

**Who polluted the water and what can we do about it? (2 days)**

<b>Grade Level</b>	8 <sup>th</sup>
<b>Subject</b>	Science and Technology
<b>Curriculum Objective</b>	<p><b>Objective 3.07</b></p> <p>Describe how humans affect the quality of water:</p> <ul style="list-style-type: none"><li>• Point and non-point sources of water pollution in North Carolina.</li><li>• Possible effects of excess nutrients in North Carolina waters.</li><li>• Economic trade-offs.</li><li>• Local water issues.</li></ul> <p><b>Objective 2.04</b></p> <p>Apply tenets of technological design to make informed consumer decisions about:</p> <ul style="list-style-type: none"><li>• Products.</li><li>• Processes.</li><li>• Systems.</li></ul> <p><b>2.06</b> Select and justify use of appropriate collaborative tools to survey, collect, share, and communicate information in content areas.</p>
<b>Guiding Question</b>	<ol style="list-style-type: none"><li>1. How have humans contributed to the quality of a water system in NC public waters?</li><li>2. Can polluted water be useable again?</li></ol>
<b>Lesson Summary</b>	<ol style="list-style-type: none"><li>1. The students will complete an activity to visually see how humans have affected the water quality of the major water systems in NC.</li></ol>
<b>Activating Strategy</b>	<p><b>Purpose:</b> To activate students' prior knowledge of a topic or topics through movement and conversation by using carousel brainstorming.</p> <p>Students will rotate around the classroom in small groups, stopping at various stations with pictures or ideas for a designated amount of time. While at each station, students will activate their prior knowledge of the topics of water pollution. Ideas shared will be posted at each station for</p>

all groups to read. Through movement and conversation, prior knowledge will be activated, providing scaffolding for new information to be learned in the proceeding lesson activity.

### **Carousel Brainstorming**

#### **“What Do I Know”**

##### **Procedure:**

1. Paste a picture or wording of various water pollution problems that NC has encountered on large chart paper. (Note: The number of questions should reflect the number of groups you intend to use during this activity.) Post the pictures and answers charts around your classroom.
2. Divide your students into groups of 5 or less. For example, in a classroom of 30 students, you would divide your class into 6 groups of five that will rotate around the room during this activity.
3. Direct each group to stand in front of a home base question station. Give each group a colored marker for writing their ideas at the question stations. It is advisable to use a different color for tracking each group.
4. Inform groups that they will have X number of minutes to brainstorm and write ideas at each question station. Usually 2-3 minutes is sufficient. When time is called, groups will rotate to the next station in clockwise order. Numbering the stations will make this easy for students to track. Group 1 would rotate to question station 2; Group 2 would rotate to question station 3 and so on.
5. Using a stopwatch or other timer, begin the group rotation. Continue until each group reaches their last question station.
6. Before leaving the final question station, have each group select the top 3 ideas from their station to share and discuss with the entire class.
7. The students will complete the following teacher-led activity after the discussion on pollution.

**Activity: “Who Dirtied The Water/Clean Water:  
Is it Drinkable?”**

This activity can be used independently or in sequence with the follow-up activity. The activity is interdisciplinary in nature and involves the use of critical thinking and analysis to solve a problem. Give students a labeled plastic film canister, or you can have them already set out on their desk.

1. Each container holds a material that will be representative of a pollutant (ie. pencil shavings = a beaver's wood chips; plastic string = fisherman's line, etc.).
2. The teacher stands at the front of the classroom next to a large jar or beaker of clear water and begins to read a story about the history of an imaginary site. As the story comes to the name indicated on a canister, the appropriate student comes forward, opens the canister, and tells the "audience" what is inside. The contents are then dumped into the beaker of water and the water is stirred. As more and more materials are added, the story periodically asks whether the audience would boat in, swim in, or drink the water. After all materials are added, there should be a discussion of who is responsible for dirtying the water and who is responsible for cleaning it up. {Story Attached}
3. Students will make a concept of the topic learned today
4. Students will complete a 3-2-1 form.

**Day Two: “Is It Drinkable?”**

**Lesson Objective:** The students will complete an activity to see if it is possible to undo the damage done to a water supply.

5. To continue the activity, each group of students is asked to design a water filtration system given only a limited number of materials (beakers, funnel, cheesecloth, charcoal, sand, ring stand, etc.). They are asked to both sketch and write down step-by-step procedures. After teacher approval of their plans, they begin to filter a sample of the dirty water that had been "made" during the story. Modifications to the original design are allowed but must be indicated in their procedures and sketches.
6. Each group's filtered water can be compared at the end of the period to serve as a springboard to a discussion of what worked and what didn't work.
  - A. Using the available equipment and material, the groups will devise a filtration system that will be used to clean their dirty water sample. They should:

	<ol style="list-style-type: none"> <li>1. Write out, in detailed step-by-step instructions, how they will use the lab materials to filter the water sample. (Each group should have one set of instructions).</li> <li>2. Sketch their filtration system set-up and label the parts. (Each group should have one sketch).</li> </ol> <p>B. Using their proposed filtration system, make their water sample as clean as they can.</p> <p>C. Make any adjustments to the model that are necessary in order to cleanse the water sample. Ask the following question:</p> <ol style="list-style-type: none"> <li>1. Was your original filtration system successful?</li> <li>2. Describe any adjustments you made to your original model.</li> <li>3. Were you able to remove all impurities?</li> <li>4. What were some of the limitations of your system?</li> <li>5. How could you tell if your water was purified? (HINT: What physical and/or chemical changes took place that would indicate that you accomplished your goal?)</li> <li>6. What kinds of tests could you perform on your filtered water to prove that it had been cleansed?</li> </ol> <p>7. Each student will test their filtration system in the presence of the teacher.</p>
<p><b>Cognitive Strategy</b></p>	<p>Day 1:</p> <ol style="list-style-type: none"> <li>1. Have students complete a concept map of pros &amp; cons of development near water sources. <ol style="list-style-type: none"> <li>1. Give each student a blank concept map to complete.</li> </ol> </li> </ol> <p>Day 2:</p> <ol style="list-style-type: none"> <li>1. Students will have the opportunity to formulate challenging questions regarding the topic of water pollution. <ol style="list-style-type: none"> <li>1. Divide the class into small groups.</li> <li>2. Give each group of students an envelope.</li> <li>3. Have each group write a challenge questions on the front of the envelope. Encourage higher level questions that have prompts like: <ul style="list-style-type: none"> <li>• What might be...?</li> </ul> </li> </ol> </li> </ol>

	<ul style="list-style-type: none"> <li>• What could be...?</li> <li>• What if...?</li> </ul> <p>4. Have each group generate the answer or criteria for a response and include a sample response. These should all be placed inside the envelope.</p> <p>5. Scramble the envelopes and have the groups rotate the envelopes through the class. When a group receives an envelope, the question is to be addressed and then checked against the answer or criteria inside the envelope.</p> <p>6. Have each group put their own response to the question inside the envelope when they are done. They should then send the envelope back into circulation.</p> <p>7. As the envelopes begin to fill with responses, the groups are to compare their responses to the others that are in the envelopes.</p>
<b>Summarizing Strategy</b>	<p>Day one &amp; two: 3-2-1</p> <p>1. Have students write 3 things they learned today; 2 things they would like to know about water quality and pollution and 1 thing they just want to know.</p>
<b>Evaluation</b>	<p>1. Teacher will circulate the room to ensure students are on task during assignment.</p> <p>2. Teacher will collect 3-2-1 for understanding of concept.</p>
<b>Resources</b>	<p><b>“Who dirtied the water” story board, Plastic film canisters, various materials to fill canisters (listed in lesson) Various colored markers, large sheets of paper, tape, pictures of pollution in NC. Various materials for water filtration system.</b></p>