could be seen as the other side of the John Muir Laws quote, although Carver's quote was said many, many years earlier.

18. Share that information that evokes emotion is more salient and memorable.

- a. There are parts of the brain that screen incoming stimuli according to how emotionally striking it is.
- b. Information that does not evoke emotional responses is often screened out or sent to short-term memory and quickly forgotten.
- c. In contrast, emotionally striking information is processed in long-term memory.
- d. Supporting learners to form an emotional connection through making observations supports learning, memory, and retention.

19. Show slide 13: *Instructor Quote. Share that I Notice, I Wonder, It Reminds Me Of can be a backbone for learning outdoors.*



slide 13

- a. Give time for participants to read the quote.
- b. Many field instructors have reported that this activity has offered a powerful way to engage learners directly with any part of nature through making deep observations.
- c. Many educators have found this activity to be transformative for learners and for their own instruction in the field.



- d. Some use it as a backbone for what they do with learners, incorporating it into such activities as sit spots, journal writing, card hikes, and explorations and investigations of specific facets of the natural world.
- e. Many use this activity whenever their group finds something learners want to learn more about.

20. Share that it's essential to follow the steps of the student activity write-up rather than try to shortcut it:

- a. Some instructors have shortcut the introduction of the activity—for example, by just telling learners the prompts and having them repeat them (Everybody say, “I notice.” Okay, now say, “I wonder.”) or by just printing the prompts in a student journal and telling learners to use them.
- b. BUT—doing all the steps in the activity is essential for ensuring learners have access to all the benefits we just shared.
- c. The activity steps engage learners in practicing their observation skills and support them to become more independent learners.
- d. When each learner tries the prompts with a leaf of their choice and then applies the prompts to whatever interests them, they will be more likely to continue to use the activity into the future.
- e. It doesn't take long to introduce this activity, and the time will pay off throughout learners' field experiences.

I Notice, I Wonder, It Reminds Me Of.
 The full student activity write-up for *I Notice, I Wonder, It Reminds Me Of* is available at: <http://beetlesproject.org/resources/for-field-instructors/notice-wonder-reminds/>.

21. Show slide 14: What kinds of instructional choices... Briefly review the session so far and transition to discussing instructional choices and how they affect learner observations and engagement with nature.



slide 14

- a. We've discussed many of the benefits of making observations and modeled how to do them with learners.
- b. Now, we're going to discuss some of the instructional choices we make and how those decisions affect learner observations and engagement with the natural world.

Splitting the session. If you are splitting the session into two experiences, this is a good stopping point.

Discussing Choices for Encouraging Learner Observations

1. Share that we make ongoing instructional choices that affect learners' abilities to make observations:

- a. The instructional “moves” we make affect learners' experiences, including the depth of learners' observations and the opportunities they have to improve those observation skills.
- b. As with teaching anything, teaching about observations means constantly making choices and addressing challenges to best serve a particular group of learners.

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 45 minutes

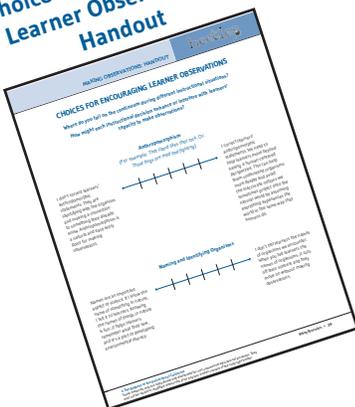


TEACHING NOTES

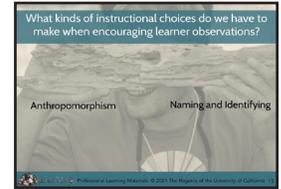
Nurturing a professional learning culture among your staff. One of the most important things program leaders can provide is a healthy professional learning culture in which there is an ongoing exchange of ideas about teaching. Crucial to this is creating a space in which instructors feel safe sharing their successes, challenges, and ideas. Do your best to facilitate, as needed, to make sure that's what is happening during these discussions. It's more important for your staff to feel that this learning culture is the case than it is to finish the discussion. Of course, discussion of such topics should never be finished anyway, but should be part of ongoing discussion among staff throughout their careers.

Mix your more experienced and less experienced field instructors. These conversations are best with mixed experience levels of field instructors in each group. Encourage instructors to form groups with individuals who have a range of teaching experience.

Choices for Encouraging Learner Observations: Handout



2. Show slide 15: *What kinds of instructional choices...* The group will be discussing two issues about instructional choices related to observations: (1) anthropomorphism and (2) naming and identifying:



slide 15

- a. This next activity is designed to start rich conversations about the choices we make in encouraging learner observations.
- b. This slide shows two issues related to making observations that we often run into when instructing learners: anthropomorphism and naming and identifying.
- c. These are topics that should be part of ongoing discussions for instructors in outdoor science.

3. Share that participants will discuss how anthropomorphism and naming and identifying might be helpful or detrimental to encouraging learners to make observations in nature:

- a. When making observations, it's common for learners to make anthropomorphic statements. For example: *The lizard likes that rock.*
- b. You'll be discussing whether or when this is detrimental to making observations and whether or when it might be useful.
- c. Another factor that can have a big influence on learner observations is when and if to identify and tell learners the names of what they encounter in nature.
- d. You'll be discussing different sides of naming and identifying, too.
- e. The discussion shouldn't be about whether the instructional decision is good or bad. Rather, it's about thinking about how these instructional decisions do or don't support learners in making observations.

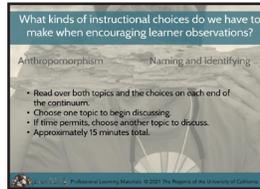
4. Hold up a copy of the *Choices for Encouraging Learner Observations* handout. Share that each of the two issues has a continuum of possible choices an instructor might make and that participants will discuss where they might fall on the continuum for these two instructional choices:

- a. Each continuum on this handout has a statement at either end that represents different views on the issue. Discuss what you think of the statements.
- b. Each participant might choose multiple points on the continuum for different contexts.
- c. The goal is not necessarily to reach consensus but to think about and discuss with your group where they might fall on the continuum during different instructional situations and why.
- d. Remember to frame these discussions around the goal of supporting learners to make observations and how these different possible instructional decisions might encourage or discourage learners to make observations.



5. Show slide 16: *What kinds of instructional choices...* Explain directions for the activity:

- In groups of 3–5, read over each of the two issues and each continuum of choices.
- Choose one issue to begin discussing. Each group member should share where they might place themselves on the continuum during different instructional situations and why.
- If you have time, move on to the other issue, but don't rush it.
- You'll have ~15 minutes total for your small-group discussion.



slide 16

6. Show slide 17: *Group Agreements for Discussions.* Introduce or remind participants of the group agreements for discussions.

- Introduce Group Agreements for Discussions. If participants are already familiar with the agreements, or if you have your own set of agreements, review those agreements and invite participants to make use of them in their discussions.
- Ask if there are any other agreements that participants would like to add.



slide 17

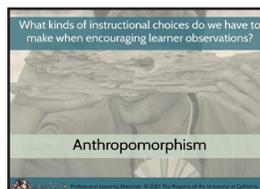
7. Distribute 1 copy of the *Choices for Encouraging Learner Observations* handout to each participant and invite participants to discuss the prompts for ~15 minutes.

- Try to check in for a few minutes with each group to get a sense of the issues they're discussing and their ideas.
- Record notes on index cards about what you hear. You can refer to your notes later during the debriefs to connect points you are making with what you heard participants say during the discussions.
- Allow small-group conversations to last about 15 minutes.

8. Bring attention back together to have a whole-group debrief on each of the issues.

9. Show slide 18: *Anthropomorphism.* Debrief anthropomorphism.

- Ask each group that discussed this issue to share one or two of the most salient points that came up.



slide 18

10. Summarize points on positive perspectives of anthropomorphism. Try to make connections to what you heard participants say during the discussions as you share:

- Anthropomorphism can help learners, especially younger learners, develop concern for other organisms. This is particularly true when

Group Agreements for Discussions.

Discussion agreements for science discussions set up a productive learning culture by making critical thinking skills and science and engineering practices visible and accessible to learners. Agreements also give learners tools that support them to be aware of how their participation affects group dynamics, inviting them to co-create an equitable and inclusive learning environment. For more on this topic, see the *Group Agreements for Science Discussions* activity (<http://beetlesproject.org/resources/for-field-instructors/group-agreements-science-discussions/>).

Assessment opportunity for you. These discussions can be an opportunity to learn about your staff and their ideas about instruction. "It was great for me to get a feel for where each naturalist seemed to stand on those topics. Initially, there were extremes on both ends in almost every small group; but after discussion, they all appeared to recognize that it is a sliding scale that needs to be adjusted, depending on the group at that time." —Program Leader

TEACHING NOTES

If participants want to keep the discussion going. Like other interesting discussions, this discussion could easily go on beyond the recommended time. Keep the time you have for the entire session in mind. If you're going over, you may want to gently limit the discussion and then pick up on the topic at another time, perhaps after staff has had some experience with applying the teaching strategies. One way to end a discussion without it feeling unresolved is to summarize what's been discussed so far.

Connecting with nature. Instructors often say that anthropomorphizing an animal helps learners make a connection to it. Empathizing with an animal and thinking about the world from its perspective can also help learners to build a connection—and can lead to more accurate observations. Instructors often will also bring up this idea, and some coined the term *organismorphism* to describe thinking about what it would be like to experience the world as a particular animal.

dealing with organisms that are very different from humans, such as barnacles or earwigs.

- b. Metaphors and analogies are particularly useful forms of anthropomorphism. The prompt “It reminds me of...” encourages these.

11. Summarize points on cautionary perspectives of anthropomorphism. Try to make connections to what you heard participants say during the discussion as you share:

- a. When we anthropomorphize, we are projecting human characteristics or values onto organisms and things that are not human.
- b. Anthropomorphic ideas can lead to concerns that are unfounded. For example: *Wolves and sharks are mean and bad because they eat bunnies and seals that are cute and good.* Or: *This baby deer I found is lonely, so I should touch it.*
- c. In making an anthropomorphic statement, learners are empathizing with what a *human* might experience, not what the organism actually experiences. Anthropomorphizing pulls an animal into our world rather than helping us understand the animal's world.
- d. Connecting to the goal of this session (which is supporting learners to make observations), anthropomorphizing an animal can also lead us to stop making close and careful observations because we've come to a conclusion about why an animal might be behaving in a certain way.
- e. To get as close as possible to what's really going on when observing organisms, scientists strive for humility and open-mindedness to avoid projecting human traits onto organisms.
- f. Scientists try to avoid making assumptions about organisms—what they feel, think, etc. Instead, scientists try to focus on learning through observation.
- g. Anthropomorphism should be avoided when the goal is to make accurate observations of organisms.

12. Share how observation and striving for accurate empathy can increase connection and understanding:

- a. It's valuable to attempt to understand the perceptions and perspectives of other organisms.
- b. It's also important to remember that we can't ever fully understand the perspective and life experience of another being. The more different from us it is, the more challenging it can be for us to understand.
- c. In order to accurately understand an organism as best as possible, scientists (and learners) should strive for accurate empathy—trying to imagine what it would be like for the organism to just be the organism—not what it would be like for a person to be in the organism's position.
- d. Striving for accurate empathy helps us understand the lives and worlds of other organisms.
- e. It's a common view that without anthropomorphism, learners will not develop concern for organisms that are not human. However, spending



TEACHING NOTES

What is empathy? “Empathy is a stimulated emotional state that relies on the ability to perceive, understand, and care about the experiences or perspectives of another person or animal.” —Ashley Young, Kathayoon A. Khalil, and Jim Wharton from the article “Empathy for Animals: A Review of the Existing Literature.”

Science as one way of knowing. In this session, we are teaching about science as one of many ways of knowing. BEETLES acknowledges and affirms the validity of Traditional Ecological Knowledge (TEK), as well as the many linkages between ecological restoration and cultural resources and values. The strategies and knowledge that were passed down over generations show a detailed understanding of ecological processes and the connection humans have with those processes. While teaching science, we want to avoid losing sight of the entire body of knowledge gained from Indigenous peoples who possess detailed knowledge of their homelands. On pages 50–53, we’ve shared some resources where the reader could learn more about where science and TEK have synergy and where they are distinct.

time observing organisms can be a powerful way for learners to develop empathy for the organisms—like the John Muir Laws quote (“A useful definition of love is sustained compassionate attention.”) described and as some of you may have experienced during the *I Notice, I wonder, It Reminds Me Of* activity.

- f. Striving for accurate empathy can encourage learners to make more insightful observations.

13. Offer the idea that anthropomorphism can be used intentionally, with awareness:

- a. When the goal isn’t to make accurate observations, anthropomorphism can be fun and playful but must be used with awareness.
- b. Without awareness, anthropomorphism may lead to misunderstanding other organisms.

14. Describe a “Yes, and…” approach for respecting a learners’ anthropomorphic perspective while also inviting them to consider an accurate empathy perspective.

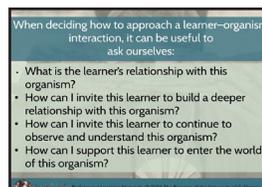
- a. Anthropomorphism is common among all cultures and will tend to come up when learners make observations of nature, especially when working with young children.
- b. A “Yes, and…” approach can be effective.
- c. For example, if a learner says that sea otters holding hands shows that they love each other, an instructor might say, “That may be true, and we’ve also found that interlocking their legs helps keep them from drifting apart as they sleep” (Khalil, K., 2018).

15. Describe how word-coaching can help learners focus on making accurate observations.

- a. Simple word-coaching can gently help learners keep an open mind and consider multiple perspectives. For example:
 - Learner: “The lizard likes that rock.”
 - Instructor: “We can’t know for sure what the lizard likes, but we can observe that it’s spending most of its time on that rock. How might the lizard benefit from spending so much time on the rock?”
 - Learner: “Those bugs are fighting.”
 - Instructor: “There may be some reason other than fighting that they are holding onto each other. What are some other possible explanations? Let’s keep watching to see if we can find out more about what’s going on.”

16. Show slide 19: *When deciding how to...* Invite participants to reflect on how they can affirm learners’ cultural values and perspectives while encouraging deep observation.

- a. Imagining the perspectives of other organisms is almost second nature within



slide 19

TEACHING NOTES

Considering Indigenous perspectives on anthropomorphism vs ascribing personhood to animals. “By placing human emotions on non-humans in creation stories, Indigenous kids grew up with a deeper connection to these species, as the species have qualities that we could relate to. Some [of the Indigenous graduate students in our cohort] see this view of animals as not as anthropomorphism—that is, human traits projected onto animals—but instead, it is a perspective that personhood is an experience common to all forms of life. The connections [in creation stories] showed us that the relationship animals play in the ecosystems, with other species, and in the human world are all connected, and that they are our kin.” —Annie Sorrell, Center for Native Peoples and the Environment

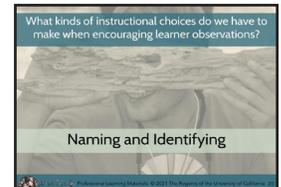
Considering Indigenous place names. “A connection to land creates a sense of belonging. This is evident in the Indigenous naming of places, plants, and animals. Places and species are intertwined with traditions, memories, myths, and oral traditions that connect the past to the future. It is important to learn the local Indigenous names of species and places, the naming is not always about the classification, but it is also acknowledging the sacred connection. Indigenous words provide a world that has a vast history from learning, understanding, and reciprocity to the land. The classifications of species among groups can range from descriptive inventories of cultural keystone species; to broader theoretical, spiritual, and comparative analyses; to how they are used during a season. An example: The Māori classificatory system is founded on a whakapapa (genealogy) relationship that incorporates, amongst other things, many deities within Māori cosmology and the natural world as well as the relationship between species.” —Annie Sorrell, Center for Native Peoples and the Environment

some cultures that place a high value on empathizing with living and nonliving things that are not human, and this may take the form of both accurate empathy and anthropomorphism.

- b. It can be offensive or counterproductive if an instructor cuts off anthropomorphism abruptly, especially if it’s integral to a learner’s culture.
- c. Aim to affirm learners’ cultural perspectives and identities by making room for learners to share their thoughts and ideas *and* thoughtfully using “Yes, and…” and word-coaching strategies to invite learners to continue making deep observations.
- d. To decide how to approach any given learner–organism interaction, it can be useful to ask ourselves: *What is this learner’s relationship with this organism? Can I offer ways for this learner to engage in a deeper relationship with this organism and continue to observe and understand it? How can I help the learner to enter the world of the organism?*

17. Show slide 20: Naming and identifying. Debrief naming and identifying.

- Ask each group that discussed this issue to share one or two of the most salient points that came up.



slide 20

18. Show slides 21–22: Robin Wall Kimmerer quotes. Share the two Robin Wall Kimmerer quotes below:

- “It’s a sign of respect and connection to learn the name of someone else, a sign of disrespect to ignore it. And yet the average American can name over a hundred corporate logos and ten plants...Learning the names of plants and animals is a powerful act of support for them.”
- “I’ve noticed that once some folks attach a scientific label to a being, they stop exploring who it is.”



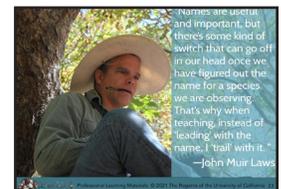
slide 21



slide 22

19. Show slide 23: John Muir Laws quote. Offer framing and suggestions about how and when to share names.

- a. Say: “Learning names of organisms is useful, but when and how organism names are shared with learners can significantly impact observations and learning.”
- b. Share this John Muir Laws quote:
 - “Names are useful and important, but there’s some sort of switch that can go off in our head once we have figured out the name for a species we are observing. That’s why when teaching, instead of leading with the name, I ‘trail’ with it.”



slide 23

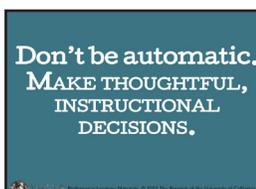
20. Offer the idea of sharing names for organisms *after* learners have made observations.

- To encourage learner engagement with and getting to know an organism through observations, questions, connections, and explanations, it's generally (but not always) best to hold off on providing a name until after learners have made their own observations of the organism.
- When asked by a learner what something is, it can be useful to first invite learners to make some observations and then, perhaps, to give learners a name for the organism, if and when it seems appropriate.
- At that point, the learner has become more deeply engaged with the organism, has context to attach the name to, and will be more likely to remember the name and recognize and connect to the organism in the future.
- Learners have also had a chance to see where it fits within their existing conceptual frameworks, which makes new information more likely to stick.
- It's also useful to have learners look up organisms, using simple accessible keys or field guides. Using a field guide can also be an opportunity for learners to develop the skills and confidence to identify organisms themselves and to consider what role that organism plays in the current ecosystem.

21. Share that in teaching, there aren't absolutes. For each instructional decision, the answer is "It depends."

- ▶ *The answer to almost every question about instructional decisions is, "It depends!" These questions and the hundreds of decisions you make each time you teach are deep and important and worth discussing and rediscussing throughout your careers as educators.*

22. Show slide 24: *Don't be automatic. Share that it's important not to fall into habits and do things automatically but, instead, to make thoughtful, intentional instructional decisions based on the situation and the needs of your learners:*



slide 24

- Sometimes, as instructors, we can fall back on habit and default to unconsciously or automatically making teaching decisions.
- But our instructional choices impact how learners learn.
- Thinking about the impact of our instructional decisions and making thoughtful choices improves our instruction.
- To be excellent instructors, we need to be thoughtful about each specific situation—the learners, what learners say, our goals, the environment, moment in time, etc.—and try to make the best decision to support learners' learning.

TEACHING NOTES

A focus on observations lessens the immediate need to name or to know what it is. We've been asked: *But won't learners be frustrated if I don't tell them what it is?* That's a common concern of field instructors who are new to the idea of sometimes holding back from telling learners information up front. It's true that the first question people often have about something they find in nature is: *What is it?* By asking learners to focus on making observations, they usually become intrigued by their observations and don't have a problem with not being told what it is right away.

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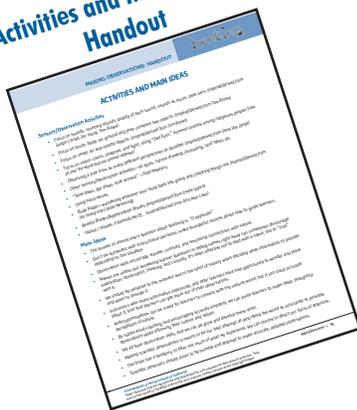


TEACHING NOTES

Observable evidence of deeply observant learners. We can't know what's going on inside a learner's head. What are some cues and types of evidence we can look for to assess whether a learner is being deeply observant?

- Looking closely at something for an extended period of time.
- Incorporating senses in addition to vision when making observations.
- Using a hand lens.
- Describing observations accurately
- Finding new (and sometimes mysterious) things to ask questions about.
- Noticing details such as texture, color, numbers of things, etc.
- Observing from different perspectives.
- Connecting new observations to prior knowledge and others' observations.

Activities and Main Ideas: Handout



Wrapping Up and Reflecting

1. Show slide 25: *What do you notice?* Summarize how we can offer support and scaffolding to invite learners to use their bodies and minds to engage in and make deeper observations.



slide 25

- At the beginning of the session, we looked at a tree, thought through some possible learner responses, and reflected on the idea that all of us can improve our observation skills.
- As outdoor science educators, we can offer scaffolding and strategies that build on learners' existing observation skills.
- Learners can call on these strategies to make accurate and detailed observations during a field experience and into the future.
- Making observations is also a way to connect with and build a relationship with nature and the outdoors.

2. Show slide 26: *Think-Pair.* Guide participants in a *Think-Pair* to reflect and then to plan to incorporate activities and ideas from the session into instructional practice. Share:



slide 26

- You'll now have a little time to reflect and consider how you might apply and integrate some of these activities and ideas into your practice.
- You'll each get a copy of the *Activities and Main Ideas* handout to help remember what you experienced. Add notes to the handout if you like.
- Think about how your ideas about making observations, connecting with nature, and instruction may have shifted and what caused them to shift.
- First, think individually, using the sentence starters. Then, discuss your ideas with a partner.

3. Distribute 1 copy of the *Activities and Main Ideas* handout to each participant and have them discuss with a partner for ~10 minutes.

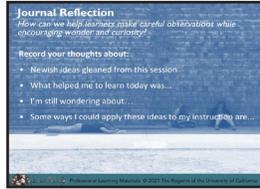
- Give participants about 10 minutes to think and discuss with a partner.

4. Get the whole group's attention and ask volunteers to share what surprised them or ideas that may have shifted for them:

- To nurture a learning community, it's useful for others in the group to hear about your reflections.
- Would anybody be willing to share something that surprised them or something that has shifted your ideas, and what caused your ideas to shift?



5. Show slide 27: *Journal Reflection*. Have participants reflect in journals. Share:



slide 27

- a. Take a few moments to record in your journals anything you'd like to remember and/or incorporate into your teaching from this session. What helped you to learn today?
- b. You can use the guiding question: *How can we help learners make careful observations while encouraging wonder and curiosity?*
- c. You can also continue to use the sentence starters to prompt your thinking.

6. Distribute final take-away handouts to participants as they are reflecting.

Distribute 1 copy of each of the following handouts to each participant:

- The Benefits of *I Notice / Wonder, It Reminds Me Of*
- A Whole Bunch of Quotes Related to *Making Observations*

TEACHING NOTES

The Benefits of I Notice, I Wonder, It Reminds Me Of: Handout



A Whole Bunch of Quotes Related to Making Observations: Handout



APPLYING SESSION TO INSTRUCTION

The session is not over! A critical phase of learning anything new is **application**—when the learner takes new knowledge and applies it. There is some application included in the session, but, as with all professional learning for instructors, the rubber meets the road (or trail) when the instructors apply what they've learned to their teaching and when they keep thinking about it and discussing it with their peers. For instructors to try out new activities/ approaches, program leader support is crucial. Even if instructors are excited by new ideas, encouragement and scaffolding can support instructors to try out new ideas and approaches. Following are a variety of suggestions to dig deeper into the topic and help you facilitate thoughtful implementation:

- **Staff brainstorm what they and you can do to incorporate observation strategies.** After the session reflection, your staff will have already written ideas they have about their own implementation. You can tap into these, and other ideas, through a brainstorm of what they plan to do and how you can support them in doing it.
- **Instructor observations.** If you do observations of instructors, discuss how you might incorporate elements from this session into the observations.
- **Discussing implementation of *I Notice, I Wonder, It Reminds Me Of*.** Assign each of your staff to teach *I Notice, I Wonder, It Reminds Me Of*, as written, during their next student program and to write in their journals about how it went. Then, lead them in a discussion of the activity at the end of the program. Here are some suggested questions on which to focus a reflection or discussion:
 - What impact did the activity have on your groups' ability to make observations and to engage with nature?
 - How did individual learners respond?
 - What was successful about the activity?
 - What might you do differently the next time you lead it and why?
 - How did you incorporate the activity into learners' other field experiences (e.g., journals, sit spots, etc.) and what ideas do you have about incorporating it in the future?
- **Continuing a discussion.** If there was a discussion that came up during the session that you had to cut off, and it seems like your staff is still interested, set aside some time to continue the discussion.
- **Look for external professional learning opportunities.** Encourage staff members to attend workshops by John Muir Laws (johnmuirlaws.com), Emilie Lygren (emilielygren.com), or others on nature journaling. Purchase a staff copy of *The Laws Guide to Nature Drawing and Journaling* and *How to Teach Nature Journaling*. Encourage staff to read and use these resources.
- **Assign your staff a reading that is related to the ideas in this session.** Invite your staff to use active reading strategies such as underlining



important points (I notice...), writing questions (I wonder...), and writing connections (It reminds me of...) in the margins. Have them pair up with someone else and compare their notes and ideas. Then, bring this discussion into the whole group. Following are some suggested readings:

- Chapter 1: Observation and Intentional Curiosity (pp. 5–12) in the book *The Laws Guide to Nature Drawing and Journaling* by John Muir Laws in collaboration with Emilie Lygren. This chapter begins with an exploration of the prompts “I notice...,” “I wonder...,” and “It reminds me of...” followed by tips on how to train yourself to be more curious.
- “Why Nature Journaling?” (pp. 4–8) in the book *How to Teach Nature Journaling* by John Muir Laws and Emilie Lygren. This excerpt explains the many benefits of nature journaling, which is connected to making observations.
- “Three Prompts for Deeper Nature Observation” by John Muir Laws. This short article reviews *I Notice, I Wonder, It Reminds Me Of* and why it helps learners make observations in nature. (Source: <https://johnmuirlaws.com/deep-observation/>)
- “Falling in Love with Nature” by John Muir Laws. In this short article, Laws speaks about how focusing “sustained compassionate attention” on organisms in nature helps create emotional bonds with the natural world, resulting in stewardship. (Source: <https://johnmuirlaws.com/falling-in-love-with-nature/>)
- “Learning the Grammar of Animacy,” a section from the book *Braiding Sweetgrass: Indigenous Wisdom, Scientific Knowledge and the Teaching of Plants* by Robin Wall Kimmerer compares scientific and Indigenous ways of observing and describing and how they shape our relationship with nature.
- “Noticing: How to Take a Walk in the Woods” by Adam Frank. A short article on how using science observation skills and mindset can lead to wonder in the natural world. (Source: <https://www.npr.org/sections/13.7/2013/05/14/178467726/noticing-how-to-take-a-walk-in-the-woods>)
- “Fine-tuning the Senses,” an excerpt from the book *Tom Brown’s Field Guide to Nature Observation and Tracking* by Tom Brown. In this chapter, Brown describes a wide variety of ways to improve observation skills.
- “A Philosophical Interlude,” an excerpt from the book *The Ardent Birder* by Todd Newberry. In this chapter, Newberry describes making detailed observations as being like interviewing an organism. The BEETLES student activity *Interview an Organism* is inspired by this approach. Some questions to ask: *How might you apply “interviewing organisms” to your instruction? How can you help learners ask questions that lead to deeper observations?*
- “Empathy for Animals: A Review of the Existing Literature” by Ashley Young, Kathayoon A. Khalil, and Jim Wharton. This review

Resources on nature journaling and how to teach it. For more information on how to help learners generate creative, reflective writing and drawing from observation, see *How to Teach Nature Journaling* by John Muir Laws and Emilie Lygren. The book is available for purchase from Heyday Books (<https://heydaybooks.com/how-to-teach-nature-journaling/>), or a free download is available (<http://emilielygren.com/product/how-to-teach-nature-journaling/>) or <https://johnmuirlaws.com/product/how-to-teach-nature-journaling/>). The BEETLES professional learning session *Field Journaling with Students* (written in collaboration with John Muir Laws and Emilie Lygren) helps instructors understand the value of nature journaling and how to do it well with learners.

See the complete citation for *The Laws Guide to Nature Drawing and Journaling* in the References section.



johnmuirlaws.com is a rich resource for reading and learning about nature journaling and making observations.



of literature summarizes findings from current research on the development of empathy in childhood (<http://iranarze.ir/wp-content/uploads/2018/07/E8488-IranArze.pdf>).

- **Distribute 1 copy of the optional handout *A Whole Bunch of Quotes Related to Making Observations* to each participant and have them discuss.**
 - Ask participants to choose a few quotes they find meaningful and then discuss them with a partner.



CHOICES FOR ENCOURAGING LEARNER OBSERVATIONS

Where do you fall on the continuum during different instructional situations?

How might each instructional decision enhance or interfere with learners' capacity to make observations?

Anthropomorphism

(For example: *That lizard likes that rock.* Or: *Those bugs are mad and fighting.*)

I don't correct learners' anthropomorphic statements. They are identifying with the organism and making a connection to something they already know. Anthropomorphism is a natural and easy entry point for making observations.



I correct learners' anthropomorphic statements. We need to help learners move beyond having a human-centered perspective. This can help them understand organisms more deeply and avoid the inaccurate notions we sometimes project onto the natural world by assuming everything experiences the world in the same way that humans do.

Naming and Identifying Organisms

Names are an important aspect of science. If I know the name of something in nature, I tell it to learners. Knowing the names of things in nature is fun; it helps learners remember what they saw, and it's a part of developing environmental literacy.



I don't tell learners the names of organisms we encounter. When you tell learners the names of organisms, it cuts off their interest and they move on without making observations.

THE BENEFITS OF *I NOTICE, I WONDER, IT REMINDS ME OF*

Learner-centered and nature-centered, not instructor-centered:

- Invites learners to slow down and make detailed observations of common objects in nature they are likely to continue to encounter.
- Balances providing structure and increasing autonomy. First, learners choose which leaf to observe, and the instructor offers structure and guidance through the three specific prompts. Then, learners choose what to observe, applying the prompts to their explorations.
- Offers a mindset for approaching nature with curiosity and humility that can be used anywhere, anytime.
- Engages learners with nature through science practices.
- Provides a routine that teachers and learners can use in future lessons/activities, in nature, science, and in other disciplines.

Promotes inclusion and agency:

- Can be done in a broad range of settings wherever learners find nature—schoolyards, neighborhoods, urban areas, in the wilderness, in a virtual learning session, or inside.
- Centering learning on observations that learners make in the moment helps create inclusive learning by focusing on experiences shared by the entire group. Participation does not require prior knowledge about science ideas or prior experience outdoors, which levels the playing field among learners who have had varying exposure to science and nature.

Promotes cultural relevance:

- While the activity does not require prior experience outdoors or knowledge about science ideas, the “It reminds me of...” prompt encourages learners to relate what they are observing to their own lived experiences, to share these experiences with the group, and to imbue the learning experience with their own cultural relevance.
- Offers opportunities for learners to hear and value one another’s different perspectives and for the instructor to learn about the lives of learners.
- Sets up a collaborative learning context in which learners’ ideas and observations drive the learning experience, and learners recognize themselves and one another as sources of expertise.

Supports engagement and equitable participation:

- The prompts “I notice...,” “I wonder...,” and “It reminds me of...” invite a wide range of divergent responses, with no wrong answers.
- Ensures that learners get time to explore and observe with a partner so everyone can share their ideas in a low-stakes setting. Thinking through ideas in a low-stakes setting benefits all learners, especially emerging multilingual learners and learners who need more processing time.
- Learners build social connections through discussion and exploration that help them be more successful in learning experiences. This is especially true for learners who have experienced trauma.

Supports language acquisition:

- Authentic discussions about engaging topics promote language development.
- Emerging multilingual learners benefit from developing discipline-specific vocabulary and literacy in all the languages they speak.
- Learners can use their preferred language in partner discussions.

Scaffolds transferable learning behaviors:

- Learners develop critical thinking skills and learning strategies they can apply in many contexts.
- Supports learners to become more independent with skills and thinking tools they can use, regardless of the support available from a teacher or instructor.

References

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- National Research Council. (2010). *Surrounded by Science: Learning Science in Informal Environments*. Washington, DC: The National Academies Press.
- National Research Council. (2012). *A Framework for K–12 Science Education: Practices, Crosscutting Concepts, and Core Ideas*. Washington, DC: The National Academies Press.



ACTIVITIES AND MAIN IDEAS

Sensory/Observation Activities

- Focus on sounds: counting sounds, quality of each sound, sounds as music, deer ears. *(inspired/derived from Joseph Cornell, Jon Young, Tom Brown)*
- Focus on touch: body, air, ground and then compare two objects. *(inspired/derived from Tom Brown)*
- Focus on smell: air and nearby objects. *(inspired/derived from Tom Brown)*
- Focus on vision: colors, shadows, and light, using “Owl Eyes.” *(common practice among Indigenous peoples from all over the world and our animal relatives)*
- Observing a tree from as many different perspectives as possible. *(inspired/derived from Steve Van Zandt)*
- Other sensory/observation activities: sit spots, nature drawing, journaling, card hikes, etc.
- “Slow down, get down, look around.” —*Todd Newberry*
- Using hand lenses.
- Body Radar—wandering wherever your body feels like going and checking things out *(inspired/derived from Jon Young and Coyote Mentoring)*
- Beauty Breaks/Appreciation Breaks *(inspired/derived from Emilie Lygren)*
- *I Notice, I Wonder, It Reminds Me Of* *(inspired/derived from John Muir Laws)*

Main Ideas

- The answer to almost every question about teaching is: “It depends!”
- Don’t be automatic with instructional decisions; make thoughtful choices about how to guide learners, depending on the situation.
- Observation skills encourage wonder, curiosity, and emotional connections with nature.
- Names are useful, but answering learner questions or telling names right away can sometimes discourage exploration, observation, thinking, and curiosity. It’s often effective not to lead with a name, but to “trail” with it.
- We should be sensitive to the moment and to the spirit of inquiry when deciding what information to provide and when to provide it.
- Instructors who share information judiciously, and after learners have had opportunity to wonder and think about it, find that learners can get more out of their observations.
- Anthropomorphism can be a way for learners to connect with the natural world, but it can cloud accurate perceptions of nature.
- By subtle word-coaching and encouraging accurate empathy, we can invite learners to make deep, thoughtful observations while affirming their culture and values.
- We all have observation skills, and we can all grow and develop these skills.
- Making scientific observations is meant to be our best attempt at describing the world as accurately as possible.
- The brain has a tendency to filter out much of what we experience. We can choose to direct our focus of attention.
- Scientific observers should strive to be humble and attempt to make accurate, detailed observations.

A WHOLE BUNCH OF QUOTES RELATED TO MAKING OBSERVATIONS

"Anything will give up its secrets if you love it enough." —George Washington Carver

"A useful definition of love is sustained compassionate attention." —John Muir Laws

"The more I wonder, the more I love." —Alice Walker

"Names are useful and important, but there's some sort of switch that can go off in our head once we have figured out the name for a species we are observing. That's why when teaching, instead of leading with the name, I 'trail' with it." —John Muir Laws

"Curiosity is not a trait that you have or don't have, but a skill that you can develop." —John Muir Laws

"They drove 150 miles to the intertidal, but they didn't go the last four feet. In order to observe in the intertidal you have to put your feet in the lowest place they can go, and then put your face down where your feet are." —Todd Newberry

"There is almost never a reason not to be slow. Nature will not speed up just because you have arrived." —Todd Newberry

"Naming and making lists of animals and plants is 'Glance & Go' nature watching. It might be a fun sport, but it's not natural history or science." —Todd Newberry

"Without questions, natural history is a stand-off. You stare at nature and nature just stares back." —Todd Newberry

"I come here to listen, to nestle in the curve of the roots in a soft hollow of pine needles, to lean my bones against the column of white pine, to turn off the voice in my head until I can hear the voices outside it: the *shhh* of wind in needles, water trickling over rock, nuthatch tapping, chipmunks digging, beechnut falling, mosquito in my ear, and something more—something that is not me, for which we have no language, the wordless being of others in which we are never alone." —Robin Wall Kimmerer

"Never take more than half. Leave some for others. Harvest in a way that minimizes harm. Use it respectfully. Never waste what you have taken. Share. Give thanks for what you have been given. Give a gift, in reciprocity for what you have taken. Sustain the ones who sustain you and the earth will last forever." —Robin Wall Kimmerer

"Gifts from the earth or from each other establish a particular relationship, an obligation of sorts to give, to receive, and to reciprocate." —Robin Wall Kimmerer

"Might science and traditional knowledge be purple and yellow to one another (putting them together makes each more vivid; just a touch of one will bring out the other), might they be goldenrod and asters? We see the world more fully when we use both." —Robin Wall Kimmerer

"It's a sign of respect and connection to learn the name of someone else, a sign of disrespect to ignore it. And yet the average American can name over a hundred corporate logos and ten plants . . . Learning the names of plants and animals is a powerful act of support for them." —Robin Wall Kimmerer

"I see no more than you, but I have trained myself to notice what I see." —Sherlock Holmes

"The world is full of obvious things which nobody by any chance ever observes." —Sherlock Holmes

"Let me keep my mind on what matters, which is my work, which is mostly standing still and learning to be astonished." —Mary Oliver

"Instructions for living a life: Pay attention. Be astonished. Tell about it." —Mary Oliver



A WHOLE BUNCH OF QUOTES RELATED TO MAKING OBSERVATIONS (continued)

"From my boyhood, I have observed leaves, trees, and grass, and I have never found two alike. They may have a general likeness, but on examination, I have found that they differ slightly. It is the same with animals . . . it is the same with human beings . . ." —*Okute Sica*

"Our job is to be an awake people . . . utterly conscious, to attend to our world." —*Louis Owens*

"It's not just a matter of grit or mindset . . . We have to help dependent students develop new cognitive skills and habits of mind that will actually increase their brainpower. Students with increased brainpower can accelerate their own learning, meaning they know how to learn new content and improve their weak skills on their own" —*Zaretta Hammond*

"On his own, a dependent learner is not able to do complex, school-oriented learning tasks such as synthesizing and analyzing informational text without continuous support. Let's not misunderstand the point—dependent doesn't mean deficit. As children enter school, we expect that they are dependent learners. One of our key jobs in the early school years is to help students become independent learners. We expect students to be well on their way to becoming independent learners by third grade, but we still find a good number of students who struggle with rigorous content well into high school, mostly students of color." —*Zaretta Hammond*

"The only true voyage of discovery consists not in visiting strange lands, but in having new eyes." —*Marcel Proust*

"Human beings have a strong, strong, strong tendency that if we see an animal do something that's analogous to what we do, like use a tool or answer an arithmetic question, we assume that the animal is doing it and understands the situation in the same way we do. And sometimes that's true but more often it's false." —*Alan Kamil*

"One way to open your eyes is to ask yourself, 'What if I had never seen this before? What if I knew I would never see it again?'" —*Rachel Carson*

"My world is full of holes . . . The way I see is a little the way a blind man taps along the street: he knows just that one spot where his cane touches down, and he hopes he can pretty much guess the rest." —*James Elkins*

"Much of the grand tradition of natural history falls somewhere in the valley between science and poetry." —*David Rothenberg*

"Hands-on experience at the critical time, not systematic knowledge, is what counts in the making of a naturalist. Better to be an untutored savage for a while, not to know the names or anatomical detail. Better to spend stretches of time just searching and dreaming." —*Edward O. Wilson*

"Every kid starts out as a natural-born scientist, and then we beat it out of them. A few trickle through the system with their wonder and enthusiasm for science intact." —*Carl Sagan*

"The best teachers are those who show you where to look but don't tell you what to see." —*Alexandra K. Trenfor*

"The most dangerous person is the one who listens, thinks, and observes." —*Bruce Lee*

"You can observe a lot by watching." —*Yogi Berra*

"The more opinions you have, the less you see." —*Wim Wenders*

"People generally see what they look for, and hear what they listen for." —*Harper Lee*

"In an age of acceleration, nothing is more exhilarating than to go slow. In an age of distraction, nothing is more luxurious than to pay attention. In an age of constant movement, it has never been more urgent to sit still." —*Pico Iyer*

A WHOLE BUNCH OF QUOTES RELATED TO MAKING OBSERVATIONS (continued)

"The most effective way to save the threatened and decimated natural world is to cause people to fall in love with it again, with its beauty and its reality." —*Peter Scott*

"Your eyes can deceive you. Don't trust them." —*Obi-Wan Kenobi*

"It is fortunate, perhaps, that no matter how intently one studies the hundred little dramas of the woods and meadows, one can never learn all of the salient facts about any one of them." —*Aldo Leopold*

"My parents were the best scientists I knew because they were always asking questions" —*Mae Jemison*

"The world shows up for us, but it doesn't show up for free. We must show up, too, and bring along what knowledge and skills we've cultivated. As with a painting in a gallery, the world has no meaning—no presence to be experienced—apart from our ability to engage with it." —*Alva Noë*

"Explore the world. Nearly everything is really interesting if you go into it deeply enough." —*Richard Feynman*

"The moment one gives close attention to anything, even a blade of grass, it becomes a mysterious, awesome, indescribably magnificent world in itself." —*Henry Miller*

"We do not see things as they are. We see them as we are." —*The Talmud*

"Shh. Listen to the sounds that surround you. Notice the pitches, the volume, the timbre, the many lines of counterpoint. As light taught Monet to paint, the earth may be teaching you music." —*Pete Seeger*

"To develop a complete mind: Study the science of art; Study the art of science. Learn how to see. Realize that everything connects to everything else." —*Leonardo da Vinci*

"I think if you look at any facet of nature in enough detail, you find it fascinating. How could you not?" —*Diane Ackerman*

"When books and animals disagree, as they often do, the animal is always right." —*Donald Abbott*

"Every observation . . . is a result of a question we ask nature, and every question implies a tentative hypothesis." —*Ernst Gombrich*

"What we observe is not nature itself, but nature exposed to our method of questioning." —*Werner Heisenberg*

"Empathy is a stimulated emotional state that relies on the ability to perceive, understand and care about the experiences or perspectives of another person or animal." —*Ashley Young, Kathayoon A. Khalil, and Jim Wharton*

"... the brain's chemistry changes when we become curious, helping us better learn and retain information." —*Brené Brown*



BACKGROUND INFORMATION FOR PRESENTERS

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More on Making Observations

- Slow Down, Get Down, and Look Closely
- Asking Questions, Observations, and Curiosity
- Observations and Awe
- Incorporating Nature Journaling as an Observation Tool

Building Environmental Literacy and Connection with Nature

Supporting Equitable, Inclusive, and Culturally Relevant Learning Experiences

Science as One Way of Knowing, Not the Only Way

Science and Traditional Ecological Knowledge (TEK)

- Gratitude
- Reciprocity
- Avoiding “Othering” Language
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Integrating Territorial Acknowledgments Into Outdoor Science Programs

- What Are Territorial Acknowledgments and Why Are They Important?

Anthropomorphism, Observations, Explanations, and Empathy

Background on Influential Leaders Cited in This Session

Connections to Other BEETLES Sessions

More on Making Observations

Being a careful and attentive observer of the natural world is a characteristic shared by scientists, naturalists, and many more people across a range of professions and community roles. Observations are a key to building an intimate understanding of nature. Observations also elicit wonder and curiosity that leads to interesting questions, further exploration, and investigation. We all can improve our observation skills. As we go about our busy lives, nature and the outdoors can sometimes become a “green blur” in the background. However, when we slow down to observe something in nature—lichen, a spider web, a leaf, a bird, a pattern in sand—this can often be an invitation to start noticing more everywhere!

Slow Down, Get Down, and Look Closely

Marine biologist Todd Newberry, whose teaching has been inspirational to the BEETLES project, says, “Naming and making lists of animals and plants is ‘Glance & Go’ nature watching. It might be a fun sport, but it’s not natural history or science.” Learners can deepen their skills of observation, and skilled teachers can offer opportunities for learners to do just that. First and foremost, observers can benefit from [slowing down](#). Most things in nature unfold slowly, and as Todd says, “There is almost never a reason not to be slow. Nature will not speed up just because you have arrived.” Most animals—from beetles to bobcats to tide-pool creatures—are startled by the arrival of humans (especially a group of 20 of them) and will do their best not to be seen. If we slow down and are quiet enough for a long enough time, these

animals recover from the shock of our arrival. For most observations, it also helps to **get down** low. Many organisms are small and located under or behind rocks, leaves, logs, grass, etc. We can make interesting and detailed observations while on our knees, belly, or back or through touch as a direct sensory experience. Finally, observers can aim to **get in close**. Todd says, “I read the seashore with the lower half of my bifocals.” Getting close can reveal details of structure and behavior that might be otherwise missed. Getting close can mean physically close, using a hand lens, or using a sense of touch to make observations. We can also get virtually close by using binoculars, a spotting scope, a telescope, or examining close-up photos or videos. These tools can be one way to enter the world of the organism or other natural features we are observing.

Interview an Organism student activity. See the activity *Interview an Organism* for specific questions and strategies to engage learners with this approach (<http://beetlesproject.org/resources/for-field-instructors/interview-an-organism/>).

Question Generators. For more on Curiosity Scaffolds and Question Generators, see the book *How to Teach Nature Journaling*, pp. 89–92.

Asking Questions, Observations, and Curiosity

Intentionally asking questions can deepen observations and increase curiosity. Todd Newberry offers the idea of posing “interview” questions to which the organism or phenomenon can “answer” back (by inviting us to make observations in response to the question). Useful “interview” questions for learners to ask: *What are you doing? How many of you are there? How far apart are you? How far will you travel in 5 minutes? What else is around you? Are they the same things that are around others like you? Can I draw you?* Asking these questions or using tools such as counting and measuring can lead to unexpected and delightful observations. Thinking about “interviewing” an organism is one way to think about creatively generating questions in nature explorations. In the book *How to Teach Nature Journaling*, John Muir Laws and Emilie Lygren offer “Curiosity Scaffolds and Question Generators,” or sets of prompts that invite learners to ask a range of different kinds of questions (Laws and Lygren, 2020). These are all tools that instructors can offer learners to invite them to build on using the prompt “I wonder...” to ask interesting and varied questions.

The act of asking questions can ignite curiosity. In *The Laws Guide to Nature Journaling*, John Muir Laws and Emilie Lygren write, “Curiosity has a critical role in learning. Curious investigation stimulates the reward center in your brain. It triggers the release of dopamine and activates the hippocampus, a brain region involved in forming new memories. As a result, a person in a state of heightened curiosity will learn more easily—and not only about what had caught their attention. Surprisingly, a person in an intense state of curiosity is also primed to absorb unrelated information that they were not innately curious about. Finally, curiosity makes it more likely that you will remember what you have learned (Gruber et al., 2014). Essentially, interest in one thing creates a curiosity vortex that sucks up unrelated material, making it easier to assimilate and remember” (Laws & Lygren, 2016).

Observations and Awe

Studies have shown that people who experience awe together in the outdoors are more primed for collaboration and that this state can even increase someone’s capacity for critical thinking. An article from the University of California, Berkeley, Greater Good Science Center reports that “...multiple studies have found that experiencing awe may make people more kind and



generous. Research suggests that awe helps us feel more connected to the people in our lives and to humanity as a whole.” These ideas, which are relatively new to science, offer support for some of the benefits of nature experiences that outdoor educators have observed informally for years. This research can also offer guidance for the structure of our outdoor science programs and experiences. If your program has a focus on team-building, consider how inviting learners into a mindset of awe and wonder through making observations can also play a role in creating a collaborative spirit. If your organization brings learners to scenic vistas to experience awe, consider how inviting learners to make close observations of their surroundings is another way for them to experience that awe.

Incorporating Nature Journaling as an Observation Tool

Nature journaling—or the process of using words, pictures, and numbers to record and document observations and ideas on paper—is a powerful practice that deepens observation and enhances memory. Learners can call on the prompts “I notice...,” “I wonder...,” “It reminds me of...” as a tool for making observations, asking questions, and making connections during any nature journaling experience. The book *How to Teach Nature Journaling* by John Muir Laws and Emilie Lygren offers a range of activities and ideas on how to engage learners in journaling, and the approach supports and reinforces the strategies highlighted in this session (www.howtoteachnaturejournaling.com).

Building Environmental Literacy and Connection with Nature

The North American Association for Environmental Education (NAAEE) defines environmental literacy (in part) as follows: “Those who are environmentally literate possess, to varying degrees: the knowledge and understanding of a wide range of environmental concepts, problems, and issues; a set of cognitive and affective dispositions; a set of cognitive skills and abilities; and the appropriate behavioral strategies to apply such knowledge and understanding in order to make sound and effective decisions in a range of environmental contexts. This definition treats the primary elements of environmental literacy—the cognitive (knowledge and skills), affective, and behavioral components—as both interactive and developmental in nature.”

Louise Chawla, Professor Emeritus at the University of Colorado, Boulder, is a widely published author on children and nature. She defines environmental sensitivity as “a predisposition to take an interest in learning about the environment, feeling concern for it, and acting to conserve it, on the basis of formative experiences,” and continues, “Contact with natural areas has emerged as one of the most significant influences in all the studies reviewed, and free encounters with the natural world are becoming inaccessible to more and more young people in the urbanized world” (Chawla, 1998, p. 19). By bringing children outdoors and offering strategies such as *I Notice, I Wonder, It Reminds Me Of*, outdoor science programs can create opportunities for learners to develop observation skills and curiosity, which are components of environmental literacy and sensitivity. These intimate experiences with nature elicit feelings of emotional connection and caring. This is a signature benefit of outdoor science that is difficult to replicate in a classroom.

Supporting Equitable, Inclusive, and Culturally Relevant Learning Experiences

BEETLES student activities and instructional materials have been intentionally designed to create an equitable, inclusive, and culturally relevant learning experience for a community of learners. BEETLES design principles (<http://beetlesproject.org/about/how-do-we-approach-teaching/>) ensure that each student activity is learner-centered and nature-centered. This enables all learners to access, participate, and engage in the learning experience.

These design principles are represented in the activity *I Notice, I Wonder, It Reminds Me Of* and in the general approach of focusing on making observations as a critical part of the learning experience.

When learners engage directly with nature, they all have access to learning, regardless of their prior knowledge or experiences.

Centering learning on learners' in-the-moment observations of nature builds an inclusive learning experience by focusing the conversation on an experience shared by every learner, as opposed to relying on learners' prior knowledge or past experiences. As learners engage with nature, instructors are in the role of the "guide on the side." This approach shifts power from the instructor to learners, challenges the typical learning situation in which the instructor is the only expert, encourages learners to share their ideas and experiences, and makes learning a more decentralized and collaborative experience.

When learners think like a scientist and practice academic language, they develop critical thinking skills that support them to become more independent learners—learners who have skills and thinking tools they use to learn, regardless of the level of support available from a teacher or instructor.

Giving learners the opportunity to think like a scientist by making observations, asking questions, and constructing explanations supports students' growth as learners and offers them the opportunity to build critical thinking skills and learning behaviors they can apply in any context. Many learners in schools that have historically been under-resourced due to racist school funding policies, redlining, income inequality, and police profiling have fewer opportunities to develop as independent learners. Specifically ensuring that learners in these kinds of schools have opportunities to develop as independent learners is an issue of equity. Learning and practicing critical thinking skills in an engaging outdoor context supports learners to succeed back in their classrooms, in science, and in other academic disciplines. Offering opportunities for learners to discuss ideas with their peers and knowledgeable adults makes science more accessible by connecting it to learners' own actions and discoveries in the moment—not to knowledge they may not have or experiences they may not have had.

Through discussion, learners make connections to prior knowledge, share their lived experiences, listen to different perspectives, and have time to process the material. Centering productive discussions in which many voices are heard and the group builds off one another's ideas creates an experience in which learners see themselves and one another as sources of expertise.

How does centering expertise on learners support the development of more equitable learning experiences?

"In equitable and inclusive work, an important shift is one of power and positionality—in this case, a power and authority shift from the instructor to the learner. The instructor actually gives up power and is not afraid of receiving/seeing what other ways of knowing arise from the learner and learning." —José González, founder of Latino Outdoors

"Classroom studies document the fact that underserved English learners, poor students, and students of color routinely receive less instruction in higher-order skills development than other students." (Allington and McGill-Franzen, 1989; Darling-Hammond, 2001; Oakes, 2005) —Zaretta Hammond, *Culturally Responsive Teaching & the Brain*

This ensures that instructors don't fall back on positioning themselves as the only source of accurate or important information. Participating in discussions also supports learners to develop cognitive rigor and the ability to take on more advanced learning tasks. Discussions make learners' thinking and ideas visible to the instructor. When instructors value, appreciate, better understand, and connect to learners' lived experiences, they create a more inclusive and culturally relevant learning space. Finally, multiple opportunities for discussion provide time and space for neurodiversity—allowing learners to process information in different ways. Using discussion strategies such as *Turn & Share* or *Thought Swap* (formerly known as *Walk & Talk*) that are part of every BEETLES student activity can help ensure that learners have these kinds of opportunities for discussion.

Specifically, the model student activity *I Notice, I Wonder, It Reminds Me Of* promotes an equitable, inclusive, and culturally relevant learning experience by:

- offering curiosity tools, an inquiry mindset, and critical thinking skills that learners can use to learn in any context and by supporting learners in becoming more independent learners.
- engaging learners with commonly found parts of nature (e.g., leaves), which contrasts the exclusionary idea that nature only exists in pristine wilderness areas, requires a panoramic view or unique geographic feature to be engaging, or is otherwise a place learners need to go to as opposed to something they are always surrounded by.
- giving learners multiple opportunities to connect to and share their lived experiences and for learners and the instructor to listen to and learn from these experiences and perspectives.
- providing space for learners to come up with connections between what they are observing and prior experiences and knowledge, which supports their learning and retention.
- giving instructors an approach they can use to guide learner-centered and nature-centered exploration and learning throughout the rest of the field experience.
- focusing the group's learning on a common experience to which everyone has access.

Overall, these factors contribute to creating a learner-centered approach in which “the ultimate goal...is to help learners take over the reins of their learning” (Hammond, 2014). This approach to teaching and learning can be applied to other activities and lessons in an outdoor science program. The approach also supports learners in becoming independent learners who are able to succeed, regardless of any individual teacher or learning context. BEETLES has intentionally designed the sequence and structure of this activity, and our other curricula and instructional materials, to support learning experiences in which all learners feel capable of success and have the tools to carry that success into other domains.

Resources on unconscious bias. There are many great resources on understanding and shifting unconscious bias. Here are a few books and organizations we have looked to consistently to work on our own unconscious bias and to better understand how it can affect teaching and learning in the outdoors:

- *White Fragility: Why It's So Hard for White People to Talk About Racism* by Robin DiAngelo
- *Culturally Responsive Teaching & the Brain* by Zaretta Hammond
- *My Grandmother's Hands: Racialized Trauma and the Pathway to Mending Our Hearts and Bodies* by Resmaa Menakem
- **Youth Outside** [<http://www.youthoutside.org/>]
- **The Avarna Group** [<https://theavarnagroup.com/>]
- **Center for Diversity & the Environment** [<https://www.cdeinspires.org/>]

Resources for further learning on synergies and distinctions between TEK and Western science.

To begin your learning:

Books:

- *Braiding Sweetgrass* by Robin Kimmerer
- *Decolonizing Methodologies* by Linda Tuhiwai Smith
- *Wisdom Sits in Places* by Keith Basso
- *Traditional Ecological Knowledge: Learning from Indigenous Practices for Environmental Sustainability* by Melissa Nelson & Daniel Shilling

Research papers:

- "On the Role of Traditional Ecological Knowledge as a Collaborative Concept: A Philosophical Study" by Kyle Whyte
- "Local Understandings of the Land: Traditional Ecological Knowledge and Indigenous Knowledge" by Roy C. Dudgeon and Fikret Berkes
- "The Earth's Blanket: Traditional Teachings for Sustainable Living" by Nancy Turner
- "Elaborating Indigenous Knowledge in the Science Curriculum for the Cultural Sustainability" by Rif'ati Dina Handayani, Insih Wilujeng, and Zuhdan K. Prasetyo
- "Indigenous Environmental Education for Cultural Survival" by Leanne Simpson

Other resources:

- "The Onondaga Nation's Vision for a Clean Onondaga Lake: An offer of biocultural restoration." <https://www.onodaganation.org/land-rights/onodaga-nations-vision-for-a-clean-onodaga-lake/>

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Using learner-centered and nature-centered learning approaches is just one piece of the work we can do to create equitable, inclusive, and culturally relevant learning experiences. Instructors must also work to become more aware of their own unconscious biases and triggers around culture, identity, and race that impact their interactions with learners and affect their learners' sense of inclusion.

Science as One Way of Knowing, Not the Only Way

All cultures have a deep history of observing, investigating, and living closely with the natural world that predates modern "science." Humans have always gathered knowledge about the natural world in ways that are similar to current scientific thinking and in other ways that differ from scientific thinking. The ecological knowledge that is obtained by Indigenous peoples and western science are both valid, with each having roots that are based on philosophical foundations, methods of validation, and communities of respected experts. Traditional Ecological Knowledge (TEK) refers to an evolving body of knowledge based on hundreds or thousands of years of close observations of ecosystems by Indigenous people. Indigenous Knowledge (IK) has been used to refer to the local knowledge of Indigenous peoples or to the unique, local knowledge of a particular cultural group. TEK includes Indigenous understandings of ecology, spirituality, and human relationships with living and nonliving things. The ways of constructing, organizing, using, and communicating knowledge that have been practiced by Indigenous peoples for centuries have many similarities with current science practices (Lambert, 2003).

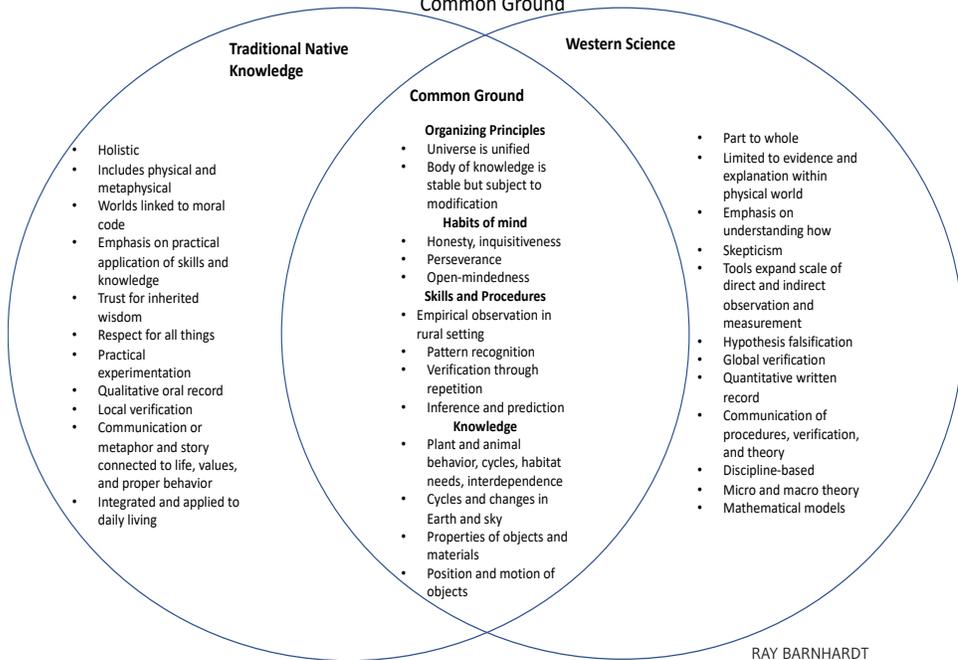
There are many different ways of knowing. Science is one way. When teaching science, it's important for instructors to acknowledge and value the many ways that learners come to understand their world. If learners feel their religion, spirituality, or cultural knowledge are being ignored or disrespected, they might disregard scientific instruction as irrelevant or disengage from the learning experience. Often (though not always), these varied ways of knowing are complementary. One of the options in *I Notice, I Wonder, It Reminds Me Of* is for learners to discuss which of their questions are scientific—questions that can be pursued through observation and investigation (scientific practices that integrate with TEK). Learners also discuss which questions are beyond the realm of science and can only be pursued through approaches and disciplines other than science. This can also be an opportunity for learners to engage with questions that approach a holistic view of the environment and the connection human beings have within that environment. The holistic nature of TEK or IK allows for practical applications in science that are balanced with spiritual practices that encompass intellectual, physical, affective, and spiritual domains of learning.

The Venn diagram (on the next page) is an attempt to illustrate the characteristics of science and TEK that overlap and those that distinguish them from one another.



Native Ways of Knowing

Common Ground



RAY BARNHARDT
ANGAYUQAQ OSCAR KAWAGLEY
University of Alaska Fairbanks

For continued learning:

Books:

- *Indigenous Methodologies* by Margaret Kovach
- *Gathering Moss* by Robin Kimmerer
- *A Sand County Almanac* by Aldo Leopold
- *Tending the Wild: Native American Knowledge and the Management of California's Natural Resources* by M. K. Anderson
- *Sacred Ecology: Traditional Ecological Knowledge and Resource Management* by Fikret Berkes
- *Recovering the Sacred: The Power of Naming and Claiming* by Winona LaDuke
- *Original Instruction* by Melissa Nelson

Research papers:

- "Local Understandings of the Land: Traditional Ecological Knowledge and Indigenous Knowledge" by Roy C. Dudgeon and Fikret Berkes
- "Indian Time: Time, Seasonality, and Culture in Traditional Ecological Knowledge of Climate Change" by Samantha Chisholm Hatfield, Elizabeth Marino, Kyle Powys Whyte, Kathie D. Dello, & Philip W. Mote
- "Weaving Traditional Ecological Knowledge into Biological Education: A Call to Action" by Robin Kimmerer
- "Native Knowledge for Native Ecosystems" by Robin Kimmerer
- "Searching for Synergy: Integrating Traditional and Scientific Ecological Knowledge in Environmental Science Education" by Robin Kimmerer
- "An Emerging Decolonizing Science Education in Canada" by Glen Aikenhead and Dean Elliott
- "Discovering Indigenous Science: Implications for Science Education" by Gloria Snively and John Corsiglia
- "Coming to Know: Weaving Aboriginal and Western Science, Knowledge, Language and Literacy in the Science Classroom" by Gloria Snively and Lorna Williams
- "Western Science and Traditional Knowledge: Despite Their Variations, Different Forms of Knowledge Can Learn from Each Other" by Fulvio Mazzocchi

(continued on next page)

Annie Sorrell and her cohort of graduate students from the Center for Native Peoples and the Environment (at State University of New York, College of Environmental Science and Forestry) offered these additions to the Venn diagram above:

Traditional Ecological Knowledge	Western Science
<ul style="list-style-type: none"> • approach nonliving relationships as relatives/kin 	<ul style="list-style-type: none"> • approach nonliving relationships as resources
<ul style="list-style-type: none"> • decision-making is based on seven generations 	<ul style="list-style-type: none"> • decision-making is guided by term limits, fiscal years, and an Individual's lifetime
<ul style="list-style-type: none"> • focus is on journey and process 	<ul style="list-style-type: none"> • focus is on destination, goals, and outcome
<ul style="list-style-type: none"> • focus on relationships (research projects include consideration of how decisions will affect the community; involvement in a research project should consider all relationships: species, people, and land) 	<ul style="list-style-type: none"> • focus on individuals (decisions are guided by self-interest, what a researcher might achieve individually from their participation in the activity or research)
<ul style="list-style-type: none"> • species/places are our relatives, they may give us gifts 	<ul style="list-style-type: none"> • species/places are resources humans have a right to use or manage
<ul style="list-style-type: none"> • increase positive relationships, tend the land, consider reciprocity, re-Indigenize 	<ul style="list-style-type: none"> • stop relationships, passive recreation (e.g., photography) vs. actively tending the land, colonizing another place to meet needs ("sacrifice zones")

Research papers (continued):

- “Beyond the ‘Ecological Indian’: Environmental Politics and Traditional Ecological Knowledge in Modern North America” by Gregory D. Smithers
- “Integrating Traditional Ecological Knowledge with Western Science for Optimal Natural Resource Management” by Serra Hoagland
- “Restoration and Reciprocity: The Contributions of Traditional Ecological Knowledge” by Robin Kimmerer
- “Learning as You Journey: Anishinaabe Perception of Social-Ecological Environments and Adaptive Learning” by Iain Davidson-Hunt and Fikret Berkes
- “Cultural Keystone Species: Implications for Ecological Conservation and Restoration” by Ann Garibaldi and Nancy Turner
- “Protecting Restorative Relationships and Traditional Values: American Indian Tribes, Wildlife and Wild Lands” by Linda Moon Stumpff
- “How Might Native Science Inform ‘Informal Science Learning?’” by Brian McKinley Jones Brayboy and Angelina E. Castagno
- “Defining ‘Science’ in a Multicultural World: Implications for Science Education” by William W. Cobern and Cathleen C. Loving
- “Indigenous Knowledge in the Science Curriculum: Avoiding Neo-Colonialism” by Ann Ryan
- “Out of Place: Indigenous Knowledge in the Science Curriculum” by Elizabeth McKinley and Georgina Stewart
- “Conversations on Cultural Sustainability: Stimuli for Embedding Indigenous Knowledges and Ways of Being into Curriculum” by Renae Acton, Peta Salter, Max Lenoy, and Robert (Bob) Stevenson
- “Re-Examining the Importance of Indigenous Perspectives in the Western Environmental Education for Sustainability: From Tribal to Mainstream Education.” by Doreen Vikashni Chandra

Science and Traditional Ecological Knowledge (TEK)

Robin Wall Kimmerer—scientist, author, poet, and director of the Center for Native Peoples and the Environment at the State University of New York, Environmental Science and Forestry School—compares, contrasts, and seeks out complementarity between science, TEK, and the arts in her writing and teaching. Indigenous perspectives and strategies for making observations in nature have tremendous relevance in environmental education. How can non-Indigenous environmental educators highlight TEK without engaging in cultural appropriation? Kimmerer provides guidance about this, and her approaches overlap nicely with those of marine biologist Todd Newberry (quoted several times in this session and other BEETLES resources). Newberry describes “interviewing an organism” as a way to deepen observations. Kimmerer, in her book *Braiding Sweetgrass: Indigenous Wisdom, Scientific Knowledge and the Teaching of Plants*, describes the blending of TEK with scientific experiments in a similar manner, “To me, an experiment is a kind of conversation with plants: I have a question for them, but since we don’t speak the same language, I can’t ask them directly and they won’t answer verbally... Plants answer questions by the way they live, by their responses to change; you just need to learn how to ask... Experiments are not about discovery but about listening and translating the knowledge of other beings” (Kimmerer, 2013, p. 158).

Kimmerer writes the following about science:

“Listening in wild places, we are audience to conversations in a language not our own. I think now that it was a longing to comprehend this language I hear in the woods that led me to science, to learn over the years to speak fluent botany. A tongue that should not, by the way, be mistaken for the language of plants. I did learn another language in science, though, one of careful observation, an intimate vocabulary that names each little part. To name and describe you must first see, and science polishes the gift of seeing. I honor the strength of the language that has become a second tongue to me. But beneath the richness of its vocabulary and its descriptive power, something is missing, the same something that swells around you and in you when you listen to the world. Science can be a language of distance which reduces a being to its working parts; it is a language of objects. The language scientists speak, however precise, is based on a profound error in grammar, an omission, a grave loss in translation from the native languages of these shores” (pp. 48–49).

Kimmerer also refers to Indigenous lore about trees talking to one another and how that idea has long been dismissed by scientists. Yet she points out, “There is now compelling evidence that our elders were right—the trees *are* talking to one another. They communicate via pheromones, hormonelike compounds that are wafted on the breeze, laden with meaning” (pp. 19–20). She goes on to describe how scientists are learning about how fungal networks connect trees and “redistribute the wealth of carbohydrates from tree to tree” (p. 20).

The idea of communication between trees was understood by Indigenous peoples long before science managed to “discover” it. Integrating TEK with



scientific knowledge allows for a holistic understanding of the environment that improves existing processes and management. TEK can also add to the understandings built through science, validating what is known about the natural world in a different way. It's a lovely example of the complementarity between science and TEK and how we can see the world more fully when we use both.

In her blending of science with TEK, Kimmerer describes the importance of gratitude, the practice of reciprocity, and the use of language that is not "othering" when describing and addressing nature. These perspectives can be common to science and TEK and can help learners of all identities develop their own relationship with nature. These perspectives can be shared and encouraged with learners in ways that are respectful to Indigenous cultures and authentic to the instructor. This can look like genuinely and respectfully sharing practices of gratitude, reciprocity, and not othering parts of nature (universal values of Indigenous people) without using or appropriating the language or ceremonies of specific Indigenous cultures.

Cultural appropriation. When aspects of a culture are copied by members of another culture, particularly if those doing the copying are members of the dominant white culture, this may be considered to be harmful and a form of colonialism. In environmental education, aspects of Indigenous culture have at times been incorporated into programs and instruction, which is often harmful to Indigenous people. Nature instruction that ignores Indigenous values, such as when learners act disrespectfully toward nature, can also be harmful. Embodying Indigenous values and wisdom without appropriating Indigenous culture is a way of honoring Indigenous people without contributing to the harm they have already experienced through genocide and the taking of their land.

Article 31.1 of the United Nations *Declaration on the Rights of Indigenous Peoples* (https://en.wikipedia.org/wiki/Declaration_on_the_Rights_of_Indigenous_Peoples) states:

Indigenous peoples have the right to maintain, control, protect and develop their cultural heritage, traditional knowledge and traditional cultural expressions, as well as the manifestations of their sciences, technologies and cultures, including human and genetic resources, seeds, medicines, knowledge of the properties of fauna and flora, oral traditions, literatures, designs, sports and traditional games and visual and performing arts. They also have the right to maintain, control, protect and develop their intellectual property over such cultural heritage, traditional knowledge, and traditional cultural expressions.

There is no clear cut set of rules for what does or does not constitute appropriation; while this will vary from tribe to tribe and culture to culture, the specific ideas of what is appropriative should always be determined by the people whose culture the practice arises from, not people from a dominant culture who wish to take up that practice. Some general ideas we'd like to offer for avoiding cultural appropriation of Indigenous cultures in the context of environmental education (for non-native instructors):

- Do not wear traditional costumes or appropriate rituals.
- If you're going to use language, talk about medicinal uses of plants, or share about how a piece of land was or is used by a local tribe, talk to a cultural committee or tribal council first.
- Whenever possible, strive to share quotes from local Indigenous tribal leaders in your area, instead of relying on often overused quotes from well-known tribal leaders such as Chief Seattle or Chief Joseph, who are not from your area.

This short list is just a starting point. To learn more, search online for the many lists of behaviors that could fall into the category of cultural appropriation.

"There are many ways of how you can incorporate traditional values without saying they're traditional values."

—Annie Sorrell, Center for Native Peoples and the Environment (at State University of New York, College of Environmental Science and Forestry)

Considering Intellectual Property Rights in working with Indigenous thought partners. Intellectual Property Rights (IPR) are the notion that ideas, innovations, and inventions, expressed through various material forms, can be owned and that individuals have distinct property rights to these forms of creative expressions and products.

"IPR and the knowledge of seven generations as IPR is the main reason that many Indigenous people struggle with sharing knowledge with nontribal members. Considering seven generations is a fundamental value for intergenerational knowledge being passed down." —Annie Sorrell, Center for Native Peoples and the Environment

"When we were given these instructions, among many of them, one was that when you sit in council for the welfare of the people, you counsel for the welfare of that seventh generation to come. They should be foremost in your mind—not even your generation, not even yourself, but those that are unborn so that when their time comes here, they may enjoy the same thing that you are enjoying now." —Chief Oren Lyons

"Indigenous people argue that western intellectual property laws are fundamentally incompatible with Indigenous cultural systems and ignore the complexities of such Indigenous systems." —Michael Davis, Consultant, Social Policy Group

To learn more: https://www.aph.gov.au/about_parliament/parliamentary_departments/parliamentary_library/pubs/rp/rp9697/97rp20#CRITIQUES

Gratitude

Kimmerer speaks of seeing nature as offering an abundance of gifts. Field instructors can incorporate gratitude into their instruction. Instructors might thank a salamander after learners have spent time gently observing it. They might regularly describe aspects of nature they are grateful for and encourage learners to share what they are grateful for, too. Kimmerer asks, “What would it be like...to live with that heightened sensitivity to the lives given for ours? To consider the tree in the Kleenex, the algae in the toothpaste, the oaks in the floor, the grapes in the wine; to follow back the thread of life in everything and pay it respect? Once you start, it’s hard to stop, and you begin to feel yourself awash in gifts” (p. 154).

Reciprocity

Kimmerer describes how the perspective of gratitude invites us to develop a relationship with nature. “The essence of the gift is that it creates a set of relationships (p. 28). ...Gifts from the earth or from each other establish a particular relationship, an obligation of sorts to give, to receive, and to reciprocate” (p. 25). But how can we reciprocate? How can we give back to Earth? Kimmerer asks, “What else can you offer the earth, which has everything?” (p. 38). We can give back to Earth by treating Earth respectfully. In *Making Observations*, we ask participants, before they begin, to think about how their actions may affect the living and nonliving things they interact with, how they will be respectful as they observe and interact with the environment, what kind of relationship they want to have with this place during their stay, how they will ensure this place is there for future generations, and how they will choose to give back to nature.

Kimmerer writes, “I’ve heard it said that sometimes, in return for the gifts of the earth, gratitude is enough... But I think we are called to go beyond cultures of gratitude, to once again become cultures of reciprocity” (p. 189). There are many forms of reciprocity Kimmerer suggests, most of which pertain to environmental responsibility. She also underscores the importance of making nature observations as a form of reciprocity, “...the least we can do in return is to pay attention” (Kimmerer, 2014, p. 9).

Avoiding “Othering” Language

Kimmerer shares that how we address nature can influence our perspectives: “In English, we never refer to a member of our family, or indeed to any person, as *it*. That would be a profound act of disrespect. *It* robs a person of selfhood and kinship, reducing a person to a mere thing. So it is that in Potawatomi and most other Indigenous languages, we use the same words to address the living world as we use for our family. Because they are our family” (p. 55). She writes about how the English language, by describing other living things as *it*, tends to imply that nonhuman organisms are things, and it’s easier for us to harm what we consider to be things, as opposed to beings. Kimmerer offers the idea that this perspective can be subtly disrupted in English by using terms such as *someone* (not *something*) to describe other organisms. A similar approach can also be seen among some field instructors who, when they come across other organisms, may greet them using terms such as, *Hey*



friend or *Hey there buddy*. For terms that acknowledge our interrelatedness, one might use *Hey cuz* or *Hey there my whiskered relative* (or substitute another descriptor such as *four-legged*, *feathered*, etc.). Some instructors may also choose to substitute the terms *he*, *she*, or *they* for the term *it*.

Developing a Relationship with Nature

Newberry describes how asking questions can encourage our curiosity and inspire us to observe nature. Kimmerer suggests that combining science, TEK, art, and other lenses can increase the fullness of how we see the world. Learning to make careful observations and to ask questions that lead to more detailed observations is key to science and to science education. It also establishes indelible relationships between learners and the bits of nature on which they focus their attention. Kimmerer states, “My natural inclination was to see relationships, to seek the threads that connect the world...” (p. 42). Naturalist E. O. Wilson writes extensively about empathy with other organisms and uses the term *biophilia* to describe “the connections that human beings subconsciously seek with the rest of life,” arguing that it is rooted in our biology. Environmental literacy includes affective dispositions—the feelings we have about nature. Environmental education helps learners increase their understanding of nature and helps them develop their own relationship with nature by allowing them to directly engage with nature. This engagement can be facilitated by educators by providing learners with opportunities to make their own careful observations of different aspects of nature. Kimmerer states, “Science can be a way of forming intimacy and respect with other species that is rivaled only by the observations of traditional knowledge holders. It can be a path to kinship” (p. 252).

I Notice, I Wonder, It Reminds Me Of engages learners directly with some aspect of nature, invites them to notice what is around them, and welcomes any and all observations they make. It welcomes any questions learners come up with, including those that are beyond the realm of science. It invites learners to share what it reminds them of, providing them with opportunities to connect what they are observing with any aspect of their own lived experience and to come up with their own metaphors. Giving sustained compassionate attention to a leaf, an insect, a bush leads to what John Muir Laws calls love and what the NAAEE Environmental Literacy Framework calls “caring and positive feelings toward the environment.” These feelings can be further enhanced through BEETLES focused explorations such as *Lichen Exploration*, *Spider Exploration*, or *Case of the Disappearing Log*. When learners get opportunities to “fall in love” with a variety of aspects of nature, these can lead to a relationship with nature as a whole.

Integrating Territorial Acknowledgements Into Outdoor Science Programs

As environmental and outdoor science educators, we have the opportunity to engage youth meaningfully with nature. This comes with a responsibility to examine our own relationship with the place where we live and teach and to learn and share the relationship between the local Indigenous people and the place. One way to do this is to include a territorial acknowledgment in our

More on creating territorial acknowledgements. See the BEETLES resource *Territorial Acknowledgements for more information on how to create and use them* (<http://beetlesproject.org/resources/territorialacknowledgment/>).

“People generally see what they look for, and hear what they listen for.” —Harper Lee

programming. Territorial acknowledgments name the Indigenous people who first lived on the land and call attention to their enduring presence.

What Are Territorial Acknowledgments and Why Are They Important?

We all live, teach, and work on land stolen from Indigenous peoples. It is easy to forget about this as we move through our daily lives, focusing on our families, communities, and work. This reality is often glossed over in educational settings where local Indigenous people are frequently unacknowledged or are talked and taught about only in the past tense. Learning about Indigenous peoples in classrooms and outdoor programs is often focused on traditional Indigenous practices, not the significant impacts of colonization on Indigenous communities, where and how those communities currently engage with the land, and how they continue to be marginalized today.

Territorial acknowledgements (also called land acknowledgments), or statements that acknowledge the Indigenous communities who originally lived on the land where an event takes place, are a way to guard against making Indigenous people invisible. They’re also a way to introduce some discomfort and awareness into our daily lives, reminding non-Indigenous people to consider the historic and current impacts of colonization on Indigenous communities and to be in thoughtful relationship with the land. Including territorial acknowledgments toward the beginning of a program or event (and putting them on your organization’s website) can be one step toward deepening understanding of the impacts of colonization on Indigenous communities.

Anthropomorphism, Observations, Explanations, and Empathy

Anthropomorphism is when people project human characteristics or values onto organisms and things that are not human. Anthropomorphism can influence the observations we make of organisms. When making scientific observations, we’re trying to capture with accuracy what we can detect with our senses. To do that, we need to do our best to avoid bias. Anthropomorphism can bias our observations in ways we may not be conscious of. For example:

Male scientists observed and described male elephant seals aggressively fighting for dominance. The scientists also observed and described the female elephant seals as being passive. From their observations, the scientists made the assumption that the seals had a male-dominated social system, which became a widely accepted perspective. Then, a female graduate student observed and inferred a different social system, one in which female elephant seals incite male aggression as a way to mate with the stronger males. The graduate student published a paper describing this framework for elephant seal social systems, and since then this perspective has been widely accepted. The observations by the male scientists were inaccurate because they were biased by their anthropomorphic assumptions. They didn’t observe things they didn’t expect to see.



Some nature educators use anthropomorphism to encourage empathy for organisms that are not human. Empathy is the ability to understand and share the feelings of another. Anthropomorphism can sometimes lead to inaccurate empathy. Inaccurate empathy is when someone *misunderstands* the feelings or actions of another or assumes that someone else feels or will react the same way they would in a specific situation. When we are observing nature and trying to gain accurate understanding of organisms' perspectives and perceptions, we are striving for accurate empathy. Striving for accurate empathy is a common characteristic of both science and TEK. Striving for accurate empathy helps us understand the lives and worlds of other organisms. Note that it's described here as *striving* for accurate empathy, to represent that there is always some uncertainty involved in this pursuit. It's valuable to attempt to understand the perspectives of other organisms, but it's also important to remember that we can't ever fully understand the perspective and life experience of another being (including humans!), and the more different from us they are, the less we can understand.

Observations and explanations. It takes effort and intention to be accurate when observing anything, and it also takes intention to avoid confusing our inferences and explanations for observations.

"What do you notice about the ants?"

"I notice that they're playing."

"That's actually an explanation you're making, but what do you actually see happening?"

"I see that they're moving fast and touching each other."

"Okay, *that's* your observation! Playing is one possible explanation for your observations. What's another possible explanation for your observations?"

It's not that inferences and explanations are bad—far from it! It's that they are not observations, and they should be recognized for what they are. Evidence-based explanations for the natural world are actually the primary goal of science (see the BEETLES professional learning session *Evidence and Explanations*). They're also very useful in daily life. However, a solid explanation needs to be clearly based on solid evidence/observations, so making accurate observations is a foundational skill. When we make careful observations, we can have more certainty about our observations than about our explanations—although even careful observations can sometimes be inaccurate. When making an explanation, it's important to be clear about what the observation is that's being used as evidence in the explanation. We want our inferences and explanations to be as directly connected to our observations as possible, and we want the observations they're based on to be as accurate as possible.

Often, anthropomorphism is a form of making an explanation about an organism. When a person notices that a lizard has been on a rock for a long time, they might say, "The lizard likes the rock." In this case, they are making an *explanation* that the lizard "likes" the rock based on the observation that the lizard has been on the rock for a while. An explanation is not an observation—although explanations are very valuable (see box above). Explanations and observations are often confused with each other, so when guiding learners in making observations, it's important to invite them to tease apart observation and explanation and see the distinction. It's another reason to avoid anthropomorphism when the goal is making observations, because anthropomorphism tends to be an explanation, not an observation.

Definitions for empathy and accurate empathy. "*Empathy* is a stimulated emotional state that relies on the ability to perceive, understand and care about the experiences or perspectives of another person or animal...*Accurate empathy* is an empathic response that is based in substantive knowledge of an animal's natural history, not projected assumptions." (Young, A., Khalil, K., & Wharton, J. 2018)

“Human beings have a strong, strong, strong tendency that if we see an animal do something that’s analogous to what we do, like use a tool or answer an arithmetic question, we assume that the animal is doing it and understands the situation in the same way we do...And sometimes that’s true but more often it’s false.” –Alan Kamil, Center for Avian Intelligence at the University of Nebraska

Fiction vs nonfiction books used in teaching. Fictional texts that include anthropomorphism are often used by science educators to engage learners, based on a common belief that learners find fiction more engaging than nonfiction. But a study comparing nonfiction informational text with fiction found that learners did not express a clear preference for one type of text over the other. In addition, comprehension of the nonfiction text was much higher, and twice as many learners who read fiction showed misconceptions than those who read nonfiction, even though the fiction used in the study was carefully based on scientific information (Cervetti, Bravo, Hiebert, Pearson & Jaynes, 2009).

Even when we are paying attention to which things we say are observations and which are explanations, anthropomorphism can bias the explanations we make. This is where awareness of anthropomorphic tendencies is particularly important. A human perspective comes very naturally to humans, but the perspective of a barnacle, fungus, or earwig is more challenging to understand. To make accurate explanations, we need to try as best as we can to consider the perspective of the organism we’re observing and to avoid projecting our own perspectives onto it.

Anthropomorphism can be fun, imaginative, and playful and is common in stories and humor. However, when attempting to make accurate observations and/or explanations in outdoor science, it should be avoided. If you invite learners to use anthropomorphism when you have different learning goals than making scientific observations, also invite them to hold awareness that it is anthropomorphism. Ask learners to reflect on how anthropomorphism is based on a human perspective, not the perspectives of the actual organisms that are not human. In making an anthropomorphic statement, we are imagining what a human might experience, not what the organism actually experiences. Without awareness, anthropomorphism may result in misunderstanding other organisms and act as a barrier to accurate empathy.

Researchers at the Seattle Aquarium write: “Incorrect empathy occurs often. At an aquarium, one might hear, ‘The octopus must be so lonely!’ Here, guests are projecting their own social needs, not knowing octopuses do not live in groups. Inaccurate empathy can also lead to negative consequences: “People will come across baby deer curled up and alone, assume that it is abandoned, and bring it to an animal rescue not understanding that the mother has left the baby there purposefully and will be back to collect it. Also, there are the accounts of people believing they can communicate with wolves or bears and end up dying or becoming seriously injured due to their incorrect empathy” (Young, A., Khalil, K., & Wharton, J., 2018, p. 9).

It’s common for learners, particularly young learners, to develop concern for organisms that are not human through anthropomorphism (Young, A., Khalil, K., & Wharton, J., 2018, p. 9), and some educators deliberately use anthropomorphism when teaching, with the intent of increasing concern and engagement. Simply spending time making careful observations of an organism—“sustained compassionate attention”—tends to lead toward emotional connection with the organism (Blizard and Schuster, 2007; Chawla, 2007, 2009; Chen-Hsuan Cheng & Monroe, 2012; Kals et al., 1999; Matteo et al., 2014). Without using anthropomorphism, observation activities such as *I Notice, I Wonder, It Reminds Me Of* engage learners directly with nature and help learners build accurate empathy, as well as accurate understanding of organisms that learners are observing.

Outdoor science instructors can help learners make observations while striving for humility, open-mindedness, and accurate empathy—focusing on the goal of making observations and trying to understand what the organism is actually experiencing, rather than imagining what it would be like to be a human in that organism’s position. To help guide learners toward more



accurate observations and empathy, instructors can note to the group when learners say things such as, “The lizard likes that rock” or “It’s scared,” which are anthropomorphic interpretations or explanations of what they are observing. Instructors can invite learners to identify the observations their interpretations are based on: “What observations did you make that led you to think the lizard likes the rock?” “What observations make you say that it’s scared?” Instructors can encourage learners to be aware of what they are actually observing and to avoid making inferences when working on making accurate observations. An instructor might say, “We might try to imagine what the lizard is thinking or feeling, but we can’t know that. We can be much more certain of our observations, such as that since we’ve been here, the lizard has spent more time on the rock than off the rock.”

Imagining the perspectives of other organisms is almost second nature within cultures that place high value on empathizing with living and nonliving things that are not human. This ability can be a tremendous asset in understanding the perspectives of organisms through accurate empathy; this empathy may sometimes take the form of anthropomorphism. Anthropomorphism is common among all cultures and will tend to come up when learners make observations of nature, especially when working with young children. It can come across as offensive if an instructor cuts off anthropomorphism abruptly and critically, especially if it’s integral to a learner’s culture. Instead, instructors can “meet them where they are at and work to develop a more accurate understanding or deeper emotional response...anthropomorphism could be the initial point of engagement for educators to activate learners towards a more accurate understanding” (Young, A., Khalil, K., & Wharton, J., 2018, p. 10). A “Yes, and...” approach can be effective at respecting the perspective as valid, while also focusing in on what’s observable. For example, if a learner says that sea otters holding hands shows that they love each other, an instructor might say, “That may be true, and we’ve also found that it helps keep them from drifting apart as they sleep” (Khalil, K., 2018).

Background on Influential Leaders Cited in This Session

George Washington Carver was a renowned agricultural scientist, inventor, professor, and leader in promoting environmentalism. He received a master’s degree in agricultural sciences from Iowa State University and was a prominent professor and researcher at Tuskegee University.

José González is a member of the BEETLES team. He is the founder of Latino Outdoors and is an experienced educator in formal and informal education settings with an array of associated interests in the arts, education, conservation, and the environment. He serves as an advisor for many organizations seeking to bring equity to their outdoor and environmental education programs.

Zaretta Hammond is the author of *Culturally Responsive Teaching & the Brain*. She is a self-described “former writing teacher turned equity freedom fighter.” As a classroom writing teacher, she “started to understand how important literacy was to equity, and how neuroscience and culture should inform our instructional practice.” She is a teacher, writer, anti-bias facilitator, curriculum designer, professional developer, speaker, and college instructor.

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Dr. Robin Wall Kimmerer is Professor of Environmental and Forest Biology at the State University of New York College of Environmental Science and Forestry (SUNY-ESF). She is the author of the award-winning books *Gathering Moss: A Natural and Cultural History of Mosses* (2003) and *Braiding Sweetgrass: Indigenous Wisdom, Scientific Knowledge and the Teachings of Plants* (2013), as well as many scientific articles. She is the director of the Center for Native Peoples and the Environment at SUNY. She teaches classes on Land and Culture, Traditional Ecological Knowledge, Ethnobotany, Ecology of Mosses, Disturbance Ecology, and General Botany.

John Muir Laws is a wildlife biologist, naturalist, educator, author, artist, and “field-journaling evangelist.” He is co-author of the book *How to Teach Nature Journaling* and the curriculum *Opening the World Through Nature Journaling*. His many other publications include the books *The Laws Guide to the Sierra Nevada* and *The Laws Guide to Nature Drawing and Journaling*. He teaches workshops on nature journaling, conservation biology, natural history, scientific illustration, and field sketching.

Emilie Lygren is a member of the BEETLES team. She is a poet, author, nature-journaling expert, and outdoor educator. She is co-author of *How to Teach Nature Journaling* and *Opening the World through Nature Journaling* and a collaborator on *The Laws Guide to Nature Drawing and Journaling*.

Dr. Todd Newberry is a founding faculty member in biology at the University of California, Santa Cruz. He is as renowned for his inspirational teaching as he is for his marine biology research. He has written many articles about teaching and observing as well as his book *The Ardent Birder* on his approach to helping learners explore the natural world by slowing down, looking closely, and asking questions.

Mary Oliver was a prolific and popular poet. “The gift of Oliver’s poetry is that she communicates the beauty she finds in the world and makes it unforgettable.” —*Miami Herald*. Oliver had an exceptional ability for capturing keen nature observations through poetry and for finding wonder in small, ordinary things.

John Okute Sica was a farmer, historian, and writer. He is the author of many stories through which he describes and shares the lives of his Lakota ancestors.

Annie Sorrell is a member of the Confederated Salish and Kootenai tribes. She is currently pursuing a master’s degree in Conservation Biology at SUNY-ESF and works with the Center for Native Peoples and the Environment. In her work, Annie focuses on reconnecting people to land and healing intergenerational traumas through culture and science. Her current research is designed to better understand the traditional knowledge of Bitterroot Salish aromatic plants within the community living on the Flathead Nation reservation in Montana.

Dr. Ashley Young, Dr. Kathayoon Khalil, and Dr. Jim Wharton, of the Seattle Aquarium, have conducted research into the role of empathy in fostering conservation behavior. They are the authors of *Best Practices in Developing Empathy Toward Wildlife* and *Empathy for Animals: A Review of the Existing Literature*. Ashley Young is the Education Coordinator at the Gardens on Spring Creek



in Fort Collins, Colorado. She has also authored and illustrated *The Curious Little Snail*, a children’s book encouraging exploration and curiosity for our natural world. Kathayoon A. Khalil is the Principal Evaluator at the Seattle Aquarium. She is interested in the social science of conservation and educating for behavior change. Jim Wharton is the Director of Conservation Engagement and Learning at the Seattle Aquarium. He also works with zoos and aquariums to develop messaging for shark conservation.

The following influential leaders are not named in the session but influenced the section on sensory activities (pages 9–13):

Tom Brown, Jr. is a naturalist, tracker, and author. He grew up in New Jersey and says that he was taught the skills of tracking, wilderness survival, and awareness by his adopted grandfather until he was 17. He became a professional tracker and for decades has taught these skills through his Tom Brown Jr.’s Tracker School. He’s the author of many books, including *Tom Brown’s Field Guide to Nature Observation and Tracking*, *The Tracker*, *The Search*, *Field Guide to Living With the Earth*. We recognize the controversy in the field about Tom Brown’s claims that he was taught by Stalking Wolf of the Lipan Apache tribe. We don’t take a position on this controversy. We refer to his activities and writing because they are useful resources for making observations in nature.

Joseph Bharat Cornell is a nature educator in the United States. He wrote the influential book *Sharing Nature with Children* in 1979 to promote outdoor learning. He has since published: *Sharing the Joy of Nature: Nature Activities for All Ages*, *Sharing Nature With Children II*, *John Muir: My Life With Nature*, *Sharing Nature Pocket Guide*, *With Beauty Before Me: An Inspirational Guide for Nature Walks*, *Listening to Nature: How to Deepen Your Awareness of Nature*, *Journey to the Heart of Nature: A Guided Exploration*, *Ocean Animals Clue Game*, *Rainforest Animals Clue Game*, *Listening to Nature: How to Deepen Your Awareness of Nature*, *The Sky and Earth Touched Me: Sharing Nature® Wellness Exercises*, and *Sharing Nature: Nature Awareness Activities for All Ages*. Cornell founded the Sharing Nature Foundation in 1979.

“Solar Steve” Van Zandt is a naturalist, director of a residential outdoor science school, credentialed teacher, activity designer, singer-songwriter, and longtime environmental educator. He is a founder and active member of the Banana Slug String Band, which records and performs children’s music about science, nature, and the environment. He has mentored hundreds of interns at the San Mateo Outdoor Education program and leads workshops on Keeping the Magic Alive at California environmental education conferences.

Jon Young was inspired by his childhood mentor—tracker and author Tom Brown, Jr. In his work, Young has blended Indigenous mentoring techniques from around the world with the tools of modern field ecology. Under his guidance, Wilderness Awareness School reaches learners all around the world with its programs that help people reconnect with nature. With Ellen Haas and Evan McGown, he is co-author of the curriculum *Coyote’s Guide to Connecting with Nature for Kids of All Ages and Their Mentors* and is also the author of *What the Robin Knows*.

Connections to Other BEETLES Sessions

Making Observations introduces many foundational ideas that are further elaborated in other BEETLES sessions. Following are a few suggestions for connecting this session to other BEETLES professional learning sessions:

- *Field Journaling with Students* includes practical activities to encourage learners to make better observations and explanations through journaling.
- *Evidence and Explanations* encourages learners to build on their observations and questions by using them to form explanations supported by evidence.
- *Questioning Strategies* explores how different kinds of questions can impact student learning and what kinds of questions encourage or discourage exploration, discussion, and meaning-making.
- *Constructing Understanding* builds on the practical approaches for learner-centered practices shared in *Making Observations* by introducing more theoretical, research-based conceptual frameworks about how we learn.
- *Teaching and Learning* provides a practical “learning cycle” model for structuring learning experiences based on what is known from research about teaching and learning.

Many program leaders have found *Questioning Strategies* to be an effective session to do after *Making Observations*.



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