Flora of North America

From Curiosity Cabinet to Museum Collection

This lesson for 5th to 7th graders integrates biology, history, art, and math through a series of collecting, classifying, and cataloguing activities. The lesson introduces students to binomial nomenclature and museum-based research. Students discover the development of museums from their origins as curiosity cabinets to today's virtual museums, providing online access to collections and specimen databases. Students create a curiosity box, label the objects in their curiosity box (using Latin binomials for plant and animal specimens when possible), develop a classification scheme for the objects, and create a database of all objects collected by the class.

Learning goals: (1) to classify objects using skills in observing, identifying, and comparing; (2) to tabulate and analyze data

Key terms: classification, taxonomy, binomial nomenclature, kingdom, phylum, class, order, family, genus, species

Background

Before museums existed, objects of natural history, art, and technology were held in private collections. Curiosity cabinets — also known as cabinets of wonders or chambers of curiosities — of the 16th and 17th century included all sorts of attractive or interesting objects. Rare items were especially prized. Peter the Great and other wealthy collectors amazed their visitors with never-before-seen shells, bones, medicinal plants, minerals, paintings, cannons, and clocks. The objects were usually displayed together. But they were categorized as *naturalia* (products of nature), *artificialia* (products of man including textiles, coins, weapons, furniture, prints), and *scientifica* (scientific instruments).

As collectors traveled the world, many new organisms became known to science. There was a great need to organize this new information. In 1735 Carolus Linnaeus outlined his scheme to classify plants, animals, and rocks. By 1753 he formalized the two-word system to name organisms. Thus, he established his role as father of classification and binomial nomenclature.

The private collections of *naturalia* eventually became natural history museums. Ashmole's collection, owned by Oxford University, opened in 1683 as the first public museum. Natural history museums quickly grew into impressive research collections. Today natural history museums around the world hold about three billion specimens. The Smithsonian Institution's National Museum of Natural History, established in 1850, has over 126 million specimens of plants, animals, minerals, rocks, fossils, and human artifacts.

Specialized collections such as fossil specimens are often housed in paleontology museums and plant specimens are housed in herbaria (singular: herbarium). The three largest U.S. herbaria are New York Botanical Garden, Missouri Botanical Garden, and Harvard University Herbaria (with 6.5, 5.2, and 5 million specimens, respectively).

The mission of natural history museums is to identify and research Earth's biodiversity, and to share their knowledge with the public. In response to increased threats to species and their habitats, researchers have stepped up efforts to catalogue Earth's biodiversity. New species continue to be discovered around the world, including North America. Between 1975 and 1995, over 1,190 vascular plant taxa (including some 600 new species) were described in North America.

Hands-on Activities and Worksheets

- *Creating a curiosity box*
- *Labeling and classifying specimens* (Classroom Worksheet 1)
- *Creating a database of your class museum* (Classroom Worksheet 2)

Time frame

Two class periods. In the first period, describe the history of museums and introduce *naturalia*, *artificialia*, and *scientifica* as one way of classifying objects. Students create a curiosity box as a homework assignment. The second period is an in-class activity and discussion.

Materials for Creating a Curiosity Box

- ❑ one small cardboard box per student, cardboard and X-Acto knife to make dividers within box
- ❑ pencil or pen
- ❑ collector labels (~ six per student—a page to photocopy is provided in Worksheet 1)
- ❑ datasheet (provided in Worksheet 2) or transfer table columns to chalkboard
- ❑ computer with web access (for optional enhancement activities)

Procedures

1. Introduce background information on curiosity cabinets as precursors to museums. Introduce *naturalia, artificialia,* and *scientifica* as kinds of objects that were collected for curiosity cabinets. Describe the homework activity. Ask students to collect a variety of natural objects, man-made objects, and scientific instruments and record information about their collections. About six objects per student is reasonable, although the number can be altered depending on class size. Within the category of natural objects, ask students to include some leaves, flowers, seeds, or nuts from their home (e.g., rice, beans, dried herbs from the pantry) or backyard or nearby park. Please ask students to collect only fallen plant parts if collecting beyond their backyard. (Collecting plants and animals in state or national parks requires an official permit.) The man-made objects and scientific instruments should be items from the students' homes. Scientific instruments may be any items used to measure, document, or understand the world: ruler, compass, watch, calculator, magnifying lens, battery, scale, accept any reasonable item. While collecting, students should record on a piece of paper when and where they collect each object. Give students one week to collect the items and arrange the items in their box in whatever fashion they choose.

2. On the day that students are expected to bring their curiosity boxes and collecting records to school, introduce current classification scheme for living organisms and some of the general characteristics of each kingdom. Ask students to consider ways they classify everyday objects.

3. Allow a few minutes for students to look at each other's boxes. Ask them to look closely at the kinds of objects that have been collected and their characteristics.

4. Break the class into three museum staffs: one for the natural objects, one for the man-made objects, and one for the scientific instruments. Give students 20 minutes to brainstorm ways to classify the non-living objects and discuss the classification of their plant, animal, fungus collections. Ask students to diagram a hierarchical classification scheme for their objects, noting the major characteristics for each subgroup of objects. A spokesperson from each museum staff should then present to the class their classification schemes and the characteristics they used to separate the objects into groups and subgroups.

5. Using the agreed classification schemes, ask students complete a label for each object in their curiosity box (a label page is provided, photocopy as needed).

6. Ask students to pool their individual label data to create a database recording all objects collected by the class. Fill in the columns on the datasheet provided (or tally on the board).

7. Each student should analyze the class database.

8. Discuss the class's data and experience. Which objects did the class most commonly collect? Are these commonly collected object commonly found in the environment? Which item was difficult to classify? Why? What characteristics did you use to group objects? How many groups did you recognize? Can you think of alternative ways to classify the set of objects? Referring to your experience in classifying objects, discuss the statement: Classification systems are human inventions.

Applying and Extending

- If you collected something new to science, how would you identify and name it?
- How many species have been named worldwide; how many do you think have yet to be discovered and named?
- Why is it important that museum labels include information about where the specimen was collected? What kinds of research do you think takes place behind-the-scene at a museum?
- Create a classroom herbarium for teaching and learning purposes. As a group project collect, press, dry, mount, and label specimens of locally common herbs, shrubs, and trees.

  Create a field guide for the plants in your classroom herbarium. Prepare a page for each species, include an image of the plant (a sketch, an image cut out of a magazine, a photograph, any medium will work), a map of the plant's range, the plant's scientific and common names, a description of the plant (its life form, its size, leaves, flowers, and other identifying features), when to find the plant flowering (or producing cones or spores, if not a flowering plant), and a list of the plant's habitats. For each plant genus in your classroom herbarium with two or more species, prepare a key that identifies each species.

A guide to plant collecting geared for middle school students is available from the University of Arizona's General Biology Lesson Plans.
http://biology.Arizona.edu/sciconn/lessons2/lessons.html/

The Canadian Botanical Conservation Network provides instructions for collecting plants and creating a herbarium accessible to elementary school students.
http://www.rbg.ca/ca/cbcn/en/kids/kids_what2.htm

Explore and do more!

How does your label data compare with labels of museum specimens? Many museums and herbaria have images and databases of their specimens online.

Check out images of plant specimens online

Missouri Botanical Garden
http://mobot.mobot.org/W3T/Search/image/imagefr.html/

New York Botanical Garden
http://www.nybg.org/bsci/hcol/

Digital Flora of Texas
http://www.texasflora.org/dftimagebase.htm/

Fairchild Tropical Garden Research Center
http://virtualherbarium.org/

Plant Information Center of University of North Carolina-Chapel Hill, School of Information and Library Science, North Carolina Botanical Garden, and UNC Herbarium
http://www.ibiblio.org/pic/

Look at some animal specimens available online
The WorldWide Museum of Natural History
http://www.wmnh.com/
Virtual Insectarium
http://www.insectariumvirtual.com/
Virtual Tour of the University of Kansas Natural History Museum
http://www.digitaljayhawk.org/Projects/DJProjects/KUNaturalHistoryMuseum/index.html

How do the early museums compare to modern museums? Learn more about the history of museums and view some curiosity cabinets.
http://www.kunstkammer.at [Although not in English, this site has spectacular images]
http://www.ashmol.ox.ac.uk/ash/amulets/tradescant/tradescant00.html

Suggested Readings

Purcell, R. 2004. A room revisited (A contemporary artist is inspired by a "cabinet of curiosities" collected by a naturalist of another era) Natural History 113(7): 46–48.
Suarez, A. V. and Tsutsui, N. D. 2004. The value of museum collections for research and society. BioScience 54(1): 66–74.
Tangley, L. 1998. A flowering of finds for American botanists. U.S. News and World Report 125: 64.

NRC Content Standards: Unifying Concepts & Processes 1.1; Science as Inquiry 2.1; Life Science 4.3; History and Nature of Science 8.2, 8.3

Grades and Levels: middle school

Evaluation: Students should be evaluated on their individual work and their ability to work together, how they completed their labels, and whether they could record data in the database, and whether they could calculate percentages.

Classroom Worksheet 1: Labeling and classifying specimens

Collector's name ______________________________ Specimen number ________

Place collected ________________________________ Date collected ___________

Common name/description ____

The object is a natural object / man-made object / scientific instrument (circle one).

Was the natural object once living? ________

If so, what kingdom does it belong to? ____

What is its scientific name? ____

If not, how would you classify the object? _____________________________________

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Worksheet 2: Creating a database of your class specimen collection

Use this table or write headers on the board.

Specimen number	Common name of object	Kind of object (natural/artificial/scientific)	Biological kingdom or classification	Scientific name

Use your class database to calculate:

What percentage of specimens collected by the class are natural objects? _____
What percentage of specimens collected by the class are man-made objects? _____
What percentage of specimens collected by the class are scientific instruments? _____
What percentage of the natural objects are plants? _____
What was the most common object collected? _____