Lesson 4 - Farming

**Problem statement**

Picture this: It’s a beautiful summer day and your family goes to the lake to swim. When you arrive there is a large sign that reads “Lake closed for swimming due to pollution.” While you are bummed out, you overhear a lifeguard stating that he hasn’t seen any salmon either. This gets you thinking about the connection between not being able to swim and the missing salmon.

The health of the environment is at a critical point. The government agency that oversees this, The Environmental Protection Agency (EPA), has lost a big portion of its budget. That means that they are unable to have enough employees to help make sure people are following the laws. Since people are not being held accountable, some people are breaking the laws and causing damage. One piece of the environment that is greatly impacted is the water. Bodies of water, like lakes and rivers, provide homes to many different types of plants and animals. When pollution enters these ecosystems the damage done is difficult to repair.

The Environmental Protection Agency is looking for new ideas to solve the water pollution problem. You will need to convince the EPA that your plan is the right one to solve this problem and save the fish!

**Learning Objectives:**

* I can name two chemicals that affect water quality that can come from farming.
* I can describe what nutrient pollution is.
* I can make a cause and effect connection between humans and water quality based on my knowledge of farming.

**Lesson standards (NGSS, CCSS, CTE):**

**4-ESS-2: Cross Cutting Concept:** Cause and effect relationships are routinely identified and used to explain change.

**4-LS-1 and 4-LS-2 Cross Cutting Concept:** A system can be described in terms of its components and their interactions.

**4-LS-1:** Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.

If relevant to lesson, include:

Soft skills: Critical Thinking and Problem Solving, Communication and Collaboration

Locally and/or personally relevant for students: Compare to local agricultural areas. In Washington the eastern side of the state is largely used for farming and it can impact the rivers that run to the ocean. ----Ask Wade if this is true

Connections to career and educational pathways: water treatment, farming

**Materials:**

-11.5x14 (or large paper) for the students to make diagrams

-Writing materials for diagrams (color if you wish)

-Powerpoint

-Water Quality Science Journals

**Lesson preparation:**

-Gather diagram materials

-Prepare powerpoint

-KLEWS chart

**Time required:** 53 minutes

**Grouping of students for instruction:**

For grouping for the diagram activity, groups can be any size, grouped a way that works best for your classroom

**What is the instruction?**

|  |  |  |
| --- | --- | --- |
| **Time** | **Teacher** | **Student** |
| 5min  10min  5min  5min  3min  5min  10min  10min  5min | Gather students in a way that works for your classroom. Introduce problem statement.  Review the KLEWS chart  Ask the class to brainstorm the ways farming can change the environment. Add ideas to KLEWS chart.  Show the class the picture of the farm.  Ask the kids, how does a farmer help their plants grow?  Possible ideas:  -Water, sun, fertilizer, pesticides  Yes! Fertilizer is something farmers use to help their plants grow. It is like plant food, and helps the plants grow even bigger. Farmers spray or dump it on the soil where their plants are in to help their plants grow.  However, while fertilizer is good for plants, it can cause a lot of harm in the ocean.  Now, farmers do not fertilize the ocean. They do not take their bag of fertilizer and dump it in the ocean. So, how do you think the fertilizer that is in the soil gets into the ocean?  Break the students into groups (of a size or your choosing) and have them draw a diagram of how they think the fertilizer gets from the farm soil to the ocean.  Gather class back together and have them share out their ideas.  Show the class the 2nd diagram that shows how fertilizer gets into the ocean. Explain the following about the diagram:  -When it rains the fertilizer washes off the soil into rivers, streams or storm drains  -The fertilizer goes from the streams and rivers and storm drains into the ocean  Have the class go back and fix their diagrams if necessary so that it shows the fertilizer going into the ocean the right way.  Ask the class, why do you think the fertilizer is bad for the organisms in the ocean? Give kids a bit to brainstorm in groups  Show the class the third diagram of how fertilizer is bad for the ocean.  Explain the following:  -Fertilizer has lots of nutrients, such as something called Nitrogen and phosphorus. These two molecules give plants on the farm lots of  - They also give bacteria lots of energy too  -There are LOTS of bacteria in the ocean, so the bacteria love the fertilizer nutrients. They “eat” the nutrients and make more bacteria because of all of the nutrients in the water.  -Now that there are more bacteria, they are using up lots of the oxygen in the water because there are more of them using it to breathe  -Then more and more bacteria grow, and soon they use up all of the oxygen in the water!!  -Now the the oxygen is gone, all of the bacteria, plants and animals die because they need oxygen to live  -The means that this area of the ocean is now “dead” because nothing can live there without oxygen  Tell the class that the process of fertilizer going to the ocean and creating dead zones is called **nutrient pollution.**  Have the kids add this new information to the ocean part of their diagram. They can make it very similar to the diagram on the board.  Gather class back together and have them share out diagrams, describing the whole process from start to finish.  Give exit ticket.  Take notes on how this could affect lake washington | Listening to problem statement.  Pair, share.  Pair, Share.  Brainstorm ideas, draw a diagram in their groups.  Share out ideas.  Brainstorm and then share out ideas.  Adding to diagram.  Add to diagram.  Share out, listen.  Work on exit ticket. |

**Accommodations:**

* Set up groups ahead of time to support different student learning needs.
* For students with vision needs, arrange for the to sit closer to the presentation or print out copies for personal use.
* Lesson may be broken up into parts if needed.
* Alternative to exit ticket may be used if the classroom has other strategies that work for assessing student growth and learning.

**Extensions:**

**Assessment:**

Exit ticket based on learning objectives: Lesson 4 - Exit Ticket

**References/Resources:**