beetles
Science and Teaching for Field Instructors

Professional Learning Materials

Field Journaling

Field journaling is a powerful practice that supports observation, thinking, and learning. This session offers opportunities for participants to reflect on how field journaling can be used to support learner engagement and science learning at their program. Field journaling supports learners to directly engage with nature, provides a venue for learner reflection, and can get learners excited about the process of observation and learning. Integrating field journaling can also reinforce equitable and inclusive learner-centered and nature-centered teaching practices. Field instructors may find that engaging in the practice of field journaling also deepens their own knowledge of natural history and can be a forum for reflecting on their teaching approaches.

In this session, participants engage in three model learner journaling activities and discuss the benefits of field journaling as a practice. Participants also look at sample pages from field journals of scientists, naturalists, and thinkers and reflect on how field journaling can support outdoor science learning. Participants consider and discuss strategies for supporting learner engagement. In an optional extension, participants can examine printed journal pages from a variety of outdoor science programs and discuss the relevance and effectiveness of different kinds of journal pages. This conversation can be a launching point for your program to reevaluate and, perhaps redesign, your organization's printed journals.

Note: Although there are many worthwhile ways to use journaling, such as creative writing and art, this session focuses on field journals used during science learning experiences. Much of the content of this session has been generously shared by John Muir Laws and Emilie Lygren, co-authors of the book *How to Teach Nature Journaling*. For free access to the activities referenced throughout the session and more resources on field journaling, visit howtoteachnaturejournaling.com.

Goals for the session:

- Model field journaling activities that can be used to support learners' observations in and connection to nature.
- Explore a variety of journal pages from naturalists, scientists, and thinkers and discuss strategies and approaches of field journaling.
- Provide a forum to discuss how field journaling as a practice supports learning.
- Discuss strategies for scaffolding journaling experiences to support student access, participation, and student learning.
- Practice giving supportive feedback to learners on their journal entries.
- Reflect on how to incorporate journaling into outdoor science instruction.
- Optional: Discuss the pros and cons of a wide variety of sample pages from printed outdoor science school printed journals.

THE LAWRENCE HALL OF SCIENCE
UNIVERSITY OF CALIFORNIA, BERKELEY

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:
Many of the activities in this session are sourced and/or adapted from the book *How to Teach Nature Journaling*, co-authored by John Muir Laws and Emilie Lygren. Its activities are designed to offer structure and focus to support learners to use journals as tools for learning. A full PDF of the book and PDFs for each individual activity can be downloaded free from howtoteachnaturejournaling.com and is highly recommended. Our sincere and abundant thanks go out to John Muir Laws and Emilie Lygren for their generosity.

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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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Field Journaling

Contents

Many of the activities in this session are sourced and/or adapted from the book *How to Teach Nature Journaling*, co-authored by John Muir Laws and Emilie Lygren. Its activities are designed to offer structure and focus to support learners to use journals as tools for learning. A full PDF of the book and PDFs for each individual activity can be downloaded free from howtoteachnaturejournaling.com and is highly recommended. Our sincere and abundant thanks go out to John Muir Laws and Emilie Lygren for their generosity.

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

	Field Journaling	Activity Locations	Estimated Time
Invitation	**Introducing the Session** Participants are introduced to the guiding question and an overview of the session.		5 minutes
Exploration	**Modeling a Journaling Activity: *To Each Its Own*** The leader models a learner journaling activity with the group and then leads a discussion about benefits of this type of activity.		45 minutes
	Observing Model Field Journal Pages Participants look at a wide array of sample pages from the journals of naturalists, scientists, and thinkers. Participants discuss the observations on the pages and the strategies used to record information.		15 minutes
Concept Invention	**Common Principles of Field Journaling** Participants learn that science journaling prioritizes accurate observations over art and uses multiple strategies for note taking—especially words, pictures, and numbers—to record information.		5 minutes
	Modeling a Journaling Activity: *Plant Timeline* The leader models another learner journaling activity. The group discusses how this activity goes beyond observation to provide for some conceptual development.		50 minutes
	Supporting Learner Engagement The leader shares tips for journaling with participants.		10 minutes
Application	**Modeling Journaling Activities and Prompts** Four groups take part in four brief learner journaling activities. Then, they discuss what learning might occur for learners and how to match journal prompts with learning goals.		50 minutes
	Offering Feedback on Learners' Work The leader models how to give supportive feedback to learners, and then participants practice offering feedback for one another's work.		15 minutes

SESSION OVERVIEW (continued)

	Field Journaling	Activity Locations	Estimated Time
Application/	**OPTIONAL: Looking at Examples of Printed Journal Pages** Participants look at a variety of sample pages from printed journals and discuss which pages seem most useful and least useful.		**30 minutes**
Reflection	**Wrapping Up and Reflecting** Participants write in their own journals about how they might incorporate more journaling in their instruction with learners.		**10 minutes**
	TOTAL:		**~3.5 hours** (205 minutes) **(+30 min.)**

TEACHING NOTES

Learners* and *students. During this session, we mostly use the word *learners* (and occasionally the word *students*) to refer to the group of people who instructors teach in your program. We use the word *participants* to refer to the group of instructors or people who are participating in this professional learning session that you are facilitating.

MATERIALS

For the presenter:

- ❑ A small portable whiteboard and marker

For the group:

- ❑ projection system and computer
- ❑ presentation slides
- ❑ place to record participants' ideas (whiteboard, chart paper, etc.)
- ❑ optional: 1 plastic page protector for each sample journal page (*Model Field Journal Pages*, *Examples of Printed Journal Pages*)
- ❑ optional: Session Overview to post on wall
- ❑ optional (if doing all activities outdoors): binder clips or rocks to keep sheets from blowing away

For each participant:

- ❑ journal or paper (and something to write on: e.g., a clipboard, binder, or piece of cardboard)
- ❑ pencil
- ❑ optional: 1 hand lens

PREPARATION

Before the day of the session:

1. **Prepare to present.** Choose who will present each part of the session (see Step 4 for information on model journaling activities). Consider including staff who have already experienced the session. Read through the write-up, slides, handouts, sidebars, and Background Information for Presenters (pages 59–67 for the latter). The more each presenter is able to "own" the session, the better the presentation will be. Record notes on a printed version, or however you prefer. If you choose to present the whole session outdoors, make large copies of the slides and/or print out half-page copies for yourself to refer to; alternatively, you can write them on whiteboards. Modeling of student activities should be done outdoors; however, if you have severe weather, you can bring leaves and other natural artifacts inside.
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. **Download a PDF or purchase a copy of *How to Teach Nature Journaling*.** This session references activities and content from the book *How to Teach Nature Journaling*. It will be useful for you as a facilitator to have access to the document/book while preparing to present the session and for your teaching staff to have access to the book after the session. The book is available to purchase in hard copy or to download as a free PDF. To find information on how to access the resource, visit https://howtoteachnaturejournaling.com/.
4. **Identify outdoor areas and prepare for model journaling activities.** Decide who among you and your staff might be best at modeling the activities during the session and allow for preparation. Ahead of time, scout outdoor areas for model journaling activities.
   - *To Each Its Own*: For this activity, you'll need an area where there are enough leaves of the same species for each participant to have one. The activity can also be done indoors by bringing leaves inside.
   - *Plant Timeline*: For this activity, you'll need an area with a lot of plants in various stages of bloom: bud, flower, fruit, seed, etc. Don't have flowers in bloom? You can also do the *Plant Timeline* activity focused on leaves or parts of compost in different stages of decomposition or fungi in different stages of growth.
   - Group activities: There are four model journaling activities that participants will do in groups: *Comparison*; *Zoom In, Zoom Out*; *Mapping*; and *Field Guide*. To complete these activities, you'll need an area that has enough space for your participants to spread out in four groups. You will also need an area with several different types of plants that will work well for the following activities:

PREPARATION (continued)

- *Comparison*: Two species or types of plants that are a similar size (e.g., two small bushes, two types of sunflowers, two types of trees, two types of indoor plants, etc.).
- *Zoom in, Zoom Out*: Any type of plant.
- *Mapping*: A type of plant, or a part of a plant, that shows strong patterns in terms of where it occurs (e.g., dandelions on a lawn, pine cones around a tree, a specific type of flower, etc.).
- *Field Guide*: At least three different types or species of plants that each have a specific plant part (e.g., seed pods, leaves, fruits, bark).

We recommend using the activities scripted in this session (and especially starting with *To Each Its Own*), but you may need to choose another activity that better suits your environment, surroundings, and learning goals. If so, use the Background Information for Presenters (beginning on page 59) to help you make your choice(s).

5. **Make sure participants are prepared.** Make sure participants bring the gear they need to be comfortable outdoors. Ask them to bring their journals and something to write with.
6. **Make and prepare copies of handouts.** See the list at right.
   - *Model Field Journal Pages* (17 half-pages): Make 1 set for the group. Cut apart each half-page.
   - *Journaling Prompts and Discussion Questions* (4 prompts): Make enough copies for each participant to have 1 prompt with discussion questions. Each group will receive 4 copies of the same prompt; clip together each set (all Prompt 1s, all Prompt 2s, etc.) so they will be easy to distribute to each group.
   - *Field Journaling: Session Summary and Main Ideas* (2 pages): Make enough copies for each participant to receive 1 set of pages.
   - *Choosing Journaling Activities From* How to Teach Nature Journaling (2 pages): Make enough copies for each participant to receive 1 set of pages.
   - Optional: *Examples of Printed Journal Pages* (16 half-pages): Make 1 set for the group. Cut apart each half-page.
7. **Optional: Make Session Overview to post on the wall.** You may choose to make a Session Overview to post in the presentation room during this session. Some presenters and participants prefer having it so they can see the trajectory of the session.

MATERIALS (continued)

Handouts:

- ❏ *Model Field Journal Pages*, ideally printed in color, 1 set of 17 half-pages for the group (pages 34–42)
- ❏ *Journaling Activity Prompts and Discussion Questions*, 1 page per participant (pages 43–46)
- ❏ *Field Journaling: Session Summary and Main Ideas*, 1 set of pages per participant (pages 47–48)
- ❏ *Choosing Journaling Activities From* How to Teach Nature Journaling, 1 set of pages per participant (pages 49–50)
- ❏ optional: *Examples of Printed Journal Pages*, 1 set of 16 half-pages for the group (pages 51–58)

YOU ARE HERE:

5 minutes

TEACHING NOTES

BEETLES Discussion Routines. See the BEETLES Resource *Discussion Routines* for more instructions on facilitating a *Turn & Share* (formerly known as *Turn & Talk*): http://beetlesproject.org/cms/wp-content/uploads/2015/12/Discussion-Routines.pdf

Adjusting the introduction. You may need to adjust this introduction depending on if or how your program is currently using journals.

Introducing the Session

1. **Show Slide 1:** *Field Journaling* **and introduce the session.**
   a. Welcome participants. Ask if everyone is ready to begin and invite participants to check and make sure they have the gear they need to be comfortable during the outdoor experiences.
   b. Share: The session is titled *Field Journaling.*

slide 1

2. **Share the guiding question and invite participants to *Turn & Share* to discuss it:**
   - *How can field journaling be used to support student-centered science learning in nature?*
3. **Invite participants to *Turn & Share* about the questions below and then invite a few participants to share with the whole group:**
   - *How have you used journals in your instruction in the past? If you haven't used journals very often, discuss why you haven't.*
   - Ask participants to *Turn & Share* about how they have used journals with learners or why they haven't.
4. **Offer the idea that journals are common in some outdoor science programs but often underused:**
   a. Printed journals are a tool used in some outdoor science programs.
   b. Today, we'll be exploring how to use journals to support student-centered learning in nature.

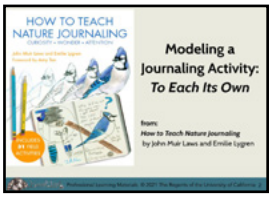
YOU ARE HERE:

45 minutes

Timing for this section. We recommend allotting ~5 minutes for the introduction of the journaling activity; ~10 minutes for participants to create their journal pages; ~5 minutes for the matching portion of the activity; ~20 minutes for facilitating the debrief *Thought Swap*, leading the short group discussion, and sharing the points from the instructor script; and ~5 minutes for transitioning back and forth from the classroom to the outdoor area where you'll be completing the activity.

Modeling a Journaling Activity: *To Each Its Own*

1. **Show Slide 2:** *Modeling a Journaling Activity: To Each Its Own*. **Explain that this model journaling activity is from the book *How to Teach Nature Journaling*:**
   a. We'll be modeling journaling activities from the book *How to Teach Nature Journaling.*
   b. This book, by John Muir Laws and Emilie Lygren, has many great journaling activities, as well as strategies for how to use journals with learners.
   c. The authors of the book have generously shared their materials with BEETLES and with you. They also offer a free PDF download of the book. Visit their website for more activities and more information about nature journaling with learners.
   d. We'll start with an outdoor activity, *To Each Its Own.*



slide 2

2. **Invite 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. We'll be modeling how you could lead this activity with learners. Please don't derail discussions too far off-topic, and also please keep in mind how learners might respond to the activity.
   c. Acting out negative learner behaviors is not helpful. Imagining how your learners might respond is helpful.
   d. There will be some questions that might seem obvious to you, but they are designed for learners.

3. **Lead the journaling activity *To Each Its Own* with your participants.**
   a. Use the activity lesson embedded here (in the blue box below and on the following pages) to model this activity with your participants, much as you would with learners.
   b. For more information on the activity, see the book *How to Teach Nature Journaling*.

TEACHING NOTES

How should participants engage with 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 your group to participate as adults, but to imagine how learners might respond.

Introducing the Activity

1. **Bring participants to the location for the activity and invite each of them to find a leaf of the same species.**
   a. Ask participants to bring their journals and pencils to an area where there are enough leaves of the same species for each participant to have one (or, if doing the activity indoors, bring in enough leaves for each participant to have their own leaf).
   b. Ask participants to find a leaf from the same species of plant. Show your leaf to the group as an example for participants.

2. **Share that the group will have an opportunity to play a game with their journals:**
   a. We're going to have the opportunity to play a matching game.
   b. Here are the rules of our game. When I say "Go," you will have around 10 minutes to make a diagram of your leaf in your journal.

3. **As you share instructions for the activity, demonstrate making an example journal page on a small portable whiteboard.**
   - Use horizontal lines to represent writing and make quick sketches as you share instructions for the journaling activity.

4. **Share that participants will make life-size drawings of their leaves and record accurate observations by using words, pictures, and numbers:**
   a. You'll make specific observations of your leaf and copy it into your journal, using words, pictures, and numbers together.
   b. Start with a life-size drawing in the middle of the page—you might try lightly tracing the leaf's shape to help make your drawing the same size as the leaf.

Rationale for starting with *To Each Its Own*. We have chosen to begin the session by modeling this activity because it is a simple and engaging introduction to journaling for learners and instructors. In case of rain, bring leaves inside. Presenters can substitute other journaling sessions from the guide, depending on staff needs. See Background Information for Presenters (beginning on page 59) to help choose a journaling activity appropriate for your situation.

TEACHING NOTES

Supporting participation of blind learners. To support the participation of blind learners in journaling activities, avoid making assumptions about what they can or can't do. Talk with the person or people you are accommodating and ask what their preferred way to record observations is. Options could include recording their own observations, choosing to share observations with someone who can jot down notes, or speaking their observations into a voice recorder. Choose nature journal subjects that the journalers can interact with directly through touch (leaves, rocks, trees, or other found objects) or through hearing (birdsong, insect sounds, etc.). Encourage learners to use the "I Notice," "I Wonder," and "It Reminds Me Of" prompts and focus on making observations through touch, hearing, or smell.

c. Then, look for details that might make your leaf different from other leaves.

5. **Encourage participants to focus on making accurate and detailed journal entries about their leaves, because their peers will try to match each diagram with each leaf:**
   a. The goal is not to make a pretty picture of your leaf. The goal is to record accurate observations.
   b. When we are done making diagrams, we'll try to match each person's drawing to their leaf.
   c. Your goal is to include as many observations as possible because they will be clues to help others know which leaf was yours, and they will be able to make a correct match.

6. **Ask participants about other possibly significant details:**

   ▶ *What might be other clues that would be helpful in telling one leaf from another?*

   - Listen to responses. As participants share ideas, add them to your whiteboard demonstration. Share any of the ideas below, if they were not already mentioned:
     - broken-off pieces or holes
     - differences in color
     - numbers of things such as pointed edges or lobes
     - details on both sides of the leaf, weird curves or bumps
     - analogies—or what the leaf reminds you of

7. **Invite participants to focus on whichever mode of communicating is most comfortable for them:**
   a. Your goal is to make a lot of observations and to show them accurately.
   b. Use words, pictures, and numbers together to show your observations.
   c. If you're more comfortable drawing, you might choose to draw more to show the details of your leaf.
   d. If you're more comfortable writing, you might choose to use more written descriptions.
   e. If you're more comfortable using numbers to describe your observations, you might focus more on that—but use words, pictures, *and* numbers together to show what you see.

8. **Invite participants to consider how to use words, pictures, and numbers together to communicate information:**
   a. Some things might be easier to show with a drawing, other things with writing, and others with numbers.
   b. For example, if your leaf is covered in little hairs that are challenging to draw, you might use words to describe the hairs.

TEACHING NOTES

c. Use words and pictures together to describe your observations.

d. For example, if you see a dark brown spot on your leaf, you could add a note that says "dark brown spot" and draw an arrow to where it goes on the drawing.

9. **Invite participants to keep looking for and adding more observations, even after they feel done.**

10. **Ask participants to begin their journal entries.**

Participants Make Diagrams of Leaves

1. **As participants are making their diagrams, circulate, check in with individuals, and offer verbal reminders to the whole group.**

   a. Try to check in with each participant individually, briefly engaging them in discussion about their journal entry or observations and offering feedback that affirms how the participant's journal page connects to the activity instructions (e.g., "I can see that you're using words, pictures, and numbers together on the page." Or, "This arrow you added next to this part of the leaf leaf helps me know exactly what the 'round hole' label is describing.").

   b. Consider inviting participants to deepen their observations or engage with a different way of recording information than they've been focused on (e.g., "I'm noticing that you've only used words so far. What is one observation you could show through drawing?" Or, "Are there any labels you can add to your drawing to connect the words and pictures on your page?").

   c. Occasionally, offer verbal reminders to the whole group (e.g., "Use words, pictures, and numbers together on the page." Or, "Remember, this isn't about making a pretty picture; it's about recording accurate observations.").

2. **Provide enough time for participants to dig into their journal entries, but not so much time that they become restless.**

   a. Keep track of time—make sure participants have enough time to make a drawing and add some written observations.

   b. If participants are engaged and you're not pressed for time, let them keep journaling. If they seem restless, let them know you'll wrap up soon.

3. **When time is almost up, call for the group's attention, share that there are ~2 minutes left, and invite participants to add final details:**

   a. Use this time to add any important details you haven't recorded yet.

   b. If you've used mostly writing so far, make sure you have a drawing, too.

   c. If you've only been drawing, add some written observations.

   d. Consider how you can include numbers in your journal entry as well.

Offering Feedback. The "Offering Feedback on Learners' Work" section of this session includes more examples of statements you might share with participants that connect back to the goals of the activity. Refer to this section for more ideas on how to engage with participants as you circulate and offer feedback during the activity.

Participants Match Leaves

1. **Call participants back to the circle and facilitate the matching exercise:**
   a. Please place your leaves carefully in the center of the circle. Then, place your journals in a circle around the leaves, opened to the page you were just working on.
   b. Take turns trying to match the leaves to the notes by placing each leaf on top of the diagram that most accurately matches the size, shape, or distinctive characteristics of the object.
   c. If you disagree with the placement of a leaf, you can change it.
2. **Once all leaves have been matched, invite participants to turn to a partner and briefly discuss the questions:**
   - *What kinds of written notes, drawings, or numbers were especially helpful in telling which leaf was which?*
   - *What did you learn through your observations and journaling?*

TEACHING NOTES

Managing wind. If you are outdoors on a windy day, consider placing a binder clip or rock on each sample page to prevent the pages from moving around or blowing away.

Setting up participants for success. The leaf-matching part of this activity works best in groups of ~15 or fewer participants. If you have more than 15 participants in your group, consider splitting the group in half and having each subgroup do the matching exercise separately.

4. **Debrief the journaling activity. As you move back toward the classroom or indoors, facilitate a *Thought Swap* about the questions below:**
   - *How did the activity instructions and activity structure support participation, engagement, and access? How did they set you up for success?*
   - *What are the benefits of doing an activity like this with learners?*
   - *How could this activity and approach to journaling support an equitable and inclusive learning experience for learners?*
5. **Lead a brief whole-group discussion about the questions below, listening to participants' responses and asking follow-up questions:**
   - *How did the activity instructions and activity structure support participation, engagement, and access? How did they set you up for success?*
   - *What are the benefits of doing an activity like this with learners?*
   - *How could this activity and approach to journaling support an equitable and inclusive learning experience for learners?*
6. **Add some of the following ideas, if they weren't mentioned by the group already:**

   The activity instructions and activity structure support participation, engagement, and access:

   - The activity has a game-like quality that focuses learners on observing details in an engaging and nonthreatening manner.
   - The prompt gave a clear goal and focus for types of observations that participants made and recorded in their journals.

Logistics of the *Thought Swap* routine (formerly known as *Walk & Talk*). See the BEETLES activity *Thought Swap* for the logistics of this discussion routine. Wondering why we changed the name from *Walk & Talk*? We received some feedback from our community partners on how we can use more inclusive language, and we decided to change the name so we were not normalizing walking as the only way of moving and talking as the only way of communicating.

- During the introduction, the group listed features and types of observations (distinguishing characteristics, color, numbers, etc.) that could help a leaf be recognized, offering scaffolding and guidance to support learners in creating their journal entries.
- The instructions included scaffolding and ideas for how to record information, such as using arrows to point out key characteristics, tracing a leaf so it is shown life size, and writing to describe leaf color.
- Learners were invited to use words, pictures, and numbers together and encouraged to rely on the type of recording information they find most comfortable.
- Learners have autonomy in choosing which leaves to focus on and how they prefer to record information.
- Learners have opportunities to engage with nature and with one another and to work alone and with partners.
- The instructor checks in with individual learners during the activity, offering support.

Some benefits of journaling include:

- Learners have the opportunity to engage in science practices and apply critical thinking skills.
- Drawing supports deep observation. Learners must look again and again as they make diagrams of their leaves. In the process, they have the opportunity to practice their observation skills and might notice details they would not have seen otherwise.
- Writing can be a way to clarify thinking and remember different kinds of observations than we make while drawing.
- Learners practice using text, pictures, and numbers to record information, which is an opportunity to build visual literacy and communication skills.
- Learners have the opportunity to engage with field journaling to collect and record data.
- If learners hold on to their journals in the future, the drawing and notes may remind them of their experiences.
- There are multiple ways to be successful in participating in the activity. Learners can call on their strengths and abilities to communicate their ideas through drawing, writing, and sharing observations verbally.
- The activity can be done virtually anywhere, including indoors.
- The practice of field journaling is one opportunity for learners to be reflective and aware of their learning. By recording observations, questions, connections, and especially reflections, learners can develop an awareness of what they understand and don't understand and look back at their journals to see how their understandings evolve.

TEACHING NOTES

7. **Offer the idea that the benefits of field journaling are connected to an equitable and inclusive learning experience for learners.**
   - **a.** Many of the aspects that we just highlighted about the instructions of the activity and the benefits of field journaling also connect to supporting an equitable and inclusive learning experience for learners.
   - **b.** The instructions are intentionally written to support participation and access; there are multiple ways to be successful in participating in the activity; and the practice of field journaling makes room for learners to share their ideas, observations, and lived experiences as a part of the learning process.

8. **Share that offering learners the opportunity to engage in science practices such as field journaling is another way to create an equitable and inclusive science learning experience.**
   - **a.** Another aspect of the journaling activity that supports an equitable and inclusive learning experience is connected to engaging learners directly in science practices.
   - **b.** Offering learners the opportunity to engage in science practices through field journaling is one way to make science feel more accessible.
   - **c.** Science is often viewed or taught as a collection of facts; this is reinforced by science learning experiences that focus on memorization or recall of facts or narrow questions posed to learners that invite only one correct answer.
   - **d.** But science is a way of knowing and a process for thinking and learning, not just a body of knowledge.
   - **e.** Offering opportunities for learners to engage in science practices through field journaling can make science as a discipline 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.
   - **f.** Engaging learners in science practices can also affirm that learners' ideas and creative thinking are an essential part of science learning, contradicting the exclusionary idea that memorizing facts is what it means to be good at science.

9. **Offer the idea that field journaling is one way for learners to build an emotional connection to and relationship with nature and the outdoors:**
   - **a.** Spending time with an organism or object in nature offers learners the opportunity to develop an emotional connection with a part of nature.
   - **b.** Doing multiple activities like this, focused on different aspects of nature, is one way for learners to deepen their relationship to nature and the outdoors as a whole.

10. Offer the idea that learners can also benefit from some quiet, focused down time.

- **a.** Learners have the opportunity to move slowly when they are journaling.
- **b.** In outdoor science programs, learners are often busy with lots of social interactions—some learners may feel pushed to go, go, go!
- **c.** Learners may benefit from some down time—even if they don't directly express that need.

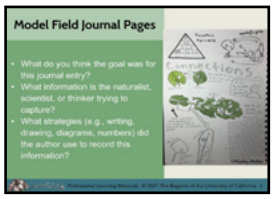
Observing Model Field Journal Pages

1. Share that naturalists, scientists, and thinkers use field journals:

- Naturalists, scientists, and thinkers use field journaling to make observations, focus on important features, clarify their thinking, and remember what they've observed.

2. Show Slide 3: *Model Field Journal Pages*. **Explain:**

- To better understand how field journals can support science learning, let's take a look at some examples of journal entries made by working naturalists, scientists, and thinkers.



slide 3

3. Display *Model Field Journal Pages* handout and invite participants to circulate, explore, and focus on the ideas and thinking on the journal pages:

- **a.** This is not a formal rotation. You are welcome to move around as you like and check out and compare as many example pages as you can.
- **b.** Use the prompts on the slide to guide your thinking about the journal entries.
- **c.** Discuss ideas with one another as you look at pages:
  - What do you think the goal was for this journal entry?
  - What information is the naturalist/scientist/thnker trying to capture?
  - What strategies did the author use to record this information?
- **d.** As you observe pages, you'll notice a range of aesthetic styles. You're invited to focus on the ideas and thinking that appear on the pages, not on their aesthetic value.

4. As participants move around and check out the field journal pages, circulate and ask questions such as:

- *What similarities do you see among these pages? What differences?*
- *What evidence of the naturalist's/scientist's/thinker's thinking process do you notice?*
- *What does the naturalist/scientist/thinker seem to be learning through their observations? How are they learning it?*

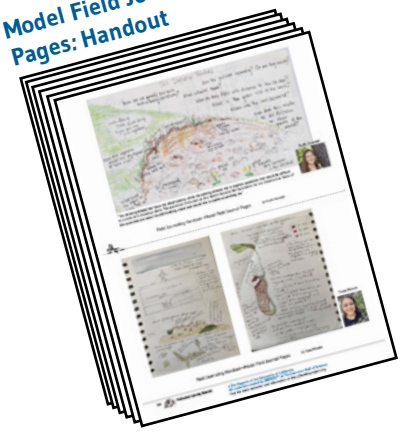
TEACHING NOTES

YOU ARE HERE:

15 minutes

or

Model Field Journal Pages: Handout



Representation, race, and historical context. The field of science and particularly environmental science is disproportionately white due to systemic racism in academia. At the same time, the contributions of Black, Indigenous, and scientists of color are often undervalued and overlooked in science teaching and classrooms. One important way to strive for inclusivity in science learning experiences is to counteract exclusive narratives and engage students in learning about and from naturalists, scientists, and thinkers who hold a broad range of identities. Consider seeking out and adding journal examples from local scientists and naturalists from your area or where your learners are from and pay attention to representation in these examples.

TEACHING NOTES

Participants' focus. Participants might say: Some individuals focused on specific, descriptive species accounts, while others captured a moment that was interesting to them. Some of the information was more general, while other entries showed an individual's thinking about a topic. Some entries included personal reflections, while others were focused on documenting procedures and processes for making observations; etc.

Strategies naturalists/scientists/thinkers used for recording information. Participants might say: labeled drawings, arrows indicating movement, charts, maps, written narrative, drawings from different perspectives, lists of organisms, tables of measurements, questions and observations, possible explanations.

YOU ARE HERE:

5 minutes

5. **After about 10 minutes, gather participants around the display of example journal pages and lead a short discussion about their discoveries, using the following questions:**

   - *How did the example journal pages show how authors use journaling as a tool to support observation and learning? What do you think their goals might have been?*
   - *How are the example journal pages and observations similar or different?*
   - *What information were the naturalists/scientists/thinkers focused on? What do you think they learned?*
   - *How are the naturalists/scientists/thinkers showing their thinking on the journal pages?*

   - Ask follow-up questions to uncover more about the group's thoughts and their interpretations of the example journal pages.

6. **Ask about strategies that naturalists, scientists, and thinkers used for recording information:**

   - *What were the strategies that different naturalists/scientists/thinkers used to record information?*

   a. Listen and keep an informal list of the strategies mentioned. Mention some from the sidebar, if they are not raised by participants

   b. Ask for any final thoughts or interesting patterns that participants may have noticed in the example journal pages.

Common Principles of Field Journaling

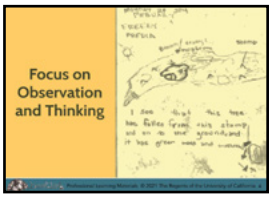
1. **Share some common principles of field journaling in the context of outdoor science learning experiences:**

   a. Field journaling is a powerful tool for science learning.

   b. Naturalists, scientists, and thinkers—and people in a range of other fields and disciplines—use journals because they get similar benefits from the process of journaling that learners do.

   c. The journal entries we looked at were different in a lot of ways, but there are some common principles of field journaling within the context of science learning experiences.

2. **Show Slide 4:** *Focus on Observation and Thinking.* **Share that the goals of field journaling are to make observations and support thinking, not to make pretty pictures:**



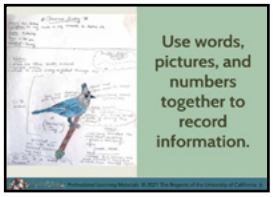
slide 4

   a. The goal of field journaling is to make accurate observations, to record information, and to support thinking—not to make pretty pictures.

   b. There's nothing wrong if the drawing turns out to be aesthetically pleasing, but the goal is to make accurate observations.

c. While this learner's picture isn't pretty from an artistic standpoint, she recorded observations and information.

3. **Show Slide 5:** *Use words, pictures, and numbers together to record information*. **Share that different strategies are useful for recording information:**



slide 5

   a. In field journaling we use words, pictures, and numbers together to show observations, thoughts, events, questions, and memories.

   b. Naturalists, scientists, and thinkers also use other strategies to organize and show information, such as arrows, mapping, lists, and charts.

   c. In field journaling, the end goal is not just drawing and writing—it is drawing and writing in the service of learning and thinking.

   d. Using multiple strategies to show information leads to a more full and accurate record of observations and experiences.

   e. Beyond that, using drawing, writing, math, and other ways of recording information together on a page can lead the author of a field journal to think in different ways and to engage with a subject from multiple perspectives.

4. **Offer the idea that field journaling is a tool that supports learning and building a relationship with nature.**

   a. Field journaling is a tool that can be used to develop a deeper understanding of nature, and it is one way to build a relationship with nature.

   b. Let's look at the process of field journaling again in another outdoor student activity, also from *How to Teach Nature Journaling*.

Modeling a Journaling Activity: *Plant Timeline*

1. **Show Slide 6:** *Modeling a Journaling Activity: Plant Timeline*. **Invite the group to go outdoors to participate in this model journaling activity.**

   • Ask participants to gather their journals and pencils and then lead them to an area with many flowers of the same species.

slide 6

Plant Timeline

1. **Share that participants will use words, pictures, and numbers to record observations of a flower at its peak.**

   a. Check out these flowers. We're going to use our journals as a tool to learn a bit more about them.

   b. First, you will find a flower that's at the peak of its bloom. Make a careful diagram of it in the middle of your page and include some numbers and written observations.

TEACHING NOTES

YOU ARE HERE:

50 minutes

No flowers in bloom? This activity also works with fungi in different stages of growth, leaves in different stages of decomposition, or components of compost in different phases of decay.

TEACHING NOTES

Flowers of the same species. If there are multiple species or types of flowers in the area where you'll be completing this activity, ask each participant to choose just one type of flower to focus on in their journal entries. (It's okay for one participant to choose one type of flower, another participant to choose another type of flower, etc.)

2. **Invite participants to add drawings of older flowers to the right of the first flower drawing and younger flowers to the left:**
   a. Once you're finished with that first drawing, try to find a flower of that same species or type that is at the oldest stage possible. Observe carefully! It might be a fruit, not a flower. Draw that stage of the flower on the right-hand side of your page and add some numbers and written notes.
   b. Next, find a flower of that same species or type that's as young as possible—one that is maybe just a bud. Make a sketch of it on the left-hand side of your paper and add some numbers and written notes.
   c. Then, look around at other flowers of the same type and try to fill in as many stages as possible by adding more drawings to the page.
   d. You might start by showing the stages right after the peak of the bloom and making sketches of flowers that are older and older, or by trying to find flowers in between a bud and the peak of bloom.

3. **Share that the goal is not to make pretty pictures, but to record observations and remind participants to include words, pictures, and numbers together:**
   a. Remember, the goal is to make observations and to show them on the page, not to make pretty pictures.
   b. If you're more comfortable drawing, then draw more to show what you see. If you're more comfortable writing, then you can use more written descriptions. If you're more comfortable using numbers, do more of that, but use all three—words, pictures, and numbers—to show your observations.
   c. If you think of questions, record them in your journal.
   d. Ask participants if they have any questions about what they are about to do and then invite them to begin journaling.

4. **Keep track of time, circulate, troubleshoot, and give participants positive feedback (but NOT on artistic ability or prettiness of pictures).**
   a. While participants are journaling, circulate to check in or to invite them to refocus if they are distracted. Encourage participants to make even more observations, to change their perspective, or to be more thorough in the documentation of their observations.
   b. Offer positive feedback on participants' observations or approaches for recording information. Connect this to the goals of the activity. For example, if a participant included written notes or made an interesting observation, say "Wow, I never would have noticed that the flower petals change shape if you hadn't written that on your page!" Or, "I really like how you made your drawing large so you had space to show the shape of the flower accurately."
   c. Do NOT comment on participants' artistic ability or the prettiness of the picture.

5. **After participants have had ~10–15 minutes to journal, call for the group's attention and invite pairs to *Turn & Share* about the following questions:**

   - *With a partner, describe some of the structures or parts of flowers you observed. Then, pick one structure to focus on and try to notice and describe how it changed from young flower to old flower.*
   - *Come up with some possible explanations for how that flower part works or functions and how its function might have changed over time. For example, if a leaf petal became withered at a certain point, why might that be the case? How is its function changing?*

2. **Debrief the activity: Invite participants to *Turn & Share* about the benefits of this activity for learners and then share their thoughts in a short whole-group discussion. Ask:**

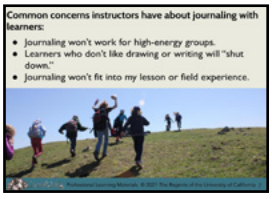
   - *Find a partner and discuss: What are some possible benefits from this activity that are different from the first model activity (To Each Its Own)?*

   a. Invite a few participants to share. Then, listen to their responses. If they don't mention any of the following points, consider adding them:
      - Learners have the opportunity to do some sensemaking around a specific science concept (in this case, about plant life cycles).
      - Learners may have "Aha" moments when they notice connections between flowers, fruits, buds, and seeds.
      - *To Each Its Own* is focused on observation. *Plant Timeline* includes observation, but may also lead to more conceptual development.
      - Engaging in scientific discussions and sensemaking support learners to take on rigorous learning tasks in the future.

   b. Return inside.

Supporting Learner Engagement

1. **Show Slide 7:** *Common concerns instructors have about journaling with learners*. **Explain that some instructors have concerns about journaling with learners:**



slide 7

   a. We've discussed many benefits of field journaling for scientists and learners.
   b. BEETLES has heard from the field that instructors have two primary concerns when it comes to implementing field journaling with learners.
   c. Some instructors think high-energy groups won't be able to sit still long enough to draw and write.
   d. Some instructors are concerned that it will feel too much like schoolwork, and learners won't be interested.
   e. There are important considerations we can use to set up journaling to be meaningful, engaging, and accessible for learners, which we will be exploring throughout the rest of the session.

TEACHING NOTES

Splitting the session. If you are splitting this session in two, this is a suggested stopping point for the first half.

YOU ARE HERE:

10 minutes

TEACHING NOTES

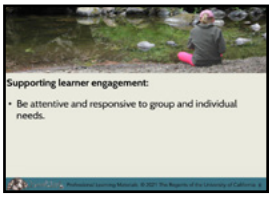
More on supporting learner engagement. If you or your participants want more information on supporting learner engagement in journaling activities, see the following resources and pages from the book and website *How to Teach Nature Journaling*:

https://howtoteachnaturejournaling.com/teaching_support/introducing-journaling-activities/

https://howtoteachnaturejournaling.com/teaching_support/supporting-student-engagement-during-journaling-activities/

https://howtoteachnaturejournaling.com/teaching_support/taking-students-outside/

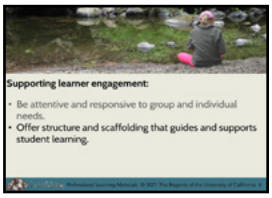
2. **Show Slide 8:** *Supporting learner engagement—Be attentive and responsive...* **Explain:**



slide 8

   a. This may seem like common sense, but be thoughtful about when you ask learners to journal and pay attention to the needs of your group.
   b. Do journaling activities between higher-energy activities or after an exploration activity during which learners have had the space and opportunity to move around.
   c. If learners have just arrived off the bus or are hot, cold, or hungry, it's not a great time to journal. Tend to these basic needs before learners journal so they can focus on their journaling.

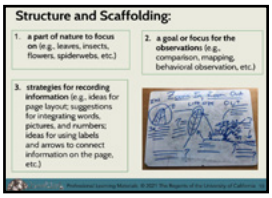
3. **Show Slide 9:** *Supporting learner engagement—Offer structure and scaffolding...* **Offer the idea that some structure and scaffolding (but not too much) supports learner participation, access, and engagement:**



slide 9

   a. Another way to support learner engagement, participation, and access is to offer structure and scaffolding to guide learners' focus and thinking.
   b. If you just say, "Go journal!" without offering any scaffolding or guidance, it can be overwhelming for learners to decide what to focus on, and a lack of support can lead learners to disengage.
   c. Learners who already enjoy drawing and who may otherwise treat the experience as an art project, may benefit from the structure of being encouraged to also use words and numbers to increase their observation and recording skills.
   d. On the other hand, too much structure, such as telling learners exactly what to write in their journals or offering a fill-in-the-blank worksheet, can be detrimental to learner engagement because there isn't much room for learners' observations, thinking, and ideas.

4. **Show Slide 10:** *Structure and Scaffolding*. **Offer the idea that like scientists, naturalists, and thinkers, learners benefit from having a goal that focuses them and strategies for recording information:**



slide 10

   a. When a naturalist, scientist, or thinker uses a field journal, they will likely have a goal that guides the focus of their observations, some ideas about strategies to record their observations, and thinking that connects to what they hope to learn.
   b. We can support learner engagement by offering them a similar kind of structure.
   c. When setting up a field journaling activity, invite learners to focus on one aspect of nature, offer them a goal or focus for their observations, and suggest some strategies that they could use to record information in their journals.

TEACHING NOTES

d. All activities in the book *How to Teach Nature Journaling* include these kinds of scaffolding and structure.

e. Using scaffolding and structure to frame nature journaling activities is one critical way to ensure that the experiences are accessible to learners and that they feel supported to participate.

Modeling Journaling Activities and Prompts

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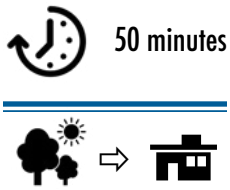
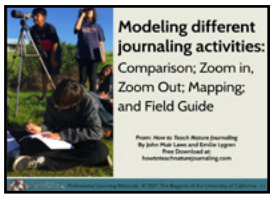


1. **Show Slide 11.** *Modeling different journaling activities.* **Share that participants will have the opportunity to engage in some more journaling activities and prompts:**



slide 11

   a. We've already done two journaling activities that showed different types of scaffolding.

   b. Now, we'll have the opportunity to engage in a few more journaling activities that show different kinds of scaffolding you might offer to learners.

   c. Again, these activities are adapted from *How to Teach Nature Journaling*.

2. **Share that each group will engage with a different journaling activity related to plants.**

3. **Invite participants to think about the kinds of observations that learners might make and how the activity could be used in a field experience to reach specific learning goals:**

   - While you are doing the activity, I invite you to think about:
     - the kinds of observations that learners might make while answering this prompt.
     - the kinds of outdoor science learning experiences this activity could support.

4. **Bring participants outside, split them into 4 groups, and give each group a *Journaling Activity Prompts and Discussion Questions* sheet. Ask them to read the prompts and give them ~10–15 minutes to do so:**

   a. Divide the participants into 4 groups.

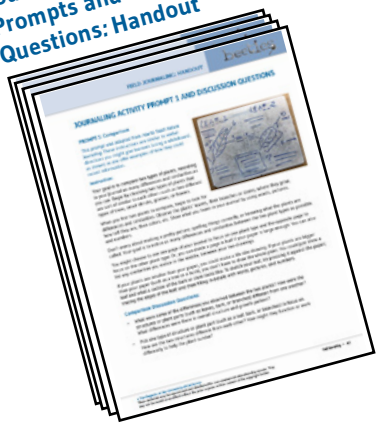
   b. Give each group member a copy of the same journaling activity prompt. For example, each group member in Group 1 would get a copy of *Prompt 1: Comparisons*.

   c. Share that participants will have 10–15 minutes to complete the prompt, focusing on a plant in the area.

   d. Each participant will make their own journal entry but can work as a team with members of their group, engaging in discussion about interesting observations or questions that arise.

   e. Share that the journal prompt includes some discussion questions to engage in as a group *after* making observations and journaling and that you will indicate when it is time for participants to begin their discussions.

Journaling Activity Prompts and Discussion Questions: Handout



TEACHING NOTES

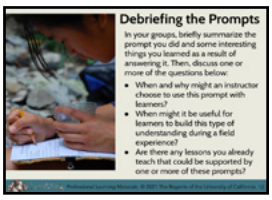
Continuing the discussion outside. You may wish to continue the debrief discussion outside. If you do so, bring the group back inside before the "Offering Feedback on Learners' Work" section.

5. **Invite participants to begin journaling with their groups. Circulate and offer support.**

6. **After ~10–15 minutes, call for the group's attention and invite participants to begin discussing their observations, using the questions for their journaling activity prompt.**

7. **After participants have had a few minutes to engage in the discussion questions about their journaling activity prompt, gather participants and ask them to discuss in their groups the debriefing questions below:**
   - Give participants the following debriefing questions to discuss in their groups:
     - *What did you learn through your observations and journaling?*
     - *How could this activity be used to support student learning in an outdoor science program?*

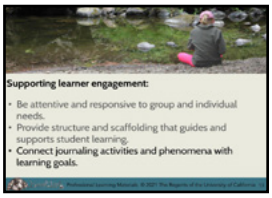
8. **Show Slide 12:** *Debriefing the Prompts*. **Bring participants back inside and ask them to form new groups, each with a member from each prompt group.**



slide 12

   a. Ask participants to wrap up their conversations and then bring them back inside.
   b. Ask participants to reform in groups of four. Each new group of four should have one person who discussed Prompt 1, one who discussed Prompt 2, one who discussed Prompt 3, and one who discussed Prompt 4.
   c. Ask each participant to summarize the prompt from the activity they just did for their new group members and to share how the activity might be used to support student learning in an outdoor science program.
   d. If they have time, they can discuss one or more of the questions on Slide 12.

9. **Show Slide 13:** *Supporting learner engagement—Connect journaling activities and phenomena with learning goals*. **Share:**



slide 13

   a. It's useful to think about how to integrate journaling into a lesson, activity, or longer field experience.
   b. Choosing a journaling activity that supports your learning goals and connects to the rest of your lesson, activity, or field experience tends to be engaging for learners because it is authentic, purposeful, and interesting in the same way it is for scientists.
   c. The journaling activities we just did focused on plants, but these prompts could be altered to guide learners to explore any aspect of nature—including other organisms, geographic or landscape features, or interesting phenomena.

d. Different combinations of journaling prompts and the phenomena or aspects of nature that learners observe can build toward different kinds of conceptual learning.

e. For example, when learners compare two leaves, they will make very different observations than if they were to compare two bodies of water subject to different conditions or if they were to compare the behavior of two different species of insects.

f. Intentionally choosing journaling activities (prompts and phenoma) that will lead learners to make observations that are connected to your learning goals is another way to support learner engagement.

10. Offer the idea that centering science learning around a common experience that all learners have access to is one way to create an inclusive context:

a. Journaling is a powerful tool for student-centered and nature-centered teaching and is particularly useful in setting up an inclusive learning context for learners.

b. Once a group of learners has all journaled about a specific part of the outdoors—such as leaf structures, the patterns of growth of a specific type of tree, or an animal's behavior—the whole group will have focused on observing the same thing, and the instructor can call on those observations throughout the rest of the activity.

c. This 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.

d. Centering a lesson or activity on in-the-moment observations that learners make while journaling helps create an inclusive learning experience by focusing it on a shared experience that every learner has access to.

e. This is in contrast to science learning in which participation in the activity requires prior knowledge about science ideas, and learners who have had more exposure to science tend to have an advantage.

11. Share: Field journaling offers learners authentic opportunities to engage in science practices to build understanding of key concepts, which is critical to the Next Generation Science Standards (NGSS).

a. Choosing journaling activities that connect to specific science learning goals also offers learners opportunities to authentically engage in science practices in order to build understanding of key concepts and ideas.

b. While field journaling, learners are gathering evidence, asking questions, coming up with explanations—all science practices named in the NGSS.

TEACHING NOTES

More on connecting journaling activities and learning goals. If you or your participants want more information about how to choose activities and phenomena that support conceptual learning goals, see the following resources and pages from the book and website *How to Teach Nature Journaling*:

https://howtoteachnaturejournaling.com/teaching_support/finding-phenomena-activities/

https://howtoteachnaturejournaling.com/teaching_support/journaling-activities-to-support-learning-goals/

Appendix B: Activity Summaries, Learning Goals, and Possible Phenomena, pages 262–268.

Appendix C: NGSS Connections, pages 269–271.

From Activities to Longer Lessons, pages 233–237.

YOU ARE HERE:

15 minutes

TEACHING NOTES

More on giving feedback on learners' work. If you or your participants want more information on giving feedback on learners' work, see the following resources and pages from the book and website *How to Teach Nature Journaling*:

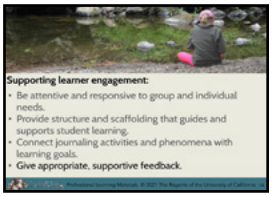
https://howtoteachnaturejournaling.com/teaching_support/giving-feedback-on-student-journals/

Developing Skills: Ideas, Practice, and Feedback, pages 227–230.

Grading and Evaluation; Evaluation Rubric, pages 231–232.

Offering Feedback on Learners' Work

1. **Show Slide 14:** *Supporting learner engagement—Give appropriate, supportive feedback*. **Invite participants to avoid commenting on the prettiness of learners' drawings when giving learners feedback on their journaling:**



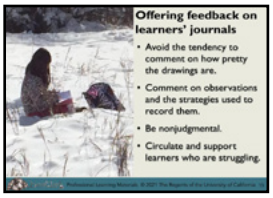
slide 14

   a. Another aspect of supporting learner engagement in journaling is giving supportive, appropriate feedback.
   b. How you react to learners' work matters and giving constructive, useful feedback is a skill.
   c. If you tell learners, "You don't have to make a pretty picture" before they journal and then the first thing you say when you see their work is, "What a pretty picture!" you'll lose credibility, especially with learners who are not confident in their artistic abilities.
   d. Yet, it's natural to comment on how pretty or well-made the drawings are.
   e. It is important to avoid this tendency because it sends the message that it's artistic ability rather than making observations that is valued.

2. **Offer the idea that participants can give learners useful feedback by commenting on observations that learners have recorded in drawing and in writing:**
   a. The key is to give feedback on *what you've asked learners to do*.
   b. The journaling activities modeled in this session ask learners to make focused observations and record information by using words, pictures, and numbers.
   c. Comment on those aspects of learners' work when you give feedback.

3. **Offer some examples of appropriate, nonjudgmental, and specific feedback:**
   a. When you give feedback, emphasize different types of observations that learners have made and different strategies for recording information that learners have used.
   b. Do this in a nonjudgmental, yet specific, way.
   c. For example, instead of saying, "You made excellent observations in your journal," you might say, "Wow, I can see that you used three different strategies for recording your observations. You made a drawing, you labeled it with words and arrows, and you wrote descriptive sentences."

4. **Show Slide 15:** *Giving feedback on learners' journals*. **Ask participants to place their journals in a circle, opened to a page from one of the journaling activities:**



slide 15

   a. We're going to model what it's like to offer this kind of feedback.

   b. Everyone, place your journals in a circle and open them to a page from one of the journaling activities we have done today.

5. **Model offering feedback on participants' journal pages.**

   a. Pick one participant's journal page and comment on the observations recorded and the strategies used to show information. For example:

   - *I see that you used arrows next to your written descriptions to show what they refer to. That helps me understand your ideas and observations.*
   - *I see that you made several detailed written descriptions. Maybe you could add some arrows to help me understand what they refer to.*
   - *Wow, you counted 15 little holes in your leaf! I wouldn't have noticed those holes if you hadn't used words and numbers to show them on the page.*

6. **Offer the idea that there's always a comment about observations an instructor can make:**

   - If no comment comes to mind when you first look at a learner's journal entry, it's always possible to point out an observation that a learner made or reflect back to a learner who has fulfilled expectations by using one or more strategies for recording information to show their thoughts.

7. **Invite participants to form pairs and to spend about 2 minutes circulating around the journals, practicing giving verbal feedback about different pages.**

   - Rotate through the journal samples with a partner and practice giving verbal feedback out loud to each other for the pages you observe together.

8. **Call for the group's attention and highlight the importance of circulating and commenting while learners are journaling.**

   - Gather participants and offer the idea that it can be helpful to circulate during a journaling activity, check in with learners one-on-one, and give this type of supportive feedback—especially to learners who seem nervous or less engaged.

9. **Offer the idea that it is also useful for instructors to encourage learners to deepen their observations and journaling by giving in-the-moment feedback.**

TEACHING NEWTS

Sharing work. Some journalers—both adults and children—are nervous to show their work to others in a group. If your participants seem reticent about placing their journals in the circle, invite them to pick a page they feel most comfortable sharing.

TEACHING NOTES

- **a.** Calling attention to what learners are doing well is an important way to build their confidence and to reflect back to them that you notice their efforts.
- **b.** Inviting learners to deepen their approaches for making and recording their thoughts and observations is also helpful.
- **c.** Notice where learners are at and offer input that invites them to develop one or more of their journaling skills.
- **d.** For example, if a learner hasn't written anything in their journal, encourage them to add written notes and offer suggestions for how they could do this (e.g., adding labels to describe color or texture, adding questions, recording "I notice" statements, etc.).
- **e.** Or, if a learner's drawings and written notes are separate on the page, you might say, "How could you connect your written and sketched observations? Are there any strategies you could use, such as arrows or labels, to show how the observations in your drawings and your written notes are connected?"
- **f.** If a learner is struggling to engage with the process of journaling, ask, "What are some things you've observed so far?" and listen to their response. If anything the learner says is data that they haven't recorded, invite them to record it on the page using words, pictures, and numbers.

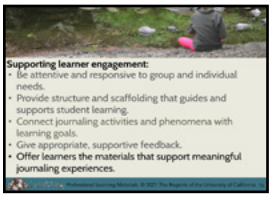
More on materials for nature journaling. If you or your participants want more information on materials for nature journaling, see the following resources and pages from the book and website *How to Teach Nature Journaling*:

https://howtoteachnaturejournaling.com/teaching_support/materials-journals/

https://howtoteachnaturejournaling.com/teaching_support/drawing-and-writing-tools/

https://howtoteachnaturejournaling.com/teaching_support/journaling-materials-nature-study-tools/

10. **Show Slide 16:** *Supporting learner engagement—Offer learners materials that support meaningful journaling experiences.* **Share some ideas about how the formatting of journal pages can impact learners' experiences:**

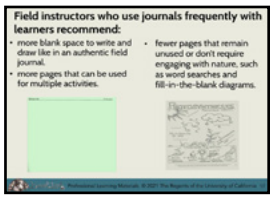


slide 16

- **a.** Another important way to support learner engagement in journaling is to offer materials that support meaningful journaling experiences. To journal, you need paper and a pencil.
- **b.** Some outdoor science programs print journals for learners to use while at their programs.
- **c.** There is a LOT of variety of pages included in these printed program journals.
- **d.** The types of formatting and content of pages can impact the experience that learners have while journaling.

Do the optional "Looking at Examples of Printed Journal Pages" section now. This optional section involves instructors discussing the possible benefits or drawbacks of different pages from printed journals. If you choose to include this optional section, jump to Slides 21–23 and the optional steps, which begin on page 29. When you have finished the optional section, return to page 27, Step 11, go back to Slide 17, and pick up where you left off.

11. **Show Slide 17:** *Field instructors who use journals frequently with learners recommend...* **Explain that blank pages are most useful and that many printed pages don't engage learners with the environment:**



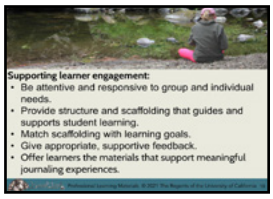
slide 17

   a. To use journaling to support meaningful, student-centered science learning, as we have today, all you need is blank paper.
   b. BEETLES and many field instructors who use journals often with learners recommend journals with more blank pages.
   c. They also recommend:
      - including printed pages that can be used in multiple ways, such as unlabeled lines or grids that can be used for different activities.
      - fewer fill-in-the-blank worksheets or word searches that do not involve learners engaging with the environment.

12. **Share that including printed journal pages can be useful, but they often leave very few blank pages for learner journaling:**
   a. Some printed journal pages—such as pages with logistical information, key vocabulary, or pages that are reference tools for learners—can be useful.
   b. However, printed journals may feature so many pre-structured printed pages that there's very little blank space left for learners to record their thoughts, memories, and observations—which is the point of journaling!
   c. Sharing with learners the invitation and blank page space to record their observations, thoughts, and experiences offers them the opportunity to deepen their relationship with nature and the outdoors.

Wrapping Up and Reflecting

1. **Show Slide 18:** *Supporting learner engagement.* **Briefly summarize the considerations for supporting learner engagement in journaling.**



slide 18

   a. Journaling is most successful and engaging for learners when instructors consider all the factors we explored during this session.
   b. Ensuring learners' basic needs are met, offering adequate journaling materials, offering supportive feedback, and using scaffolding and guidance to frame activities supports learner engagement in journaling.
   c. If an instructor matches journaling prompts with their learning goals for learners, then the meaning that learners make while journaling will be authentic and relevant to the rest of their field experience.
   d. Field journaling is a powerful tool that can be used to support student-centered and nature-centered learning in outdoor science programs.

TEACHING NOTES

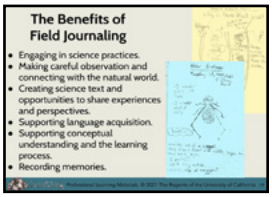
BEETLES Model Field Journal Pages. See the BEETLES Model Field Journal Pages for examples of different types of journal pages you might choose to include in your program's printed journal. http://beetlesproject.org/resources/field-journal-pages/

YOU ARE HERE:

10 minutes

TEACHING NOTES

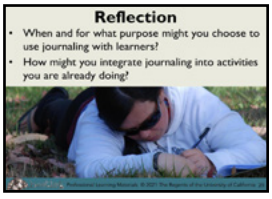
2. **Show Slide 19:** *The Benefits of Field Journaling*. **Reiterate some benefits for learners:**



slide 19

   a. Journaling is a valuable tool that supports learning and memory and can be integrated into a wide range of science learning experiences in order to support student-centered and nature-centered learning.
   b. When field journaling, learners are using science practices and engaging in the kind of learning called for by the NGSS.
   c. Field journaling supports learners in making careful observations and in building connections with nature, the outdoors, and their prior knowledge and experiences, offering a way for them to learn from their direct experiences and observations.
   d. Since learners can record their ideas in their journal entries, it is a practice that supports them to share their lived experiences and ideas as a source of expertise.
   e. By creating accurate, detailed field journal entries, learners are creating science text by using illustrations, academic language, and numbers.
   f. Through field journaling, learners are developing their disciplinary literacy in science, which is required to meet most English Language Arts standards.

3. **Show Slide 20:** *Reflection*. **Invite participants to engage in a final reflection in their journals:**

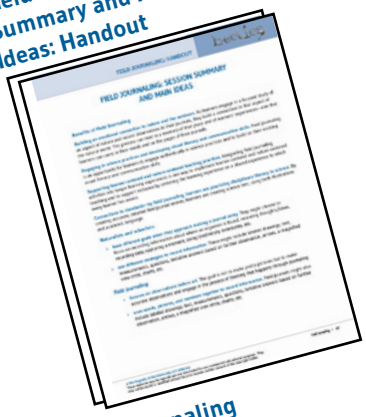


slide 20

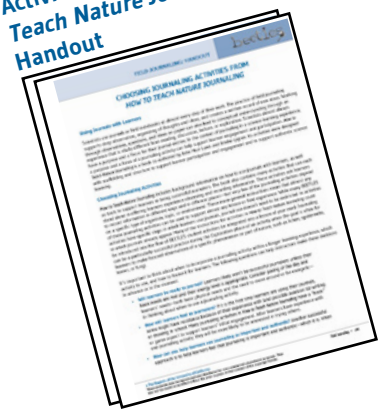
   a. Now we'll have some time to reflect.
   b. Think back on the whole session and what you may have learned. Record your thoughts in your journal.
   c. Record any "Aha" moments you had, things that you did that shifted your thinking, and specifically think about how this type of journaling could influence your field instruction.

4. **Distribute handouts:**
   - *Field Journaling: Session Summary and Main Ideas*
   - *Choosing Journaling Activities From* How to Teach Nature Journaling

Field Journaling: Session Summary and Main Ideas: Handout



Choosing Journaling Activities from How to Teach Nature Journaling: Handout

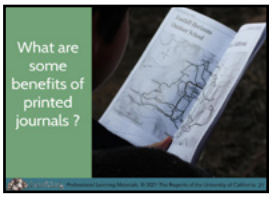


Optional: Looking at Examples of Printed Journal Pages

YOU ARE HERE:

30 minutes

1. **Show Slide 21:** *What are some benefits of printed journals?* **Share:**



slide 21

   a. We're going to look at some examples of printed journals used by different programs.

   b. We can use this conversation to think about journals we already use in our own program or whether we think it is worth printing journals for learners to use while they are at our program.

   c. Ask:

      ▶ *What are some benefits of using printed journals in outdoor science programs?*

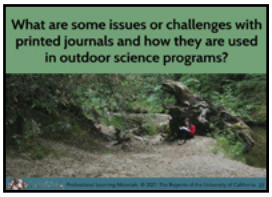
2. **Listen to participants' ideas and facilitate a brief discussion. You may want to add any of the following points not already brought up by participants:**

   a. Printed field journals offer learners:

      - reminders of the outdoor science school experience.
      - a place to reflect on ideas and learning and to do authentic field journaling.
      - logistical information (map of site, trails, etc.).
      - resources/tools to use in investigations (field guides, rulers, graph templates).
      - key vocabulary and definitions.
      - guidance and organized space to record data for specific activities.
      - tasks to keep them occupied during unstructured times.
      - science content information.

   b. Printed field journals can help guide what field instructors do with learners and can help meet expectations of classroom teachers.

3. **Show Slide 22:** *What are some issues or challenges with printed journals and how they are used in outdoor science programs?*



slide 22

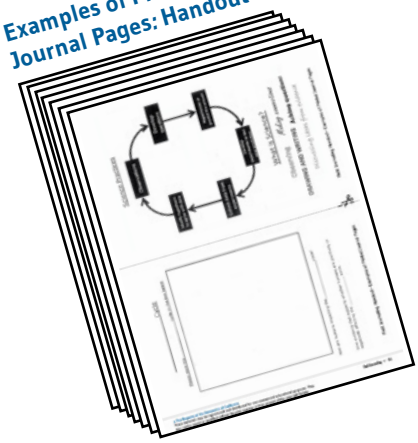
   - Listen to participants' ideas and then consider sharing any of the following if they have not already been mentioned by the group:
      - Pages that can only be used for a specific activity don't get used by those who don't do that activity.
      - Fill-in-the-blank worksheets don't offer space for learners to make their own sketches and write their own ideas.
      - Pages that focus on content delivery may be ignored.
      - Some printed journals don't include many blank pages or pages with space that learners can use for authentic field journaling.

TEACHING NOTES

Revise your program's journals? You may want to use the momentum of staff interest in journaling to revise your programs' printed journals. This way, you can keep the discussion going and redesign your programs' journals to better suit your staff and program goals. For more information, see the suggested follow-up activities in the "Applying Session to Instruction" section (beginning on page 31).

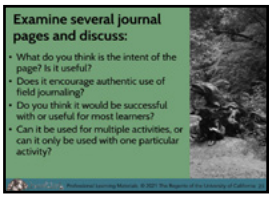
TEACHING NOTES

Examples of Printed Journal Pages: Handout



4. **Spread out the *Examples of Printed Journal Pages* handout on tables or on the floor.**

5. **Show Slide 23:** *Examine several journal pages and discuss.* **Offer instructions for the next activity:**



slide 23

   a. With a partner, please circulate among the sample journal pages and discuss the following:

      - *What do you notice about the field journal pages?*
      - *What do you think the intent of the page is? Does it seem useful?*
      - *Does it encourage an authentic use of field journaling—something a naturalist or scientist might do? Something that supports student learning?*
      - *Do you think it would be used successfully by learners?*
      - *Can it be used for multiple activities, or can it only be used with one particular activity?*

   b. Allow about 10 minutes for participants to explore sample journal pages with partners.

6. **Gather the group and invite pairs to categorize one journal page as least useful and one journal page as most useful, explain their rationale, and engage in a group discussion:**

   a. Gather everyone in a large seated circle around the journal pages.

   b. Invite participants to create two categories in the center of the circle: least useful and most useful.

   c. Ask each pair to choose one page they think is one of the least useful pages, and one that they think is one of the most useful.

   d. Invite each pair to take turns moving the two pages they chose to the appropriate category and explaining their rationale.

   e. Encourage agreement, disagreement, and general discussion about each choice.

7. **Invite the group to make generalizations about the kinds of pages they categorized as most useful and least useful.**

   a. Invite participants to notice patterns in how the group categorized the pages—try to characterize the kinds of pages they seem to find least useful and those they seem to find most useful.

   b. Tie in their comments with any of the features currently appearing in the journals used by your program.

8. **Return to page 27, Step 11, Slide 17:** *Field instructors who use journals frequently with learners recommend...* **and resume the session.**

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's some application in the session, but, as with all professional learning for instructors, the rubber meets the road (or trail) when instructors apply what they've learned to their teaching and when they keep thinking about it and discussing it with their peers. If you want your instructors to try out new activities/approaches, program leader support is crucial. Even if instructors are excited by new ideas, it's easy for them, especially veteran instructors, to keep doing what they've been doing successfully and not try out new activities/approaches. Following are a variety of follow-up activities and discussions to dig deeper into the topic and help you facilitate thoughtful implementation:

- **Discussing implementation of journaling activities.** During your next outdoor science program, invite each of your staff to try out a journaling activity from this session or from the book *How to Teach Nature Journaling*. They could all do the same activity or different activities. Invite them to write in their journals about how it went. Then, at the end of the program during a meeting, lead them in a discussion of the activity. Here are some suggested questions for a reflection and/or discussion:
    - How did learners respond to the activity?
    - What was successful about the activity? What was challenging?
    - What might you do differently the next time you lead it and why?
    - How have you incorporated journaling into other field experiences and what ideas do you have about incorporating it in the future?
- **Redesigning your program's printed journal.** After this session, while your staff is revved up on the topic, you might want to have a follow-up session in which they attempt to improve your program's printed journal. BEETLES Model Field Journal Pages [http://beetlesproject.org/resources/field-journal-pages/] includes a range of different kinds of field journal pages that can be downloaded and incorporated into printed journals for your program. It can take time to choose a combination of journal pages that work well for your program. Consider developing a plan for testing different kinds of journals and journal pages with learners and bringing results back to the group.
- **Engage with content from the *How to Teach Nature Journaling* book or website.** Invite your instructors to read one or more pages or chapters of the book or website *How to Teach Nature Journaling* and discuss how they might integrate the information into their approach to teaching field journaling with learners. Some pages and chapters to consider reading include:
    - Why Nature Journaling? (pp. 4–8)
    - Managing the Outdoor Classroom (pp. 11–14)

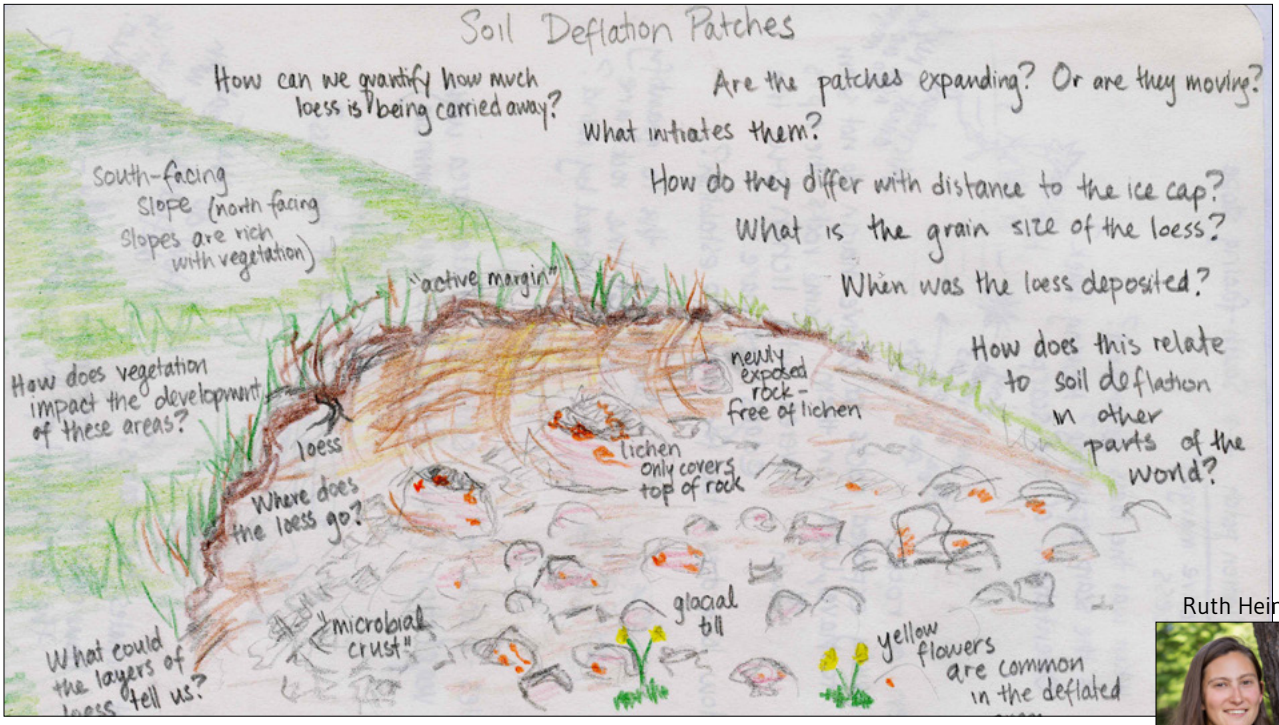
TEACHING NOTES

- How to Lead Journaling Activities (pp. 15–19 or https://howtoteachnaturejournaling.com/teaching_support/introducing-journaling-activities/)
- Supporting Student Engagement During Journaling Activities (https://howtoteachnaturejournaling.com/teaching_support/supporting-student-engagement-during-journaling-activities/)
- Adjusting Activities for Age and Experience (https://howtoteachnaturejournaling.com/teaching_support/adjusting-activities-for-age-and-experience/)
- Finding Phenomena for Journaling Activities (https://howtoteachnaturejournaling.com/teaching_support/finding-phenomena-activities/)
- Intentional Curiosity and Inquiry (pp. 88–89)
- Writing to Observe, Writing to Think (pp. 130–132)
- Observational Drawing (pp. 162–165)
- Numbers and Quantification (pp. 198–199)
- Developing Skills: Ideas, Practice, and Feedback (pp. 227–230)
- From Activities to Longer Lessons (pp. 233–235)

- **Staff brainstorm on how to encourage incorporating field journaling into your program.** The session reflection offers staff an opportunity to record ideas they have about integrating journaling into their instruction. Invite staff to share their ideas and have a conversation about what they plan to do and how you can support them in doing it.
- **Encourage your instructors to take up the practice of field journaling themselves.** In the introduction to the book *Field Notes on Science and Nature*, Michael Canfield writes, "The value of taking field notes lies both in the actual information that is recorded as well as in what is gained in the process of recording itself." Field journaling on a regular basis is one way that instructors can build a rich rapport with the place in which they teach and gather knowledge of the local natural history of your site. This supports them in becoming more versatile instructors—better prepared to engage learners deeply in the study of flora, fauna, and phenomena. This also supports instructors to introduce journaling to learners from a place of authenticity; instructors might even share examples from their own journals. Offer *The Laws Guide to Nature Drawing and Journaling*, by John Muir Laws, as a resource for instructors to guide their practice.
- **Continuing a discussion.** If there was a discussion topic that came up during the session that there wasn't time to finish, and if it seems like your staff is interested in and would benefit from continuing the discussion, set aside some time to do so.

TEACHING NOTES

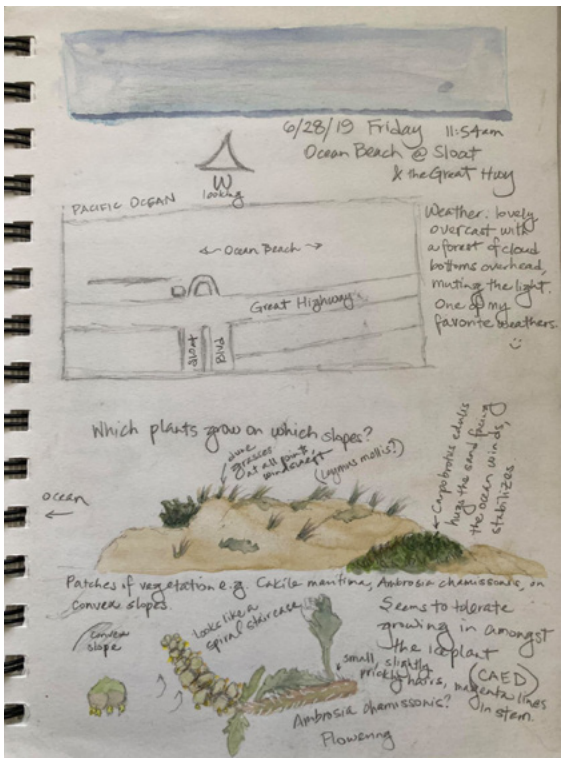
- **Assign your staff to read the Building Knowledge Through Nature Journaling chapter and the Focused Awareness chapter, both from *The Laws Guide to Nature Drawing and Journaling* by John Muir Laws.**
    - Possible questions/prompts for discussion after the reading:
        - What ideas or phrases struck you?
        - Describe one thing you know through direct experience and one thing you know from being told by someone else. Does your "knowing" of those two things feel different?
        - Do you trust things you know through personal experience more than or less than things you know from books and other secondhand sources?
        - In your education, were you taught mostly through direct experiences that led to learning or through being given information? How do you think that affected you as a learner?

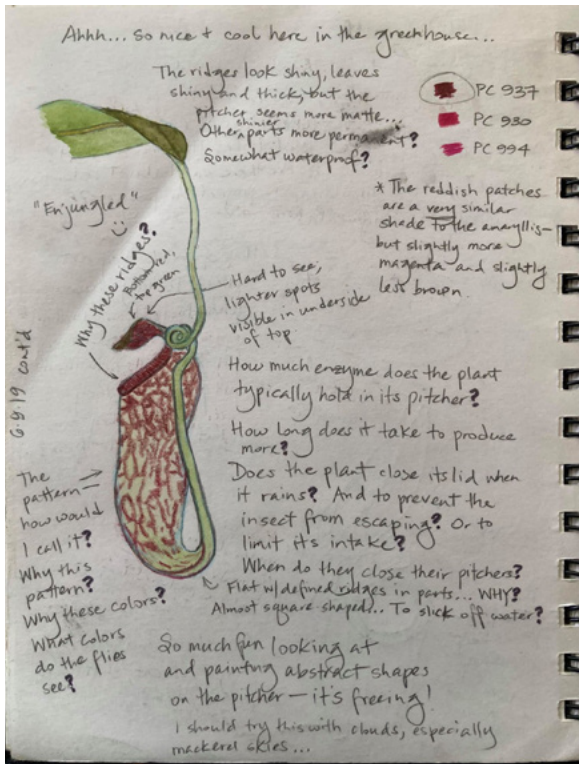


Ruth Heindel

"The drawing helped me focus my observations, while the writing allowed me to express questions that would be difficult to convey with drawings alone. The questions I included on this sketch became the foundation for my dissertation. Some of the questions are ones I'm still thinking about and would like to continue working on."

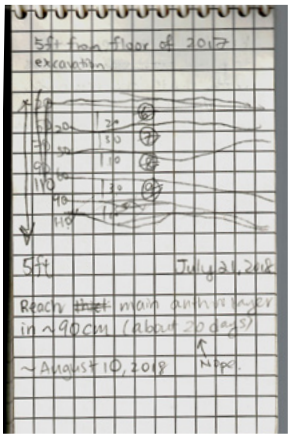
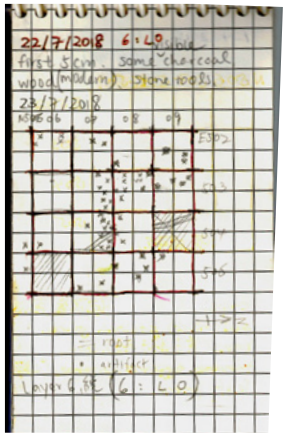
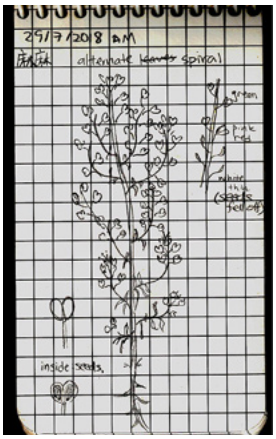
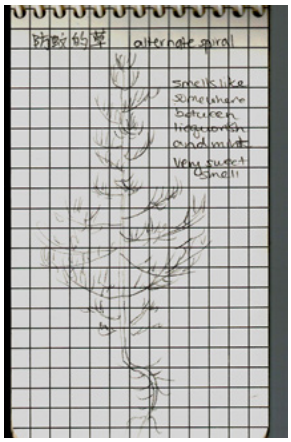
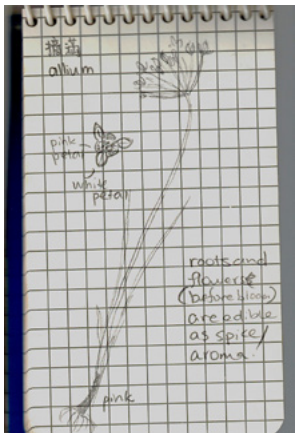
Field Journaling Handout—Model Field Journal Pages (c) Ruth Heindel





Yvea Moore

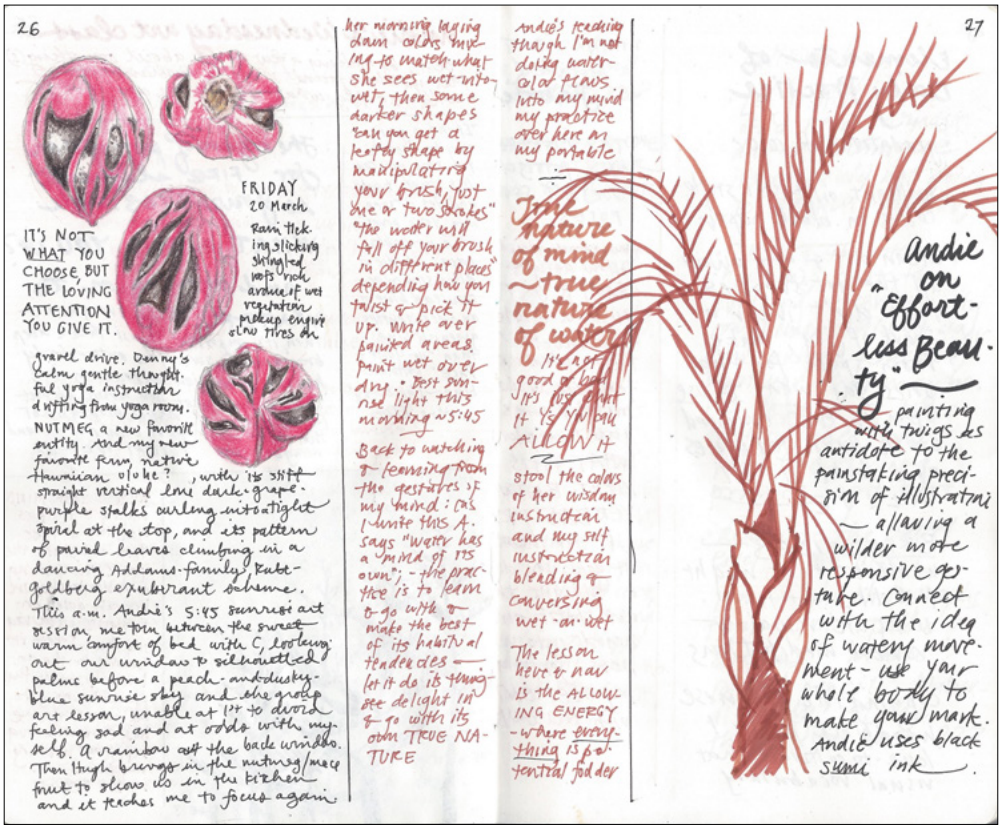
Field Journaling Handout—Model Field Journal Pages (c) Yvea Moore


These are field notes for my research project on Late Pleistocene plant foods in Hebei, northern China. My goals were to look for carbonized evidence of food refuses left behind by ancient people at an archaeological site and learn about the wild plants, which are useful to people who are currently living near the site. Entry 1 was notes on the excavation profile/ stratigraphy in which I analyzed the relative order of sediment layers containing artifacts (objects related with human activity) at the site. Entry 2 recorded where artifacts and carbonized plant remains were surfacing during the archaeological excavation, which helped me decide where in the site to focus my sample collection. Entries 3 and 4 are two examples of some exploratory notes that I had taken while interviewing local farmers on the plant foods that they eat and collect from the wild. Entry 3 is a type of spice, while entry 4 repels insects when dried and burnt to create smoke. I was especially excited to take notes on entry 5. I had been looking for ethnographic evidence of edible roots and tubers in the region for about a month when one of the farmers showed me how to eat the flowers and roots of zhai man (wild onions), which they use as a garnish in pork dishes.

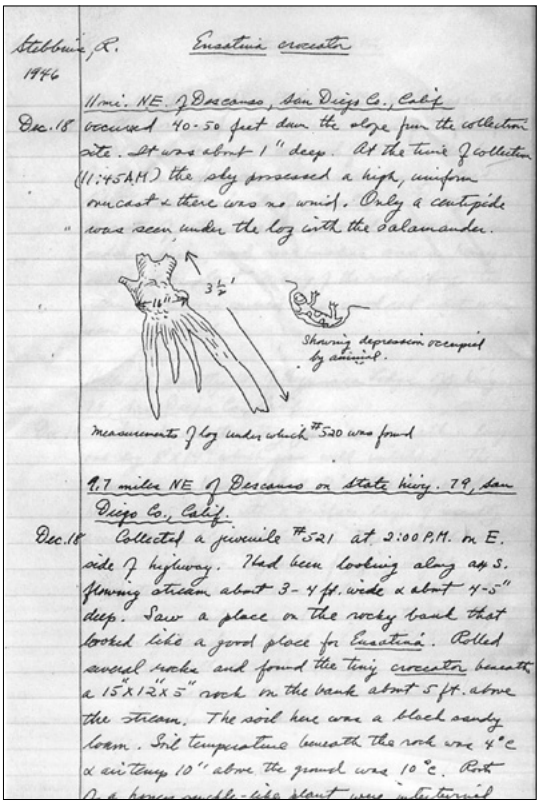
Mana Hayashi Tang

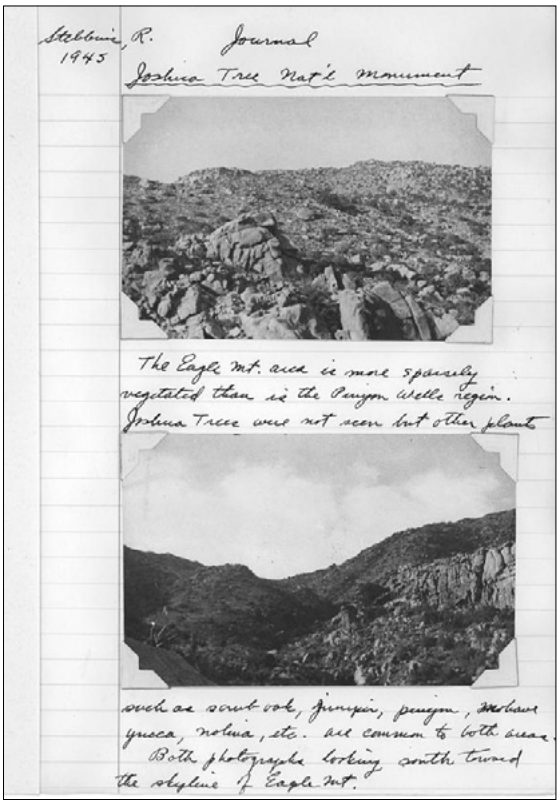
Field Journaling Handout—Model Field Journal Pages (c) Mana Hayashi Tang



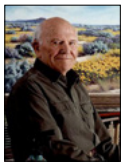
Sarah Rabkin

Field Journaling Handout—Model Field Journal Pages (c) Sarah Rabkin



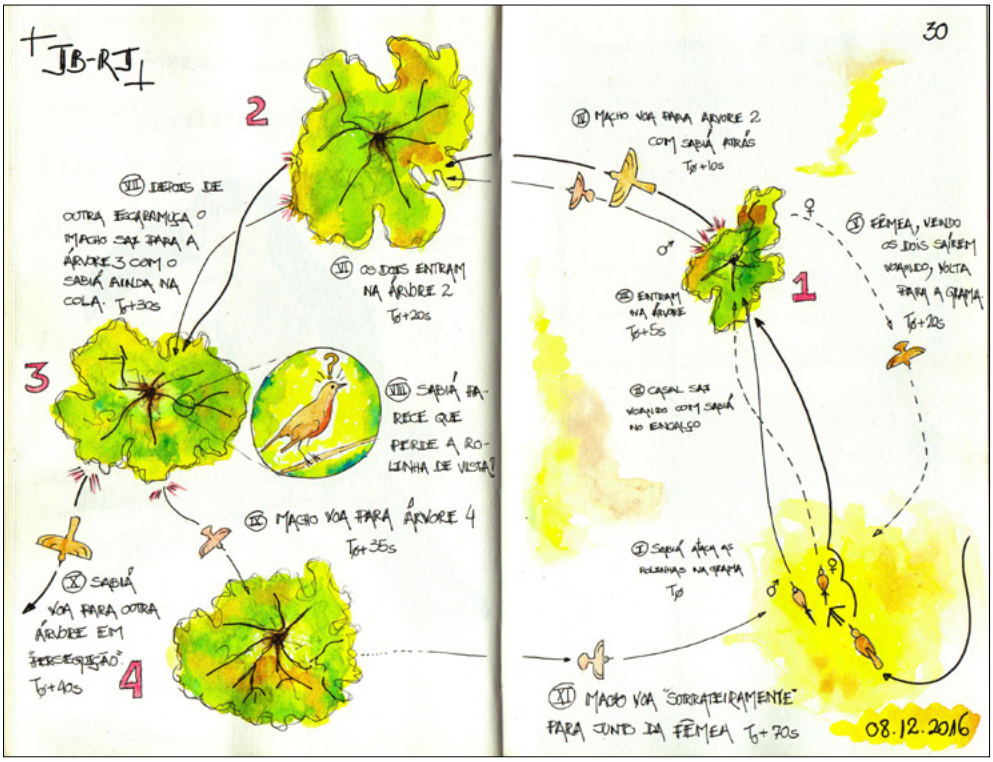


Robert Stebbins



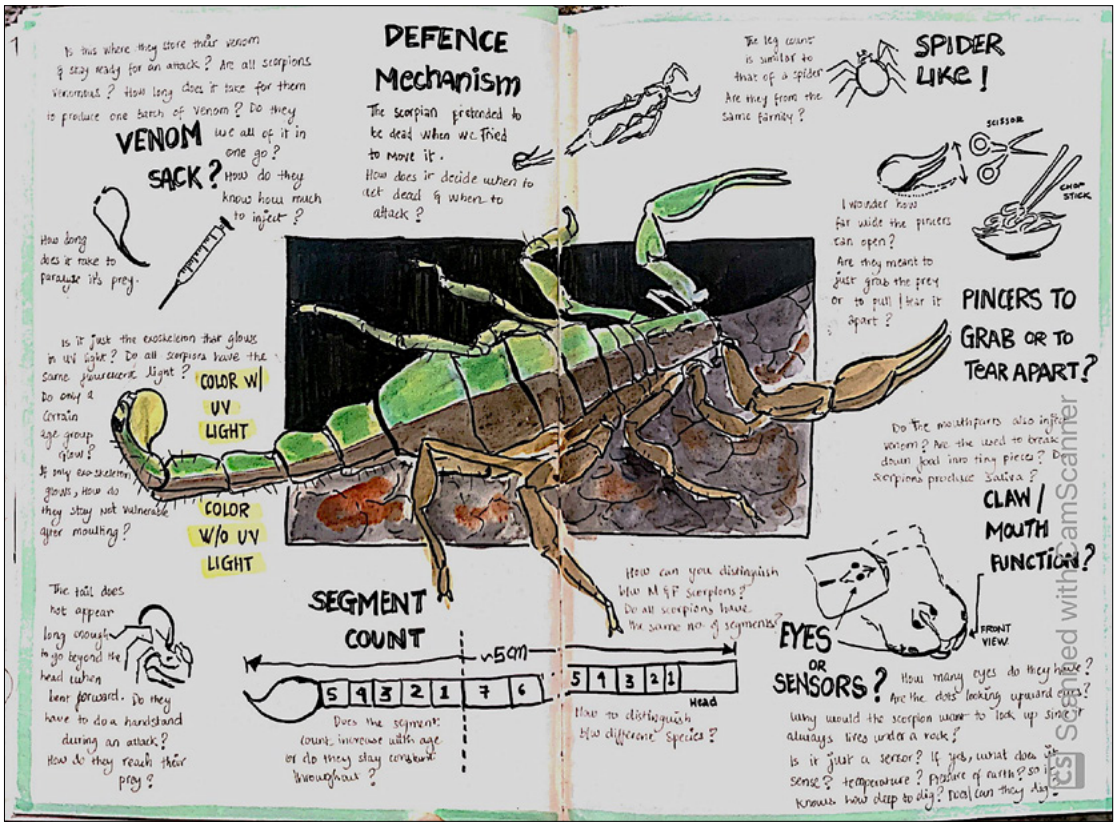
Field Journaling Handout—Model Field Journal Pages (c) Robert Stebbins

Translation:
T=0, Sabiá attacks the doves at the grass.
II, Couple flew away with Sabiá on the chase.
III, Tree 1, T=5s, Everyone enter tree.
IV, T=10s, Male fleds to Tree 2 chased by the Sabiá.
V, T=20s, Female, seeing the two flying away, goes back to the grass.
VI, T=20s, Both enter Tree 2.
VII, T=30s, After some more skirmish, the male fleds to Tree 3 still with the Sabiá at his tail.
VIII, Sabiá apparently loses track of the dove!
IX, T=35s, Male flew to Tree 4.
X, T=40s, Sabiá flies to another tree, still 'chasing.'
XI, t=70s, Male stealthily flies to meet the female.
This took around one and a half minutes to complete, with the Sabiá losing track and the doves coming to resume eating at the same spot they were in the beginning.



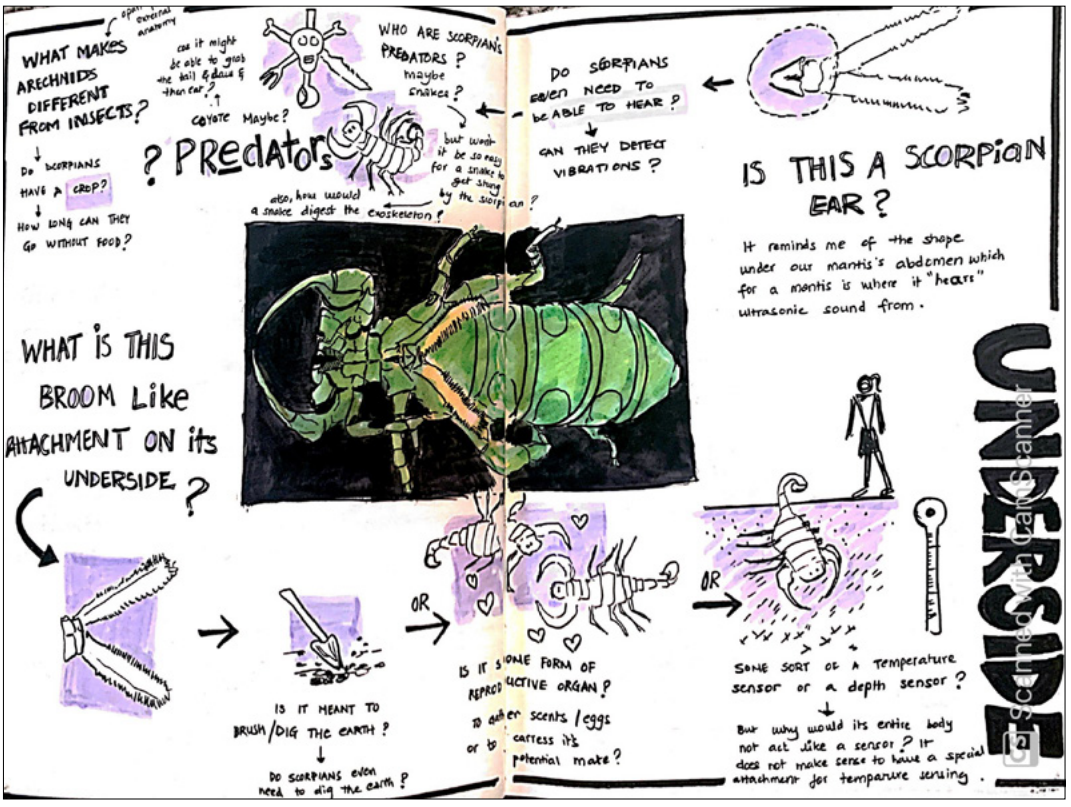
Marcelo Jost

Field Journaling Handout—Model Field Journal Pages (c) Marcelo Jost



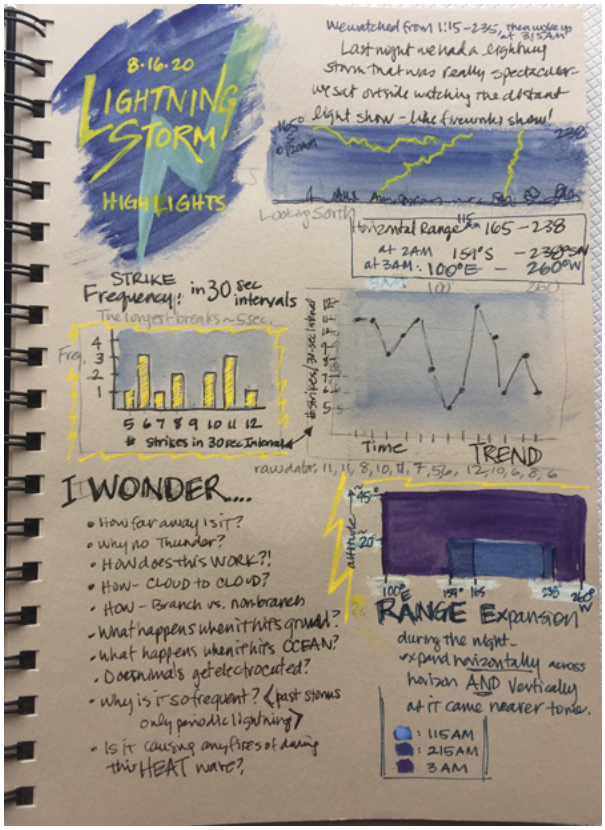
Gargi Chugh

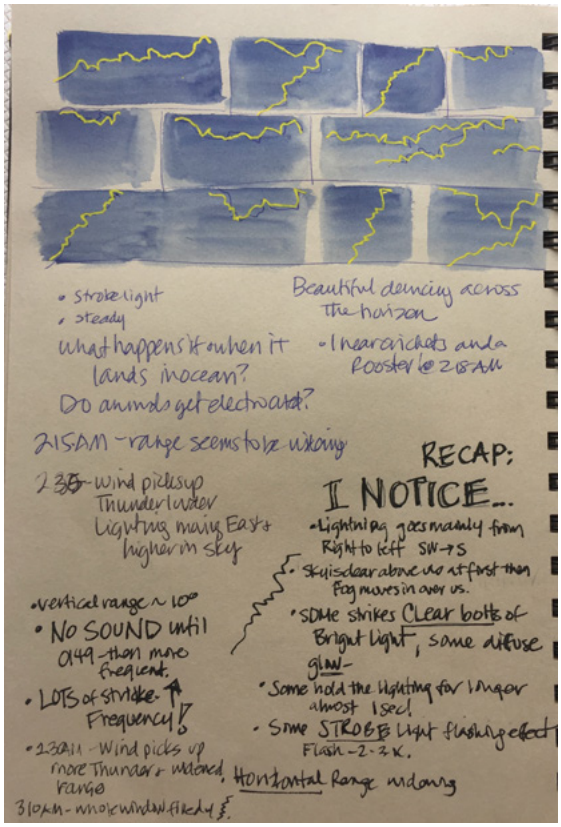
Field Journaling Handout—Model Field Journal Pages (c) Gargi Chugh



Gargi Chugh

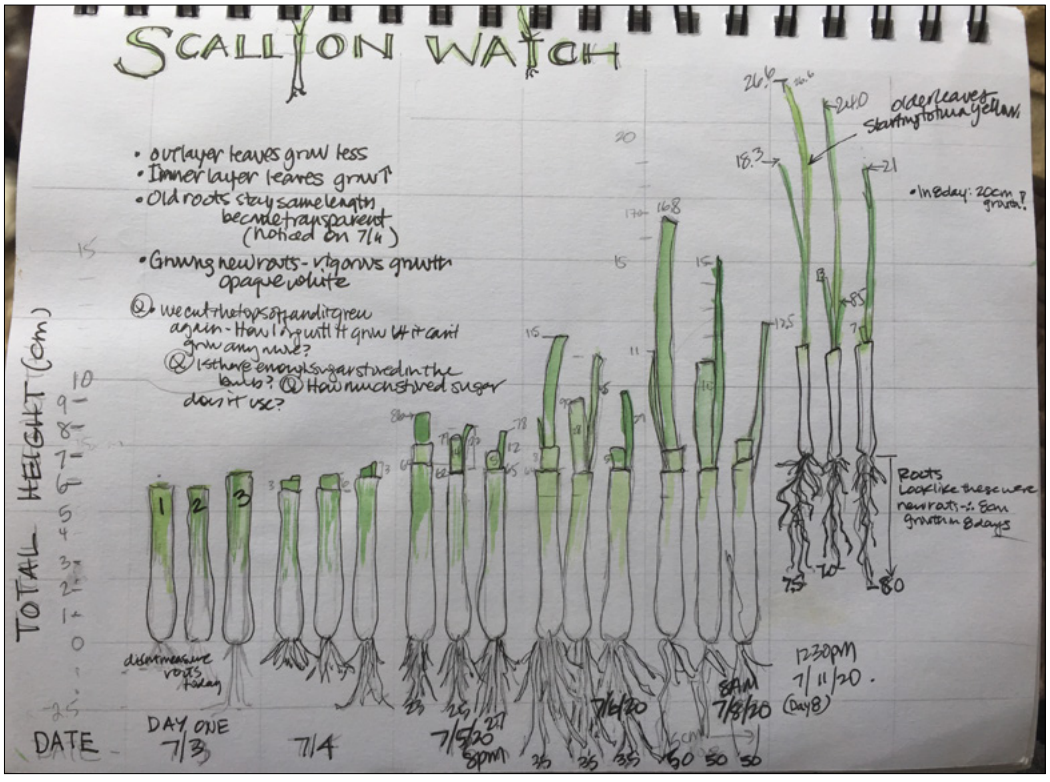
Field Journaling Handout—Model Field Journal Pages (c) Gargi Chugh





Melinda Nakagawa

Field Journaling Handout—Model Field Journal Pages (c) Melinda Nakagawa



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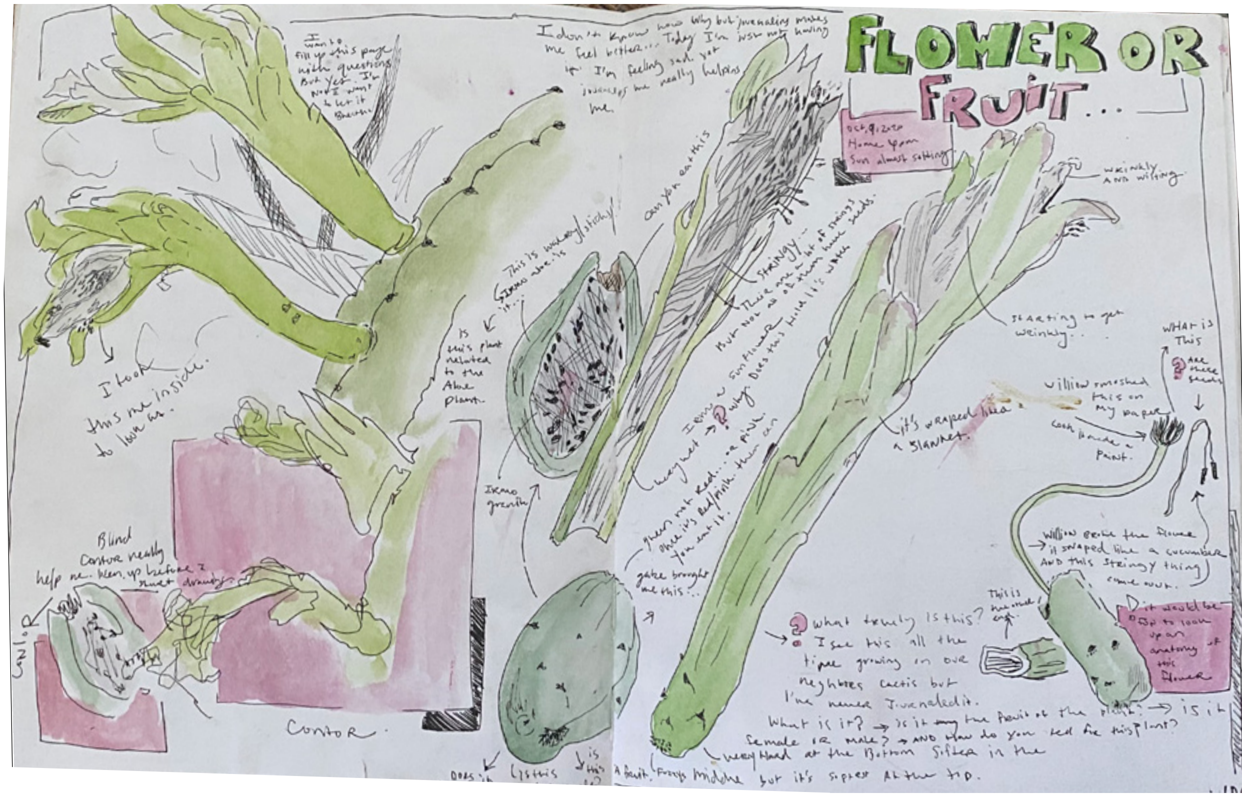
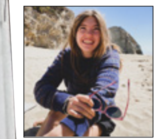


Amaya Shreeve



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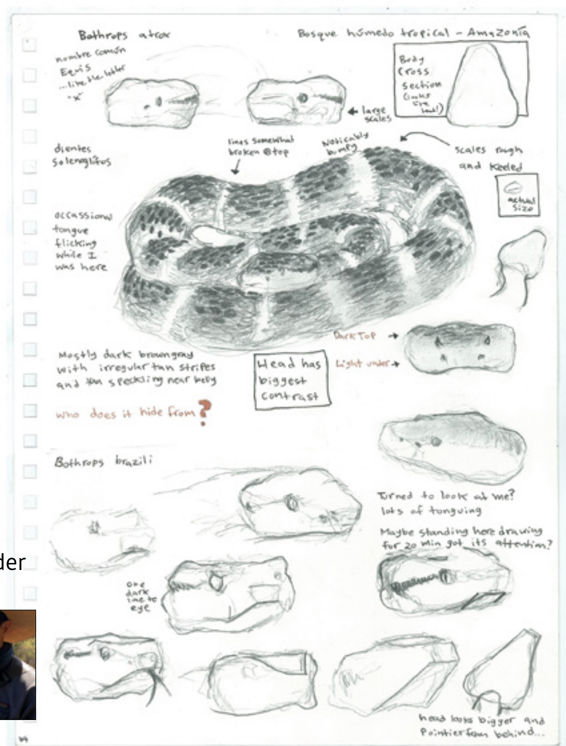
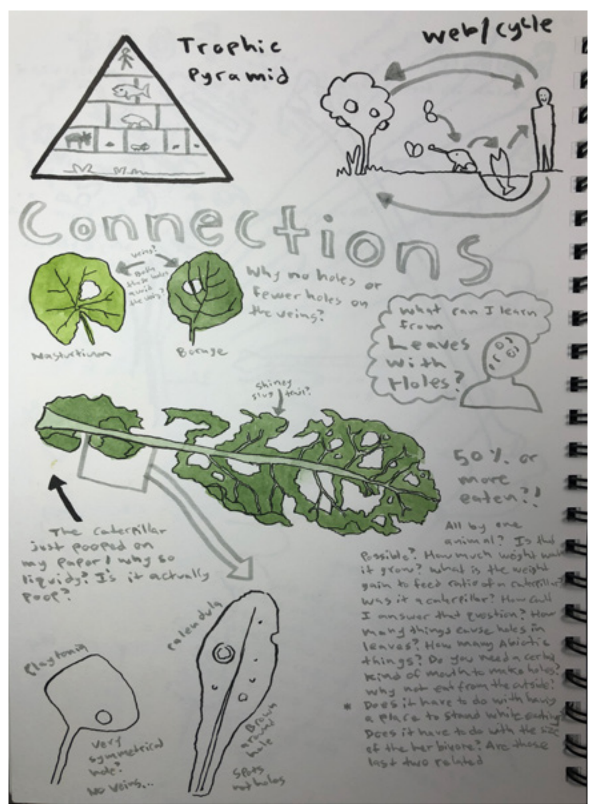
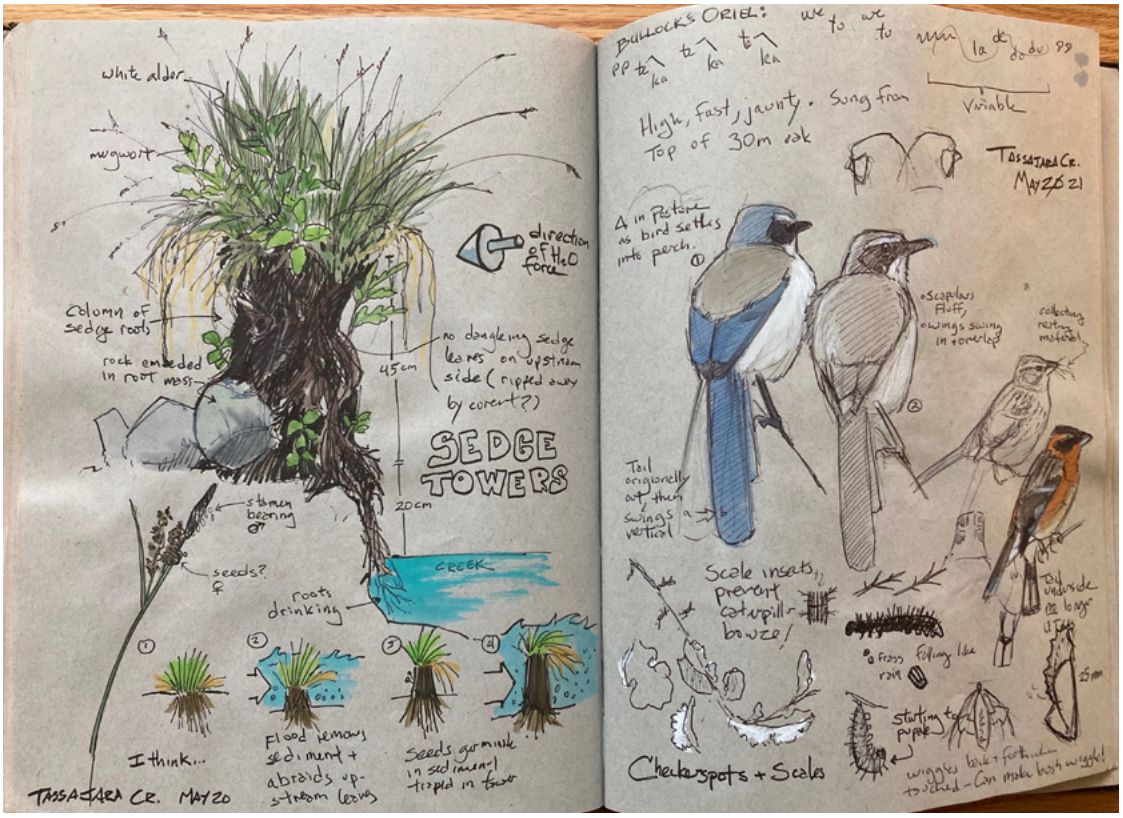


Marley Alexander Peifer



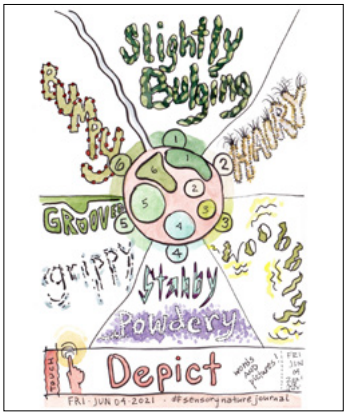
Field Journaling Handout—Model Field Journal Pages (c) Marley Alexander Peifer

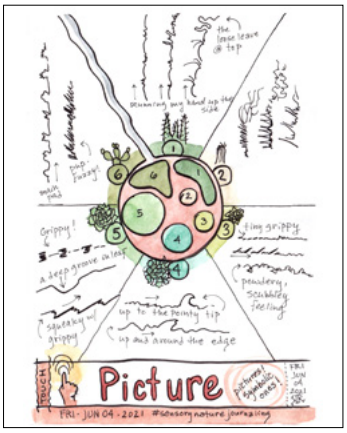
John Muir Laws

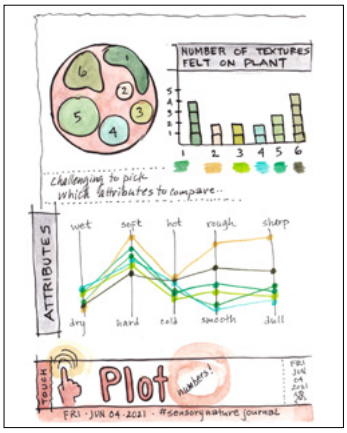


Field Journaling Handout—Model Field Journal Pages (c) John Muir Laws

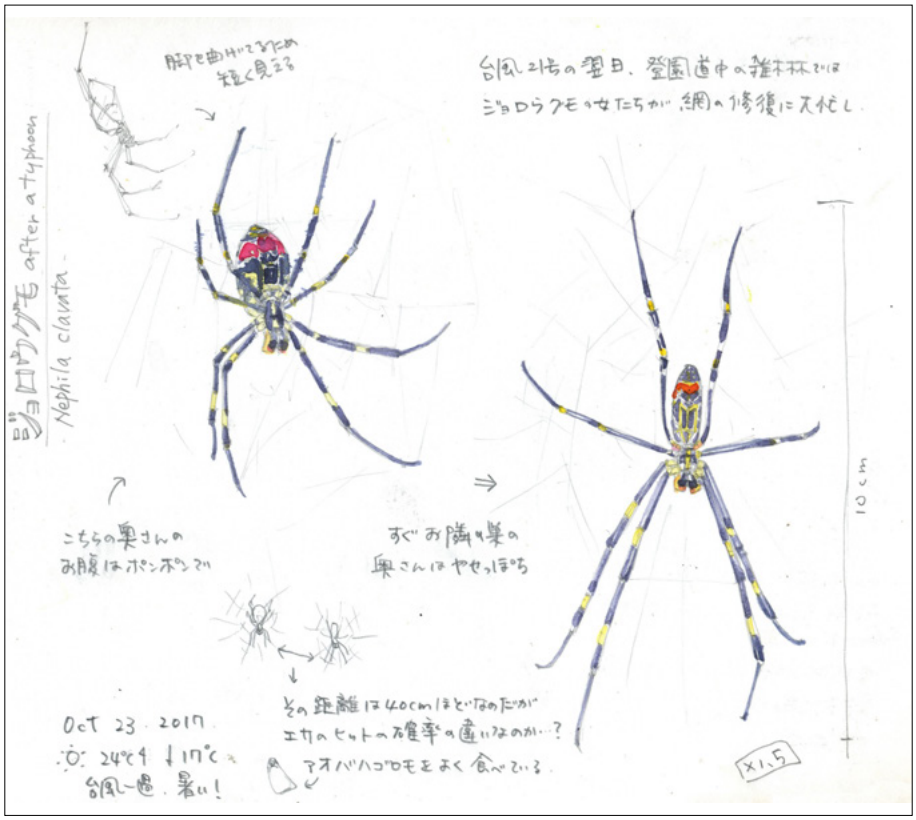
Kate Rutter







Field Journaling Handout—Model Field Journal Pages (c) Kate Rutter

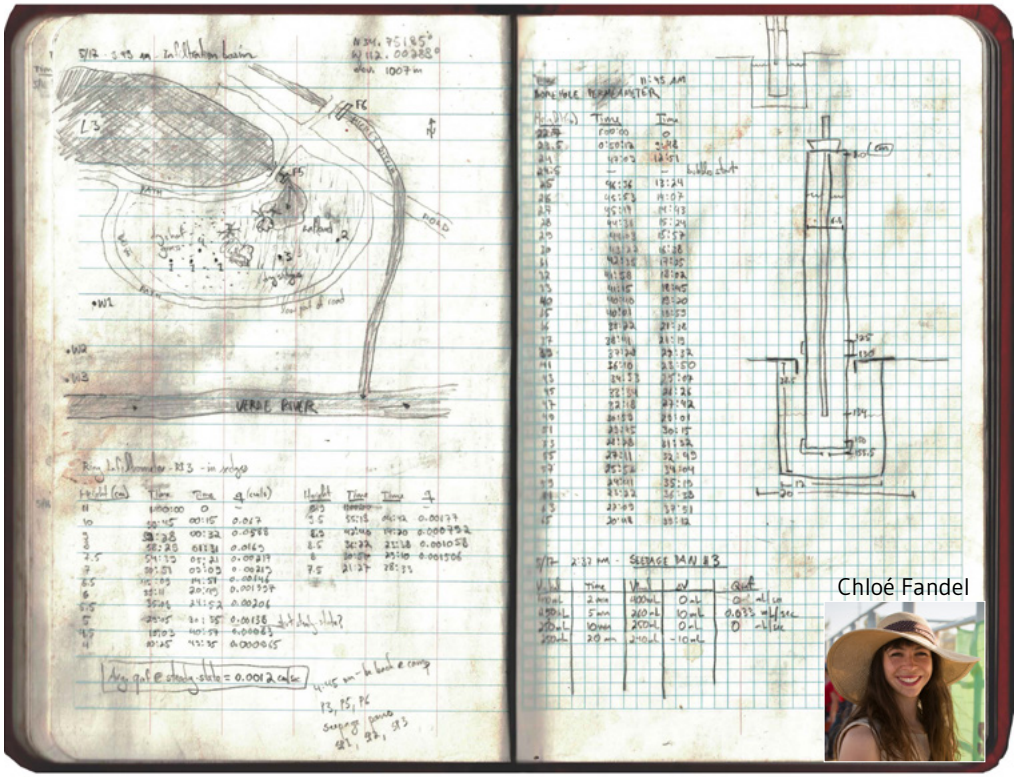


Translation:

1. In the morning, we found lady spiders busily working to fix up their webs, which were broken by the powerful typhoon No. 21.
2. Legs look shorter here because it bends them.
3. I realized one of the lady spiders was plump.
4. But the one right next to her was skinny.
5. Only 40 cm difference between each of their webs. Does the quantity of food make the difference?
6. they often eat Aobahagoromo—Geisha ditinctissima. (Arrow points to the small diagram of an insect remnant.)

Eriko Kobayashi

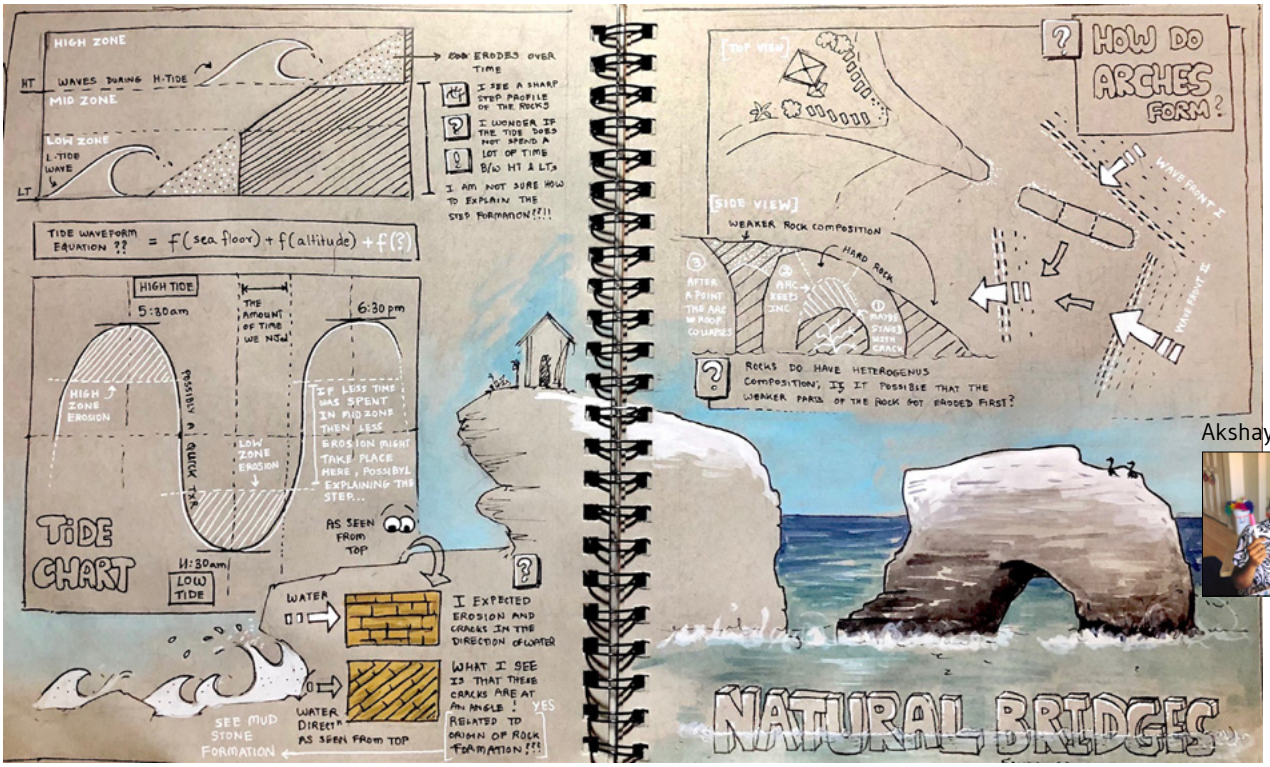
Field Journaling Handout—Model Field Journal Pages (c) Eriko Kobayashi



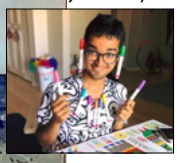
Chloé Fandel

"These two pages record a variety of field measurements, all referenced to the map on the upper left. There are several other pages with columns of data for the other locations on the map. The map is extremely important, because it shows where each data column comes from, and which bodies of water are connected to each other. For the measurements on the right-hand page, instead of writing down "length of tube 134 cm, depth of hole 38.5 cm," etc., I drew a diagram [of the instrument], because it's more specific and less likely to cause confusion later. I also calculated some results quickly in the field, which we checked later using Excel. These [field calculations] are to see if the results are reasonable. Sometimes they are not, and then I know that I made a mistake and need to retake measurements while I am still in the field."

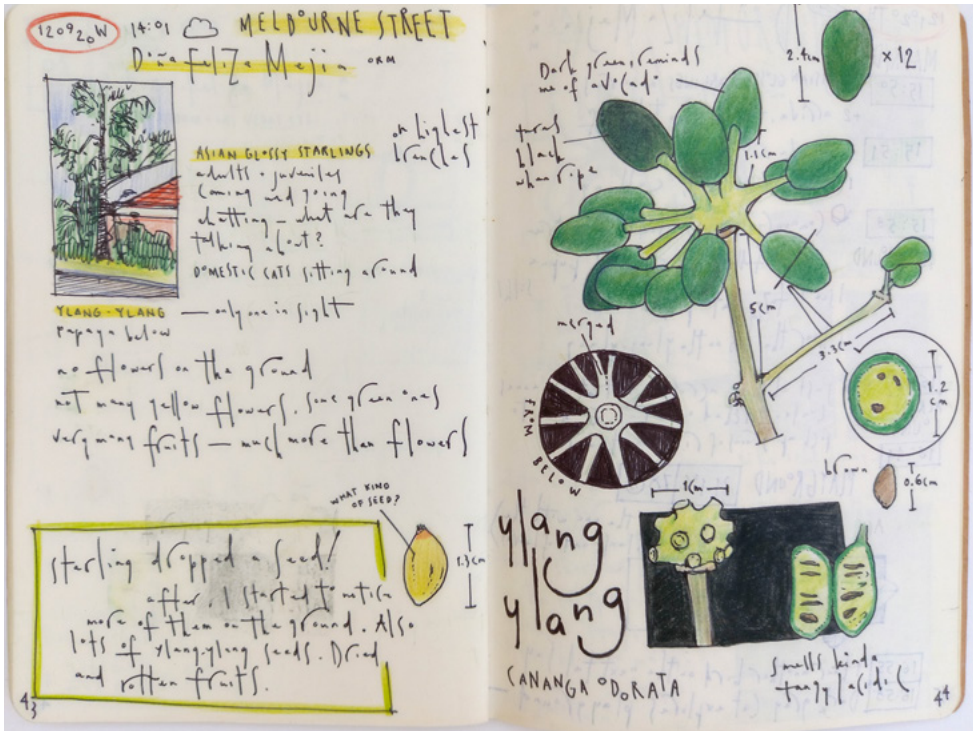
Field Journaling Handout—Model Field Journal Pages (c) Chloé Fandel



Akshay Mahajan



Field Journaling Handout—Model Field Journal Pages (c) Akshay Mahajan



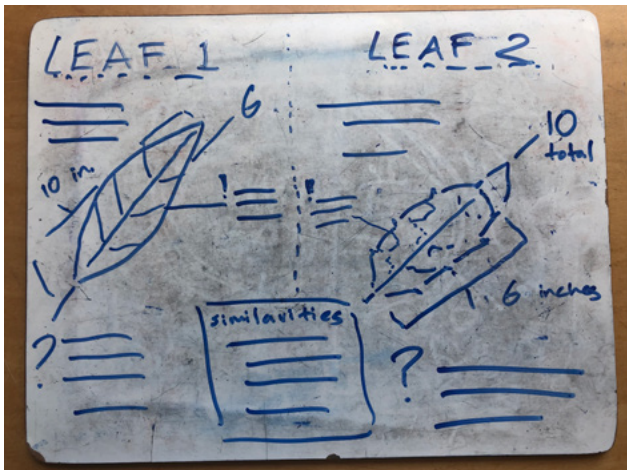
Subhelic

Field Journaling Handout—Model Field Journal Pages (c) Subhelic

JOURNALING ACTIVITY PROMPT 1 AND DISCUSSION QUESTIONS

PROMPT 1: Comparison

This prompt was adapted from *How to Teach Nature Journaling*. These instructions are similar to verbal directions you might give learners (using a whiteboard, as shown) as you offer examples of how they could record information.



Instruction:

Your goal is to compare two types of plants, recording in your journal as many differences and similarities as you can. Begin by choosing two types of plants that are sort of similar to each other—such as two different types of trees, small shrubs, grasses, or flowers.

When you find two plants to compare, begin to look for differences and similarities. Observe the plants' leaves, their branches or stems, where they grow, how tall they are, their colors, etc. Show what you learn in your journal by using words, pictures, and numbers.

Don't worry about making a pretty picture, spelling things correctly, or knowing what the plants are called. Your goal is to notice as many differences and similarities between the two plant types as possible.

You might choose to use one page of your journal to focus on one plant type and the opposite page to focus on the other plant type. Or, you can divide a page in half if your paper is large enough. You can also list any similarities you notice in the middle, between your two drawings.

If your plants are smaller than your paper, you could make a life-size drawing. If your plants are bigger than your paper (such as a tree or a bush), you don't have to draw the whole plant. You could just show a leaf and what a section of the bark or stem looks like. To sketch your leaf, try pressing it against the paper; tracing the edges of the leaf; and then filling in details with words, pictures, and numbers.

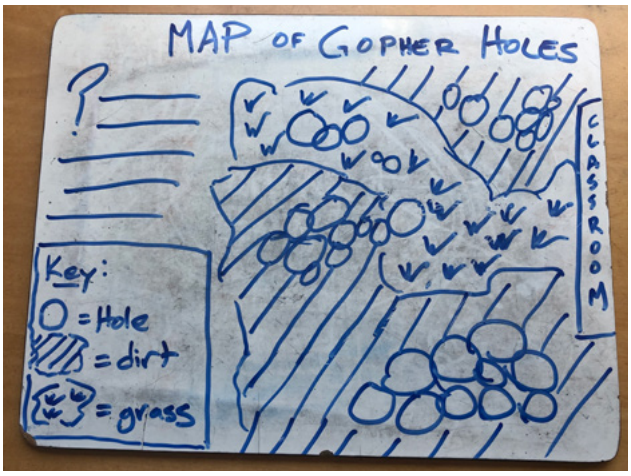
Comparison Discussion Questions:

- What were some of the differences you observed between the two plants? How were the structures or plant parts (such as leaves, bark, or branches) different from one another? What differences were there in overall structure and growth pattern?
- Pick one type of structure or plant part (such as a leaf, bark, or branches) to focus on. How are the two structures different from each other? How might they function or work differently to help the plant survive?

JOURNALING ACTIVITY PROMPT 2 AND DISCUSSION QUESTIONS

PROMPT 2: Mapping

This prompt was adapted from *How to Teach Nature Journaling*. These instructions are similar to verbal directions you might give learners (using a whiteboard, as shown) as you offer examples of how they could record information.



Instruction:

Your goal is to make a map to show where different types of plants appear in this area. Use symbols on your map to show the location for each type of plant or landscape feature and include a key where you describe what each symbol means. Map symbols can be letters or simplified shapes (e.g., a clump of lines to indicate grass, a circle to show the location of a tree). Map symbols should not be detailed drawings because the goal is not to show the details of every single thing; it is to show their location. The symbols should be easy to draw and distinct from one another. They could also be letter codes (such as GH for gopher hole). You can add additional key elements as you go. You don't need to know the names of species of plants or other features to add them to your map. You only need to be able to tell them apart from one another. If there is a plant (such as a grass) or something like dirt that covers a very large area, you can use hatching lines or a grid to show this.

Before you begin, pick out a few important landmarks to add to your map, such as a building or a picnic bench. Use these as reference points to help you place other features on the map. If any questions occur to you as you make your map, record them.

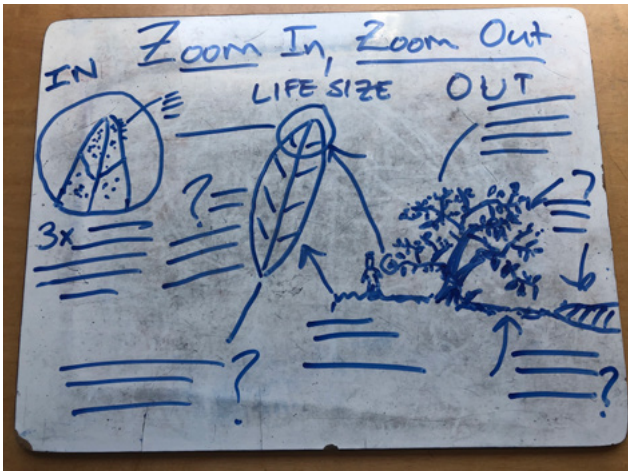
Mapping Discussion Questions:

- What did you learn about the distribution of your plants through making your map? Where were they and where weren't they? What patterns did you notice?
- What might have caused some of the patterns of distribution you observed? Why do you think the plants you mapped were in some places and not in others?

JOURNALING ACTIVITY PROMPT 3 AND DISCUSSION QUESTIONS

PROMPT 3: Zoom In, Zoom Out

This prompt was adapted from *How to Teach Nature Journaling*. These instructions are similar to verbal directions you might give learners (using a whiteboard, as shown) as you offer examples of how they could record information.



Instruction:

Your goal is to observe a plant from different perspectives, or points of view, to see what you can notice. Pick a smaller plant—about the size of your journal. Start by looking at the plant and recording a few details about it through a life-size drawing and through writing. You don't have to make a pretty picture of the plant—make a quick sketch and record some observations of the plant.

Next, pick one plant part—such as a leaf, flower, bark, or stem—to zoom in on and do a close-up drawing. To show that this is a close-up drawing, you might want to put a circle around that feature on your life-size drawing and then make a larger circle next to that and make your close-up drawing inside the larger circle. Use words and numbers to add some observations.

Then, zoom out and start to look at everything around the plant. Are there other individuals of this plant type close by? Where does this type of plant grow? Where does it not grow? What is the soil like around this plant? Where are leaves found on this plant? Where aren't they found? Describe what you find below or around the plant. Is there any evidence of herbivores eating this plant or evidence of other interactions between the plant and the environment? Would you expect this plant to look any different in another season?

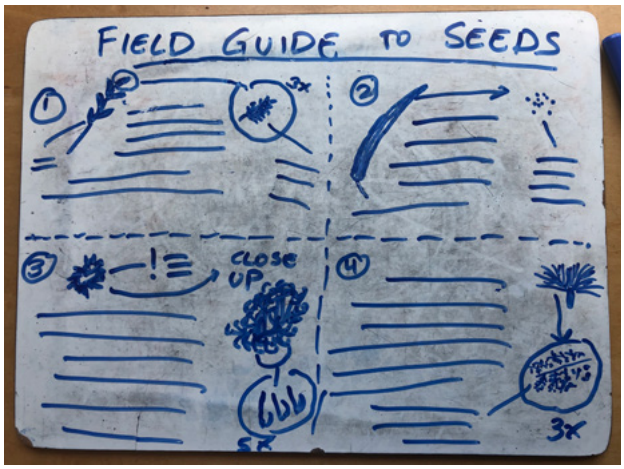
Record what you learn by using words, pictures, and numbers and use more of whichever is easier for you. When you're looking at the plant from far away, you could show its surroundings in a drawing or describe them in words. Use arrows and labels to describe evidence of interactions you see between the plant and its surroundings.

Zoom In, Zoom Out Discussion Questions:

- What kinds of details do you notice when up close? When far away?
- What things in the surrounding environment might impact or influence your plant? How do you think your plant is connected to the surrounding environment?
- How could you use this zoom in, zoom out approach in other journal entries?
  to help the plant survive?

JOURNALING ACTIVITY PROMPT 4 AND DISCUSSION QUESTIONS

PROMPT 4: Field Guide



This prompt was adapted from *How to Teach Nature Journaling*. These instructions are similar to verbal directions you might give learners (using a whiteboard, as shown) as you offer examples of how they could record information.

Note: For this activity, it can be useful to offer learners an example of a field guide before they begin.

Instruction:

In a moment, you will have the opportunity to pick one plant part—such as leaves, bark, stems, seed pods, or fruit—to focus on as your subject for this activity. Then, in your journal, make a field guide of this plant part. A field guide usually shows a picture and some information about unique features and characteristics of each subject.

Field guides show different species—not individuals from the same species. If you choose to focus on leaves, for example, you will describe one leaf from three or four different plant types or species.

Use words, pictures, and numbers to describe each subject and to show similarities and differences between different types of plant parts. To start off with, try to show at least three subjects in your field guide.

If you're not sure where to begin, record a few *I notice* statements or observations of each plant part. Or to get started drawing, try tracing each plant part. Don't worry about making a pretty picture of your subject—focus on making a lot of observations.

Field Guide Discussion Questions:

- What were some of the similarities and differences between the subjects you recorded in your field guide?
- Are there any features or structures that are shared by several or all of your field guide subjects? If so, describe them.
- What are some possible explanations for the similarities and differences you saw?
- Did you notice anything interesting as you made your field guide or did any cool questions arise?

FIELD JOURNALING: SESSION SUMMARY AND MAIN IDEAS

Benefits of Field Journaling

Building an emotional connection to nature and the outdoors. As learners engage in a focused study of an aspect of nature and record observations in their journals, they build a connection to that aspect of the natural world. This process can lead to a memory of that place and of learners' experiences—one that learners can carry in their minds and on the pages of their journals.

Engaging in science practices and developing visual literacy and communication skills. Field journaling is an opportunity for learners to engage authentically in science practices and to build on their existing visual literacy and communication skills.

Supporting learner-centered and nature-centered teaching practices. Integrating field journaling activities into longer learning experiences is one way to implement learner-centered and nature-centered teaching and to support inclusion by centering the learning experience on a shared experience to which every learner has access.

Connections to standards—by field journaling, learners are practicing disciplinary literacy in science. By creating accurate, detailed field journal entries, learners are creating science text, using both illustrations and academic language.

Naturalists and scientists:

- **have different goals when they approach making a journal entry.** They might choose to focus on recording information about where an organism is found, recording thoughts/ideas, recording data, capturing a moment, doing biodiversity inventories, etc.
- **use different strategies to record information.** These might include labeled drawings, text, measurements, questions, tentative answers based on further observation, arrows, a magnified view circle, charts, etc.

Field journaling:

- **focuses on observations before art.** The goal is not to make pretty pictures but to make accurate observations and engage in the process of thinking that happens through journaling.
- **uses words, pictures, and numbers together to record information.** Field journals might also include labeled drawings, text, measurements, questions, tentative answers based on further observation, arrows, a magnified view circle, charts, etc.

FIELD JOURNALING: SESSION SUMMARY AND MAIN IDEAS (continued)

Instructors who use journals successfully to support science instruction suggest:

- **paying attention to group and individual needs.** There are great times for journaling, and there are . . . *less* great times for journaling. If learners are super energetic, have just gotten off the bus, or are very hungry, they may not be able to focus on journaling as much. Weather conditions—such as very cold, windy, or extremely hot conditions—can also be challenging. Set up learners for success in journaling by choosing a time and location in which you think they will have the best possible chance of being engaged. Consider and address learners' physical and emotional needs so they can be present in the learning process.
- **offering structure and scaffolding.** Field journaling activities can be more engaging and accessible for learners when there is structure and scaffolding. You might offer a focus for learners' journaling and observations (e.g., do a comparison of two types of acorns, make a map of where spiderwebs occur) and offer some suggestions for how learners could record information in their journals. The activities in *How to Teach Nature Journaling* include this kind of structure and scaffolding.
- **matching scaffolding with learning goals.** The kind of scaffolding you offer will affect the types of observations and thinking learners do while journaling. Think ahead of time about what part of nature or the outdoors you will offer for learners to focus on, and which nature journaling activity might help guide learners to make observations and engage in thinking relevant to your learning goals.
- **giving appropriate and supportive feedback.** Avoid the tendency to comment on the artistic quality of drawings. Instead, give feedback on what you are asking learners to do—make accurate observations and record them in drawing and writing. Be nonjudgmental as you highlight observations that learners made or methods they used to show thinking on the page.
- **giving learners adequate materials for journaling.** Make sure learners have at least some blank pages on which to record their observations and experiences.

See more journaling activities and tips at howtoteachnaturejournaling.com and www.johnmuirlaws.com.

CHOOSING JOURNALING ACTIVITIES FROM *HOW TO TEACH NATURE JOURNALING*

Using Journals with Learners

Scientists use journals or field notebooks at almost every step of their work. The practice of field journaling supports deep observation, organizing of thoughts and ideas, and creates a written record of new ideas. Working through observations, questions, and ideas on paper can also lead to conceptual understanding through an experience that is vitally different from reading, discussion, lecture, or exploration. Scientists almost always have a purpose and a focus for their journal entries. In the context of journaling in a science learning experience, a purpose and a focus of a journaling activity can help support learner engagement and participation. *How to Teach Nature Journaling* is a book co-authored by John Muir Laws and Emilie Lygren. Its activities were designed with scaffolding and structure to support learner participation and engagement and to support authentic science learning.

Choosing Journaling Activities

How to Teach Nature Journaling includes background information on how to use journals with learners, as well as tools to support learners in being successful journalers. The book also contains many activities that can each stand alone in offering learners experience observing and recording information. These activities ask learners to record information in different ways and in different places—but very few of the journaling activities depend on a specific type of organism, topic, or environment. These more general instructions mean that almost any of these journaling activities can be used to support almost any lesson or field experience. While many BEETLES activities have specific steps in which learners use journals, journal use doesn't need to be restricted to activities in which journals already appear. Many of the instructions for activities in *How to Teach Nature Journaling* could be introduced into the flow of BEETLES student activities (or integrated into a lesson of your own). Journaling can be a particularly successful practice during the Exploration phase of an activity when the goal is often for learners to make focused observations of a specific phenomenon or part of nature, such as lichen, spiderwebs, leaves, or fungi.

It's important to think about when to incorporate a journaling activity within a longer learning experience, which activity to use, and how to frame it for learners. The following questions can help instructors make these decisions in advance or in the moment:

- **Will learners be ready to journal?** Learners likely won't be successful journalers unless their basic needs are met and their energy level is appropriate. Consider pacing of the day and learners' needs—both basic physical needs and the need to move around or be energetic—in thinking about when to use a journaling activity.
- **How will learners feel as journalers?** If it is the first time learners are using their journals, some might have resistance because of their experience with (and possible aversion to) writing or drawing in school. Many journaling activities in *How to Teach Nature Journaling* have a "hook" or game aspect to support learners' initial engagement. After learners have experience with one journaling activity, they will be more likely to be interested in trying others.
- **How can you help learners see journaling as important and authentic?** Another successful approach is to help learners feel that journaling is important and authentic—which it is. When

CHOOSING JOURNALING ACTIVITIES FROM *HOW TO TEACH NATURE JOURNALING* (continued)

journaling is explained as a tool to record what learners discover, journaling becomes a part of the exploration process and is less likely to feel like busy work. Learners also may feel trusted with information, that what they observe matters, and that they are invited into the lineage of naturalists/scientists/thinkers who use journals similarly. Showing learners examples of naturalists'/scientists'/thinkers' notebooks can help illustrate this point.

- **What will learners get out of the activity?** Deep, focused observation is the foundation of nature journaling. Journaling can help learners see and remember more of their surroundings. To use journals well, though, use journaling activities to support a field experience, activity, or lesson—not just to get learners to observe. Many of these activities could be used at any stage of the Learning Cycle, depending on how the activities are framed and what they ask learners to focus on.
- **What kinds of observations will this activity lead learners to make? How does that connect to my learning goals?** Different kinds of journaling activities will tend to lead learners to think and make meaning in different ways. When choosing a journaling activity, think about the kinds of observations learners are likely to make while engaging in the activity and consider which activity will best support your science learning goals.

The following chapters in *How to Teach Nature Journaling* offer further information and insight to guide you in choosing nature journaling activities to meet your specific goals and the needs of your learners:

- Choosing Activities to Meet Learning Goals (page 22)
- Nature Journaling Activity Chapters (page 27)
- From Activities to Longer Lessons (pp. 233–237)
- Appendix B: Activity Summaries, Learning Goals, and Possible Phenomena (pp. 262–268)
- NGSS Connections (pp. 269–271)

Following is an example of a thought process for deciding when and how to use journals:

> *Okay, so I'm going to do the* Spider Exploration *activity after a couple of active introductory games in the morning. We've done a few journaling activities this week, so learners are familiar with their journals and journaling. I want learners to really go into depth when looking at the different kinds of spiderwebs. Since we are doing the follow-up activity* Spider Investigation *later this week, I'm hoping learners will remember what they discovered during* Spider Exploration. *Journaling will help with that. I also want them to have a lot of ideas about how sheet webs and orb webs are different from one another. I want students to do the* Comparisons *activity (where students record every similarity or difference between two aspects of nature) while they are exploring different web types. But I think I'll give them a few minutes to check out webs without their journals first, so they'll be ready to focus later.*

_____ Cycle

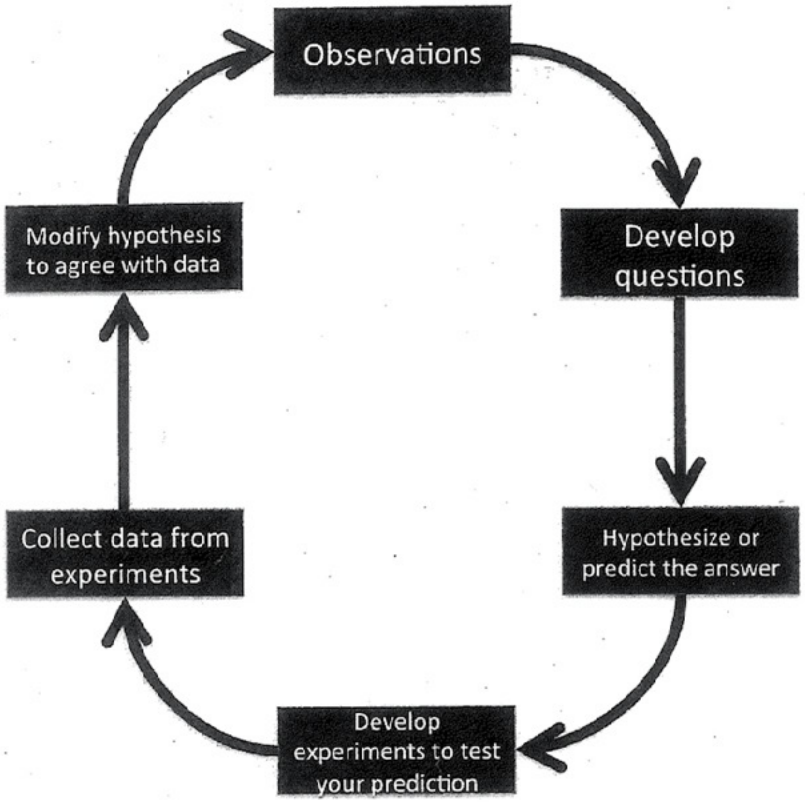
Please draw the _____ cycle in the box below

How are humans impacting the _____ cycle?

Give evidence that supports whether humans are positively or negatively affecting the _____ cycle.

Field Journaling Handout—Examples of Printed Journal Pages

Science Practices



What is Science?

Observing

Making connections

DRAWING AND WRITING

Asking questions

Discussing ideas from evidence

Field Journaling Handout—Examples of Printed Journal Pages

Glossary

Abiotic: the non-living parts of a habitat (water, rocks, soils, etc.)

Adaptation: a feature or behavior that helps a plant or animal to survive in its environment

Amphibian: a type of animal that lives in and out of water

Aquatic: describes an organism that lives in water

Biome: large geographic areas with similar climates and ecosystems

Biotic: describes the living components of a community including plants, animals, fungi, and bacteria

Camouflage: the ability of an organism to blend with its surroundings

Carnivore: an animal that feeds mainly on other animals

Carrying capacity: the maximum population of a given organism that an ecosystem can support without being destroyed or degraded over time

Chaparral: a shrubby coastal community characterized by hot, dry summers and mild, rainy winters

Chlorophyll: the green pigment in plants responsible for absorbing light energy for photosynthesis

Climate: the average weather conditions of a place over a period of time

Community: a group of living things within a particular area

Competition: the simultaneous demand by two or more organisms for limited environmental resources such as nutrients, space, or light

Condensation: the process by which matter changes from gas (or vapor) to liquid

Consumer: an organism that obtains its energy by feeding on other organisms

Crepuscular: an animal that is active at dawn or dusk

Cycle: a series of events that are repeated in the same order

Deciduous: a type of plant that sheds its leaves every year

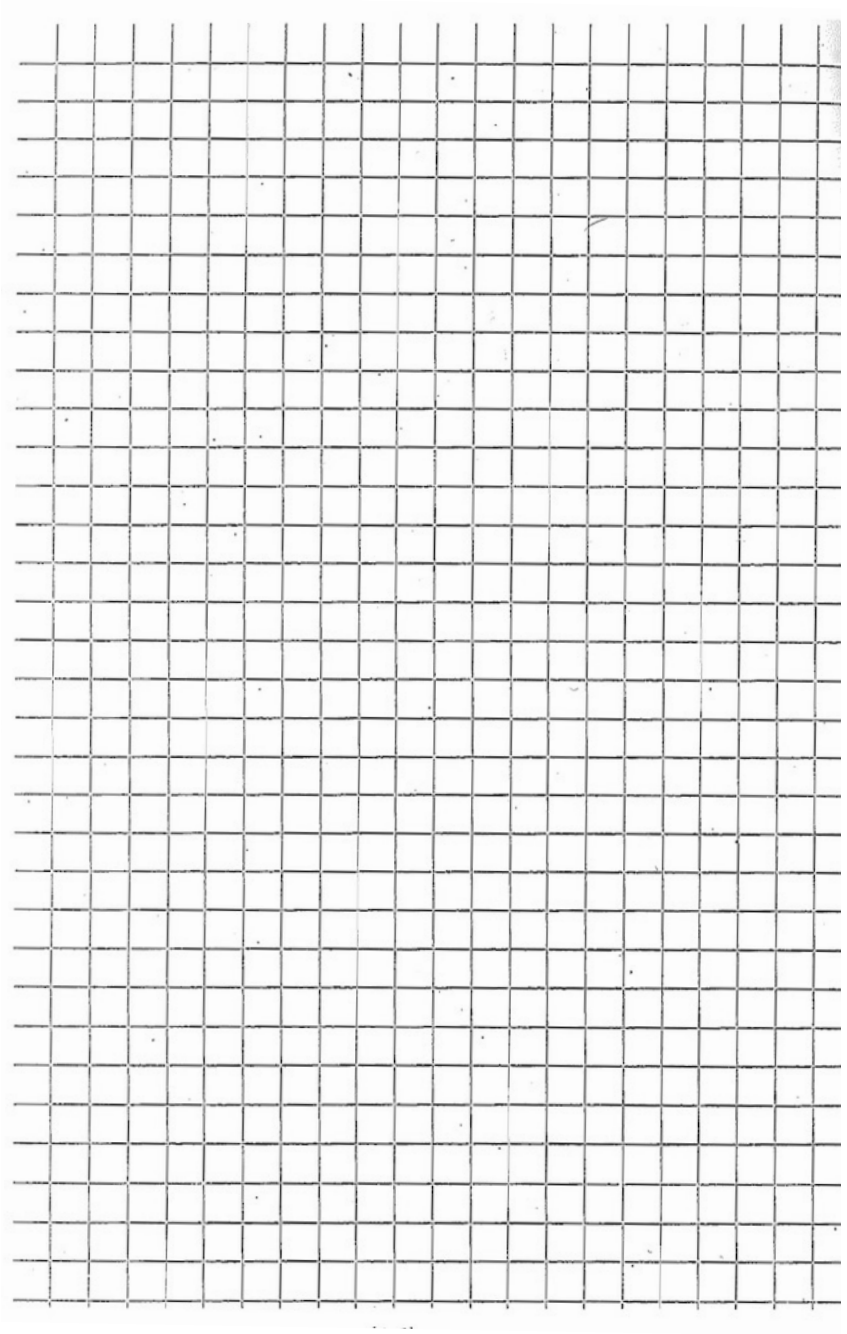
Decomposer: an organism that feeds on dead plant or animal matter, making organic nutrients available to be recycled in the ecosystem

Diurnal: an animal that is active during the day

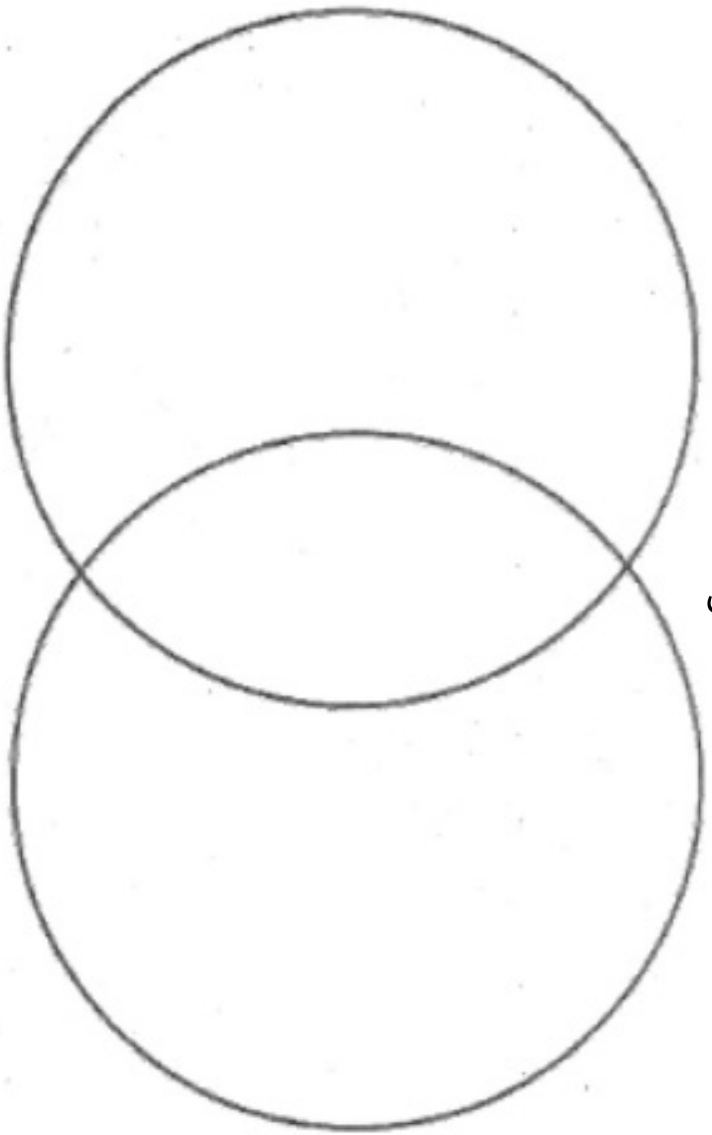
Ecology: the study of the relationships between living things and their environment, including other organisms

Ecosystem: all living and non-living elements within an area and the interactions among them

Field Journaling Handout—Examples of Printed Journal Pages



Field Journaling Handout—Examples of Printed Journal Pages



Venn Diagram

Field Journaling Handout—Examples of Printed Journal Pages

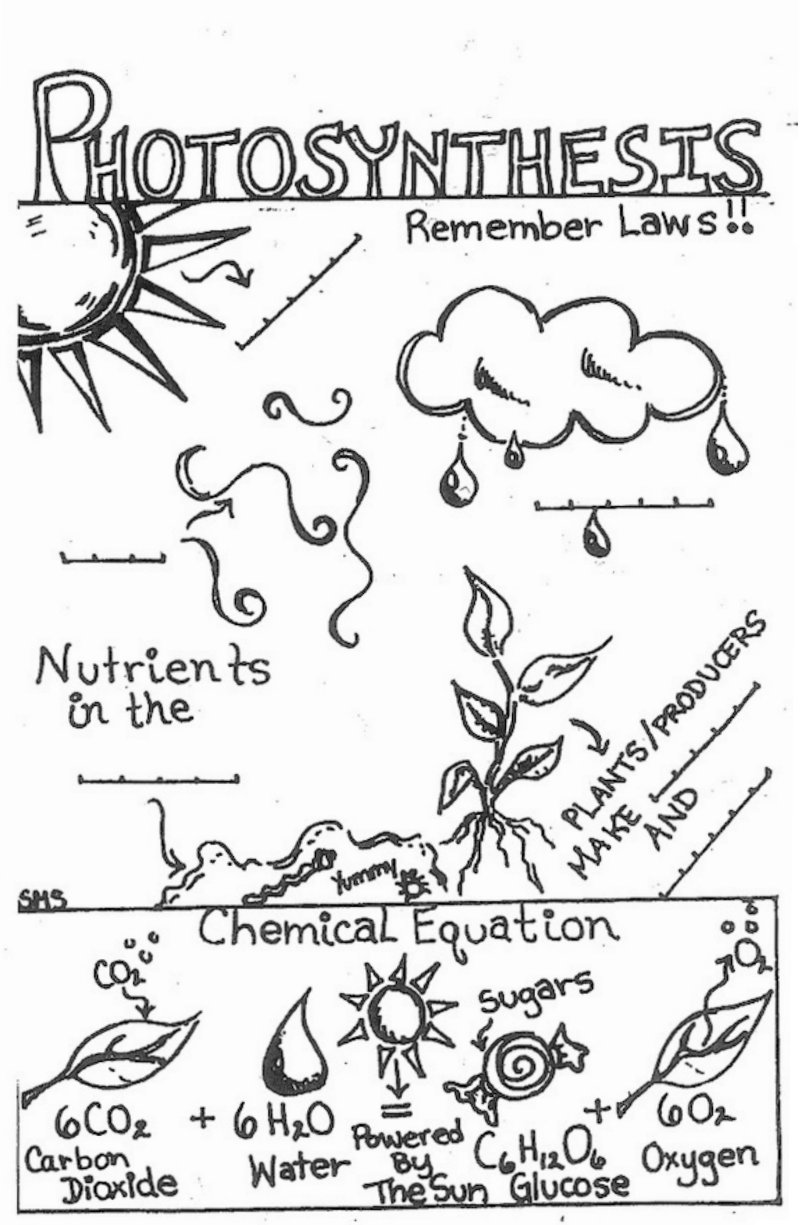
Aquatic Macroinvertebrate Pollution Tolerance

Aquatic invertebrates that have low tolerance for pollution (PTI=3)
Aquatic invertebrates that have medium tolerance for pollution(PTI=2)
Aquatic invertebrates that have high tolerance for pollution (PTI=1)

Name	Pollution Tolerance Index (PTI)	Write PTI # if you found this organism
Caddisfly Larva	3	
Mayfly Nymph	3	
Stonefly Nymph	3	
Dobsonfly Larva	3	
Flatworm	2	
Cranefly Larva	2	
Damselfly Nymph	2	
Dragonfly Nymph	2	
Freshwater Scud	2	
Aquatic Snail	2	
Water Mite	2	
Blackfly Larva	1	
Horsefly Larva	1	
Midge Larva	1	
Backswimmer	1	
Giant Water Bug	1	
Water Boatman	1	
Water Strider	1	
Mosquito Larva	1	
Whirligig Beetle	1	
Aquatic Worm	1	
Leech	1	
Crayfish	1	
Total of PTI # =		

PTI Scale:
0 – 5 = Poor water quality
6 – 9 = Fair water quality
10 – 13 = Good water quality
14 – 17 = Excellent water quality

Field Journaling Handout—Examples of Printed Journal Pages



Producers are the only living organisms on Earth that can take in non-living (abiotic) things and turn them into living (biotic) energy.

The Ohlone People

Did you ever wonder how the traditional people of the redwood forest lived? After looking around the forest, imagine what it was like to live here 1000 years ago.

The word **Ohlone** is Miwok language word meaning "western people." The Ohlone People possess a deep understanding of **ethnobotany** (the cultural uses of plants) in this area. For example, the **California bay laurel** is nature's insect repellant. Additionally, the smoke created by burning these leaves can be used to drive squirrels out of their burrows. The **tan oak** tree produces acorns that can be ground into a mush and used to make bread. The bark could also be used as a dye. The berries from the **manzanita** can be eaten raw, or soaked in water to make a cider.


poison oak


manzanita


coastal redwood


California bay laurel

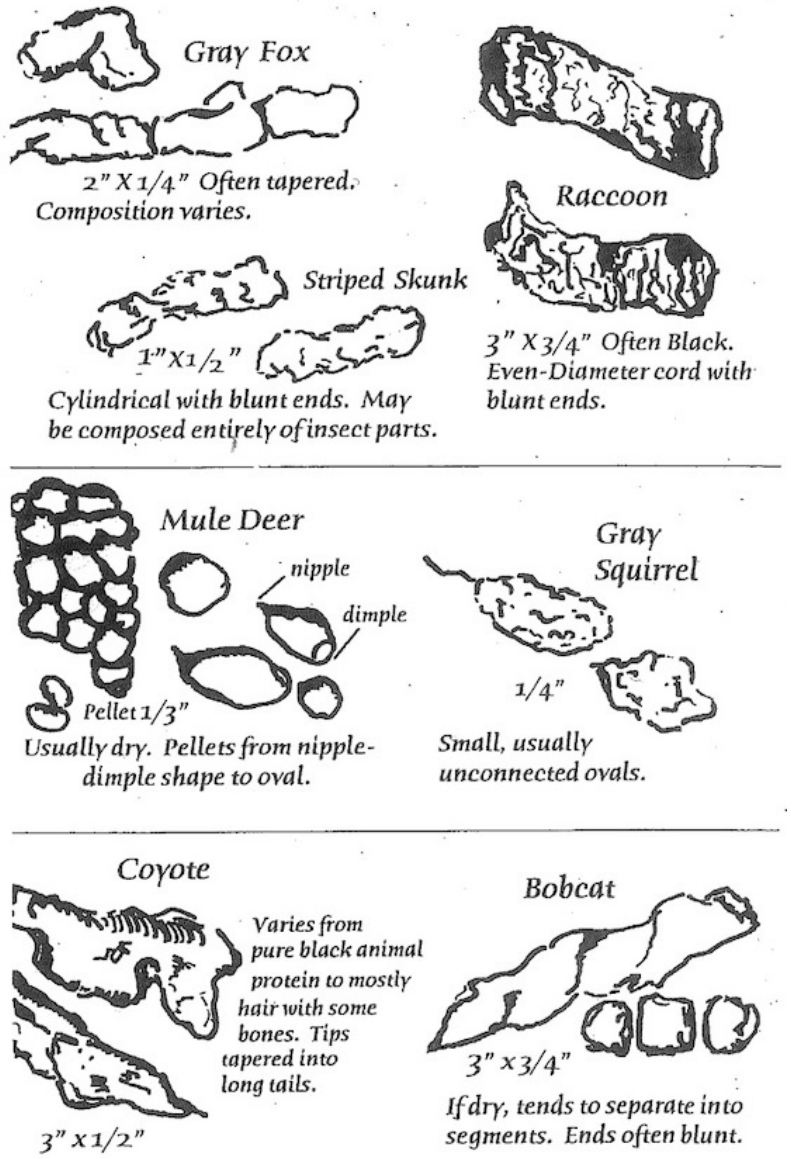

tan oak leaf


tan oak acorn

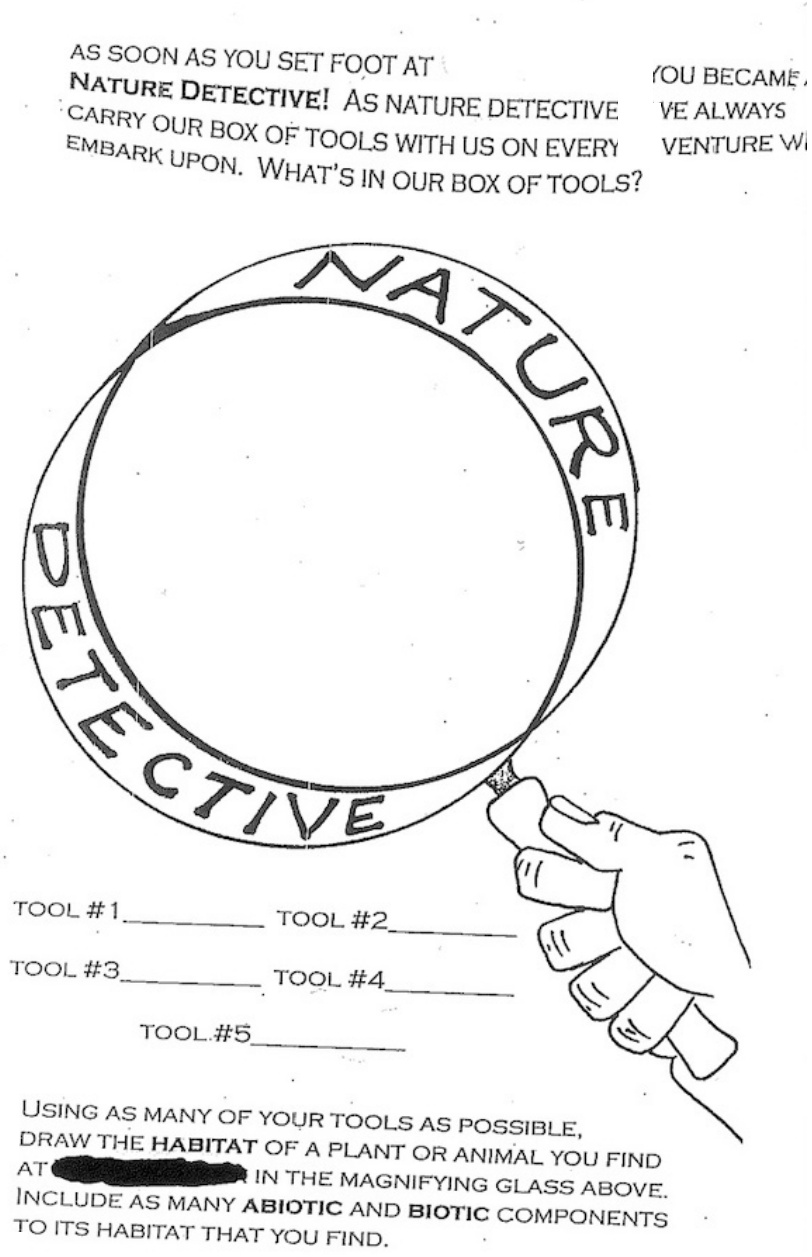
Pick one of the above plants and create a story that uses the plant to solve a problem.

Describe some ways plants are utilized by our society today.

What is one of your favorite foods? Describe what plants were involved in creating it.



Field Journaling Handout—Examples of Printed Journal Pages



Field Journaling Handout—Examples of Printed Journal Pages

Outdoor School Pledge

I, _____, as a citizen of the Earth and new member of the (_____) Community, understand that I have a responsibility to treat our home the planet Earth with care and respect. From this moment on, I pledge to:

I also understand how my actions affect other people. Therefore, I set the following goals to build positive relationships with others:

Signed _____

Witness _____

Field Journaling Handout—Examples of Printed Journal Pages

Welcome to Outdoor School!

What expectations do you have for outdoor school this week? Have you heard anything about it from friends/brothers and sisters who have been here before? Write a few sentences about what you'd like to accomplish and experience here this week.

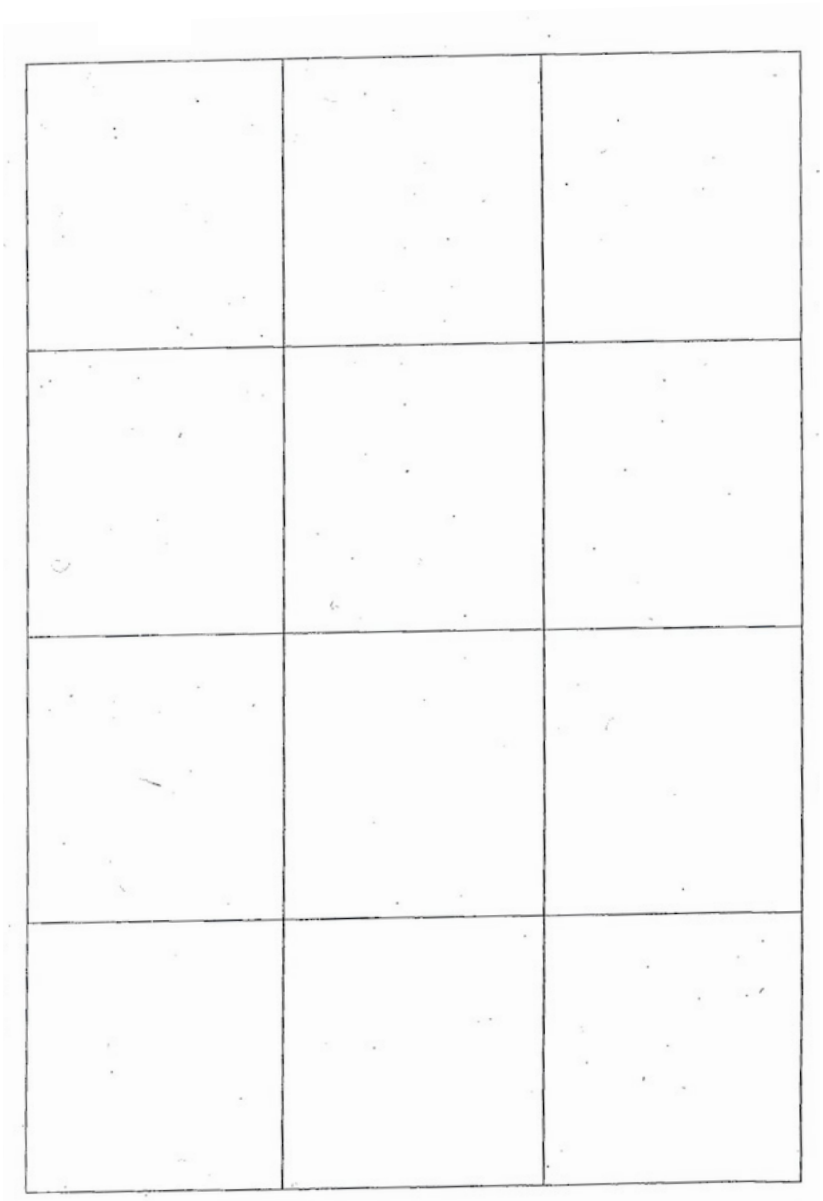
What is your cabin leader's nature name? Write one interesting thing they have told you so far.

What would your nature name be if you could choose one?

What do **you** think of when you hear the word *science*?

/hat aspects of science do you want to learn about/experience most
his week?

Field Journaling Handout—Examples of Printed Journal Pages



Field Journaling Handout—Examples of Printed Journal Pages

Word Search

R	E	D	N	A	M	A	L	A	S	C	D	P	F
C	O	L	O	B	S	S	T	N	E	I	R	T	O
N	A	S	C	N	R	O	W	H	P	M	Y	N	N
H	O	T	B	Y	E	A	T	O	O	F	O	O	G
E	O	Y	M	K	C	H	C	L	Y	I	R	I	O
R	E	T	A	W	O	R	C	C	T	A	G	T	S
B	P	I	L	I	D	B	E	I	O	C	W	A	Y
I	R	N	G	N	O	Y	S	P	L	O	B	R	L
V	E	O	A	D	R	O	C	W	E	N	N	O	E
O	Y	M	E	Y	P	T	A	O	D	S	C	P	S
R	A	M	P	M	I	H	T	M	P	O	I	A	R
E	B	O	O	W	L	G	R	O	W	M	R	V	E
S	A	C	A	R	N	I	V	O	R	E	C	E	V
K	E	M	L	I	O	L	D	A	T	R	L	A	I
D	A	D	A	P	T	A	T	I	O	N	E	K	D

WORD BANK

ALGAE	NYMPH	GROW	DIVERSE
PREY	LICHEN	RACCOON	LIGHT
WINDY	AIR	WATER	NUTRIENTS
SOIL	FUNGUS	CYCLE	DECOMPOSITI(
BAY	CONSUMER	ADAPTATION	SALAMANDER
OAK	COMMUNITY	PRODUCERS	EVAPORATION
CARNIVORE	HERBIVORES	CIRCLE	SCAT

INTERDEPENDENCE

"In all things of nature there is something of the marvelous."
-Aristotle

Field Journaling Handout—Examples of Printed Journal Pages

Blank Page

Banana Slug Song

Chorus:
Ba - na - na - Slug! (Slug! Slug! Slug!)
Banana Slug Ba - na - na - na - na - na - na
Banana Slug Ba - na - na - na - na - na - na
Banana Slug Banana Slug

You know I love my baby (love my baby)
I love the way that it hugs (way that it hugs)
People don't understand it (don't understand it)
It's a banana slug (banana slug)

It's just got one foot (got one foot)
It ain't got no toes (got no toes)
It hangs out in the forest (out in the forest)
And helps to decompose (decompose)

The way you wiggle your antennae (wiggle your antennae)
You know it gives me such bliss (gives me such bliss)
Come on, come on banana slug (come on banana slug)
Why don't you blow me a kiss?

The way it slides through the forest (slides through the forest)
You know it looks so odd (looks so odd)
Its stomach is its foot (Its stomach is its foot)
It's a gastropod (gastropod)

Some people say that it's gross (say that it's gross)
Don't want to hear that jive (hear that jive)
'Cause if it weren't for my baby (if it weren't for my baby)
The forest might not survive (might not survive)

You know I love my baby (love my baby)
But he doesn't love me (doesn't love me)
He is hermaphroditic (hermaphroditic)
That means he's also a she

BACKGROUND INFORMATION FOR PRESENTERS

Scientists and Field Journals

Field journals and notebooks are ubiquitous in nearly all disciplines of science and natural history. Lab scientists use notebooks to keep records of data and experimental procedures, and professional naturalists carry field journals everywhere and draw what they see. Recording information on paper requires focused, quality observation; practicing this makes scientists better at what they do. According to John Muir Laws, field guide artist and environmental educator, "Keeping a nature journal is [an] effective way to train yourself to be a keen observer of the natural world."

A journal offers more than just the opportunity for deep observation. Working on paper also can lead to conceptual understanding and new ideas. Bernd Heinrich, the famous bird biologist and author of *Mind of the Raven* writes, "Taking notes has always helped me zero in on the interesting questions. They have made the difference between simply observing and being able to get the meat out of science." Scientists use journals to grapple with conflicting ideas or to explore questions. A page offers a different forum than a discussion or thinking about something without journaling. Darwin famously drew a simple branching tree in a journal as he considered 34 ideas of evolution. Countless other major and minor discoveries in science were worked out on paper first.

A journal is also a record, one that is not subject to the alteration and degradation that memory is prone to. John D. Perrine and James L. Patton (*Field Notes on Science & Nature*) refer to journals as letters to the future. The journal is not only a letter to the author's future self—who can access data or information they have recorded—it is also a useful record for future generations of researchers.

For many naturalists, scientists, and thinkers, a journal is also a meaningful place to record the details of amazing experiences or to reflect on conversations and feelings. This can support learners in increasing their personal connections with nature, as well as their development of a scientific approach to understanding how nature works.

Effective Use of Printed Journals in Outdoor Science Instruction

Field journal use is most effective when it mirrors that of a professional naturalist, scientist, or thinker. A naturalist, scientist, or thinker will almost always have a purpose in mind when they begin a journal entry. We can support learners' participation and engagement in journaling activities by offering a similar kind of focusing structure. The activities in this session offer learners the tools and guidance for gathering and organizing information in their journals. The activities are sourced from the book *How to Teach Nature Journaling* by John Muir Laws and Emilie Lygren, which is a comprehensive

resource that contains information about how to use journals to support meaningful science learning experiences. The activities and much of the content in this session was generously shared by the authors, and the entire book is available at howtoteachnaturejournaling.com.

In the world of outdoor science instruction, many instructors will not need to significantly alter their approach to successfully incorporate journaling into their teaching. Journaling supports science practices such as observation, asking questions, and constructing explanations from evidence; instructors can use journals when they are leading any activities that involve science practices. In addition to using journaling during other outdoor science activities, instructors ideally would integrate activities that are specifically journaling activities into the rest of their field experience.

Learning in this way offers lively opportunities for learners to engage in practices described both in the Common Core State Standards for English Language Arts and Literacy in History/Social Studies, Science and other Technical Subjects, and in the Next Generation Science Standards (NGSS).

According to these documents, learners must: "Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately," and "Communicate scientific and/or technical information orally and/or in written formats, including various forms of media and may include tables, diagrams, and charts."

As learners journal, they gain exposure to all these skills, use other science practices, and engage with content. For more information about connecting journaling activities to the Common Core State Standards and the NGSS, see *How to Teach Nature Journaling*.

Printed journals shouldn't be used only for science instruction. A journal can also be a place for personal reflection and creative expression. A creative writing or reflective activity can enrich learners' whole experience during an outdoor science program and offer them an opportunity to process their experiences in writing. Additionally, if learners write, they are more likely to remember—not just because they'll have a record of their thoughts, but also because they took the time to intentionally choose which thoughts were important to them in the moment.

Recommendations for Structuring Printed Journals

Learners are more likely to feel ownership over a journal if it contains mostly their own thoughts and reflections. They will also be less likely to lose track of a journal if they care about the work within it. Printing journals takes time, money, and paper, so we should be judicious when creating printed journals. Classroom-style worksheets or games can distract learners from their outdoor surroundings. Pages that focus on content delivery take up space that could be filled with learners' thoughts and ideas. We suggest that printed outdoor science journals offer mostly blank pages or pages with minimal structure (such as grids, boxes, or lightly colored lines) that can be used in a variety of ways.

Many programs try to strike a balance between including resources such as field guides or keys and having blank pages. Some instructors enjoy having field guides or other informational pages in journals because learners can reference information easily on a trail and can take these resources and information home with them—resources and information they might not have access to otherwise. The field guides included in a printed journal can be more simple and site- or region-specific than most published field guides. Other instructors prefer to keep field guide pages out of journals so the journal feels more personal and so learners get practice using real field guides as tools. Make a decision based on the goals of your staff and program.

Check out the BEETLES resource Model Field Journal Pages for examples of different types of pages you might choose to include in your program's journals (http://beetlesproject.org/resources/field-journal-pages/).

There are some useful tools worth including in journals such as rulers and formulas that help learners use leg strides or arm length to make measurements. Just the presence of tools like those can offer guidance on ways learners might include numbers in their field journals. These pages can be cut out and pasted in printed journals: (https://howtoteachnaturejournaling.com/teaching_support/cut-and-paste-toolkits/).

Barriers to Learners' Engagement in Journaling and Possible Solutions

If learners and instructors have pre-existing negative associations with writing and drawing through school work, or if they think journaling might distract them from a nature experience, they may initially react negatively to field journaling. If learners are just filling out a worksheet in a journal, this might add to these sorts of perceptions. Offering blank pages in printed journals and using activities that connect learners to the environment can help overcome any such barriers. Learners' resistance to journaling may also arise if journaling prompts include too much or too little structure. Prompts that tell learners exactly what to write can be frustrating, as can directions that are so general that learners may be unsure how to begin. Instructors can use focused journaling activities, such as those modeled in this session, to support learners' participation and engagement. Instructors can also cultivate their own practice of nature journaling, which will help them gain more confidence in helping learners use journals as learning tools.

Learners' varying comfort levels with drawing, writing, or math can also affect their engagement in journaling activities. Many learners may have received messages during their school experience that they are good or bad at writing, drawing, or math. These messages can impact their identities as learners and, by extension, their engagement in journaling activities. Reminding learners that field journaling is about making observations, wondering, and communicating ideas and emphasizing that they can use words, pictures, and numbers together can help reduce any anxiety. More ideas on how mindset and messages about learning can impact learners' engagement in journaling and on how to support learners' participation in journaling can be found in *How to Teach Nature Journaling*.

Thoughtfully choosing journaling opportunities and activities that you think will be exciting for your learners can also help overcome any resistance. If learners feel successful and engaged by their first field journaling experience, they'll be more likely to be open to more field journaling experiences. If you offer learners the opportunity to journal when it seems like they have just had an experience they may want to record or have a lot to say about it, they will be more likely to engage enthusiastically.

If your program provides printed journals, come up with a simple system to ensure that learners will have their journals throughout field experiences. The simpler the system, the easier it will be for instructors to integrate journaling into their teaching.

Another logistical barrier to using journals is weather. Many programs operate where there is frequent precipitation and/or cold or hot temperatures. Some instructors and programs have found success through using materials from Rite in the Rain, a producer of waterproof paper. Other programs continue to use journals in cold, hot, or wet periods by having learners gather samples from the outdoors—such as leaves, small organisms, etc.—and bringing them to an indoor or shaded space (or an area with a roof) for journaling. Instructors have also used the strategy of handing out index cards, golf pencils, and clipboards in environments such as intertidal zones where materials often get a little wet. Later, learners can paste the index cards into their journals.

Incorporating Choice into Activities Encourages Relevance and Intrinsic Motivation

Offering learners some autonomy through choice during activities is one way to encourage intrinsic motivation and learner participation. Offering enough structure for clarity and guidance is important, but so is some learner autonomy. In general, if learners have the opportunity to have some choice in what they are going to focus on and study during journaling experiences (e.g., the specific plant or leaf they will sketch) and how they are going to record their observations and ideas, and if their individual perspectives feel welcome, they are more likely to feel some ownership of the process. Including many opportunities for learners to voice their ideas, perspectives, and lived experiences will also help center learning on what learners are interested in. Listen to your learners and allow their ideas to help guide learning experiences—in effect, allowing the group to feel that their hands are also on the rudder and that the collective choices expressed by their interests are guiding their learning.

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.

The field journaling activities in this Professional Learning session make use of some of the same design principles. Specifically:

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.

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

Focusing on learners directly engaging with nature found anywhere democratizes access and relationship to nature. Sometimes, nature is portrayed and perceived as being something that only exists and can be appreciated in established wilderness areas, which can make nature and outdoor experiences feel less accessible. Centering field journaling experiences on local and common aspects of nature (e.g., leaves, ants, rocks) is one way to share the idea that nature can be found anywhere and that engaging with nature can be part of anyone's daily experience. Direct engagement with nature also offers opportunities for learners to develop their own individual ongoing relationship with nature, independent from instructor-led experiences.

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.

"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*

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. 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. The discussion questions featured at the end of each field journaling activity in this session can help ensure that learners have these kinds of opportunities for discussion.

Specifically, field journaling as a practice supports equitable, inclusive, and culturally relevant learning experiences by:

- scaffolding skills of scientific observation, illustration, and communication to support learners' visual literacy, language acquisition, and engagement with the activity.
- connecting how learners are learning in-the-moment to practices of working scientists—contradicting the exclusionary ideas that science is a list of facts to memorize or that only people who are good at memorizing facts can be good at science.
- using broad questions to invite learners to share their observations, prior knowledge, and experiences with one another and with the instructor.
- engaging learners with commonly found parts of nature, such as worms, contrasting 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.
- focusing the group's learning on a common experience to which everyone has access.
- providing an opportunity for instructors to have a window into how learners think and providing a genuine opportunity for instructors to learn from learners.
- providing a teaching approach in which the instructor acts as a "guide on the side" and builds a collaborative learning environment in which learners make observations, share ideas, and see themselves and one another (not just the instructor) as sources of expertise.

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 experience. 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.

Using learner-centered and nature-centered teaching 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.

Background on Authors of Model Field Journal Pages

Gargi Chugh has been a member of the Nature Journaling community in the Bay Area of California since 2018. A data analyst by profession, she enjoys the process of using data not just to answer questions but also to generate additional hypotheses and questions. Nature is her favorite setting for cultivating curiosity.

Chloé Fandel is an assistant professor at Carleton College in the Department of Geology. Her research focuses on modeling groundwater flow in alpine karst aquifers and the hydrology of working landscapes. She received a PhD and an MSc in hydrology from the University of Arizona and a BA in geological sciences from Brown University. She has also worked in environmental education, hydrologic consulting, public land management, the oil and gas industry, and land and water conservation.

Dr. Ruth Heindel is an environmental Earth scientist who conducts field research on atmospheric dust deposition, nutrient cycling in soils, and the impact of winds on landscape evolution. Ruth grew up in Vermont, attended Brown University and Dartmouth College for her undergraduate and graduate degrees, and was a postdoctoral scholar at the University of Colorado Boulder. Ruth is currently the Dorothy & Thomas Jegla Assistant Professor of Environmental Studies at Kenyon College where she teaches courses on Earth systems, climate change, and landscape evolution.

Marcelo Jost is a naturalist who sees nature as a never-ending source of wonders and challenges (depending on whether he understands what he is seeing or not). His nature journal is a place to graphically debate what he is seeing, to dialogue with nature, and to (he hopes!) produce wonder out of challenges.

Eriko Kobayashi was born in Mitaka city in the suburbs of Tokyo. She started her career as a nature artist and illustrator in 1996. Recently, she has started nature journaling and including writing in her journals. She finds that drawing and writing together lead her to observe nature more and more deeply. In 2018, Eriko started the Japan Nature Journal Club and has gathered people of all ages to look at and learn from nature. She lives in Zama, Kanagawa.

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**

Justice Outside. https://justiceoutside.org/

The Avarna Group https://theavarnagroup.com/

Center for Diversity & the Environment https://www.cdeinspires.org/

John Muir Laws is a scientist, educator, and explorer who uses nature journaling to enhance his memory, observation skills, and creative thinking.

Akshay Mahajan is a hardware engineer from Mumbai, India. He is in love with the experience of learning absolutely anything. Today he finds this in nature journaling, dancing, Mandarin, social psychology, music, and, of course, engineering!

Yvea Moore can usually be found in the field combining her two loves: habitat restoration and nature journaling. Yvea is from San Francisco.

Melinda Nakagawa is a biologist, naturalist, and educator with a passion for connecting people with nature. With an approach that bridges science, art, and heart, she guides her students to cultivate a deeper relationship with nature, slowing down to nature's pace and *being truly present* rather than just looking and labeling. Through her gentle guidance, students awaken a spark of curiosity, wonder, and genuine connection with nature.

Marley Alexander Peifer is a naturalist, educator, and artist. He longs for a reintegration of art with science and words with images, a synthesis that he develops in his journals. Nature journaling has been a fundamental practice for Marley ever since he discovered how it improved his observation and learning.

Sarah Rabkin is the author and illustrator of *What I Learned at Bug Camp: Essays on Finding a Home in the World*. A former high school biology teacher and UC Santa Cruz faculty member in writing and environmental studies, she now works as a freelance editor and oral historian. Sarah leads retreats and workshops that foster awareness of the more-than-human world and the true nature within each of us.

Kate Rutter is a nature journaler, sketchnoter, and digital designer with an experimental and rambunctious visual practice. Kate is a professor at the California College of the Arts, hosts the East Bay Sketchers Meetup group, and has illustrated three books. She holds a BA in studio art from Wellesley College.

Amaya Shreeve is 16-years-old and spends her time reading, working on her YouTube channel and her nature journaling magazine, and most importantly, nature journaling! Amaya loves nature journaling and sharing its wonder and beauty with everyone she meets.

Robert Stebbins (1915–2013) was a researcher, herpetologist, and field guide author of many popular books, including *Peterson Field Guide to Western Reptiles & Amphibians*. He was also a professor of zoology at UC Berkeley and a curator of herpetology at the Museum of Vertebrate Zoology.

Subhelic is a graphic designer and illustrator from Leyte, Philippines. He found nature journaling during the COVID-19 pandemic, and it's the most enriching hobby he's picked up so far.

Mana Hayashi Tang is a paleoethnobotanist, educator, and taiko drummer. In her research and teaching, Mana explores the intersections between plant biology, traditional knowledge, and political ecology. Her areas of interest include early food systems, human relationships with weeds, and music ethnohistory. She is a PhD candidate in anthropology at Washington University in St. Louis, Missouri, and a performing member of St. Louis Osuwa Taiko.

Connections to Other BEETLES Sessions

Field Journaling can be a nice follow up to the BEETLES Professional Learning session *Making Observations* as it offers a practice for engaging learners in making observations and builds on ideas around learner-centered and nature-centered teaching approaches that are introduced in *Making Observations.*

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