BRINGING BIOFUELS TO YOUR CLASSROOM

growth energy
America's Ethanol Supporters

WHY BIOFUELS IN THE CLASSROOM MATTER

A strong rural America means not only fostering future farmers, but also future biologists, future chemists, future veterinarians, future engineers, and future entrepreneurs. By better educating tomorrow's leaders, we can create advocates for biofuels, agriculture, and rural America.

The biofuels curriculum was created in conjunction with the National Association of Agricultural Educators to promote agriculture in the classroom, as well as reflect innovation in the industry and the bright future of agriculture. This curriculum, supported by the ethanol industry, is an example of how rural America continues to evolve and innovate in the Heartland.

In this curriculum, students research the history of ethanol, produce ethanol from corn products, discuss the benefits of the Renewable Fuel Standard, and combust ethanol to measure its energy content and coproducts. This is the first-ever in-classroom biofuels curriculum for ag educators and includes STEM-based activities, as well as historical and political background for students.

MATERIALS IN CURRICULM

The full curriculum includes lesson plans for each week, activity materials, assessment tools, and Powerpoint presentations with notes. It is a high school-level course with 6 activities across 2 weeks, but components can be extracted to fit your requirements.

Growth Energy will be offering a workshop series in partnership with NAAE to provide teachers an introduction to the curriculum and grant money to get them started in the classroom. Visit growthenergy.org/curriculum for your own copy and to sign-up for updates on our upcoming workshop series.

WHAT YOU'LL TEACH

Students will know and understand:

1. How industry, innovation, and technology led to the development of starch-based ethanol.
2. How ethanol plants use fermentation to convert corn into biofuels and animal feed products.
3. The history and background of the RFS.
4. The benefits of biofuels: for greenhouse gas emissions, for drivers, and for rural economies.
5. How advancing technologies are used to convert cellulosic components of corn into ethanol.

HOW STUDENTS ENGAGE

Students will learn concepts by:

- Making a poster board describing the history and development of ethanol.
- Making ethanol and distillers grains from ground corn seed and corn starch.
- Researching the RFS program and debating the benefits of the program from multiple perspectives.
- Comparing energy content, coproducts, and cost of ethanol and kerosene.
- Producing ethanol from cellulosic corn-based material.

Over 1,600 teachers have already taken steps to bring biofuels to the classrom.

Join them and download the curriculum at **GrowthEnergy.org/curriculum**

SAMPLE LESSON PLAN

DAY	ACTIVITY
1-2	• Present **Concepts, Performance Objectives, Essential Questions,** and **Key Terms** to students in order to provide a lesson overview. • Present **Ethanol History and Production** which includes the video, **How is ethanol made?** and **Ethanol Process Graphic.** • Provide a copy of **Ethanol Activity 1 – Productive History** to students. • Students work in pairs to complete *Ethanol Activity 1 – Productive History.*
3	• Provide a copy of **Ethanol Activity 2 – Production and Coproducts** to students. • Students work in pairs to complete part one of *Ethanol Activity 2 – Production and Coproducts.*
4-6	• Present **Ethanol Importance and Policy.** • Provide a copy of **Ethanol Activity 3 – Community** and **Role Card** to each student. • Students will use their role card to prepare for a debate on developing an ethanol plant. • Students will complete *Ethanol Activity 3 – Community.*
7	• Students work in pairs to complete part two of *Ethanol Activity 2 – Production and Coproducts.*
8-9	• Provide a copy of **Ethanol Activity 4 – Combustion** to students. • Students work in pairs to complete part one of *Ethanol Activity 4 – Combustion.*
10-11	• Provide a copy of **Ethanol Activity 5 – Energy** to students. • Students work in pairs to complete *Ethanol Activity 5 – Energy.*
12-14	• Present **Cellulosic Ethanol** which includes the videos **The Future of Ethanol** and **Biomass: A New Opportunity.** • Provide a copy of **Ethanol Activity 6 – Technology** to students. • Students work in pairs on *Ethanol Activity 6 – Technology.*
15	• Students work in pairs to complete *Ethanol Activity 6 – Technology.* • Distribute **Ethanol Lesson Check for Understanding.** • Students complete *Ethanol Lesson Check for Understanding* and submit for grading. • Use **Ethanol Lesson Check for Understanding Key** to grade student assessments.