Lesson: Mathematical Mixing
5th Grade
STANDARDS: California

1.0 Students understand and compute the volumes and areas of simple objects:

1.3 Understand the concept of volume and use the appropriate units in common measuring systems (i.e., cubic centimeter [cm^3], cubic meter [m^3], cubic inch [in^3], cubic yard [yd^3]) to compute the volume of rectangular solids.

1.4 Differentiate between, and use appropriate units of measures for, two-and three-dimensional objects (i.e., find the perimeter, area, volume).

1.0 Students make decisions about how to approach problems:

1.1 Analyze problems by identifying relationships, distinguishing relevant from irrelevant information, sequencing and prioritizing information, and observing patterns.

1.2 Determine when and how to break a problem into simpler parts.

2.0 Students use strategies, skills, and concepts in finding solutions:

2.1 Use estimation to verify the reasonableness of calculated results.

2.2 Apply strategies and results from simpler problems to more complex problems.

2.3 Use a variety of methods, such as words, numbers, symbols, charts, graphs, tables, diagrams, and models, to explain mathematical reasoning.

2.4 Express the solution clearly and logically by using the appropriate mathematical notation and terms and clear language; support solutions with evidence in both verbal and symbolic work.

2.5 Indicate the relative advantages of exact and approximate solutions to problems and give answers to a specified degree of accuracy.

2.6 Make precise calculations and check the validity of the results from the context of the problem.

3.0 Students move beyond a particular problem by generalizing to other situations:

3.1 Evaluate the reasonableness of the solution in the context of the original situation.

3.2 Note the method of deriving the solution and demonstrate a conceptual understanding of the derivation by solving similar problems.

3.3 Develop generalizations of the results obtained and apply them in other circumstances.

6. Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other three strands, students should develop their own questions and perform investigations. Students will:
    a. Classify objects (e.g., rocks, plants, leaves) in accordance with appropriate criteria.
    b. Develop a testable question.
    c. Plan and conduct a simple investigation based on a student-developed question and write instructions others can follow to carry out the procedure.
    d. Identify the dependent and controlled variables in an investigation.
    e. Identify a single independent variable in a scientific investigation and explain how this variable can be used to collect information to answer a question about the results of the experiment.
    f. Select appropriate tools (e.g., thermometers, meter sticks, balances, and graduated cylinders) and make quantitative observations.
    g. Record data by using appropriate graphic representations (including charts, graphs, and labeled diagrams) and make inferences based on those data.
    h. Draw conclusions from scientific evidence and indicate whether further information is needed to support a specific conclusion.
    i. Write a report of an investigation that includes conducting tests, collecting data or examining evidence, and drawing conclusions.

Using Mathematical Tools to Investigate Scientific Evidence

***Motivation*:** Ask students to point to as many different colors as they can around the room. How were these colors made? How do you classify colors?

Group Activity: Watch *Creating Color* in *My Studio* in *Painting with Elizabeth Murray*. How does Murray create color? Do you think you could create the exact same color as her? What could you do to make it easier to reproduce the color? How does she describe color? Keep in mind that she does not just use visual images to describe it.

Independent Activity: Have students write procedures for creating colors using mathematical terms and measurements. Students should include the measuring tools, amounts, and names of the colors they create. Have students make at least four colors. Then, have them trade procedures and see if they can make the same colors as their classmates. Have students comment on each others' procedures and critique them.

Reflection**:** Did the colors come out the same when you swapped? Why or why not? What tools were most appropriate for measuring and why? How did you distinguish between types of colors?