Classifying Conundrum

Summary

Students will identify plant characteristics from different environments and be able to communicate that information in different ways.

Materials

Several sets of plants representing species found in Utah OR
Student collected sets of plants
Sets *Plant Round Cards*
Field guides or materials to assist student investigations

For each student:

4 paper bags
2 large brads

- *Plant Classification Journal* handout
- *Plant Identification Terms* handout
- *Field Guide Project Rubric*
- *Leaves Diagram* handout

Additional Resources

Books

- *Is it Red? Is it Yellow? Is it Blue?*
  , by Tana Hoban; ISBN 0688070345
- *Is it Rough? Is it Smooth? Is it Shiny?*
  , by Tana Hoban; ISBN 088038239
- *Is it Larger? Is it Smaller?*
  , by Tana Hoban; ISBN 068815282
- *Crinkleroots Guide to Knowing Trees*
  , by Jim Agnosty; ISBN 0027058557
- *Plants of the Rocky Mountains*
  , by Linda J. Kershaw; ISBN 1-55105-088-7
- *Rocky Mountain Tree Finder*
  , by Tom Watts; ISBN 0912550058
- *Rocky Mountain Plants and Animals Coloring Book*
  , by Dot Barlowe; ISBN 048640456
- *Easy Field Guide To Common Desert Cactus*
  , by Richard and Sharon Nelson; ISBN 0-935810-15-3
- *Trees: A Golden Guide*
  , by Herbert S. Zim and Alexander C. Martin; ISBN 1-58238-133-X

Background for Teachers

This activity should be used after introducing the concept of structure and function of a dichotomous key. Students will have practiced on common and simple items such as candy, shoes, etc. They should then begin to generalize that information by identifying plant characteristics from different environments, and be able to communicate that information in different ways.
The word "dichotomy" means "division into two." A dichotomous key reduces the task of identifying something into a series of questions that are based on physical features. Each set of questions offers

opposing answers from which to choose. As students make choices and eliminate others, they will eventually discover the name of the mystery item.
Throughout this lesson, students will make observations and record them in a science journal. They will also spend time in cooperative learning groups in a variety of ways to ask questions and discuss the information they learn.
The plants used in your investigations should include (but not be limited to) the ones on the Science wordlist for Standard 5:

cottonwood	Utah juniper	*Sego lily	*Bristle cone pine
quaking aspen	pinyon pine	*Douglas fir	
bulrushes	cattails	Blue spruce	
sagebrush	prickly pear	Gamble's oak (oak brush)	

*common but not in 4th grade core curriculum list

Intended Learning Outcomes

1. Use Science Process and Thinking Skills
2. Manifest Scientific Attitudes and Interests

Instructional Procedures

Invitation to Learn

Before starting the lesson, put on something unique you don't usually wear such as a funny hat, odd glasses, or something outrageous on your head like a pan. Start talking to the students about something not specifically on the topic, acting like nothing is different. When students react to you with giggles or comments, innocently ask, "What?" "Is something the matter?" When they identify what is different, they might say, "You've got that pan on your head!" "Oh, so this thing is different? What is another name for thing (attribute, characteristic)? If they can't think of any, have them look it up in the thesaurus/dictionary. "You're right! When something is different, we notice it and need to identify it so we can communicate our discovery with others. This pan makes me different, just like characteristics make many "things" different...Like Utah plants!"

Instructional Procedures

Ask students what characteristics they might use to identify Utah plants. List these on the board and accept all answers (e.g., size, color, texture, etc.).

How could these characteristics be used to identify plants? List the ideas in another column on the board. Example of responses:

Look at the shape of the leaves—round, oval, long, etc.

Look at the number of leaves on a stem.

Look at the stem (Is it woody?).

Look at the color.

Does it have needles?

If possible, take students outside and collect an assortment of leaves. If this is not a possibility, use collections that you have acquired. These leaves can be preserved by laminating them for use from year to year.

Divide the students into groups to study the assortment of leaves.

Students record their observations. Encourage them to answer questions such as:

What are the differences between the leaves?

What do the leaves have in common?

Do any leaves have edges that look like teeth on a saw blade?

Do any leaves have hair-like structures?

What do the leaves feel like?
Can you trace the veins on the leaves? What do they feel like?
If there are needle-like leaves, are the needles in clusters?
What color are the leaves?
Compare the leaves—size, shape, structure.
Have students group leaves into three piles that show which environment they might live in—wetlands, forests, or deserts.
Record this information in their science journals.
Share these lists with the class. (Remember, many of these plants can live in all of the environments. If a student can give a logical answer for his/her choices, it should be accepted.)
Can we use this information to create a dichotomous key to identify any of the plants in your piles? Review again how this occurs if students are not familiar with the system. (Use the *Leaf Dichotomous Key* as a guideline. Remember, let students do the creating. Their key may look different from the example. Encourage the use of "has" and "has not.")
Students share the keys within their groups. Teacher should identify and correct any misconceptions.
Make a *Plant Classification Journal* and store in your science journal.
Use the *Plant Round Cards* to practice using the information you observed and recorded. Fill in the blanks with some of the Utah plants you investigated. Take turns reading your cards. The student whose card matches the previous question becomes the next to read. Continue until play can go no further.

Extensions

- *Plant Classification Journal*

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Relay Race

Line up in teams and place a pile of leaves at a predetermined distance in front of each team. Tell the students that you're going to call out the name of a Utah plant and then say, "Go!"
At the signal, the first student in each team should run to the pile of leaves, find the leaf that comes from that plant, and hold it up. Each team gets one point for each leaf correctly identified. The team with the most points wins.
After each round, players put the leaves back in the piles and go to the end of their team's line. (If working with students who might have difficulty with this activity, adapt it to use pictures instead of names of plants, or play as a matching game.)

Family Connections

Make a tally sheet with the three environments listed. For a few days, or over the weekend, have students keep track of how many plants they see in their daily activities, on television, in the newspaper, or driving in the car. Which column has the most? Why do they think this happens?
Either on the walk home from school, or in their own yard, have students try to find at least three of the different types of plants discussed. This is only *observing*, not *collecting*, especially if it belongs to someone else!

Assessment Plan

Observe and note student responses to the leaves they examine. Review the characteristics of leaves and plants if necessary. For special needs students, provide simplified ways of writing down data (such as circling the kind of leaves they see from illustrations).
Provide additional information for students who are ready to learn more about a more diverse selection of Utah plants.

Play relay game for a quick assessment of class understanding of Utah plant identification. (See Curriculum Extensions.)
Students design an individual field guide to the Utah plants that they have studied during this activity. Their guides should include the characteristics they learned about, such as leaf shape, bark color and texture, and the branching pattern of leaves. They should also include environments where this plant might be found. They should include a drawing of their plants, or perhaps leaf prints and bark rubbings. (See *Field Guide Project Rubric*.)
Collect science journals and review recorded information to assess/correct student understanding.

Bibliography

Research Basis

Nesbit, C., Hargrove, T., Harrelson, L., (Winter, 2004). Implementing Science Notebooks in the Primary Grades. *Science Activities*, 40(4), 2.
This article details the process teachers can use to teach how to use science notebooks. It highlights the benefits associated with using notebooks, and provides connections to National Science Standards.
“Data from science notebooks provide the teacher with a true record of each student’s thinking and level of understanding over the course of the investigation. This information can prove to be extremely insightful as teachers begin to understand how each student thinks, where their strengths and weaknesses lie, and why they make the mistakes they make. This information should be used to improve classroom practice, correct misconceptions, and guide the students toward developing a deeper understanding of content. The science notebook can be used as a tool to measure students’ understanding of a variety of areas including, but not limited to, science, mathematics, and writing.”
Shlomo, S. (1999). *The Handbook of Cooperative Learning Methods*. Westport, Connecticut, Praeger Publishers, 226.
This text defines and discusses cooperative learning and outlines a variety of ways to use this strategy in different curriculum areas.
“While students conduct their inquiry individually, in pairs, and in small groups, they gather a great deal of information from a variety of sources. Interpretation of their combined findings is a process of negotiation between each student’s personal knowledge and the new knowledge acquired, and between each student and the ideas and information contributed by other members of the group. This promotes ability to organize, confirm, and consolidate their findings and thus to make sense of them.”
Adams, D., & Hamm, M. (1998). Literacy in Science, Technology, and the Language Arts: An Interdisciplinary Inquiry. Westport, Conneticut: Bergin & Garvey. p. 129.
This text deals with science and mathematics inquiry processes as tools that enable students to gather and discover data for themselves through the process of scientific inquiry.
“Most science educators today agree that science can best be viewed as a continuous process of trying to discover order in nature and looking for consistent patterns of the universe through systematic study. It guides the inquirer to a variety of sources, revealing previously undetected patterns. These undiscovered openings can become sources of new questions that can deepen and enhance inquiry. Science is a way of thinking and asking questions.”

Authors

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