Classification and Dichotomous Keys

Subject: Science

Grade Level: 8th – 12th

Rationale or Purpose: The purpose of this lesson is for students to understand why the scientific community classifies living things and how scientists decide on the criteria by which to classify them. The students will be able to:

- create their own classification system and explain their logic behind it
- understand the history of classification
- identify the importance of living things being classified

Materials per group:

- Cutout pictures of 20 things that live in the sea (plant and/or animal)
- History of classification links: www.fossilmall.com/Science/Domains.htm
- Binomial Nomenclature links: www.biocrawler.com/encyclopedia/Binomial_nomenclature
- PowerPoint presentation with a picture of five different things that live in the sea (plant and/or animal).

Lesson Duration: 90 minutes (can be broken up into two 45 minute classes or one 90 minute class)

Source of Lesson: *Hot Science – Cool Talks* CD-ROM # 45: "The History and Future of Whales"

TEKS Objectives:

Biology:

(2C) organize, analyze, evaluate, make inferences, and predict trends from data;
(2D) communicate valid conclusions.
(3A) analyze, review, and critique scientific explanations, including hypotheses and theories, as to their strengths and weaknesses using scientific evidence and information.
(8B) analyze relationships among organisms and develop a model of a hierarchical classification system based on similarities and differences using taxonomic nomenclature.

ENGAGE: The teacher will present PowerPoint presentation with the pictures of plants and/or animals that live in the sea and ask the kids to write down different groups that the living things could fit into. The teacher will then ask the students to share the groups that they picked and the teacher should compile a list on the board. The teacher should highlight the large variety of answers that are given by students and make mention of how many different ways the students could group one thing.

EXPLORE: The teacher will next ask the students to pair up with a partner. The teacher will give each group 20 pictures of things that live in the sea and ask the students how they would group these things. Give the students about 10 minutes to organize and classify these items into groups.

Teacher note: Think of your own groups when you choose the pictures but do not tell the students what your groups are. The students should come up with a large variety of classifications that are different from the reason you picked the pictures to begin with.

EXPLAIN: Have the students present the classifications along with the method they used to classify their objects. Discuss after each group presents the pros and cons of their system. (Why is this method better or worse?) Hopefully these classifications will be more advanced than in the first example, and maybe delve into the behavior of the things in the picture, their uses, or even their physiology.

ELABORATE: After a couple of the student groups have shared their personal classification systems, discuss the history of the classification system (Carl Linnaeus and the six kingdom classification) up to the most current system (RNA Domains). Also talk about what phylogenies are (they show the evolutionary relationship between species) and how they are created. Compare how these methods are different/same than the methods of classification that your students came up with.

EVALUATE: Have the students regroup in groups of four and allow them the rest of the class period to create a dichotomous key and an order tree for whales (Order: Cetacea). Provide them with pictures and a fact sheet on each of the species and have them write out the dichotomous key on a poster board. Between each step of the key, ask the students to list the defining characteristics that differentiate the animals into the separate groups.

- If you have more time with your class, you may want to think about having the groups of students switch their dichotomous keys and use the other groups' to classify the whales.
- Teacher note: A good resource for whale species activity is: http://www.royalbcmuseum.bc.ca/programs/whales/t-activity-1.html
  This site has color photos with descriptions of behavior, eating and physiology.