The Naturalist’s Journal
A Resource Guide for using the naturalist’s journal as a tool in teaching

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Part I: Introduction:

"The real magic of discovery lies not so much in finding new landscape as in having new eyes." - Marcel Proust

Why revive the naturalist’s journal as a teaching and learning tool? The most general answer is that the journal can help our students become more actively connected to and engaged with nature, in order to increase their familiarity, understanding and positive attitudes regarding the natural environment.

One reality of modern life is that most of us live in highly artificial environments. This can obscure the fundamental connection between us and the natural world that we depend on for our survival. For many of our students, life in our artificial environment makes the natural environment seem peripheral and even irrelevant. Consequently, they may not develop attitudes that include caring about the natural environment. As educators, we realize that if we don’t actively care about the environment, it will become increasingly degraded and the world that supports us and other species will change, with negative consequences for all of life on earth.

Learning about nature: Much of the research on how we learn suggests that we use multiple modes for learning. Howard Gardner (Howard Gardner. Intelligence Reframed: Multiple Intelligences for the 21st Century. New York: Basic Books, 1999), claims that all human beings possess multiple intelligences (MI). In addition to verbal, spatial, logical, kinesthetic and other qualities, Gardner has recently added the naturalistic intelligence (= ability to recognize and classify patterns and organisms in the natural environment.) A student’s multiple intelligences can be nurtured and strengthened, or ignored and weakened. Creating the naturalist’s journal uses several senses and learning modes (intelligences) as we experience nature in meaningful ways.

Learning to care about the environment: Paul Taylor (Paul Taylor. Respect for Nature. Princeton: Princeton University Press, 1986) describes one model for the development of values that may then direct our actions, in discussing the development of what he calls a biocentric worldview. Fundamentally, learning about and experiencing the natural world, can lead to a life-centered (vs. anthropocentric) attitude of respect for nature. This moral attitude then engenders sets of moral norms and standards regarding nature that may become a commitment to live in ways that support life-centered systems. As E.O. Wilson (The Future of Life, 2002) observes, “To know this world is to gain a proprietary attachment to it. To know it well is to love and take responsibility for it.”

The naturalist’s journal can help us use our experience of nature to change the way we understand nature. The journal is a tool for translating our experience
into verbal and visual language through processes that are both analytical and creative. At the same time, it can bring to the surface, feelings about nature. It can help us explore the relationship between the way we perceive and think about natural phenomena and the way we feel about them. Learning to see life in a different way, leads to thinking, feeling and acting differently.

**Encouraging scientific inquiry based on one's own observations nature**

The naturalist journal strategy provides a different approach to science. Over the last century disciplines within science have become increasingly specialized and splintered (Noss, 1996). The ‘teaching’ of science has also become narrow, focusing on specific questions and on prefabricated experiments. An important part of the scientific process has been neglected in science education, that of observation and conjecture. The naturalist journal strategy, in contrast, encourages synthesis of knowledge and observations both within the sciences and from disciplines outside of science. It reinforces the fact that science is a process that requires freedom for creativity, a creativity based on observations from the natural world to answer one’s questions about this world.
Specific learning objectives
The goal of the naturalist’s journal is to help students develop a broader understanding of the natural history of their environment. ‘Natural history’ requires extensive observation as its raw material and yields meaningful and expansive synthesis as a final product. For centuries the naturalist’s journal has been a tool to accomplish this goal. Benefits of keeping a field journal include:

- **increasing powers of observation.** “It would take a lifetime to explore your own backyard” (Brown 1983)

- **improving retention of experiences.** Noss (1996) states that “scientific abstraction and fancy technologies are no substitutes for the wisdom that springs from knowing the world and its creatures in intimate, loving detail”.

- **documenting observations for future reference by ourselves** (An old Chinese proverb states that *the palest ink is better than the best memory*) and by others (Thomas Jefferson commanded Lewis and Clark to keep journals and make multiple copies in case of loss, and he instructed that their observations "be taken with great pain and accuracy" (Herman 1980).

- **providing opportunity to be creative and to use skills from other disciplines**

- **providing opportunity to synthesize observations and to integrate this synthesis with knowledge from other fields of biology and from other disciplines outside of biology.** Though the trend in science has been toward specialization, the importance and need to preserve the naturalist approach (e.g. Noss 1996) has not gone unrecognized.

In technical work a man of this age must specialize, but in a reconnaissance of a part of the earth’s face, whether soil or sea, I want my comprehension, like that of Charles Darwin, to be able to interpret the underlying significance of clouds, hailstones, argillaceous rock, hot springs, cacti, land planarians, ice-bourne boulders, carrion beetles, wingless flies, graminivorous birds, nest-building fish, viviparous reptiles, dodders, omnivourous rodents, sessile-eyed crustaceans, insect-eating plants, and foraminiferous protozoans!"

Robert Cushman Murphy, in Logbook for Grace (1947), from a journal on a voyage to the Antarctic in 1912 (Herman, 1980)
Part II: Using Journals in Teaching & Learning

Learning about natural environments means dealing with complex systems such as the web of interconnections between multiple components of the environment. Unless you are already very familiar with the ecosystems and organisms you study, you may be faced, as are the first explorers in any new land, with sensory overload. This parallels the contemporary information overload we experience while surfing the Internet. In the field, as on the Internet, you will need to be selective. Think about what you want to accomplish on each day’s study. Be open to all that may be relevant, but be selective.

Careful selection fosters careful observation and forces us to clarify our goals. The range of possible goals is reflected in the range of materials we have referenced in this Resource Guide. Some directions for field or laboratory work are highly focused on scientific approaches to the environment while others take a more interpretive artistic approach. We believe that the best Naturalist’s Journals use both approaches. An appropriate combination of these is probably most effective for capturing the true nature of your experience and learning from it.

Observe carefully! Don’t be in a hurry to begin capturing everything in your journal. Experience the situation first and select what seems most useful. In today’s fieldwork, will you be most interested in plants, animals, landscapes, adaptations to local conditions, or human influences? We tend to try to capture everything. But we are often more successful if we consciously focus on parts of the larger picture.

The journal can be used in many settings, from nature centers, to museums, to the classroom. The journal experience is ideal for formal off-campus field trips, but field experiences can be as simple as visits to a woods or meadow adjacent to the school grounds or even to the schoolyard or campus itself. Journals are also effective in the lab, where specimens previously collected (by students or others) can be examined and ‘keyed out’. Where practical, collected organisms can be kept alive in aquaria and terraria.
The field is often wet and dirty and time is limited. One solution is allow students to keep two sets of records:

1) **The Notebook - rough draft notes (a small pocket-sized spiral notebook)** for observations and data collected while in the field and lab. This notebook is not graded, so it can be messy and disorganized to some degree. However, it must be complete and organized enough so that the student can transcribe the information in it to your final notebook.

2) **The Journal - final draft version (a bound notebook)** to be turned in for grading. The information from the field notebooks and in their heads should be transcribed to this journal as soon as possible (i.e. in the van or car, at camp in the evening, or upon returning home). Memories will be fresher; details are lost quickly. This journal should be neat and organized. The notebook should be sturdy, bound, and hard-covered; it may be lined or un-lined depending on your preference. Bookstores sell blank journals and ledgers. Un-lined bound notebooks are sold at art supply stores. Avoid the flimsy "composition" books typically used as lab books.

**Suggestions on types of information to be recorded in the journals.**
The journal can be organized into sections such as follows. It is important to emphasize to students that they do not have to record everything:

1. Field notes:
   - date, location (relative to nearest town, identifying county and state), type of habitat, weather conditions, ...
   - list of organisms collected and observed (do as best as you can but it is likely that you will not be able to document all species we encounter). Underline **genus** and **species** names with straight lines (capitalizing the former) and put squiggly lines under **common names**.
   - description of collection techniques
   - observations of microhabitats (descriptions and inhabitants)
   - behaviors of animals in the field
   - information from instructors and other experts
   - quick sketches concentrating on topography, habitats, maps, behaviors, etc., recognizing that organisms collected can be sketched back at the lab
   - non-visual information (sounds, smells, textures)
   - anything else that might be of interest to the student (be creative/observant). This might also include observations on local culture, land practices, etc.
Great insights and understanding in science have arisen by bringing together disparate observations.

2. **Lab notes on specimens collected:**
   - Documentation of characteristics used to make identifications when keying out specimens.
   - Notes and sketches should **not only** include characteristics that were used to key out the specimen, but also other characteristics that were observed.
   - Behaviors of live specimens (e.g. reaction to stimuli)
   - Anything else that might be of interest (be creative/observant)

3. **Synthesis of information:**
   For example: How could any observed structures and behaviors allow organisms to get along in the environment/habitat from which the organisms were collected? How do the taxa collected in one environment compare with those from another habitat, site, or region?

*Information from outside sources* can be included. This should not, however, be the main focus of the journal. Students should use other resources information only to **supplement** their observations, making sure that this information is as relevant as possible to your observations. A comparison of descriptions by previous naturalist who have visited the area would be particularly interesting, if available.

*Students should use both written descriptions and drawings*, though flexibility should be allowed on the degree to which each is used depending on whether they prefer expressing information in written form or more graphically. Allow students to be artistic with such things as page layouts and lettering.

*Criteria used in grading journals*
The journal may end up anywhere along a three-way continuum from the 'scientific' record, to the 'artistic' journal, to the 'literary' book. That is a decision you may wish to leave up to the student. However, regardless of your finished product, specific criteria can be established and used in a simple grading rubric. For example:

- **20% - Completeness, neatness, organization, and clarity** (i.e. an effort been made?).
- **20% - Accuracy**
- **20% - Effective use of outside information** (sources are cited)
- **20% - Observation ability** - Credit should be given original observations.
- **20% - Synthesis of observations and thoughts** - This is a good place to allow creativity and speculation.
Part III: Drawing in Journals

Why draw?

Many of us would agree that in order to develop truly original ideas and insights in science, one must “see” things “outside of their normal context”. The first step in the scientific process is observation of the natural world. Artists and naturalists follow remarkably similar paths in the way they must learn to see the world. Compare the two quotes below, first by one who teaches art, the other by a one who teaches nature observation.

On drawing: “Drawing is not very difficult. Seeing is the problem, or, to be more specific, shifting to a particular way of seeing...to see things in a different way..."The reason for ... misperception ... derives from our past knowledge and experience..."
- Betty Edwards, author of Drawing on the Right Side of the Brain

On nature observation: "To a newborn baby or a newly sighted person, everything in the field of vision has equal meaning - that is, none at all. Until we tag names and values onto specific objects, we see everything purely... Everything is seen as a marvelous collage. Once we begin to define our places in the world, it is almost impossible to go back to seeing purely. But we can relive this fresh vision if we calm our minds and allow the veneer of society to dissolve. See the world as it really is - without values, judgments, or preconceptions."
"The key is to force the eyes to look at new things, and to see familiar objects as though looking at them for the first time"
- Tom Brown, Jr., Nature writer and tracker

More specifically, drawing is extremely useful even if we have no artistic ability. Drawing enhances observation and retention. To draw requires attention to both detail and overall composition. The tactile act of transferring this to paper forces us to use different sets of neural pathways that enhance the learning experience (kinesthetic learning). Drawing an organism or landscape re-enforces a memory far better than does snapping a photograph. In addition, drawing captures large amounts of information (the old cliché ‘a picture is worth a thousand words’). An example might be a simple sketch of topography that might otherwise be difficult to describe in few words. A quick sketch of key morphological characteristics of an unidentified organism is often useful upon return to the lab where more reference materials and keys are available, particularly if the organism is not collected or if key characteristics are lost in preservation.

“I have learned that what I have not drawn, I have never really seen, and that when I start drawing an ordinary thing, I realize how extraordinary it is...”
- Frederick Franck, The Zen of Seeing
Instruction for Drawing Activity

“Drawing on the Right Side of the Brain”
Seeing “the world as it really is – without values, judgments, or preconceptions.”

1) Examine the drawing of the Upside-Down image below. **Do not turn this page upside down yet!** Relax. Take a minute to look at this image.

2) Use a pencil and sketch the outside perimeter (contour line) of the object and then start to add other details if you have time. (Lefties can tear a piece of paper from the back of the handout so that your drawing arm does not cover the image.)

3) Now turn the paper right side up and compare the two drawings. You are an artist!
Some tips on drawing in the field:

Drawing Media
At the very least, you will need in the field a pencil and easer (mechanical pencils eliminate the need for a sharpener). In addition, you may incorporate other media:

- Permanent ink pen (fine tip)
- Kneaded easer
- Ink wash using a cheap water-soluble ('flair' or 'felt tip') pen and a small brush
- Color pencils
- Field watercolor kit or color pencils (colors can add important information).

Drawings should be labeled as to what they are, their scale (e.g. 2x), and with relevant structures and other information. Write on only one side of the page to reduce smearing.

Capturing information quickly in the field
Because time is limited in the field, you may wish to make partial field sketches then add detail upon return to the van, camp, or home. Quick notes in pencil on colors, textures and detail along side partial sketches will make this easier upon your return. However, often a quick field sketch alone will suffice in conveying information.

An example of an ink wash where a quick field sketch with a felt tip pen is improved upon return from the field with an equally quick brush and water touch up. Depth is given to the subject by wetting and smearing the pen strokes near areas that should be darker.
A scribbling stroke is also a useful technique for rapid sketches in the field. The image on the right is enlarged from the 'hawks in the tree' drawing on a previous page. Note the pencil has rarely been lifted from the page in parts of the picture.

Also note that the pencil was lifted when drawing finer branches. Though in reality all branches on the tree are connected, it is not necessary (or even desirable) to do this in the drawing.

Take advantage of lighter spaces and lack of clear edges. Your mind spends a lot of effort in interpreting edges that in many cases your eyes do not see. By leaving light space and subtle edges blank, time is saved in the field sketch and often the sketch appears more "realistic". Avoid continuous lines. You'll be surprised.

Note on the leave drawing (left) that detail on veins is only drawn on part of one leaf, yet the drawing conveys the needed information. Time was also saved because this drawing was made by laying the leaf on the paper and lightly tracing the outer margin. An ink pen was used later to add detail.
Sketches may have to be very rapid and hence very simple. The sketch of an elk (right) was completed in about 5 seconds from a passing van. Seek out the lines that immediately jump out at you.

Because time is limited in the field, sketches of parts of organisms and quick outlines capture information efficiently.

Remember, sketching is not the same as illustrating. Sketching is a technique of quick gestural drawing done in a short time. You may wish to collect specimens and objects for more detailed drawing at a later time.
**Some ideas on what to draw in the field**

Drawings should not necessarily be of whole specimens or entire landscape. For example, you might sketch:

- an outline of the organism
- an unusual or distinguishing part of an organism
- traces left behind such as tracts or nests
- stick figures representing a behavior
- a diagram of the sampling device
- the habitat
- topography (e.g. the shapes of boulders, treelines, ridges, and mountain tops)
- a map of the study site (a carefully labeled map can tell a story)
- conceptual diagrams that are a composite of observations (e.g. a cross-section of the dune plant community).

etc.

**Be Creative.** Not all observations need to be immediately relevant to the study subjects (great ideas in science often arise from incidental observations).

*Maps are important both for future reference and because they can convey an experience or process.*
The organism itself often does not tell the whole story. Indirect traces of organisms abound in the field. An organism's place within its habitat should also be noted.

Not everything one draws must be "as you see it". Observations can be synthesized in conceptual illustrations that summarize information.
Not everything in the journal must be directly biological. Observations from outside of biology may lead to understanding of biological systems.

Finally, one does not have to a great artist (note the sketch to the right and its author).

**OPUNTIA GALAPAGEIA** (from http://www.galapagos.to/TEXTS/J-OF-R-G.HTM)
Part IV: Writing in Journals

In order to learn from our experiences we have to do something to help make sense of them. Writing is a particularly effective way to make an experience our own and to learn from it. Much of our thinking and communicating is, after all, through language. As with drawing, we re-create the experience when we write, thus improving retention. In addition, writing requires association of the experience with past experiences and knowledge, providing opportunities for synthesis. Remember that writing and field experience are both generative, that is, new insights and questions may come to you as you write. Further, the field experience and writing of one day can become the raw material for even more significant insights, when you have many such days. Recall for example, Darwin’s experiences aboard the HMS Beagle and the multiple individual observations that later gave rise to his theory of natural selection. Here are some general guidelines we have found worthwhile.

• Begin by answering the classic journalistic questions -- who, what, when, where, why and how. Some of these will be easier to answer than others. Identifying the study site and locating it relative to other landmarks and describing the environmental conditions as well as the time and date are easy. The "why" and "how" type of questions may be more speculative, as you note such things as the relationships between components of the environment or the structures, behaviors or relationships that allow organisms to adapt to that environment.

• Use the most precise language you can. The specialized terms used in environmental science make it a language of its own. Since most of our thinking and communication is through language, the learner’s goal should be to practice thinking and communicating in this language. In the same way that using scientific names for organisms makes communication less ambiguous, so does the correct use of appropriate terminology.

• Neatness counts. We often use the smaller field notebook for capturing impressions under difficult field conditions and later transfer the day’s notes to the field journal. This also allows us to expand our notes, using our memory of the day’s experiences, and to consult field guides and resources to answer some the questions that arise. Don’t put this off! A good rule for fieldwork is to complete the days expanded notes before bed.
• Generally, your writing style will be straightforward, simple declarative sentences. Full sentences are best; they force us to tell the whole story. Sometimes lists (e.g. of organisms observed) or other organizing strategies are appropriate. Most of your writing will reflect Detective Joe Friday's admonition on the TV show Dragnet, "just the facts ma'am, just the facts." When you stray from the facts, to speculate or pose questions, make clear that that is what you are doing.

• At the same time, your personal reactions may be useful in recalling the experience. But transform the aesthetic reaction... "Great sunset..." into several more descriptive lines in your journal. That will make it more meaningful to you and others. Later, you may even discover that the sunset you described is actually characteristic of atmospheric conditions that are meaningful to your fieldwork!

• As always, be flexible. If you decide to capture your experience through poetry, you will have to select carefully from the environment and express yourself with special care. The ultimate examples of focused selection and disciplined expression may be the poetic forms of Japanese haiku.

• Asking questions fosters learning, and your field journal is the place to record your questions. While many questions arise during a field experience, many of them can be answered by further observations or by consulting field guides or other resources. Don't accumulate questions that you could answer with a little effort. But the questions that remain are a rich source for your thinking and future studies. You may want to leave room in the field journal so you can respond further to those questions when you have had additional experiences and insights.

• As your understanding and experience grow, you will be increasingly able to notice that which you do not see directly, but might expect. In one of the Sherlock Holmes mysteries (Silver Blaze), Holmes remarks on the "curious incident of the dog in the night time." When his colleague Dr. Watson responds, "...the dog did nothing in the night time," Holmes notes that as the curious incident. The absence of barking from the dog when the crime was committed is the pivotal clue, that is, the perpetrator was known to the dog and the crime was an "inside job."

• It's often useful to leave some space in your journal to tie things together. Periodically, write a brief synthesis from your experience of the day, week, or your experience in a particular environment. Even for brief experiences,
it is often useful to ask, for example, "what were the three most outstanding things?"

Finally, remember that what you are doing is important. If you do it carefully, you can be confident that your observations and your records of these are worthwhile. It's easy to believe that everything worth knowing is available on the Internet, or that the system you study today will be the same next month or over the next several years. The first claim is certainly not true, and the second may or may not be. Another misconception is that the great number of sophisticated technologies available today has made careful direct observation unnecessary. While these technological tools are useful, they don't tell us much about dynamic interrelationships and interactions of organisms and their environments. For that we need the human mind, with its capacity for making observations-- that lead to insights and connections, and that may go on, as Wilson suggests, "to concoct new patterns of thought."

"The best of science doesn't consist of mathematical models and experiments, as textbooks make it seem. Those come later. It springs fresh from a more primitive mode of thought, wherein the hunter's mind weaves ideas from old facts and fresh metaphors and the scrambled crazy images of things recently seen. To move forward is to concoct new patterns of thought, which in turn dictate the design of the models and experiments."

--E.O. Wilson
The Diversity of Life, 1992
Part IV: A brief assessment of the journal experience

Our assessment of the field journal as a learning tool has been quite encouraging. When specifically asked in course evaluations about the value of journals in enhancing learning, all student comments were positive. “You don’t learn about living things by reading. You better learn about them by going out, finding them, observing them, and trying to identify them. It is all wrapped up by having to collect your data and info and organize it into a book.” “The notebooks were good to observe similarities/differences…my favorite part was drawing,” commented another student. When asked about whether they would have preferred a more structured learning experience than the more open-ended journal approach, students overwhelming choose the journal (“it gave us a chance to learn on our own”, “creativity was refreshing for a science class”, and “I really enjoyed the chance to explore”).

Below are student examples that indicate success in meeting our objectives:

- Increasing powers of observation
➢ Documenting observations for future reference

![Image of fish]

Blue Shiner → endangered
Cyprinella sp. Cyprinidae
Blue cast on lateral line
found in Etowah River System

➢ Improving retention of experiences

* Wax myrtle, Myrica cerifera

**Family: Myricaceae**

*Description:* Rounded evergreen shrub with jagged branches. Leaves are irregularly serrate at the apex, glossy olive green and glandular above, dotted with yellowish resin glands above + beneath. Leaves are alternate.

- Spherical, waxy, grayish
- Fruit are densely clustered along shoots and persist over winter

*Leaves: Narrowly ovate*

Extremely variable in size: 4½" long x 3" wide, (typically) 3½" long x 3/4" wide
✓ Providing opportunity to be creative and to synthesize observations and to integrate this synthesis with knowledge from other fields

Alder, Ironwood and Lobelia in the riparian area. A tree that was on the bank had an odd scar, remnants of the logging company that area. The tree was be classified any species as it was though a chainsaw of it but left it pines seem crooked but only there.

A last forested this a pine but could not further towards dead. It appeared as had cut a slice out standing. Interesting through the forest skeletons remained.

✓ Increase their familiarity, understanding and positive attitudes regarding the natural environment

13 October 2002

We got a good bit of rain at Tugaloo last night - its official - we do good things for the environment! We packed up & headed Northwest a bit to Smithgall Woods Conservation Area. We were able to speak with Pete Griffin (Interpretive Ranger) before sampling - he gave us great info & insights to the history & purpose of Smithgall. Great guy! We went across the road to the upstream sample site of Duke's Creek. This was a great, beautiful creek. (I guess they all would be if they were all protected!) Where we
References and Resources


Internet Sites

Blind Contour Drawing: Drawing by Touch - Carol Rosinski


Field Sketching http://www.geoexplorer.co.uk/sections/skills/field_sketching.htm

Free drawing lessons - illustrated lesson notes for teachers and students
http://www.geocities.com/~jlhagan/K9-14/introduction.htm

Helpful Hints for Field Sketching
http://www.amnh.org/learn/biodiversity_counts/read_select/ht/sketching.htm

Nature Journaling Bibliography


Smithsonian (fall 2006) - Introduction to the nature journal
http://www.smithsonianeducation.org/educators/lesson_plans/journals/smithsonian_siyc_fall06.pdf
Instructions for Journaling Activity

A. Observation and Retention Exercise (~20 minutes)
   1) Find a fellow naturalist to work with.

   2) Choose an natural object or area to examine. The area may be no more than a few square meters of ground or a section of landscape.

   3) For one minute (no longer) scan and take a mental note of your study area. For the next minute scan and take a mental note of the larger environment surrounding your area of study.

   4) Turn away from your area and describe to your partner what was there.

   5) Go back to the area and complete the following tasks:

      - Make two drawings
        - something (or even part of something) within part of your study area
        - a quick sketch of the broader landscape which includes your study area using few, relatively simple lines.

      - Write a few sentences
        - describing a visual observation
        - describing a non-visual observation

B) Practicing workshop skills (on your own time)

   Suggestions:

      - continue to describe your area with both writing and drawing (you may wish to redraw the same objects or to embellish earlier drawings).

      - practice the techniques from the drawing “Experience” you were introduced to earlier in the workshop.