GEMS Kit Descriptions

Acid Rain

Written by Colin Hocking, Jacqueline Barber, and Jan Coonrod

This stimulating unit fosters scientific inquiry and critical thinking skills as it harnesses the curiosity, agility, and determination of student minds to study the troubling environmental issue of acid rain. Students learn about acids, bases, and the pH scale; make "fake lakes" and determine how their pH changes after an acid rainstorm; present a play on the effects of acid rain on aquatic life; determine the effect of various dilutions of acid on seed germination; and hold a town meeting to discuss possible solutions to the problem of acid rain. A "startling statements" game challenges students' preconceptions and prompts investigation. *Grades 6–8*

Crime Lab Chemistry: Solving Mysteries with Chromatography

Written by Jacqueline Barber and Kevin Beals with Carolyn Willard

This all new, updated version of the classic GEMS best seller has been significantly enhanced, with new sessions and added background for the teacher. In this unit's prime scenario, pegging the pen used to write a ransom note comes down to chromatography, a technique for separating mixtures into their (telling) component parts. Poirot never had it this good. This New GEMS rewrite starts with the classic sessions from the original guide: Challenged to determine which of several black pens was used to write a ransom note, student-detectives explore the concepts of solubility, pigments, and separation of mixtures as they use chromatography to ferret out the culprit. New sessions provide multiple opportunities for students to visualize the molecular nature and behavior of matter, as they create and revise models and consider the advantages and limitations of models. Ink is one of many substances for which chromatography is used in science; the separation of blood and other constituents has become invaluable in real-world forensic science, and students' fascination with detective work makes a terrific springboard for further discussion. Several mystery scenarios are possible, using nefarious characters drawn from any context you like; many teachers have cast themselves or the school principal as suspects! Time: Five 35- to 45-minute sessions plus follow-up sessions. *Grades 4–8*

Global Warming & the Greenhouse Effect

Written by Colin Hocking, Cary I. Sneider, John Erickson, and Richard Golden

The application of solid science to real-life conditions—and the urgency of this resolvable environmental problem—make this GEMS unit invaluable to teachers of young people whose understanding of global warming may affect their lives and those of their children. Students explore this powerful environmental topic in a wide variety of formats, from hands-on science activities and experiments to a simulation game, analysis of articles, a story about an island threatened by rising sea levels, and a world conference on global warming. This GEMS guide has two major aims: to present the scientific theories and evidence behind the phenomenon of global warming, and to help students see environmental problems from different points of view—from those of a remote, developing community on an island in the Pacific to those of people who work in the lumber and auto manufacturing industries. Like the GEMS unit Acid Rain, this guide seeks to provide students with a sense of empowerment when facing complex environmental issues and to develop the scientific skills with which to understand and contribute. Extensive background for the teacher is provided. Time: Eight or more 45- to 60-minute sessions. *Grades 7–8*

Ocean Currents

Written by Catherine Halversen, Kevin Beals, Craig Strang

What causes ocean currents? What impact do they have on Earth's environment? How have they influenced human history? Students gain fascinating insights into our ocean planet through these innovative activities. They learn how wind, temperature, salinity, and density set water into motion, and they make an "in-depth" investigation of the key physical science concept of density. They model how pollution dumped in one location can spread throughout the ocean. Learning is placed in a real-world context as students predict and analyze routes taken by shipwrecked sailors, the 1990 Nike shoe spill, the raft Kon Tiki, and other voyages. In "Message in a Bottle," students create stories to show what they've learned over the course of the unit. *Marine Science Activities for Grades 5–8*

Plate Tectonics: The Way the Earth Works

Written by Kevin Cuff with Ian Carmichael and Carolyn Willard

The theory of plate tectonics represents a revolutionary breakthrough in the earth sciences, providing a coherent model of how the outer surface of the Earth moves and changes. In these activities, students conduct simulated research at key geological sites around the world. They visit Hawaii, California, Iceland, Japan and Nepal, and their investigations range from the bottom of the ocean to the top of Mount Everest. Classroom models of erupting volcanoes, strike-slip faults, rock layers, and sea-floor spreading help reveal the dynamic nature of the Earth's crust. Students record observations, calculations, and conclusions in a geological field notebook. Plate tectonics is a challenging subject that many middle school teachers are required to teach. This new GEMS guide provides clear, step-by-step presentation instructions, concise and accessible background information, built-in assessments, resources, student reading and literature suggestions, and helpful suggestions from teachers who tested the activities in classrooms nationwide. These activities use readily available materials and no special science knowledge or background is required to present them. *Grades 6–8*

Schoolyard Ecology

Written by Katharine Barrett and Carolyn Willard

Whether your schoolyard is an ocean of blacktop or a little slice of nature, this guide uncovers the animal organisms and plants that share recess space with students every day. In this series of outdoor investigations, children work in teams outdoors to sample, record, and analyze information about living organisms and their environment, and then return to the classroom to share their findings and explore ecological, environmental, and life-science concepts. In the course of these activities, students learn biological sampling techniques and develop mapping and related mathematical skills recommended by the National Council of Teachers Mathematics for this grade range. Practicing gentle stewardship, they collect temporary specimens—including ants, spiders, and other often-maligned animals—in "shake boxes" in order to study them as individual and interdependent organisms. There is ample opportunity to relieve students of their fears of certain crawly creatures and to explore why some animals seem to provoke such reactions. Based on their observations and findings, students select small areas as sample study sites, and summarize by writing about these favorite locations in the closing activity. This guide is designed to spark student curiosity about the patterns and interactions in nature, beginning with their most immediate outdoor environment—the schoolyard. *Grades 3–6*