LESSON TITLE	Saltwater Intrusion				
SUBJECT (S):	Biology, Earth Science, Environmental, Chemistry				
GRADE LEVEL:	6-12	**AUTHOR:**	Becky McKinney, MS		
TYPE OF LESSON (activity, lab, project…)	Activity			**DAY(S):**	4+ days

OBJECTIVE

Students will both model how wells function and model and explain what causes saltwater intrusion. They will then design and present a solution for saltwater intrusion.

NGSS/CC STANDARDS

NGSS
Science and Engineering: 1, 2, 3, 4, 6, 7, 8
Crosscutting Concepts: 2, 3, 4, 6, 7
Core Ideas: ETS1, LS2, ESS3

PERFORMANCE EXPECTATIONS
Earth and Space Science: HS-ESS3-1, HS-ESS3-4, MS-ESS3-3, MS-ESS3-4
Life Science: HS-LS2-7
Engineering: HS-ETS1-1, HS-ETS1-2, MS-ETS1-1, MS-ETS1-2

CC MATH
HS – MP.2; MS – MP.2

CC ELA/LITERACY
HS – WHST.9-12.9, WHST.11-12.8, WHST.9-12.7, SL.11-12.5; MS - WHST.6-8.9, WHST.8-8.7, WHST.6-8.8, SL.8.1, SL.8.5

ASSESSMENT(S) & GRADING/RUBRIC

Rubric for grading project is below.

SUBJECT AREA(S):

Biology, Ecology, Earth Science, Chemistry, Environmental Science

TEXTS/MATERIALS/TECHNOLOGY/AUDIO-VIDEO/OTHER RESOURCES:

DAY 1

- **For Well Model Setup**: small plastic container, sand, small pipe (PVC) or tube, water, food coloring
- **PER GROUP**: 1 100 mL beaker with blue water (food coloring), 1 100 mL empty beaker, pipette, Well Model
- **Teacher**: PowerPoint, digital projector for introduction

DAY 2-3: Computer Lab

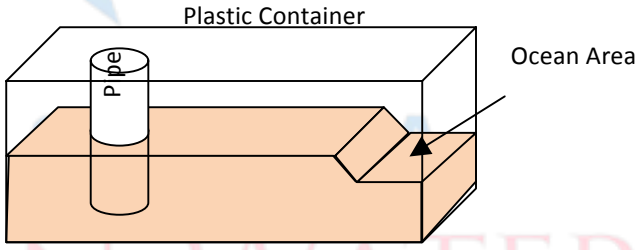
INSTRUCTIONAL STRATEGIES/PROCEDURES/GROUPING:

DAY 1: Using the PowerPoint, teacher will facilitate lesson using the PowerPoint presentation, allowing students to draw then showing the information.
During Step 7 have students form into groups (4/group). The teacher will need to have preassembled their containers. The teacher can have students assemble their containers, but this will take more class time (see image below).

How to assemble containers:

1. Place the pipe upright toward the back of the container such that it is touching the bottom of the container.
2. Pour sand around the pipe but be careful not to pour sand into the pipe.
3. Moisten the sand. Water should enter into the pipe which now acts like a well.
4. Remove any excess standing water from the container, but **leave the water in the pipe**.
5. Create a slope at the opposite end from the pipe. This will serve as the OCEAN area.

   *** Before students start, tell students that they should add a small amount of blue water at a time so that they don't flood the container. They must also only add blue water in the ocean area.***



After students run the model, have them start the project.

If you DO want your students to do the Saltwater Intrusion Solution project, then by the end of Day 1, introduce students to their project. They should continue to work in the same group. Make the rubric available so that they can see how they will be graded.

If you DO NOT want to have your students do the project, you can have students read and summarize articles about saltwater intrusion OR you can have students watch this video about saltwater intrusion: https://www.youtube.com/watch?v=k4XcBx7OT3Y

Days 2-3: It is up to the teacher to determine how much class time you wish to give students to research and design their 5 minute presentation. Students will work in teams to design a presentation for their solution to saltwater intrusion.

Day 4: Allow students to present to the class. You can have the class take notes on each presentation and turn in these notes if you feel the need. To make voting easy, you can have

kids simply close their eyes and raise their hands to vote for the best two projects. This will force them to vote for another group, not just their own. It is UP TO YOU if you want the "winning" team to receive any extra points.

You can have teams self assess using the rubric and compare this to your assessment.

SAFETY/SECURITY ISSUES:

N/A

NOTES/REFLECTIONS/EXTENSIONS:

GROUP MEMBERS		
TOPIC	**SCORE (0 to 5)**	**Explanation**
GROUP PRESENCE • Body language & eye contact • Contact with the public • Poise, not slumping/fiddling		
LANGUAGE • Correct usage • Appropriate vocabulary and grammar • Understandable • Spoken loud enough to hear easily		
ORGANIZATION • Logical • Clear objectives with Idea stated • Stayed on task		
SUBJECT MATTER • Clearly knew topic • Did not read from PowerPoint • Competent in material • Able to answer questions		
VISUAL AIDS • Slides are easy to read • Audio, visual, etc. • Handouts or fliers		
OVERALL • Clearly put a lot of effort into project • Very polished • Very interesting/not boring • Excellent communication		

TOTAL POINTS: _____/30