

MESA: Mathematics, Engineering, Science Achievements

ATS Water Treatment

Subject Area: Math and Science

Grade Levels: 6th

Date: Fall 2013

Lesson Overview

Materials Included in this Lesson

- Worksheets
- Experiment Prediction/results sheet

Other Materials for this Lesson

- Power Point or SMART Lesson
- Experiment Materials

Skills the Student will Learn

- Predict and perform experiments
- How to build a filtration system
- Practice calculations with decimals
- Find area of rectangles and composite shapes.

Student Deliverables

- Experiment prediction and recording sheet
- Water filtration systems
- 2x Footprint of filtration system
- Calculations Worksheet

Length of Lesson: 5 Days

Activity Day One

Students will conduct an experiment on erosion. Using 3 water bottles sliced in half filled with soil: 1 will have just soil, 1 will have a ground cover such as hay, 1 will have plants w/roots. The water will be poured and capture the run off. Students will see the general effect of storm water run off in construction zones and the need to monitor it especially when near fresh water sources.

Activity Day Two

Introduce ATS: Active Treatment Systems, their mission, and the work that they do: types of projects, why it is important what they do. Talk about different ways to filter water, what can be used, why stronger filtration systems are necessary. What items might you think to use to filter water. Put into groups and brain storm ideas

Activity Day Three

Build a filtration system and filter dirty water using ideas from day 2. If time show experiment of what different polymers such as chitosan will do.

Activity Day Four

In teams, create 2 blue print of a filtration system and calculate the area foot print needed for each system

Activity Day Five

Finish blue prints and work on real life problems worksheet. Ex. Calculate cost of different treatment systems for 1 month, 4 months, 6 months and a year.

Enrichment Suggestions

Delve deeper into the math. Calculate the cost of polymers for a project based on gallons per second. Calculate entire costs for projects. Create in estimate bid for a water treatment job based on rough numbers. Create a 3 dimensional model of the different water treatment system that can be built.

Student Resources

Students will have notes taken from power point and an information packet for the entire project. They will also be in cooperative learning groups with clear expectations.

Common Core Academic Standards

Ratios and Proportional Relationships

6.RP 2. Understand the concept of a unit rate a/b associated with a ratio $a:b$ with $b \neq 0$, and use rate language in the context of a ratio relationship.

6.RP 3. Use ratio and rate reasoning to solve real-world and mathematical problems

The Number System 6.NS

6.NS 3. Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation.

Geometry 6.G

6.G 1. Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems.

Reading Standards for Literacy in Science and Technical Subjects 6-12

- 9. Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.

CTE Pathway Standards

Building and Construction Trades

Knowledge and Performance Anchor Standards

- 5.0 Problem solving and Critical Thinking
- 5.1 Identify and ask significant questions that clarify various points of view to solve problems.
- 5.2 Solve predictable and unpredictable work-related problems using various types of reasoning (inductive and deductive) as appropriate.
- 5.3 Use systems thinking to analyze how various components interact with each other to produce outcomes in a complex work environment.

Pathway Standards

- B1.1 Understand the importance of knowing a site's water table and its effect on site preparation.
- B1.5 Understand the importance and impact of environmental concerns and regulations in relation to building site preparations.
- B3.2 Distinguish soil types and land cover as related to runoff, precipitation, drainage and seepage.
- B3.2 Recognize non-point-source (NPS) pollution, erosion, and erosion control methods.
- B3.3 List sources of NPS and their possible impact related to water quality.
- B3.4 Prepare site plan and grading and drainage plan.
- B4.0 Demonstrate understanding of water and wastewater systems.
- B4.2 Describe drinking-water sources, contaminants, disposal options, regulations, and basic treatment methods.
- B4.3 Perform basic calculations for sizing pipe and pumps for the movement of water
- *B4.4 Define gravity and forced systems.
- *B8.3 Estimate the cost of supplies and materials for an engineering and heavy construction project. (Water Treatment System)
- B8.6 Demonstrate understanding of storm drainage, retention ponds, wastewater treatment.

Lesson Plan Relevance To Externship

ATS (Active Treatment Systems) primarily treats storm water and ground water from construction sites. The students will become aware of erosion especially in a construction zone. They will learn how to treat dirty water and that will be able to then be discharged into the environment. Students also will calculate and create a system footprint and costs for a set amount of time. The Lesson Plan mirrors a part of what I experienced during my time with ATS.

Rubric for the ATS Water Project

Student Deliverables	4 Exceeds Expectations	3 Meets Expectations	2 Approaches Expectations	1 Fails to meet Expectations
Experiment 1 Erosion prediction and results sheet	Completes all aspects of experiment and analyzes the results	Completes all aspects of experiment	Completes 1 aspect of experiment	Does not complete any part of experiment
Notebook	All key points are covered along with a written analysis of information	All key points covered	Some main points but missing 1 or 2 key points	No Notes Taken
Water Filtration System	Perfect Water PH	Able to create water with a clear NTU (Turbidity)	Water is clearing but still very cloudy	No change in the water Turbidity
Worksheet	10/10	8 or 9 /10	6 or 7/10	0 – 5 /10