

Inquiry Lesson on Microbial Contaminants

Title of Lesson: Microbial Contaminants in Drinking Water II

Date of Lesson: N/A

Source of Lesson: Roland Ramirez

Description of class: N/A

Lesson Length: 50min

Grade Level: 9 - 12

Honors or regular: N/A

TEKS Addressed:

2) Scientific processes. The student uses scientific methods during field and laboratory investigations. The student is expected to:

- (A) plan and implement investigative procedures including asking questions, formulating testable hypotheses, and selecting equipment and technology;
- (C) organize, analyze, evaluate, make inferences, and predict trends from data; and
- (D) communicate valid conclusions.

(3) Scientific processes. The student uses critical thinking and scientific problem solving to make informed decisions. The student is expected to:

- (A) analyze, review, and critique scientific explanations, including hypotheses and theories, as to their strengths and weaknesses using scientific evidence and information;
- (C) evaluate the impact of research on scientific thought, society, and the environment;

The Lesson:

I. Overview

The student's will be divided into groups where they will play the role of either a Microbiologist, a patient or recorder. The students will be responsible for finding out what has made the patient sick, how to treat it and what has polluted the ground water supply.

II. Performance or Learner Outcomes

The students will be able to think critically about a problem and come up with possible solutions to resolve that problem.

III. Resources, materials, and supplies needed

Paper, pens

IV. Supplementary materials, handouts

The patients script, Students playing the role of the microbiologist will be able to refer to their reading assignment from the first day.

V. Resources for packets

www.hc-sc.gc.ca/ehp/ehd/catalogue/bch_pubs/98ehd211/chapter1.pdf

www.epa.gov/safewater/dwh/health.html

www.epa.gov/safewater/mdbp/mdbp.html

<http://www.epa.gov/ORD/NRMRL/Pubs/600R01110/600R01110.htm>

Five-E Organization

Teacher does:

Student does:

<p>Engage: Have 3 bottles of the same unopened name brand spring water. Tell the class one bottle is contaminated with a microbe (even though none would really contain a microbe) Have a student come up and have the class decide which bottle she/he should drink and why. Then tell the students that none of the bottles were really contaminated and that there isn't a way to tell just by looking.</p> <p><i>Questions:</i> Why did you choose the bottle that you chose? Do you think you can always tell water is free of microorganisms just by looking at it? What do you think you should do if you are not sure your water is free of microorganism?</p>	<p>Hoped for student response: The students will list their reasons for which bottle and why.</p> <p>Expected student response: The students will wait to be called on and may not have any read their reading assignment and will not be able to list reasons.</p>
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Evaluate:

Listen to the student's responses and give them feedback. Give the students the quiz over the reading from the day before.

Decision Point Assessment (DPA):

If the students seem to be having trouble justifying their reasons for choosing a certain bottle, then go over the reading with them and give them examples of possible responses.

<p>Explore: Explain to the students that they will be dividing into groups and that they will be assigned a role in that group. In the groups, one of the students will be exhibiting signs of having ingested water, which has been contaminated by some time of microbe, for a long period of time. The students who are the microbiologists will be responsible for deciding which type of microbe the water source contains and a possible treatment for the individual and for generating a</p>	<p>Hoped for student response: The students will listen and prepare to be broken up into groups and receive their role in the group. The students will play out their roles in the group and discuss and debate the possible microbe causing the patient's illness, the possible treatment and the possible cause of the water contamination. The students will present their findings to the class.</p>
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<p>hypothesis for what could have possibly caused the water supply to become contaminated. The student playing the part of the “patient” will be given a script containing what symptoms to exhibit as well as clues to what could possibly have caused the water supply to be contaminated. Tell the students they will present their findings to the class. Divide the class into groups of four or five students and assign the students roles in the group. Two/three of the students will be Microbiologists, one will be a person exhibiting symptoms and the other student will be responsible for recording what the groups is doing. The Microbiologists will be responsible for evaluating the symptoms of the “patient” and determining what is the possible cause of the individual’s ailments, how to go about treating this and forming a hypothesis, based on information given to them by the patient as to how the water supply could have become contaminated. Once all groups have completed the activity, have them go up and present their findings to the class.</p> <p><i>Questions:</i> Can you think of any other microorganisms that could cause these symptoms? What different venues microorganisms have for getting into drinking water supplies?</p>	<p><i>Expected student response:</i> The students will listen and prepare to break up into groups. The students will break up into their groups and will have questions about their specific roles in the group and will ask some questions. The students will not want to debate immediately and will require probing questions to get them to discuss the possible solutions further.</p>
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Evaluate:

The teacher will walk around to the different groups to make sure they are progressing in a timely manner. The teacher will check to see what the recorder has observed and to make sure the students are on the right track. The teacher will propose questions to the students that will cause them to further debate the issues at hand. The students will go up and present their findings to the class.

Decision Point Assessment (DPA):

If the students are having trouble with the coming up with a hypothesis as to what is making the patient ill or what could be causing the ground water to be contaminated, go over parts of the reading that could be helpful to the student in coming up with their hypothesis.

<p>Explain: Once the students have presented their hypothesis to the class go over how important it is to have protect our drinking water sources from microorganism contaminants and discuss further the results of the group's presentations.</p> <p><i>Questions:</i> How did your group decided what caused the contaminants? What other possibilities did your group come up with before you made your final decision and what was the justification for the other positions?</p>	<p>Hoped for Student Response: The students will answer the listen to the questions posed and volunteer responses when asked.</p> <p><i>Expected Student Response:</i> The students will have to be called upon and probed in order to get responses that show they fully understood the lesson.</p>
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Evaluate:

Listen to the students responses to the questions posed and provide them with feedback.

Decision Point Assessment (DPA):

If the students are having trouble with the questions, review sections/makes points from the handout that are specific to the questions.

<p>Elaborate: Have the students imagine what it would be like if a major city's (i.e. New York or Los Angeles) water supply were to become contaminated with some time of microorganism.</p> <p><i>Questions:</i> Ask them how they think the city would go about trying to amend the problem and what types of problems it could cause in industry?</p>	<p>Hoped for Student Response: The students will respond with well thought out responses and will apply the knowledge they gained from the days activity to their answers</p> <p><i>Expected Students Response:</i> The students will be hesitant to respond and will require some probing.</p>
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Evaluate:

Allow each group to have a few minutes to discuss the new question. Ask each group how they feel about the problem and what they would do in that situation.

Decision Point Assessment (DPA):

If the students are having trouble with the question, review the reading with the students again.