



Consumer benefits from research

Middle School Food and Agricultural Literacy Curriculum

Precepts

- F. Continuous Improvement
- F4. Adapt to emerging technologies.

National Standards

- CS.06.02.01.a. Use proper safety practices/personal protective equipment.
- BS.01.01.02.c Analyze the scope and impact of agricultural biotechnology in today's global society.
- BS.01.01.03.c. Assess the future impact agricultural biotechnology could have on world populations.
- BS.03.02.04.c. Produce biodiesel and co-products from biomass.
- BS.03.03.08.b. Assess the characteristics of biomass that make it useful for biofuels production.
- NL-ENG.K-12.4 – Communication Skills
- NL-ENG.K-12.12 – Applying Language Skills
- NS.5-8.1 – Science as Inquiry
- NS.5-8.3 – Life Science
- NS.5-8.5 – Science and Technology
- NS.5-8.6 – Science in Personal and Social Perspectives
- NT-K-12.2 – Social, Ethical, and Human Issues

Student Learning Objectives

- As a result of this **unit** the students will...
- Discuss agricultural research.
- As a result of this **lesson** the students will ...
- Analyze how agriculture research has benefited the consumer.

Content Outline

- I. **Discuss how research benefits modern day conveniences.**
- II. **Invention and usage of biodiesel as a result of research.**
 - A. Invention of Biodiesel

Time

Instruction time for this lesson: 45 minutes

Resources

Benefits of Biodiesel. (2009) Retrieved July 28, 2009. University of Oregon Website: <http://www.uoregon.edu/~sskach/index.html> — Harrison, Hailey. How to Make Biodiesel in a Two-Liter Pop Bottle. Retrieved July 28, 2009, from eHow Web site: http://www.ehow.com/how_5016611_make-biodiesel-two-liter-pop-bottle.html — National FFA Organization. (2009). LifeKnowledge Online. Retrieved July 28, 2009, from <http://agedlearning.org> — National FFA Organization. (2003). LifeKnowledge Precepts and Signs of Success.

Tools, Equipment, and Supplies

Overhead projector/transparencies
Prepare a biodiesel sample three to five days in advance.
Pure methanol, 200 mL
Funnels, – 2
½ Liter plastic container
5.3g KOH lye
Hotplate
Soybean oil – 1 L
Thermometer
Blender
2 L pop bottles – 4
Box cutter
Duct tape
Fresh water – 600 mL
Plastic Bags
MS.AST.2.3.AS.A – one sheet per one to three students
MS.AST.2.3.TM.A – one per teacher
MS.AST.2.3.AS.B – one copy will be cut up and put into envelopes.
MS.AST.2.3.ASSESS.A – one copy per student
MS.AST.2.3.ASSESS.B – one per teacher

Key Terms

Fiber

Natural resources

Consumer

1. Since the invention of biodiesel, we have received many benefits.
 - a. Cleaner automobile emissions
 - b. Energy security
 - c. Increased economic benefits
 - d. Reduced dependency on foreign oil
 - e. Safe handling and transport for the environment



Lesson Number: MS.AST.2.3

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B. Usage of Biodiesel

1. Biodiesel is an organic fuel that can be used in many venues.
 - a. Engines
 - b. Generators
 - c. Furnaces
 - d. Organic fuels vs. non-organic fuel effects

Interest Approach

Before students arrive, cut **MS.AST.2.3.AS.A** into strips and place them into small plastic bags. Create one bag per each one to three students depending on your class size or choice.

In this lesson some prep work is needed. Making biodiesel requires a large amount of preparation time and pre-mixing. Be sure to make biodiesel on your own three to five days ahead of time so students can be shown the end result and what each stage looks like. It is recommended that the teacher do this lab as a demonstration; however, if students do the lab, realize that it will take three to five days for completion. Safety rules and attire should be addressed while working with reactive chemicals. Have all your materials set up before class time so that the process can be efficiently started after giving directions.

Thank you for making the effort to be here and in your seats. Today we are headed toward learning the modern conveniences that agriculture research offers us. Listen for words like **fiber** and **natural resources** as we learn about agriculture products. What words?

Students should repeat back the words... fiber and natural resources.

Good! Here we go.

Take the previously cut **MS.AST.2.3.AS.A** that is now in small plastic bags. Create one bag per one to three students depending on your class size or choice. Before opening the bags, ask students to categorize basic items within the classroom, showing them how to categorize items. Ask students to empty the paper strips out of the plastic bag and categorize the modern day conveniences into categories of food, fiber, and natural resources. Once every group has categorized the items, ask the students to share how and why they categorized each convenience.

Look around the room at all the items that are present. Where do they come from?

Elicit responses from students.

What categories might we be able to make for the different items in the room?

Student responses may include technology, food, wood products, humans, etc.

Very good! Today we are going to look at the categories of food, fiber, and natural resources. Let's define these categories. What is food?

Elicit student responses.

Good, something you can consume. What is **fiber**?

Elicit student responses.

Excellent. **Fiber** is a material product such as cloth or wood. What are **natural resources**?

Elicit student responses.

Very good. **Natural resources** include land, trees, minerals, and water.

When I say CREATE, categorize the strips of paper that are located in the plastic bag on your table. Each strip of paper is inscribed with a modern day convenience. Empty out the bag onto your table and with your neighbor categorize each strip into one of the three categories: food, **fiber**, or **natural resources**. We have two minutes to complete this task. Hold up your hand if you understand the directions. CREATE!

Time's up! Let's quickly share which modern day convenience falls under each category.

Student groups will share which conveniences they placed in each category. See the bottom of **MS.AST.2.3.AS.A** for the correct categorizations.

Nice job! This activity gives us a clear picture showing that agriculture research has made modern day conveniences in a variety of different areas of agriculture. From wood products to quail farms, we are blessed with many outcomes of agriculture research. Now let's get our hands dirty and create a modern day convenience from the result of agriculture research.



Consumer benefits from research

Summary of Content and Teaching Strategies

Objective 1. Analyze how agricultural research has benefited the consumer.

Prior to this activity, cut strips from **MS.AST.2.3.AS.B** and fill 12 envelopes with one of the 12 biodiesel making steps. Write one number from one to 12 on each envelope and set them out on each table prior to the activity.

How do we use products of agriculture in today's world?

Elicit student responses.

Great answers. So what are some examples of how we use agricultural products differently, or use different agricultural products to accomplish the same tasks, from the 1950s to now?

Elicit student examples and provide this example if necessary: Pig lard was used as the number one cooking agent and now it is rarely used due to health conscious diets. Soybeans were used for human consumption and now we are producing them for their oil to make biodiesel.

Agricultural products are utilized in many non-traditional ways. As **consumers**, or people who use a product for their own benefit, we have the need for more agricultural products. However, demand for environmentally friendly methods of production has increased, so agriculturists have continued to evolve in order to meet the needs of the American public.

As we learned in previous lessons, agricultural research can be commended for beneficial outcomes both simple and vast. From the simple creation of the Maraschino cherry that tops almost every ice cream sundae in the nation to environmentally safe biofuels, agriculture has given us many benefits. Today we are going to explore one of the most current inventions from the agriculture industry that is benefiting the world population, biodiesel.

Making biodiesel requires a large amount of preparation time and pre-mixing. Be sure to make biodiesel on your own three to five days ahead of time so students can be shown the end result and what each stage looks like. It is recommended that the teacher do this lab as a demonstration; however, if students do the lab, realize that it will take three to five days for completion. Safety rules and attire should be addressed while working with reactive chemicals. Have all your materials set up before class time so that the process can efficiently be started after giving directions.

Display transparency **MS.AST.2.3.TM.A** and direct students to take notes.

To ensure our understanding of the benefits we receive from biodiesel, please take 10 seconds to open your notebook and take down a few notes before we start the production process.

At your table you will find an envelope. When I say the number that is written on your envelope, one person from your table should open the envelope and read the directions. Each set of directions explains the next step towards making our biodiesel. What questions do you have? Number one!

After you call a number, students will read the step from their envelope, the instructor reveals the same step from **MS.AST.2.3.AS.B**, and then demonstrates it. Discuss how agriculture research has made such a worldwide impact with biodiesel as you work through the process.

Continue to call out envelope numbers and demonstrate all 12 steps of the process.

And that is how simple biodiesel is made! Pretty cool, huh?

Engage students in a mindset that embraces change. Connect the changes that scientists made in their thinking about fuels and its impact on the world to how people have to adapt to changing situations to make improvements in their lives.

Now let's turn our thoughts back to how this all came about. Making biodiesel seemed pretty easy today, but it took a lot more time than a class period to invent biodiesel. Scientists and agriculturists had to adapt to a new way of thinking – a way of thinking that would make our environment safer while maintaining an efficient and productive fuel. They had to adapt! What does it mean to adapt?



Lesson Number: MS.AST.2.3

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Possible answers may include change, modify, and become used to something different.

Very good. It means we have to make change. What are some situations in our lives when we have had to adapt or make change?

Possible answers may include: a teacher's classroom style, a coach's way of practicing, a friend's attitude or behavior.

Is adapting and making change always good?

Elicit student responses.

Correct! It may depend on the situation, but being willing to change or adapt is a must. As we saw today, being open to a new kind of fuel paved the way for agriculture to advance. Agriculture has adapted to a new, emerging technology paving the way for the future, just as we have to adapt to situations in life to better ourselves and move forward.

The benefits of agricultural research in our lives are widespread, ranging from the simple selection of a wide variety of foods at any time of the year to the creation of a world-changing environmentally friendly fuel to run our world. Let's review the benefits of agriculture.

Review/Summary

Students will participate in an *Eye Witness News e-Moment®*. Students will group into pairs and take on the role of a reporter and expert. The reporter should ask questions that reflect the outcomes of agriculture research while the expert divulges all the great benefits that humans receive from agriculture research. Explain that this activity is to aid in understanding today's content and that it is a timed event. Students should switch roles midway through.

When I say REPORT, become a reporter or an expert and share with the world the benefits we receive from agriculture research. As a reporter, stand tall and ask the tough questions of what and how agriculture research is changing the world today. You may pose questions to the expert about any of the content we learned today. As the expert, you will explain to the reporter how the outcomes of agriculture research are impacting human's lives. We will have six minutes to complete this task. Midway through, we will switch roles. If you understand the task, raise your hand. Excellent. Let's pick our partners. REPORT!

Agriculture Science and Technology: Research

At three minutes, announce for students to switch roles.

Great job! I heard some awesome reporting going on. Today, we talked about the impacting benefits of agriculture research. We saw first-hand just how easily agriculture research is a part of our lives. As we leave class today, make a conscious effort to look around and take notice of how many things in our world are direct results of agricultural research. Fantastic job listening and participating in today's learning process.

Application

Extended Classroom Activity:

Students will research a list of 10 outcomes of agriculture research that they have personally benefited from through the Internet, magazines, books, etc.

FFA Activity:

Students may prepare a three- to five-minute public speech on the benefits of agriculture research in today's society.

SAE Activity:

Students may start an agriscience research supervised agriculture experience project. Example: Determine what types of agriculture research outcomes affect the largest percentage of youth.

Evaluation

MS.AST.2.3.ASSESS.A

Answers to Evaluation

MS.AST.2.3.ASSESS.B



Interest Approach Activity Cut Outs

CLEAN WATER
MINERALS TO FEED LIVESTOCK
ROTATIONAL GRAZING PATTERNS
ABUNDANT CLOTHING MATERIALS
TOILET PAPER
READILY AVAILABLE LUMBER SUPPLY
HIGHER PRODUCING COWS
ROUND-UP READY SOYBEANS
YELLOW WATERMELONS

Print and cut out the strips for interest approach activity – one per group. The first three strips belong to the Natural Resources category, the second three to Fiber and the last three to Food.



Make Your Own Biodiesel...It's an Agri-science Adventure!

Instructions

- Step 1 - With the help of the funnel, pour the methanol into the plastic container. Using the second funnel, add the lye.
- Step 2 - Tightly screw on the cap and then shake the liquid in a circular motion until the lye is completely dissolved.
- Step 3 - With a stove or hot plate, heat the oil to 130 degrees Fahrenheit.
- Step 4 - Combine the oil and the methanol mixture into a blender that will not be used again for food. Blend for 30 minutes.
- Step 5 - Pour the mixture into one of the pop bottles. Place the cap on the bottle and allow the solution to settle for 24 hours.
- Step 6 - While the solution is settling, prepare two wash bottles by puncturing a 2mm hole in the bottom corner of two of the pop bottles. Cover the holes securely with duct tape.
- Step 7 - After settling, slowly pour the top glycerin into the final pop bottle. Be careful not to do so too quickly or the glycerin and the fuel will become mixed again. If this happens, allow the mixture to settle again. Discard the glycerin.
- Step 8 - Mix the raw biodiesel and 150mL of water in one of the wash bottles. After capping it tightly, lay the bottle on its side and roll it until the water and fuel are evenly mixed.
- Step 9 - Place the bottle upright and allow it to sit for three hours. The water and biodiesel will separate into two layers with the biodiesel on the top.
- Step 10 - Remove the duct tape and drain the water. Replace the duct tape before the biodiesel can exit the bottle.
- Step 11 - Repeat Steps 8, 9, and 10 until you have washed the biodiesel four times. Alternate bottles each time and wash the bottle not in use before re-using.
- Step 12 - After the final washing, allow the biodiesel to dry in an upright, open soda bottle until it is translucent. This could take up to five days.



Benefits of Biodiesel

- 1. Clean automobile and farm equipment emissions**
- 2. Increased energy security**
- 3. Increased economic benefits**
- 4. Reduced dependency on foreign oil**
- 5. Environmentally friendly**
- 6. Easier to handle and transport**



Critical Thinking Questions

Directions: Answer the following questions related to today's content. Utilize the knowledge you gained in the discussion and biodiesel lab to critically answer each question. Please write in complete sentences using a paragraph format.

1. List three outcomes of agriculture research that you directly benefit from today and explain how you benefit.

2. Explain how the invention of biodiesel is a direct result of agriculture research and name two ways that it has positively impacted the human race.

3. What evidence is there to show that agriculture research has made and continues to make a positive impact on the world and its population?



Critical Thinking Questions

POSSIBLE ANSWERS

1. Many answers would be acceptable in this question. Examples might include:

- Safe food supply – With the increased rules and regulations on food security, handling, and quality standards, our nation boasts the safest food supply of any in the world.
- Availability of agriculture products – Due to new discoveries in storage methods, chemical processing techniques and plant and animal engineering, agriculturists can supply many products year round regardless of the typical growing season. Example: flowers and fruits in winter via temperature and light regulated greenhouses.
- Sustainable building products – Through research on renewable resources, we are producing wood products faster than before by raising fast growing trees, example: poplars, providing us with an abundance of wood products.

2. Answers may include:

Part A of the question –

- Use of agriculture products as the number one ingredient to make the fuel.
- Invented based upon using agriculture products in a non-traditional method.

Part B of the question –

- Cleaner air to breathe
- Alternative to petroleum
- Less dependency on foreign oil
- Energy security
- Safer to handle and transport

3. Answers may include:

- Increased crop yields on less acreage
- Safer and larger food supplies for human consumption
- More effective animal safety regulations
- Healthier standards for food processing and production
- Government programs that regulate food-borne and animal diseases