A Quiet Garden

Overview

In this unit, students will pose questions, develop hypotheses, make predictions, create testing procedures, analyze data, and modify their initial hypotheses in a quest to design a garden pond for a peaceful courtyard in the high school.

The task is plausible, in that the courtyard in question does exist, and people have suggested that a pond or fountain be added. Practically, however I the pond will not be built in the near future, as the courtyard is used in the morning to play hacky-sack! On the other hand, the experience of scientifically investigating and designing a physical structure is both meaningful and relevant.

The unit begins with an essential question, one that runs through the entire earth science curriculum- "What is more constant than change?" Students are expected to view the earth and the universe as a dynamic system after studying earth processes.

Students then consider the question "What causes rocks at the earth's surface to change?" The discussion flows into the concept of weathering and the agents that bring it about. To put a practical and proximal twist to the concepts, students are directed to design a garden pond for a nearby
courtyard, using the scientific method to determine which commonly available rock materials would be suitable as coping stones and decorations.

The bulk of the unit then focuses on the scientific method and on the exploration of the weathering process in the pond area and elsewhere.

Essential Question:
What is more constant than change?

Guiding Questions:

What causes rocks at Earth's surface to change?

What factors will affect the choice of materials for the garden? (materials such as gravel, stones, fountain, etc.)

What properties are desirable in the materials?

How will the environment affect the chosen materials?

Which of the rocks commonly found in the garden center would be most suitable for use in the garden?

The Environmental Defense Club's courtyard is a quiet place to sit and think. Several students have suggested that we add a garden pool with trickling water to add a touch of serenity found in many Japanese gardens.

The club's budget is very small. They already have a solar pump and black plastic pond liner, donated by the P. T .S.O. They have raised $150 for the other materials. You are asked to design a pond for the courtyard that is esthetically attractive, non-toxic to fish and plants, durable, natural looking, and within their budget.

Your job is to use the scientific method to determine what type of natural material to use with and around the liner. Then you need to design the pond using the results from your experiments and information from reading about garden ponds.

The report you submit must include the following:

1. Report on each experiment carried out, including hypothesis, prediction, materials, procedure, observations, and conclusions.

2. Summary of your experimental results as they relate to your pond design. (The results may tell you what not to use or what you should use.)

3. Design (drawing) with a description of the area and an itemized cost estimate to complete your project design.

Module Plan

Module 4	A Practical Application of The Scientific Method: Studying the factors that affect the type and rate of weathering
Learning Opportunities	The Scientific Method √ Review the scientific method and develop rubric for a good experiment; use an example to go through the steps of the scientific method. √ As a group students, observe weathered rocks and develop the hypothesis: ROCKS WEATHER WHEN THEY ARE EXPOSED TO THE ATMOSPHERE, HYDROSPHERE, AND BIOSPHERE. √ As a class or in lab groups make predictions, and have students design experiments to investigate the factors that affect the type and rate of weathering (surface area, mineral composition, temperature, duration of weathering, etc.). An example: *"If rocks weather by exposure to the hydrosphere, then the exterior of rocks will be more weathered than the interiors."* √ Carry out experiments, gather data, devise report sheets, create graphic presentations, write lab reports • Reflection √ Use rubric to evaluate their experiments. √ Seek connections between their experiments and the garden design. √ Class discussion: "What have we learned?" share results, problems, and formulate new questions.
Assessments	experiment designs (predictions, materials lists, procedures) report sheet and graph layouts observations recorded on report sheets with graphs of data written report reflection
N.Y.S. Standards/ Outcomes	MST #1, 4, ELA #1, 3, CDOS # 3 a, Reflection
Program Modification Curriculum	Unit 4: A 1, 2, 4, 5 [in addition, there is an opportunity at this time to review Unit 2: Rocks and Minerals]

Module Plan

Module 7	Final Garden Plan and Evaluation
Learning Opportunities	• Garden Design √ Students use U.S.D.A. Hardiness Zone map to determine local conditions and general pattern of hardiness zones that are related to climate. √ Students read about garden design and answer questions. √ Students sketch design. √ Students calculate size, surface area, and volume of pond. √ Students determine the equipment and plant requirements for their design. √ Students describe their plans, summarize their experiments, and estimate the cost for implementing their plans. √ Students self-evaluate plans using checklist. • Experiment Evaluation √ Journal writing focused on 3 questions: What did you learn that applies to the garden? What other questions do you have? How realistic were your experiments? √ Journal writing focused on experimental procedure. • Unit Summary √ Draw a concept map on weathering. Compare it to the one you drew before the unit. What does this map show about what you have learned? √ Students write a post-activity journal entry on the essential question, "What is more constant than change?" citing specific things they have learned in this unit to support their answer.
Assessments	journal writing concept map
N.Y.S. Standard / Outcomes	MST #1, MST #4, MST #7, ELA # 1, CDOS #3 a, Reflection
Program Modification	Unit 4: A 1-5, Unit 7: C 1, 4, 5