**Module 6 Instructional Plan**

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| **General Information**  |
| **Lesson Title:** Preparing Specimens for the Herbarium  |
| **Overview:** Once students have pressed and dried their plant material (Module 5), they will learn about the curatorial techniques used to create a permanent museum specimen.  |
| **Subject(s):** Biology, Botany |
| **Grade Level/Setting:**Grades 9-12/ Biology or Ecology Science Classroom  |
| **Prerequisite Skills/Prior Knowledge:**Completion of previous Modules 1-5.  |
| **Three Dimensions**  |
| **Disciplinary Core Ideas:**Life Sciences: LS2 - Ecosystems: Interactions, Energy, and DynamicsLife Sciences: LS4 - Biological Evolution: Unity and Diversity |
| **Science & Engineering Practices:**Obtaining, Evaluating, and Communicating Information  |
| **Crosscutting Concepts:**Structure and Function |
| **Integration:**Students will document their family’s botanical history through the creation of a permanent museum specimen. This will help them appreciate natural history collections and the unique information these specimens provide.  |
| **Standards and Objectives**  |
| **NGSS Performance Expectations:**Not applicable |
| **Tennessee Science Standards:** ECO.LS2.10 - Plan and carry out an investigation measuring species diversity (richness and evenness) and density in a local ecosystem |
| **Learning Objective(s):** **The learner will:**1. Compare and contrast different examples of herbarium specimens.
2. Generate a specimen label based on field data.
3. Create a high-quality herbarium specimen from their pressed plant.

**Guiding Questions:** How are herbarium specimens prepared?  |
| **Materials /Resources** | **Technology** |
| * Vocabulary list **(Handout 6.1)** and answer sheet
* Videos (see links below)
* Notes from Nature activity **(Handout 6.2)**
* Notes from Nature website: <https://www.notesfromnature.org/>
* Plant presses with dried specimens
* Herbarium supplies\* (to be provided by herbarium staff): archival mounting paper, glue, linen tape, fragment packets, tweezers, scissors, weights, foam, wax paper

***\**** *Each herbarium has its own methods of specimen preparation, so this list may differ* | * Internet access (e.g., computer or cell phone)
* Laptops for students to prepare labels in word processing program

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| **Safety Concerns** |
| Students should use caution with scissors and glue. |
| **Academic Language** |
| **Vocabulary:**Review terms from Module 2 (taxonomy) and Module 5 (field data) Additional terms: taxonomic authority, archival, acid-free, curation. |
| **Other Language Demands:**Syntax**:** taxonomy, binomial nomenclature, specimen labels |

**5E Instructional Strategies and Learning Tasks**

**Engagement**

Students will begin by watching some introductory videos about preparing herbarium specimens. This one, prepared by Cambridge University Herbarium, is a good video to begin with as it reviews many of the steps the students went through in earlier modules: <https://www.youtube.com/watch?v=fpfmfTZV4G4>. Next, students should watch the video to accompany this module, located here: <https://www.youtube.com/watch?v=ZDuhxehynTg&list=PLvzMzHvAgzWi_leFvfUMccUKaaopAJSXH&index=6&t=14s>. This video is about 10 minutes long, and students should complete **Handout 6.1** while they watch the video.

**Exploration**

Students will work individually on an activity related to Notes from Nature (*NfN*). The activity in **Handout 6.2** will walk students through the process of creating an account in *NfN* and then have the students transcribe label data from a minimum of 10 herbarium specimens. Optionally, the teacher may want to have a friendly competition with a deadline to see who transcribes the most specimens. Students will also answer questions about the specimens they transcribe in the handout.

After completing the handout, the teacher should ask the class for examples of label data they saw that was of high quality (lots of details, good descriptions, etc.) and labels that were lacking information. Is there a relationship between the age of the specimens and the amount of detail on the labels?

**Explanation**

 The students will now learn how to mount their own herbarium specimen. Herbarium staff member(s) should describe each of the tools/materials used and explain the proper layout for specimens, fragment packets, barcodes, or other elements. Staff can then work with students to begin mounting their specimens. Once specimens have been glued, they will need to dry for at least 24 hours. The herbarium staff can demonstrate how to reinforce specimens (using linen tape, etc.) so that once the specimens are dried the class can complete this next step independently if they wish.

**Elaboration**

 Students will compare their finished herbarium specimens to their mock specimens drawn in Module 3.

Questions to discuss:

● How closely do their mock specimens align with their finished specimens?

● How do they differ? Why were these changes important?

● What are the most important aspects of specimen preparation?

● Why are these aspects important?

**Evaluation**

 Students will complete a short reflection on their experience and level of success with pressing and mounting their specimens. This could be accomplished as an exit ticket or homework assignment.