



Not a Drop to Drink? Understanding the Impact Water Quality Has in Sustaining Life

Middle School Food and Agricultural Literacy Curriculum

Precepts

- E. Awareness
- E1. Address issues important to the community

National Standards

- ESS.03.03.01.b. Describe characteristics of water that influence the biosphere and sustain life.
- PS.02.01.02.a. Describe the effects air, temperature, and water have on plant metabolism and growth.
- NL-ENG.K-12.3 – Evaluation Strategies
- NS.5-8.6 – Science in Personal and Social Perspectives
- NSS-GK-12.5 – Environment and Society

Student Learning Objectives

- As a result of this **unit** the students will...
- Explain the role of clean water in sustaining life.
- As a result of this **lesson**, the students will ...
- Explain the impact of **water quality** on plant, animal, and human life.

Content Outline

Objective 1. Explain the impact of **water quality** on plant, animal, and human life.

- I. **Define water quality**
 - A. **Water quality** is the condition of water for a particular use.
- II. **What affects water quality?**
 - A. The way people use and abuse water will affect its quality.
 - B. Natural occurrences – weather, earthquakes, etc.
- III. **What impact does water quality have on plant, animal, and human life?**
 - A. Plants, animals, and humans all require water in order to survive. If the condition of water is not suited for a particular use, the quality of life of a plant, animal, or human would be compromised.

Time

Instruction time for this lesson: 45 minutes.

Resources

Lee, Jasper (2006). Natural Resources (2nd ed.). Upper Saddle River, NJ: Pearson. — Perlman, H. (2009). Water quality. Retrieved July 30, 2009, from United States Geological Survey, Water Science for Schools. Web site: <http://ga.water.usgs.gov/edu/waterquality.html>

Tools, Equipment, and Supplies

Overhead or writing surface
LCD Projector, SMART board or computer (optional technology)
Writing utensil
One glass of clean, clear water
One glass of dirty, turbid water (Mix together water with soil to create a murky water)
3x5 index cards
MS.NR.3.1.TM.A-E – one per teacher
MS.NR.3.1.ASSESS.A – one per student

Key Terms

The following terms are presented in this lesson and appear in **bold italics**:

Water quality

Interest Approach

Before students enter class, place two glasses of water at the front of the classroom: one glass clear, clean water (Water A), the other turbid, dirty water (Water B). Once all students arrive, acknowledge the class for being prepared and on time.

In front of the class notice the two different glasses of water, Water A and Water B. When you hear the word GO, take 30 seconds to write down two similarities and two differences between these two glasses of water. How many similarities do you need to write down? Wait for student response of "two." Great. How many differences? Wait for the student response of "two." Excellent. Be ready to report to the class and by the way, you can work with a partner. What questions are there? Answer any questions students have about the activity. GO.

As students prepare similarities and differences on the two glasses of water, refer to **MS.NR.3.1.TM.A** to place on an overhead or duplicate on a writing surface to record their findings. At the end of 30 seconds, regain the students' attention.



Lesson Number: MS.NR.3.1

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Summary of Content and Teaching Strategies

Objective 1. Explain the impact of **water quality** on plant, animal, and human life.

If technology is available for use, similar to an LCD projector or a SMART board, prepare **MS.NR.3.1.TM.A-E** using presentation software. This will be a time consuming process, so make sure to allot enough time prior to teaching.

Let's look at these two glasses of water again. We came to the conclusion that Water B was the less desirable of the two. How did we come to this conclusion?

Have students discuss the color and turbidity and relate it to why Water B was less desirable than Water A. Lead students to refer to this as the "quality" of water.

Ok – so the "quality" of Water A was greater than the "quality" of Water B, correct?

Allow students to respond yes.

Well, what if I told you this water were going to be used to wash your car. Why would this or would this not change your opinion of this water?

Have students discuss this thought. Most students would still not want to wash their car with Water B, but some may stop and think that it might not make as big a difference as if you were to choose which water to drink. If desired, prepare **MS.NR.3.1.TM.B** on the overhead or writing surface to display only the definition of "**water quality**."

So it might make a difference.

Instruct students to write down the following definition for future reference.

We can actually define **water quality** as the condition of water for a particular use. If I needed to water my yard, then Water B would be completely fine to get the job done. So the quality of Water B in association to its "job" would be satisfactory.

Who will report what similarities they found between Water A and Water B?

As students report, write down information in the "Similarities" column of **MS.NR.3.1.TM.A**.

Collect as much information as you feel necessary to understand that the similarity between the two glasses of water is that they are water.

Great job. Now who will report what differences their group found between Water A and Water B?

As students report, write down their information in the "Differences" column of **MS.NR.3.1.TM.A**.

Again, collect as much information as you feel necessary for the class to understand that Water A is clear, clean water and that Water B is dirty, undesirable water.

Looking at our chart, who will be the first to share which of these two waters they would prefer to drink and why?

There should be an overwhelming response of students wanting to drink Water A. Allow students to share their decisions. If no one responds with Water B, then pose the question: Why is Water B not an ideal water to drink?

Students should have concluded that Water B was undesirable to consume based primarily on clarity.

Close your eyes. Imagine getting home from school one day and you are super thirsty. The only thing you want is a big glass of water. Without thinking, because you always do, you take your glass over to the sink and turn on the cold water. When you pick your glass up, you notice that the water looks very similar to Water B we observed today. This is all you have to drink.

Think how this makes you feel. Now open your eyes. Our quality of water can affect our quality of life. Can you imagine not being able to have access to clean water? Today let's talk about how **water quality** can impact not only us, but also plant and animal life. Great start today – now put your thinking caps on and let's better understand the meaning and importance behind **water quality**.



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I. Define water quality

- A. **Water quality** is the condition of water for a particular use.

Turn to a neighbor and brainstorm another use that Water B might have. We have 30 seconds. GO.

Allow students to discuss this concept. At the end of 30 seconds bring the class back together.

Who will share their idea with the class?

Wait for responses.

Take enough time for the students to understand that even though Water B may look undesirable, it still has a purpose.

Great job brainstorming. Let's look back at our two glasses of water. Who will be the first to explain how Water B became different from Water A? What could cause this to happen?

Allow students to think about this concept. Discussion will likely occur.

There are probably many ways Water A and Water B are different. The water could vary due to a natural occurrence like a storm that pushed more sediment into the local water source. Water around large cities may have fertilizer runoff from community yards that causes increased chemical levels. Turn to a neighbor and brainstorm one way or process that could affect the **water quality** in our community. Think of something different from a sediment or chemical contamination. We will have one minute to complete your brainstorm. What questions are there? Answer any questions there might be. GO.

II. What affects water quality?

- A. The way people use and abuse water will affect its quality.
- B. Natural occurrences – weather, earthquakes, etc.

Allow students one minute to discuss what could affect **water quality**. At the end of one minute, bring students' attention back.

Which group will share their ideas first?

Allow for class discussion. As information is shared, have students write down ways that both humans and natural occurrences can affect **water quality** on their own paper for future reference. Collect enough information – answers will vary depending on the location. If students struggle with ideas, have them think about what happens when flooding occurs or an oil spill takes places. This may get them to start thinking of similar ideas that could generate **water quality**.

Excellent. As you can see, there are a variety of things that can affect the quality of water. Both natural occurrences, like wind and rain, and human use and abuse, like the fertilizer runoff, can have a lasting affect on the quality of water in a given area.

Prepare **MS.NR.3.1.TM.C-E** to illustrate plant, animal, and human life that has been impacted by **water quality**.

Let's look at these pictures.

Display **MS.NR.3.1.TM.C**.

Here are pictures of plants that have access to appropriate quality water and plants that do not have access to the appropriate quality of water. What are some noticeable differences in these two types of plants?

Lead classroom discussion to talk about the amount of leaves, appearance of fruit, etc.

Now let's look at these pictures.

Display **MS.NR.3.1.TM.D**.

Here are pictures of animals that have access to appropriate quality water and animals that do not have access to the appropriate quality of water. What differences are noticeable in these two pictures?

Lead the class in discussion about the difference in the two pictures. Students may discuss the terrain as well as the animals. They may point out that the availability of feed as well as the **water quality** may have an effect on the animals.

Finally, let's look at these pictures.

Display **MS.NR.3.1.TM.E**



Lesson Number: MS.NR.3.1

Middle School Food and Agricultural Literacy Curriculum

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In these pictures are two different individuals, one who has access to clean, purified water, and the other who only has access to water that is unclean and unpurified. What can we observe are the differences in these two individuals?

Students will discuss the quality of water that each individual receives their water from. They will probably talk about the quality of life each individual has on a daily basis as well.

III. What impact does **water quality** have on plant, animal, and human life?

- A. Plants, animals, and humans all require water in order to survive. If the condition of water is not suited for a particular use, then the quality of life of a plant, animal, or human would be compromised.

If you haven't thought about it before, next time you take water out of the tap, water the plants in your landscape, or give the dog a bowl of fresh water to drink, think about the quality of the water – is it really suitable for the job at hand?

Review/Summary

Utilize the Show What You Know e-Moment®

Pass out a 3x5 index card to each student. Instruct students to place their name on the card, plus any other class identifier deemed necessary.

OK– it's time for you to Show What You Know! When you hear the word DRAW, illustrate the definition of **water quality** on one side of the note card. Remember, **water quality** can be defined as the condition of water for a particular use.

If you had to explain what **water quality** was to a person who had never heard of it before, how would you illustrate it? We have three minutes to complete this task. Show what you know and DRAW!

As students work, circulate around the room and check for understanding. Answer any questions that students might have, but do not lead them in their illustrations. Through this exercise, you should have a clearer picture if any re-teaching will need to take place. When three minutes end, regain the students' attention.

Great job! Now flip the card over. Think about the illustrations we saw today. When you hear the word WRITE, write what impact **water quality** has on plant, animal, and human life. Take three minutes to write complete sentences in your own words that answers how **water quality** can affect plant, animal, and human life. WRITE.

Again, circulate throughout the room to check for understanding. Answer any questions, but refrain from guiding answers. At the end of three minutes, regain the students' attention.

Water quality is an important part of living a healthy life. Often we do not think about the quality of water we come into contact with every day; however, it could matter in the quality of life for not only us, but also the animals and plants we come in contact with. Tomorrow we will explore the water cycle and see how this process may be key in helping improve the quality of water. Make sure tomorrow you bring your creative toolbox – our activity will have you “feeling” like water!

On your way out of class, please make sure you hand in the note card we just completed. It is your exit ticket out! Great job!



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Application

Extended classroom activity:

Obtain a **water quality** test kit and introduce students to pH and dissolved oxygen levels and their importance in waters surrounding their community.

FFA activity:

Visit a **water quality** facility to see how water is processed and purified for use.

SAE activity:

Create an agriscience fair project testing waters throughout a community for different pH and dissolved oxygen levels and relate it to the aquatic life and health of local waterways.

Evaluation

MS.NR.3.1.ASSESS.A

Answers to Evaluation

1. Water quality can be defined as the condition of water for a particular use.
2. Answers will vary depending on class discussion. Answers could be, but are not limited to: natural occurrences (weather, natural disasters, etc.), human use and abuse (fertilizers, etc.)
3. Answers will vary. Answers will refer to the decreased productivity, less fruit, loss of leaves, etc.
4. Answers will vary. Answers will refer to lack of water to supply feed; lack of water will also lead to diminished health and appearance in animals, etc.
5. Answers will vary. Answers will talk about the quality of water available to an individual and also the quality of life of the individual. Both could have an effect on health and appearance, etc.

Water A vs. Water B

[illegible]



The Impact of Water Quality

Objective 1. Explain the impact of water quality on plant, animal, and human life.

I. Define water quality

A. Water quality is the condition of water for a particular use.

II. What affects water quality?

A. The way people use and abuse water will affect its quality.

B. Natural occurrences – weather, earthquakes, etc.

III. What impact does water quality have on plant, animal, and human life?

A. Plants, animals, and humans all require water in order to survive. If the condition of water is not suited for a particular use, then the quality of the life of a plant, animal, or human would be compromised.









The Effect of Water Quality on Plant, Animal, and Human Life

Name: _____

Short Answer:

Answer the following questions.

1. Define water quality.

2. Name one action that can affect water quality.

3. Name one way that water quality can impact plants.

4. Name one way that water quality can impact animals.

5. Name one way that water quality can impact humans.
