Overview

Chemistry is the study of matter, its structure and the changes or transformations that take place in it. Understanding the composition of substances gives us knowledge of how things go together and can be taken apart. Learning these changes is important because changes in matter can be controlled to produce new materials and changes can be used to give off electricity. In this module students are introduced to the fundamental concepts of chemistry.

In the first activity, students learn about the composition of substances by making mixtures of gravel and salt and water, and diatomaceous earth and water. They then use screens to separate the mixtures and engineer a way to separate a mixture of three dry materials.

In the second activity students are introduced to the concept of saturation. The students add solid material to water until the solutions are saturated. Adding two different materials, one to each of two volumes of water, the students compare the amount it takes to saturate the solution.

In the third activity, students work with salt and Kool-Aid to learn about the concept of solution concentration.

In the fourth and final activity, students learn about changes in substances by mixing solutions to observe chemical reactions.

This FOSS module provides students with new experiences to:

- Gain experience with the concepts of mixture and solution
- Gain experience with the concepts of concentration and saturation
- Gain experience with the concept of chemical reaction
- Apply an operational definition to determine the relative concentrations of solutions
- Use group problem-solving techniques to plan investigations

Scientific Processes

- Measuring solids and liquids to make solutions
- Observing behavior of solid materials in water
- Comparing weight of a mixture to the weight of its parts
- Organizing and communicating observations
- Relating added weight of a solution to dissolved material in the saturated solution
- Relating the concentration of a solution to the amount of solid material dissolved in a volume of water
- Determining all possible pairs of reactants involving a set of three chemicals
- Comparing properties of precipitates to determine their identities
- Determining relative concentrations of solutions

Inquiry Extensions

- Make more mixtures and solutions using a number of substances:
  "I wonder if I mix ...?"
- Make a mixture of water and cornstarch and explore its properties:
  "I notice this mixture is different than..., I wonder why?"
- Make saturated solutions using baking soda, alum, Epsom salts, or sugar:
  "I wonder how these solutions will be similar to or different than each other?"
- Grow crystals using supersaturated solutions:
  "I wonder why the shapes of the crystals are different?"
- Explore the variables of temperature and time in the solubility of materials:
  "Will this material dissolve if I stir longer? What did I notice and what do I think?"
Analyze reactions of liquid solutions:
"When I do this..., this happens, but when I do that..., that happens. I wonder what will happen if...?"

Curriculum Integration

- Use vocabulary words in games to reinforce definitions.
- Invent and write a recipe for gorp.
- Research diatomaceous earth and sodium chloride.
- Find out how much salt or citric acid it takes to saturate different volumes of water. Graph the results.
- Teach ratios using the concentration activity.
- Determine the most economical powdered drink from a variety of products.
- Describe a specific chemical reaction and write those observations in a sequential manner.
- Invent a product from one of the reactions and design an ad campaign for the product.

Assessments

FOSS assessment is organized into three categories:

- **Content knowledge**: the facts and scientific concepts of the module
- **Conducting Investigations**: the skills needed for successful inquiry
- **Building Explanations**: the communication of ideas and evidence to support student learning

*Formative* and *summative* assessment strategies help the teacher understand what the students have learned and can do. Throughout the investigations, teachers use formative assessment strategies to inform their instruction, and the end-of-module and portfolio summative assessments provide evaluate information.

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