

Lesson 2: Using SCRATCH to Classify with Dichotomous Keys

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Grade Level(s)

Grades 6-8

Lesson Overview

Students will be introduced to SCRATCH programming as a way to formalize the “dichotomous keys” method of object classification. Students will have created dichotomous keys to classify footwear in a previous lesson. A sample SCRATCH project will exemplify one approach to translate the classification process into digital programming. Students will then learn the tools necessary to design and create their own SCRATCH classification program.

Learning Objectives

- To learn to create a SCRATCH program through which a user can classify an object using dichotomous keys.
- To apply the classification criteria determined in Lesson 1 to develop a creative programming solution.

Standards

NGSS MS-ETS1-1 Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.

Preparation

- Sample SCRATCH project illustrating Dichotomous keys’ assignment from Lesson 1
- Student workstations with SCRATCH programming capability
- Copy SCRATCH helpers PDF for each student

Materials and Resources

- 1:1 Student computers with SCRATCH programming capability
- Student copies of SCRATCH helpers
- “How Many Species Are There on Earth and in the Ocean?”
Scientists recently have estimated the number of eukaryotic species on Earth
<http://journals.plos.org/plosbiology/article?id=10.1371/journal.pbio.1001127>
- Discussion of the “How Many Species” study
http://www.nytimes.com/2011/08/30/science/30species.html?_r=0
- An online dichotomous key for Oregon trees
http://oregonstate.edu/trees/dichotomous_key.html

Activity 1: SCRATCH Introduction (40 Minutes)

Students will be introduced to SCRATCH through a pre-designed program that demonstrates a few steps of how footwear can be classified with dichotomous keys. Distribute the SCRATCH helpers “cheat sheet” to each student and explain that these are a few of the blocks that have been found to be most helpful (but certainly not the ONLY ones to be used). Instructors will go through the programming code to illustrate how the program can be used to reflect dichotomous keys. Students will also be introduced to various other design and programming capabilities of SCRATCH.

Activity 2: SCRATCH Programming (90 Minutes)

Students will design and program their own individual SCRATCH project that transfers the dichotomous keys to a digital project. This activity is an opportunity for students to creatively solve a computer programming design challenge. Students should be encouraged to try different approaches until they find one that works. Emphasize that there are many “right” ways of doing this and that however they reach the solution is completely up to them. Encourage collaboration between peers, but also make sure that each student is doing their own program. The program will be designed to allow someone other than himself or herself to classify something in the classroom using dichotomous keys.

Activity 3: Application to Life Sciences (20 Minutes)

Students and teachers will discuss SCRATCH as a tool for classification and how it might be useful in a variety of settings: Life Sciences, Community Agencies, interested individuals. Students will discuss the wide variety of naturally occurring things that have been and can be classified and the potential that students have to create SCRATCH tools to aid in that classification. Students will then be presented with the design challenge of applying SCRATCH and dichotomous keys to a real world environment in the local community--to be discussed further in Lesson 3.

Troubleshooting

During the programming process, students are expected to have difficulty with some of the programming syntax and rules, and this difficulty is an encouraging aspect of the creative learning process. It is important to stress that there are multiple ways in SCRATCH to get a

certain action to work. Some alternative possibilities can be discussed to inform students of alternate ways to achieve the same programming results. Particularly, students may have trouble with the “timing” of messages that they want to program to display. It should be noted that messages could be displayed in various ways: through the “ASK,” “DISPLAY,” and other code blocks. Students will be able to refer back to the sample project. Students can also refer to a printed cheat-sheet, explaining the function of various coded blocks and their associated syntax.

Assessment

At this stage, students will be assessed on participation and their ability to effectively transfer the concept of dichotomous keys from Lesson 1 into a SCRATCH project. Once each student has individually completed a SCRATCH example to classify footwear, they will exchange with their peers to be tested. Following testing, each student will complete a prototype self-assessment form (see below) to be given a process grade by the instructor.

Student Self-Evaluation

What was the most difficult part of developing your prototype?

What was the easiest?

What feedback did you receive about your prototype?

Does my prototype work?