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# K-12 Partnership Lesson Plan

# Brook Wilke

# *Hairy Leaves*

## Overview

Plants have small hairs on their leaves and stems called trichomes. These structures are important for defense from herbivory and protection from cold, heat and drought. Students will investigate leaf hairs of many different plants in the schoolyard using an inquiry based activity. Two hypotheses will be made, one about whether or not all plants have leaf hairs, and whether most plants are highly pubescent (hairy) or modestly pubescent. Leaves will be collected and classified into three categories. Students will create a data table and bar graph from their data and present this to the rest of the class. The teacher will conclude with some ideas about why plants have leaf hairs and try to stimulate future questions from the students about the topic.

**Objectives**

At the conclusion of the lesson, students will be able to:

* Conduct a basic scientific investigation to support predictions
* Explain why plants are pubescent and have small hairs called trichomes
* Explain that not all plants or leaves of the same plant have the same number or type of trichomes

**Length of Lesson**

1 hour

**Grade Levels**

Middle school

**Standards covered (NGSS)**

Disciplinary Core Ideas:

* **MS-LS1-4**: use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively

Cross Cutting Concepts:

* Patterns
* Structure and function

Science and Engineering Practices

* Planning and carrying out investigations
* Analyzing and interpreting data
* Engaging in argument from evidence

***Previous Michigan Standards Met:***

* **(C ) I.1.m2:** design and conduct scientific investigations
* **(R )II.1.m5:** develop an awareness of and sensitivity to the natural world
* **(LO)III.2.m1:** compare and classify organisms into major groups on the basis of their structure
* **(LH) III.3.m2:** describe how heredity and environment may influence/determine characteristics of an organism

**Materials**

* Schoolyard to collect leaves from different plants
* Magnifying glasses

**Background**

### *Strategy:* *inquiry cycles*: finding and explaining patterns in data (arguments from evidence); *inductive or field inquiry*: techniques-observations-patterns-explanations (TOPE)

### *Observations, patterns, and explanations*

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| --- | --- | --- |
| Observations or experiences (examples, phenomena, data) | Patterns (laws, generalizations, graphs, tables, categories) | Explanations (models, theories) |
| Students examine trichomes on leaves of different plants including how many there are and the differences in the anatomy of the trichomes. | Students classify leaves into groups based on the abundance of trichomes. | Students understand that some plants have more trichomes than others and think about why that might be. |
| Application: Model-based Reasoning | | |
| Inquiry: Finding and Explaining Patterns in Experience | | |

### *Introduction/Anticipatory Set*

Students will be asked to draw a detailed picture of any type of leaf they want. After doing so, the teacher will show a high resolution picture of a leaf that clearly shows the leaf hairs (trichomes). Did any students draw trichomes on their leaves? Students will then be asked to suggest why leaves may have trichomes. What are their benefits? Finally, students will be asked to hypothesize whether or not all leaves have leaf hairs and if most leaves have a lot of leaf hairs like the picture, or if most leaves have very few hairs.

### Activities of the session

1. Introduction activity as described above
2. Each student will go out into the schoolyard and collect at least three leaves from different plants to bring back to the classroom
3. In the classroom, students will form groups of four or five and place all their leaves in a pile in the middle.
4. Students will use magnifying glasses to classify all leaves from their group as one of three possibilities (high pubescence, medium pubescence, low pubescence)
5. Students will make a data table and bar graph for their leaf pubescence data.

**Conclusion**

* Each group will present their results to the rest of the class by showing their bar graph
* The teacher will share with the class that trichomes are important for plants to reduce herbivory (being eaten) and to reduce stress from extreme environmental conditions (heat, cold, drought). The teacher should discuss that this is an adaptation that is passed between generations. As a class, students will be asked to think about and suggest when and where plants might be found that are highly pubescent.
* Students will either place their leaves back outside or press them between the pages of a heavy book to preserve for the future.

**Extensions and Modifications**

* Students will be working in groups, so those that understand the lesson can help those that are struggling
* Students can collect leaves from different ecosystems or habitats to compare leaf pubescence. They may find that plants in certain areas have adapted to have higher pubescence based on some environmental stress.
* Students can press the leaves between books to use for artistic decorations

**Assessment**

Students should be graded based on the correctness of the data table and graph they generate. They should also be given suggestions about how to improve oral presentations in front of the class.

**Post-lesson Comments and Reflection**

*I developed this lesson plan after teaching the lesson, so my suggestions are incorporated into the lesson plan. When I taught the lesson, I provided the students first with some background about leaf trichomes and their importance and they were asked whether all plants had equal amounts of leaf hairs. Students immediately answered “no”, but in order to complete the lesson, they had to go out and collect data. My suggestion would be to make sure they are given a question that is not easy to answer without collecting data because it makes the lesson much more interesting for them.*