

Teacher's Guide

THE METHODS OF SCIENCE AND PAPER HELICOPTERS

OVERVIEW:

This introductory science workshop will set the stage for the remaining workshops throughout the year. The main emphasis will be introducing the students to “the scientific method.” After some exposure to the terms used to describe the scientific method, students will conduct a paper helicopter experiment in which they use all the methods of science. Students will work in groups of four for their experiment.

Group assignments should be made before coming to the science lab.

TERMS WE WILL BE USING:

- **Process related**—wonder, observation, hypothesis, comparison, classification, prediction, independent variable, dependent variable, inference, qualitative data, quantitative data, measurement, control, experiment, replication, repeated trials, methods, procedure
- **Content related**—physics, force, motion, seed dispersal, plant adaptations

OUTLINE OF WORKSHOP:

We will use slides, demonstrations, and student volunteers in the first half of the workshop to acquaint students with science as a discipline and the methods used by scientists to learn about the world. After stressing the SAFE rules that we will have for the year, students will view a slide program to learn about two SREL scientists who use the scientific method to study “extremophiles.” Extremophiles are organisms (usually bacteria or archaea) that can live in very extreme environments where scientists used to think conditions were too harsh to support life. The slides and the large science poster in the lab will be used to teach some of the terms that are commonly used to describe the scientific method, such as observation, hypothesis, prediction, and experiment.

This will be followed by a class activity where the instructors and class teacher demonstrate how the scientific method can be used to conduct a helicopter flight experiment. We will provide several helicopters of a basic design that vary in blade characteristics, the person who flies them, and the amount of extra weight added. We will point out that helicopter design in some ways mimics the design of some plant seeds. Helicopters will be flown to convey ideas about observing, repeated trials in experiments, and the nature of variables. We will emphasize that without preliminary observations it is impossible to come up with questions.

Groups of four students, working in pairs, will then conduct their own helicopter experiment. We will explain the tasks that each student will be expected to perform, including data recording and measuring, and assist kids in making the helicopters. Students will then conduct the experiment as detailed by the instructors. Once all groups have conducted the experiment we will all gather for a “science seminar” to compare the results and demonstrate how data can be analyzed. We will reiterate the concepts of variation, repeated trials, control, hypothesis—all parts of the scientific method.

SOUTH CAROLINA STANDARDS COVERED:

Sci	Life Sci	Ecosystems	Functions and roles of organisms/niche concept
Sci	Phy Sci	Mixtures and solutions	motions and forces--points of reference, speed
Sci	Inquiry	Process skills	observe, classify, measure, communicate, infer, predict, hypothesize
Sci	Inquiry	Inquiry skills	Plan and conduct simple investigations
Math	Alg-S1	Understand patterns, relations, and functions	Describe, extend, and make generalizations about geometric and numeric patterns
Math	Alg-S1	Understand patterns, relations, and functions	Represent and analyze functions, using words, tables, and graphs
Math	Alg-S2	Represent and analyze mathematical structures	Use variables
Math	Alg-S2	Represent and analyze mathematical structures	Use equations
Math	Alg-S3	Use models to represent and understand quantitative relationships	
Math	Alg-S4	Analyze change	How one variable affects another

SUGGESTED FOLLOW-UP ACTIVITIES:

Science and Math

- **Follow up sheet**—Do the science follow-up sheet on Activity 1 (the scientific method), including analysis of helicopter experiment.
- **Poster**—A poster is a large piece of cardstock that provides information on a topic. Make a science poster for your classroom on plants that use helicopter-like seeds for dispersal.

Language Arts

- **Research (Reading)**—Go to the library and check out a book that will expand on your knowledge on the scientific method, helicopters, or plant seeds. Read the book, and then write a book report or do an oral presentation for your class.
- **Log or Journal (Writing)**—A log or journal is a written record of events or observations. They can be made daily, weekly, or monthly. Keep a log or journal about observations you make in nature.
- **Limerick (Writing)**—A limerick is a humorous verse of five lines. The first and second lines rhyme with the fifth line. The shorter third and fourth lines also rhyme. Write a limerick about the “Scientific Methods” workshop. **Example:** In the science lab surrounded by helicopters/I imagined those ancient velociraptors./You know if dinos had rotors/Or even good motors/They might not have needed such choppers.
- **Flashcards (Vocabulary)**—Make vocabulary flashcards from the Activity 1 definitions sheet and spend 10 minutes every day studying your cards.

Technology

- **Internet Research**—Use the Internet to do further research on red maple trees and their seeds.

Physical Education

- **Game**—Have students use the bald eagle model of planes (or balls if easier) in an experiment to study the effect of different throwing methods (the independent variables) on flight distance, hang time, or accuracy (dependent variables).

Art

- **Mobile**—A mobile is a hanging or standing construction or sculpture of balanced moveable parts. It is sometimes made of different types of materials such as wood, metal, and paper. Create a mobile to hang in your classroom made of models of animals (birds and insects) and plant seeds that have different designs for flight.
- **Collage**—A collage is an organized collection of images that represent a single idea. Make a collage about helicopters and some plants and animals that use helicopter-like flight to maneuver through the air. Collect your pictures from old magazines and news papers and glue them onto poster board. Give your collage a catchy title!