

BACKGROUND INFORMATION FOR PRESENTERS

Scientists and Field Notebooks

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; professional naturalists carry field journals everywhere, and draw what they see. Recording information on paper requires focused, quality observation, and 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 the most effective way to train yourself to be a keen observer of the natural world.”

A journal provides more than just the opportunity for deep observation. Working on paper also leads 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 explore questions. A page provides a different forum than a collaborative environment or thinking about something. 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 call journals “Letters to the Future.” (*Field Notes on Science & Nature*). The journal is not only a “letter” to the author’s future self, who can access data or information—it is also a useful record for future generations of researchers.

For many field scientists and naturalists, a journal is also a meaningful place to write down the details of amazing experiences or to reflect on conversations and feelings. This leads to a personal connection with nature, in addition to developing a scientific approach to understanding how it works.

Effective Use of Student Journals at Outdoor Science Schools

Student field journal use is most effective when their process mirrors that of a professional naturalist. A scientist or naturalist will almost always have a purpose in mind when they begin a journal entry, but students lack the focus and experience to create that structure. Without structure, students will be overwhelmed and often won’t know what to draw or how to organize information. It’s the role of instructors to provide students with scaffolding so they can use journals effectively. The activities in this session were created to give students tools for obtaining and organizing information that resemble naturalists’ approaches to journaling. They are sourced from the 2nd edition of *Opening the World Through 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 learning experiences. The activities and much of the content in this session was generously shared by the authors, and the entire curriculum at johnmuirlaws.com is free to download. The 3rd edition, currently in process, will be available in 2016 and will contain new activities and even more information on journaling with students in a variety of settings.

In the world of outdoor science schools, many field 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—and instructors can use journals when they are leading activities that incorporate any of these science practices. Ideally, instructors should integrate the learning students do while journaling into the rest of their lesson or field experience. If a group of students did *To Each Its Own* as a stand-alone activity, they would practice observational skills and deepen their connection to the natural world. However, even deeper learning is possible when an instructor matches the learning goals they have for students with journaling prompts. For example, an instructor who has an overall goal of students better understanding ideas around structure and function throughout the course of a field experience might use the journaling prompt

“Comparisons,” which asks students to make comparisons between two similar organisms. This instructor could ask students to compare two tree species, to focus on how their structures are different from one another, and to write down tentative explanations for how those structures might function differently, and how their functions are related to their structures. This gives students the opportunity to engage with tangible, observable phenomena, and the learning students do in the process can be integrated into future discussions and activities.

Learning in this way relates to both the *Common Core State Standards for English Language Arts and Literacy in History/Social Studies, Science and other Technical Subjects*, and the *Next Generation Science Standards*.

According to these documents, students 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 students journal, they gain exposure to all these skills, utilize other science practices, and engage with content. For more information about connecting journaling activities to the *Common Core State Standards* and the *Next Generation Science Standards*, see the 3rd edition of *Opening the World Through Nature Journaling*, available at johnmuirlaws.com in 2016.

Student journals should not be used solely for science instruction. A student journal can also be a place for personal reflection and creative expression. So much of student time at outdoor science schools is collaborative and social. A creative writing or reflective activity can enrich students’ whole experience during a program because it will allow them to process their experience in writing. And if students write, they will 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 Student Journals

Students will feel more ownership over a journal if it contains mostly their 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 student journals. Classroom-style worksheets or games can distract students from their surroundings. Pages that focus on content delivery take up space that could be filled with student thoughts and ideas. Offer mostly blank pages or pages with minimal structure that can be used in a variety of ways, such as grids, boxes, or lightly colored lines.

Many programs attempt to strike a balance between including resources like field guides or keys and having blank pages. Some instructors enjoy having field guides in journals because students can reference information easily on trail and are able to take home resources and information they might not have access to otherwise. The field guides can be simple and site- or region-specific. Other instructors prefer to keep field guide pages out of journals so the journal feels more personal and students get practice using real field guides as tools. Make a decision based on the goals of your staff and program.

There are some useful tools worth including in journals like rulers and formulas that help students use pace or arm length to make measurements. John Muir Laws (johnmuirlaws.com) has an index of these types of tools that can be printed or incorporated into a journal.

Barriers to Using Journals Effectively and Possible Solutions

Initially some students and instructors react negatively to journaling because they think it will be too much like school work. If students are just filling out a worksheet within a journal, this might be true. Overcome this barrier by providing blank pages in student journals and using activities that connect students to the environment. Student resistance to journaling can also come from poorly-worded journal prompts. Students can become bored or frustrated by prompts that tell them exactly what to write or directions that are so unfocused that students don’t know where to start. Instructors can use focused journaling activities to ensure student success. Instructors can also

cultivate their own practice of nature journaling, which will help them to gain more confidence in helping students use journals as learning tools.

Students' varying comfort levels with drawing or writing can also cause issues when implementing journaling activities. Some students may feel that they are strong writers but are uncomfortable drawing, and vice versa. Reminding students that their observations and ideas are more important than how they are written or sketched helps take the pressure off. Other useful drawing and writing techniques and more ideas on how to encourage students to use journaling can also be found in *Opening the World Through Nature Journaling*—the *Tips for Naturalist Journaling with Students* handout has tips on leading journaling activities that are specific to outdoor science schools.

Instructors often share that it is difficult to make sure students have journals with them and easily accessible, because journals are often used at night or at other times within the program. If your program provides printed student journals, support your instructors and come up with a simple system to ensure that students will have their journals throughout field experiences. The simpler the system, the easier it is for instructors to integrate journaling into their teaching.

Another logistical barrier to using journals is weather. Many programs operate where there is frequent precipitation or cold temperatures (or both at once!), and instructors from such programs aren't sure when or if to journal with students in such conditions. Certain 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 and wet months by having students gather samples from the natural world—like leaves, small organisms, etc.—and bringing them to an indoor space (or an area with a roof) for journaling. Instructors have also used the strategy of handing out index cards and golf pencils in environments like inter-tidal zones where materials often get a little wet. Later, students can paste the index cards into their journals.