

The Destination is the Conservation of Our Nation!

Building an Early Foundation of Conservation

Description

This lesson is geared toward helping students understand the importance of conservation and stewardship practices. As aligned with the state standards issued by the Department of Education for North Carolina, students will begin to understand the importance of crop rotations and cover crops in the field of agriculture. Students will also be able to understand the importance of water filtration and its impact on families around the world. This lesson plan aims to focus on the 8th grade Energy: Conservation and Transfer unit of the North Carolina Essential Standards.

Disclaimer: *Please note that the activities in this lesson plan are geared toward certain sub-standards that are required in the Essential Standards. More information will need to be taught to the students to fully understand all the objectives and sub-standards within the Energy unit. The activities are largely supplementary for teachers to use at their discretion.*

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Objectives

Students will be able to...

1. Understand and apply terminology directly related to the North Carolina Essential Standards for the “Energy: Conservation & Transfer” objective.
2. Explain the importance of conservation and stewardship practices for commercial agriculture.
3. Discuss their observations on the different lab activities.

Introduction

This lesson plan is geared toward 8th grade science. It is highly recommended students be exposed to the workings of hands-on activities and procedures, such as classroom talk, collaborative group work, questioning, and writing to learn. These are key strategies implemented in this lesson plan.

Noteworthy activities and assessments for this lesson plan include the use of hands-on activities which require students to use the Create portion of Bloom’s Taxonomy to demonstrate their understanding and newfound knowledge, as well as a discussion piece that gives students the opportunity to share their reasoning behind their creations.

It is important to note that students will be using plastic bottles, pond water samples, and dirt. It is ideal that the teacher asks students a week beforehand to bring in these materials before planning the lesson.

Real Science Application

The context of this lesson plan is to provide an opportunity for students to analyze the importance of conservation in the realm of agriculture, specifically. Students who are looking to go into a field of agriculture or agribusiness / agriscience will especially enjoy this lesson.

Please emphasize the importance of stewardship, conservation, and preservation/restoration when implementing this lesson plan—this is especially important in the realm of agriculture or agriscience. Students who are interested in working in the field of agriculture or agriscience may especially be keen on learning the multiple forms of conservation practices and methods employed by the United States’ government agencies.

Erosion is a big problem in the world today, especially in rural areas that are heavily focused on agriculture. Understanding its effects, as well as simple conservation and stewardship practices, is important for students as they transition into citizens who care for their environment.

Curriculum Alignment

8.P.2.2 Explain the implications of the depletion of renewable and nonrenewable energy resources and the importance of conservation.

8.E.1.4 Conclude that the good health of humans requires:

- Monitoring of the hydrosphere
- Water quality standards
- Methods of water treatment
- Maintaining safe water quality
- Stewardship

Time & Location

Estimated Classroom Time for Project (5-7 Days)

Location may vary. This can be an indoor or outdoor lesson. There are multiple parts to this lesson plan, so it is completely up to the teacher's discretion as to how or where to implement all or parts of the lesson. Typically, this can be done indoors—however, the demonstration may be more powerful outside of the classroom.

Teacher Materials

Soil Erosion Lab

1 plastic bottle per group of students (groups of 4) **

Soil (enough to fill bottles)

Clear, plastic cups

4 wire hangers

Blocks (something to support your bottles at an angle)

Scissors or utility knife (utility knife works better)

Mulch

Dead leaves

Sprinkling-style watering can

Gloves, goggles, and other lab safety equipment

Water Filtration Challenge

Coffee filters (pack of 200)

Fine sand (or soil)

3 types of aquarium gravel (blue, white, brown—all different textures)

Cotton balls

Clear, plastic cups

Pre-cut filtration “apparatuses” made from 2-liter plastic bottles

Samples of pond water (from the same pond)

Gloves, goggles, and other lab safety equipment

Student Materials

Soil Erosion Lab

Soil Erosion Lab worksheet

Water Filtration Challenge

Water Filtration Lab worksheet

(Optional) pond water**

(Optional) clear, plastic 2-liter bottles with caps**

** As for pond water and plastic 2-liter bottles, I ask my students ahead of time if they would like to donate clear, plastic bottles or gallons of pond water for this lab. Typically, one volunteer from each class brings at least a gallon of pond water. I would suggest at least 6 plastic, 2-liter bottles with the caps per class.

Safety

Students with allergies to dust or pollen may need to beware if going outside. Students may also be dealing with sharp objects (plastic, scissors, etc.). Additionally, students with cuts or scrapes should NOT deal with pond water samples as it may become infected.

Additionally, this is considered a lab activity. Make sure students understand all the rules and guidelines established by the teacher when conducting lab protocol. Flinn’s Lab Safety Contract for Middle School Students is my personal preference.

Student Prior Knowledge

Students should have previous exposure or knowledge of...

- Lab safety protocol
- Respect for each person’s thoughts, contributions, and even misconceptions in any discussions
- Erosion
- Conservation methods (at least know what “conservation” means)
- Renewable vs nonrenewable resources

Teacher Preparations

Teacher should first find an engaging way of introducing key vocabulary terms and concepts. My suggestion is to use Quizlet Live, a fun and interactive way for students to learn vocabulary terms.

Students will need to work in groups of 4, preferably. The teacher should group students accordingly. The teacher should create boxes with the following items for each group of students:

Soil Erosion Lab

- Pre-cut plastic bottles
- Cups
- Blocks

Water Filtration Challenge

- Pond water samples (samples should have leaves, stems, etc. that can be easily filtered)
- Sand (or soil)
- 3 cups of 3 different types of aquarium gravel (blue, white, brown—all different textures)
- Cotton balls
- Coffee filters (about 10 per group)
- Pre-cut “filtration apparatuses” made from the 2-liter plastic bottles

Activities

**** My experience with this lesson is to teach students in a linear fashion. I recommend teachers start this lesson on a Monday and conclude by Friday of the same week, if your schedule is on a 45-minute time-frame. ****

Days 1-2: Introduction to Key Concepts

The teacher will assess prior knowledge and introduce the lesson the incorporation of critical vocabulary terms, listed below. This can be flexible, depending on your students’ needs.

*(Side Note: I use a blend of **student-led learning**, **whole-group discussion** and **Quizlet** to start off each of my units.)*

- **Engage:** The teacher will ask the students “what are some ways you practice conservation every day?” This may lead into a discussion on what conservation is. This could be in the form of a free-writing exercise or a classroom talk to start off the day. I used this as one of my daily journal entries to start this unit. Have the students explore the idea of conservation. **Think-Pair-Share** is a way of exploring how other students practice conservation on an everyday basis. This is open to discussion and may lead to some open-ended discussion with the

class. Use student-led practices and become a facilitator in the discussion.

- **Explore:** Using pictures you have gathered or in the **Conservation Photos Document**, separate the students into 4-6 equal groups, giving each group 1 picture.
 1. Have the students, as a group, write down their responses to the following question: **What comes to mind when you hear the word “conservation” in association with the picture given to your group? *Each student should contribute to the conservation about the picture.***
 2. The teacher will then allow each group to present their picture and their thoughts. This can be done in a variety of ways; you can facilitate a **Gallery Walk** or **Graffiti Carousel** where the students go from table to table and write down their thoughts on the picture or the teacher can engage the group in a **Whole-Group Discussion** where they present their pictures and their thoughts to the class.
- **Explain:** Make sure to address any misconceptions noticed during the discussion. It is important to smoothly transition from the exploration stage to the explanation stage when dealing with this part of the unit.
- **Elaborate:** The teacher will allow the students the time to individually understand the vocabulary / key terminologies for this unit. During this time, explain to the students the importance of conservation in our daily lives (recycling, turning off lights, “green” energy, etc).

If there is access to the Internet, I have the students write down the words and the definitions and drawing a picture that helps them familiarize themselves with the term. In the past, I have used **Quizlet** as my introductory tool for vocabulary terms. It is important students know these key concepts, as they align with the 8th Grade Science Essential Standards. There are many different types of “study modes” students can choose from, including *matching, flashcards, “gravity,” and spelling.*

Quizlet Study Set: https://quizlet.com/_3bhw7m

Days 3-4: Soil Erosion Lab & Water Filtration Challenge

**** Just a Reminder! For smoother transition, please make sure all materials are prepped the day before you engage in these two labs! ****

Soil Erosion Lab Activity

- **Engage:** The teacher will pose a question to the students dealing with the effects of erosion. This is completely dependent on the teacher’s style; I recommend a daily journal prompt asking ***what effect can erosion have in our daily lives? Write a brief paragraph response using at least 4 of this week’s vocabulary terms.***

You may choose students to either share their responses with the entire class after a few minutes or have them engage in **Think-Pair-Share** with their neighbor.

During this time, the teacher will allow/assign students to get into groups of 4 or more while preparing and setting up lab. Remind students of lab protocol as materials are being placed.

- **Explore:** The teacher will assign each group to construct a certain soil type (if you have approximately 6 groups, assign 2 groups to do each soil type). There are 3 soil types: **Soil with Mulch, Soil with No Cover, and Soil with Dead Leaf Cover.**

Instruct students to do the following (adapted from Soils4Teachers.org):

1. Fill their pre-cut bottles with soil.
 2. For the groups with the mulch, have them add mulch after the soil is administered.
 3. For the groups with the dead leaf cover, have them add the dead leaves to the soil after it has been administered.
 4. Have students take their bottles with their soil and place them side by side (one bare soil, one soil with mulch, and one soil with dead leaf cover. Use the wire hangers to connect them together.
 5. Suspend each bottle over a cup at a 25 to 40-degree angle with the spouts facing downward. Get creative in finding ways to accomplish this. I recommend using wood blocks with notches in them to hold the bottles in place. **Make sure each bottle is angled the same!**
 6. Have students fill out the **Soil Erosion Lab Worksheet** before doing the “rain simulation” with the watering can.
 7. The teacher will tell the students to observe what happens before, during, and after the “rain simulation.” Students should be writing down their observations.
 8. Finally, have students answer the question at the back of their worksheet.
- **Explain:** Ask for a volunteer to share their response to the question on the back of the worksheet. Discuss this question as a class. Make sure to clear any misconceptions concerning erosion, turbidity, etc. with the class.

NOTE: If there is a guest speaker, have them explain how it affects their job or the implications erosion can have on society in a broader scale. It is important to relate this activity to the students’ real life situations.

Water Filtration Challenge

- **Engage:** Before students begin their writing prompt, have them watch one of these videos and think about water quality and potability:
 - <https://www.youtube.com/watch?v=YW6GBciRHLg>
(Where Does Your Sewage Go? | I Didn't Know That)
 - <https://www.youtube.com/watch?v=tuYB8nMFxQA>
(Water and You: The Water Treatment Process – *this is my personal favorite!*)

Similarly to the Soil Erosion Lab, the teacher will pose two questions to the students: *how can erosion have an effect on water quality and potability? What modern-day technologies do we have to help improve water quality? Write a brief paragraph response using at least 6 of this week's vocabulary terms.*

During this time, the teacher will allow/assign students to get into groups of 4 or more while preparing and setting up lab. Remind students of lab protocol as materials are being placed.

- **Explore:** The teacher will instruct the students to follow along using the **Water Filtration Challenge Worksheet**. The teacher will then explain the objective of the challenge: *using the materials provided to you, plan the order in which you can filter a sample of pond water to have the least amount of turbidity. However, there are a couple of stipulations:*
 - Students do NOT have to use all the materials:
 - Sand (or soil)
 - Blue aquarium gravel
 - White aquarium gravel
 - Brown aquarium gravel
 - Cotton balls
 - You can only use each material once, so choose the order wisely!
 - *Incentives:* The team with the clearest amount of water wins _____.
 - My incentive was 3 pieces of candy per student with the clearest water after a class vote.

Important! You should model for your students how to do the procedure for this lab. If you need pictures to help, please visit my webpage on this activity at <https://www.duplinschools.net/Page/14727>

- **Explain:** After deciding who had the clearest sample of water, have them explain the order they used to filter their sample of pond water. Explain to the class they used the same samples of water, but the results were much difficult from group to group. Have a discussion on why there were some differences in variables.

Additionally, make certain to explain the **water filtration process**. If you want to reiterate points made in the Water Treatment video, this would be the time to do so. Focus on using vocabulary words to drive your classroom talk.

Day 5: Concluding the Lesson on Water Conservation

- **Elaborate:** Have students explain what they have learned for the past week from the last two activities: Soil Erosion & Water Filtration Challenge.
 - The teacher will ask students to write a paragraph or more using all of their vocabulary terms to explain the process erosion has on water conservation, as well as the importance of water treatment in measuring water potability. This can be either an assignment for homework, during class, or on an assessment.

This day can be used as a day to give an assessment or to expose students to additional information that is necessary in the mastery of the standard. **Please note that the activities in this lesson plan are geared toward certain sub-standards that are required in the Essential**

Standards. More information will need to be taught to the students to fully understand all the objectives and sub-standards within the Energy unit.

Assessment

Evaluation: Each day, the teacher should use informal assessment to address misconceptions students will have about erosion and water quality. Additionally, the lab worksheets provided should be used as an assessment tool. Students should turn these in as a grade each day. The teacher should also look individually at each worksheet, identifying any glaring problems or struggles the students may be having.

The teacher should also make a vocabulary assessment using the words they have been using each day. This is left up to the teacher's discretion, as it may be fill-in-the blank, matching, multiple-choice, or write the definition.

Community Engagement

Visiting and talking to your local USDA center is a great way to obtain a guest speaker. I would recommend speaking with a Soil Conservationist or even your school's Agriculture teacher.

Ideally, having a person in the classroom, perhaps from the USDA, would be very beneficial because they can explain the process of erosion and its potential effects. Local farmers are also a great candidate, as they would be able to explain the importance of cover crops and crop rotations and why erosion and water quality have such a huge effect on the agriculture industry.

Critical Vocabulary

This vocabulary list is what we started at the beginning of the lesson using **Quizlet**. I recommend teachers giving an assessment on their knowledge of these vocabulary terms, as they are expected to know these concepts for the North Carolina End of Grade exam for 8th Grade Science:

- Conservation
- Stewardship
- Turbidity
- Water Quality
- Sedimentation
- Sediment
- Erosion
- Renewable Resources
- Nonrenewable Resources
- Pollutants
- Potable

Author Information

Hello, my name is Mitch Harper and I am a second-year teacher at North Duplin High School, located in Mount Olive, North Carolina. My Bachelor's degree is in English / Secondary Education, with certification to teach Middle Grades Science from UNC Charlotte. In addition to being an alumni of UNC Charlotte, I am also a North Carolina Teaching Fellow and Kenan Fellow!

If you have any questions, suggestions, or comments, please do not hesitate to contact me at miharper@duplinschools.net.

You are free to use any materials or labs I have created from my website at <https://www.duplinschools.net/Page/13637>.

My mentor's name is Jacob Giddens. He was the District Conservationist located at the USDA-NRCS in Kenansville, North Carolina. He has now relocated to the Goldsboro district. His e-mail is jacob.giddens@nc.usda.gov.