Unit Title: **Water Treatment on a Small Scale**  Grade Levels: **Middle/High**

Topic/Subject Areas: **Environmental Science/Mathematics**

Key Words: **Sewage, Effluent, Influent, Density, Flow, Microbes**

Designed By: **Lee, Tom, Rich**  Time Frame: **2 weeks**

School District: **Bulloch County**  School: **Statesboro High School**

**Brief Summary of Unit (including curricular context and unit goals):**

**Things in the Universe behave differently based upon size, especially when approaching the nano sized particles. In this unit students will be informed on how modern day water purification systems occur within developed nations, in Statesboro, Ga. Students will learn how to properly conduct water quality analysis and use base line data to analyze information to determine appropriate water quality for a balanced ecosystem. Using simulation models students will develop a water treatment system designed to meet the needs of a growing city and future use to use this same methods in developing country.**

**Unit design status:**

- [ ] Completed template pages – stages 1, 2, 3
- [ ] Completed blueprint for each performance task
- [ ] Completed rubrics
- [ ] Directions to students and teacher
- [ ] Materials and resources listed
- [ ] Suggested accommodations
- [ ] Suggested extensions

Status:

- [ ] Initial draft (date: _________)
- [ ] Revised draft (date: _________)
- [ ] Peer Reviewed
- [ ] Content Reviewed
- [ ] Field Tested
- [ ] Validated
- [ ] Anchored
Stage 1 – Identify Desired Results

Established Goals:

(1) SEV5 Students will recognize that human beings are part of the global ecosystem and will evaluate the effects of human activities and technology on ecosystems
   (a) Describe factors affecting population growth of all organisms, including humans. Relate these to factors affecting growth rates and carrying capacity of the environment.
   (b) Describe the effects of population growth, demographic transitions, cultural differences, emergent diseases, etc. on societal stability.
   (c) Explain how human activities affect global and local sustainability
   (d) Describe the actual and potential effects of habitat destruction, erosion, and depletion of soil fertility associated with human activities.
   (e) Describe the effects and potential implications of pollution and resources depletion on the environment at the local and global levels (e.g. and water pollution, solid waste disposal, depletion of the stratospheric ozone, global warming, and land uses)
   (f) Describe how political, legal, social, and economic decisions may affect global and local ecosystems.

(2) SEV 2 Students will demonstrate an understanding that the Earth is one interconnected systems.
   (a) Describe how the abiotic components (water, air, and energy) affect the biosphere

What understandings are desired?

*Students will understand that:*

(1) The world is interconnected, and their individual actions have the potential to positively or negatively affect their environment.
(2) Nanotechnology involves developing explanations for how and why things works on a smaller scale as well as solve problems and answer questions of societal interest and need.
What essential questions will be considered?

(1) How does the clarity of water determine the quality of water?
(2) How does the size of filtration material have an effect on water purification?
(3) Now that you simulated a developed water filtration device, how would this be used, or impact, in the public health developing nations

What key knowledge and skills will students acquire as a result of this unit?

Students will know…
(1) The importance of water quality in a society
(2) How certain materials interact with water filtration

Students will be able to…
(1) How test for water quality
(2) How to analyze samples of various materials (macro through nano technology) for effective water treatment
(3) (Create and conduct a simulation regarding water filtration)
Stage 2 – Determine acceptable Evidence

What evidence will show that students understand?

Performance Tasks* (Summary in GRASPS form):
(1) Build a model of water filtration based upon a variety of given materials
(2) Test water quality with provided kit (Certify with River Keepers)
(3) Make a simulated city water treatment facility
(4) Using statistics from water quality sample students will create a presentation on the effectiveness of different filtration systems

*Complete a Performance Tasks Blueprint for each task (next page)

Other Evidence (quizzes, tests, prompts, observations, dialogues, work samples)

(1) Test
(2) User Rubric (field trip)
(3) Work samples
(4) Computer simulation
(5) Teacher observation

Student Self-Assessment and Reflection:

(1) Reflection of field and laboratory exercises in your lab notebooks
(2) Rubric for guest speaker and field trip
(3) Peer observation
(4) Final SIMULTAED project
(5) Final filtration device
Performance Task Blueprint

What understandings and goals will be assessed through this task?

- Our dependence on clean water resources
- Processes that involve cleaning water
- Use of scale to size particles

- Know how to test for containments in water
- Justify new and merging water filtration devices for developing nations

What criteria are implied in the standards and understandings regardless of the task specifics? What qualities must student work demonstrate to signify that standards were met?

- Unit size to scale
- Water filtration/purification
- Global Health Issues/Public Health

- Accurate use of laboratory equipment
- Precise use of scientific terms
- Correct annotation of data generated
- Properly constructed lab reports
- Successful completion of water

Through what authentic performance task will students demonstrate understanding?

1. Building a simulation, creating or developing, of a water filtration systems
2. Building a scale model, prototype, of a water filtration device
3. Develop a critic, log book, journal of a real-life experience from the observations students made from visiting a local water treatment facility

What student products and performances will provide evidence of desired understanding?

- Simulation of water filtration system
- Scale model of water filtration device
- Document evaluation of real life experiences made from site visitation

By what criteria will student products and performances be evaluated?

- Accuracy of reported data
- Efficiency of simulation
- Defensibility of written documentation from field visit

- Reflection in log book
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