Interdisciplinary Unit

1. Descriptive Data

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Class: Science, Art, Mathematics Date: October 27, 2009 Grade Level: 5th

Lesson Topic: Properties of Matter Time duration: 150 minutes (5 class periods)

2. Goals and Objectives of Unit

Instructional Goals

Science State Goal 12: Understand the fundamental concepts, principles and interconnections of the life, physical and earth/space sciences.

Mathematics State Goal 7: Estimate, make and use measurements of objects, quantities and relationships and determine acceptable levels of accuracy.

Fine Arts State Goal 26: Through creating and performing, understand how works of art are produced.

Objectives

Cognitive:

a. Students will be able to recognize that different materials are made by physically combining substances and different objects can be made by combining different materials. (comprehension)
b. Students will be able to relate length, width, height, area, mass, and volume. (analysis)

Affective:

a. Students will be able to perform, collect, share and record information for a scientific investigation. (characterization)
b. Students will be able to participate in a class discussion related to mass, matter and their properties. (responding)

Psychomotor:

a. Students will be able to combine a variety of measurements to compare and contrast the physical properties of matter. (naturalization)

b. Students will be able to produce origami frogs and relate them to the changes of matter. (mechanism)

3. Rationale

State Science Standards

12.C.3a Explain interactions of energy with matter including changes of state and conservation of mass and energy.

12.C.3b Model and describe the chemical and physical characteristics of matter (e.g., atoms, molecules, elements, compounds, mixtures).

State Math Standards

7.A.3b Apply the concepts and attributes of length, capacity, weight/mass, perimeter, area, volume, time, temperature and angle measures in practical situations.

State Fine Arts Standards

26.B.3d Demonstrate knowledge and skills to create 2- and 3-dimensional works and time arts (e.g., film, animation, video) that are realistic, abstract, functional and decorative.

4. Procedure

Content:

Matter can be measured using balances, rulers and graduated cylinders. These tools help us to determine such physical properties as length or dimensions, mass, volume and density. The density of matter can be compared with water, creating mixtures and solutions. The individual substances keep their own properties when they are combined physically. When substances are combined chemically, their properties change and new substances are produced. We will give students a variety of objects – solids, liquids and gases – and they will be given the opportunity to use manipulatives to practice measuring. Students will integrate their knowledge of mathematics into their creation of original origami figures.

Activity 1: Introduction (10 minutes)

Show students two objects that have the same dimensions, but different masses (medicine ball and basketball) and ask students: “Do objects that are the same size always have the same mass?”

“If you are not sure which object is heavier, how can you take the mass of it?”

Students give possible answers.
Have students calculate what they would weigh on the Moon by dividing their Earth weight by six.

Activity 2: (30 minutes)
Students work in small groups to explore what properties cause liquids to form layers.
Students pour liquids of differing densities together and experiment with paper clips, Styrofoam, and rubber bands to see what will float or sink.

Activity 3: (20 minutes)
Students make origami frogs to discover the difference between physical and chemical changes.

Activity 4: (20 minutes)

Students add vinegar to two cups: one containing sugar, the other containing baking soda.
Students observe and record what happens. This will emphasize which is a chemical or physical change.

Activity 5: (30 minutes)

Students will work in small groups to measure everyday items in order to find mass and volume.
Students will use rulers to help measure area, length, width, height and volume; and will use pan balances to measure mass. They will use a combination of rulers and pan balances to determine density.

Closure: (30 minutes)

Students work in small groups to discover how the properties of glue can be changed.
Students make a new substance ("slime") out of borax, water, food coloring, and glue.

5. Assignments and Reminders

a. Students will go home and find objects in order to determine dimensions, mass, volume and density.
b. Students will be given "foldables" (foldable shapes), which they will take home, color, and assemble. They will be measured during class and used for an activity.

c. Students will pick an element from the Periodic Table and will create “Element-mobiles.”

6. Materials and Equipment Needed

Class set of rulers, water, pan balance, borax, corn oil, corn syrup, dish detergent, food coloring, medicine cups, plastic cups, foam peanuts, paper clips, rubber bands, basketball, plastic spoons, medicine ball, origami paper, foldables, Element-mobile rubric, hangers, glue, sugar, baking soda, vinegar, masking tape, safety goggles, graduated cylinders, book for measuring, portable Periodic Tables, calculators, and research from ChemKid.com.

7. Assessment, Reflection, and Revision

Formative:

- Chapter test
- Element project rubric
- Experiment reflection sheets
- Guided inquiry sheets
- Origami checklist

Summative:

- Review questions
- Teacher observations of student performance