"Henry Thoreau and Phenology: Making Nature Observations" Lesson Plan

Overview
This elementary-school lesson asks: how does history apply to today's science, and what is a citizen scientist? After an introduction to Thoreau, students will observe the natural world and report their findings on Project Budburst, a botany and phenology database website.

Grades
K-5

Suggested Time Allowance
1-2 class periods

Resources
Outside access to plants for observation, clipboard and writing materials, observation worksheet, computer and internet access

Activities Summary
1. Opening discussion of links between History and Science
2. Introduction to Henry Thoreau
3. Phenology, Nature Cycles, and Citizen Science
4. Observation Activity
5. Optional: GoBotany or Project Budburst Activity

CONCORD MUSEUM

"Henry Thoreau and Phenology: Making Nature Observations"

Learning Objects and Curriculum Standards

This lesson addresses the following curriculum objectives identified by the National Science Teachers Association (Next Generation Science Standards) and the Common Core State Standards Initiative.

National Science Teachers Association
Students develop understanding in the following Standards categories:

Grade K: Interdependent Relationships in Ecosystems: Animals, Plants, and Their Environment Grade K: Weather and Climate
Grade 2: Interdependent Relationships in Ecosystems
Grade 3: Inheritance and Variation of Traits: Life Cycles and Traits
Grade 3: Interdependent Relationships in Ecosystems: Environmental Impacts on Organisms
Grade 3: Weather and Climate
Grade 4: Earth's Systems: Processes that Shape the Earth

Common Core
Student activities address the following objectives:

Grade K: CCSS.ELA-Literacy.W.K.2 Use a combination of drawing, dictating, and writing to compose informative/explanatory texts in which they name what they are writing about and supply some information about the topic.
Grade 1: CCSS.ELA-Literacy.W.1.2 Write informative/explanatory texts in which they name a topic, supply some facts about the topic, and provide some sense of closure.
Grade 2: CCSS.ELA-Literacy.W.2.8 Recall information from experiences or gather information from provided sources to answer a question.
Grade 4: CCSS.ELA-Literacy.W.4.2 Write informative/explanatory texts to examine a topic and convey ideas and information clearly.
Grade 4: CCSS.ELA-Literacy.W.4.2b Develop the topic with facts, definitions, concrete details, quotations, or other information and examples related to the topic.
Grade 4: CCSS.ELA-Literacy.W.4.2d Use precise language and domain-specific vocabulary to inform about or explain the topic.
Grade 5: CCSS.ELA-Literacy.W.5.6 With some guidance and support from adults, use technology, including the Internet, to produce and publish writing as well as to interact and collaborate with others; demonstrate sufficient command of keyboarding skills to type a minimum of two pages in a single sitting.

"Henry Thoreau and Phenology: Making Nature Observations"

Lesson Plan

Activity 1. Opening discussion of links between History and Science

Ask students: What do the study of history and the study of science have in common?

One answer: observation. Tell students they will spend the day looking closely at objects from the past and at plants. Their observations will reveal more links between History and Science.

Ask students: How can studying history be useful to scientists?
Possible answers: Learn from past mistakes; build upon work done in the past; see patterns over time.

Activity 2. Introduction to Henry Thoreau

Introduce your students to Thoreau. Henry Thoreau lived in Concord, Massachusetts 160 years ago, but he's important today to both historians and scientists. He was a writer and poet, but also a nature-watcher. One of his most famous books was called Walden: it was about the time he spent living at Walden Pond. He liked to live his life simply at the pond and observe nature closely.

In today's class, students will observe photos of some of Thoreau's personal belongings to learn more about him as a person and a scientist – this is how historians use skills of closer observation to learn about the past.

(Walking Stick) *Ask students:* This is the handle to Thoreau's walking stick. What might Thoreau have done with this stick? What do you see on the side? What are they for?
Possible answers: On the side are inch-wide markings. Measured plants, snow depth, water depth.

(Spy Glass) *Ask students:* What did Thoreau use this for?
Answer: Thoreau observed birds with this, and kept track of what days of the year he saw different types of birds.

Continue discussion. Thoreau also tracked changes in plants over the course of a year. Thoreau was interested to see how plants changed during each season in their life cycles. Scientists today learn about Thoreau and use his data: it was so accurate that they can look for patterns from the 1800's until now. Scientists use Thoreau's data to learn about the climate in the past and today.

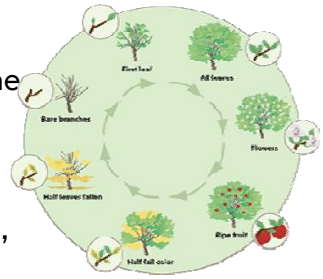
“Henry Thoreau and Phenology: Making Nature Observations”

CONCORD MUSEUM

Activity 3. Phenology, Nature Cycles, and Citizen Science

Explain that the kind of observing Thoreau was doing is called phenology. Scientists, or phenologists**,** are interested in the timing of certain events in plants and animals and how they are affected by changes in season and climate. (The word phenology comes from the Greek words "phaino" (to show or appear) and "logos" (to study).)

Discuss the kinds of changes or cycles students have noticed as the seasons change. For example: An apple tree. Use the cycle slide in the PPT.



Ask students: How do trees like the apple tree chance each season? Use PPT slide to discuss spring (buds/leaves/flowers), summer (apples), fall (changing leaves) and winter (falling leaves).

Ask students: Why is it important to look at these plants stages? What can they tell us about our climate?

Reiterate: These are the kinds of events that Thoreau was looking at, making notes and drawings about his observations. He noticed a pattern and figured out that temperature and the seasons could have a direct effect on plants and animals.

Using Thoreau's data from the 1800's, current scientists have noticed that the plants in his hometown of Concord are budding and opening their leaves and flowers 16 days earlier than they did in Thoreau's time because things such as temperature are a little different. So, because of Thoreau's nature observations, we know that our environment is changing.

Citizen Scientists

Explain to students that scientists need their help! Phenologists need data from all over the world do their work to learn more about the seasons. In order to help scientists understand what is happening with plants, students are going to make some nature observations that they can send to scientists to use in their research.

Transition to activity:
"Today you are going to learn to be a citizen scientist like Henry Thoreau, and observe the plants at our school. This will help us and help other scientists learn more about how the climate on earth affects plants and animals."

CONCORD MUSEUM

Activity 4. Observation Activity

Provide each student with an observation sheet (found here: www.budburst.org/buddies/pdf/journal_pages.pdf) on a clipboard. This worksheet is produced by Project Budburst, an online database you may wish to utilize at the end of the lesson.
Advanced grades may not require this sheet, which is intended for the lower elementary grades.

Activity Directions (explain to students before going outside)

- Students will break into 4-6 different groups depending on class size
- They will go outside and each group will observe a plant. Each group will be assigned a specific plant to answer questions about and sketch.
    - For a guide on selecting which plants to assign, see http://budburst.org/educators/educator_K_4.php. If you wish to use an additional website, gobotany.com, to let students identify their own plant species, do not reveal the name of their plant to students.
- Groups will try to discover which cycle their plant is in as they complete the worksheet
    - Is it flowering? Are there any buds or seeds? Is there any fruit? Are there new leaves or leaf buds?
- After groups are done the class will gather together to discuss what they saw
    - How might your plants look in other seasons?

Activity 5. GoBotany and/or Project Budburst Activity

- Optional: Instruct students to use gobotany/newenglandwild.org to identify their plants
    - On projector, pull up the website to show students the basics, if groups each have access to a computer. Leave the relevant PPT slide up, with instructions. Students should use the Simple ID Key to begin.
- Enter data into an online database to share it with scientists!
    - Project Budburst is a classroom-friendly database that will help your class contribute to the scientific community. Depending on the age of your students, you may wish to project the website on a computer and have the class direct the submission of each group's findings; or, for advanced elementary grades and classrooms with multiple computers, let each group submit their own findings.
    - Find Project Budburst instructions and registration (for K-4 teachers) here: http://budburst.org/educators/educator_K_4.php