



Problem Based Learning Template

Created By: Chad Marzec	Topic: Water pollution	Grade Level or Subject: 11-12 Environmental Science
<p>Science Standards: Guiding principles from Ohio Learning Standards for Science (pg 4): Scientific and Engineering Practices:</p> <ol style="list-style-type: none">1. Asking questions (for science) and defining problems (for engineering)2. Developing and using models3. Planning and carrying out investigations4. Analyzing and interpreting data5. Using mathematics and computational thinking6. Constructing explanations (for science) and designing solutions (for engineering)7. Engaging in argument from evidence8. Obtaining, evaluating, and communicating information <p>ENV.ER.3: Water and water pollution</p> <ul style="list-style-type: none">• Potable water and water quality• Point source and non-point source contamination		

Math Standards (optional):

Mathematical practices (page 62 of Ohio Learning Standards for Math):

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.

ELA Standards (optional):

Ohio Learning standards for ELA (pg 10)

1. Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation.
2. Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information, while avoiding plagiarism.

Additional Standards (Social Studies, Art, Physical Education) optional:

PBL Summary:

This unit starts off with a presentation from the Blanchard Rivershed Partnership (Lauren Sandhu;conducted via GoogleMeet) on its mission of improving local water quality.

The Environmental Students receive first hand accounts of the problems of local water pollution from local experts.

The students are then presented with the driving question and are then placed into groups of 3-4 where they are challenged to help solve this place based problem using collaboration and research.

The products will differ from year to year based on what students choose to work on. Looking at nonpoint source runoff coming from the school grounds is an excellent way to tackle water quality issues. Runoff from the parking lot can have a large impact on water quality. We could try to calculate how much runoff is coming from the paved areas around the school, what that runoff contains, how those pollutants affect water quality, etc.

We could also have students pay attention to where water seems to collect on the school grounds after the next rainfall. That could spur ideas for a potential rain garden installation project.

BRWP focuses on agriculture since northwest Ohio is mostly rural, but urban nonpoint source runoff from yards, parking lots, etc. also can impact water quality.

Multi-Dimensional/Driving Question:

How can we help the Blanchard Watershed Partnership with its mission of improving local water quality?

Some problems include: sediments, bacteria, excess nutrients, trash.

We can also start the project by having the students identify which subwatershed Liberty Benton falls in. At a large scale it falls within the Blanchard River Watershed, but at a smaller scale, what watershed does the school fall in? Students could then look at data from that particular subwatershed, identify key pollutants in the pre-existing data, and see if their results match up with that data after they analyze the nonpoint source runoff.

Students will work to define the problem, gather information, share information, propose information, determine the best solution, and present a proposal.

21 st Century Skills Addressed (bold all that apply):			
Creativity	Collaboration	Critical Thinking	Communication
<p>Culminating Event: What final student learning products will show student mastery of the content area standards?</p> <p>Students present their final product to their stakeholders at the BRWP. Products include water sampling data, trash collection data, awareness posters, and water sampling device OR trash collection device.</p>			
<p>Hook Event: Develop an introductory activity that will spark student interest and further questions.</p> <p>Presentation from the Blanchard River Watershed Partnership on local water problems and issues.</p>	<p>Community Partners: List potential business or industry partners that could add to the learning experience for students. Include websites or contact info.</p> <ol style="list-style-type: none"> 1. Blanchard River Watershed Partnership 	<p>What do you need from these partners (i.e. guest speaker, field trip, help facilitate an activity)?</p> <ol style="list-style-type: none"> 1. Guest speaker (Lauren Sandhu) 2. Help with follow-up questions 	

Daily Activities: What activities will students complete to answer the multi-dimensional/driving question (that reinforces content from the standards)?

Activity:

1. Test water samples from Liberty-Benton property
 - a. Learn about testing software
 - b. Test for pH, DO, turbidity, nitrates, phosphates, temperature
 - c. Develop tracker

2. Trash clean-up of Liberty-Benton property
 - a. Determine how much trash was collected by keeping track of pounds collected
 - b. Develop tracker

3. Promote awareness among students in Liberty-Benton High School
 - a. Promote BRWP
 - b. Link up with student action teams
 - i. Mental health awareness
 - ii. Media team
 - iii. Art team
 - iv. Green team

4. Develop, create, and make a trash collection device OR a water sampling device that could be used in sewer drains throughout the Liberty-Benton property.

Resources/Materials Needed:

- Computer for Google Meet
- Water sampling tools
 - Vernier interface
 - Vernier pH, turbidity, and temp probe
 - Water sampling kit
- Trash bags
- Scale
- Computers and art supplies for awareness posters
- Tools to help build trash collection or water sampling device. Some suggested supplies include:
 - bird netting
 - various size containers
 - tape
 - rope

Technology Integration: How is technology embedded into this PBL unit?

Computer for data collection trackers, creating posters, creating a template for trash collection device or water sampling device. Vernier water sampling tools (interface, pH probe, turbidity, temp probe)

Capstone Presentation: How will students present what they've learned publicly? This can be the culminating event if that event is presenting what has been learned publicly.

Students will present their final products to their stakeholders at the Blanchard River Watershed Partnership.