

Summary:

Students use research skills to investigate various viewpoints surrounding the issue of ethanol as a fuel in Wisconsin.

Grade Level: 9–12 (5–8)

Subject Areas: Agriculture, Environmental Education, Language Arts, Science, Social Studies

Setting: Classroom, Library, Computer lab

Time:

Preparation: 30 minutes

Activity: Up to one week

Vocabulary: Energy input, Energy output, Ethanol, Net energy value (NEV)

Getting Ready: It may be helpful to involve the school librarian with research.

Academic Standards:

Common Core ELA: RL.9–12.1, RI.9–12.1, W.9–12.1-2&4&7-8

NGSS: HS-ESS3-1, HS-ESS3-4

SEP: Engaging in Argument from Evidence

DCI: ESS3.A: Natural Resources, ESS3.C: Human Impacts on Earth Systems, ETS1.B: Developing Possible Solutions

CCC: Influence of Science, Engineering, and Technology on Society and the Natural World, Science is a Human Endeavor

WI Env Literacy & Sustainability:

C1.A.h, C1.B.h, EX2.C.h, EX3.A.i, EX3.B.h, EX3.C.h, EX4.B.h, EX5.A.h, EN6.A.m, EN6.B.h, EN6.C.i, EN6.C.m, EN7.A.h, EN7.B.h

Materials

- Copies of **Ethanol Viewpoint Form**
- Articles and Web sites on ethanol (see the *Resources* section of the KEEP Web site for *BioFutures* and the articles).

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Biofuel Beliefs



Objectives

Students will be able to

- provide an overview of ethanol production;
- identify at least two different viewpoints about ethanol; and
- write an objective paper about the opinions of different people involved in the ethanol debate.

Background

To better understand environmental issues, it is helpful to analyze the viewpoints surrounding the issue. Investigating the viewpoints involves research, observation, and critical thinking skills.

See background material from “*Corn in Your Car.*”

Read the articles listed below (found on the KEEP Web site in the Curriculum < *BioFutures* section) to gain a better understanding of the debate about ethanol.

- History of Ethanol Production (websites)
- Why are there disparities in the net energy value of ethanol? Read the United States Department of Agriculture’s article, “The Energy Balance of Corn Ethanol: an Update.” A summary of the article is on page iii.
- Read David Pimentel’s article “Biomass Utilization, Limits.” Section C is specifically about ethanol production.

Procedure

Orientation

Write the word “ethanol” on the board and ask students what they have heard or know about the topic. Note their responses.

Survey students to get an idea of their opinions and knowledge on the topic. Ask students if they think there is agreement about the use of ethanol as fuel. Help students understand that there are disagreements about the benefits of ethanol and that they are going to learn about the varying viewpoints.

Provide students with a basic description of what ethanol is and how it is made. Make sure students understand all vocabulary words.

Steps

1. Tell students they are going to investigate different people’s opinions about the positive and negative impacts of producing and using ethanol as a fuel.
2. Discuss sources where students can find articles and Web sites on ethanol. Students should mention the Internet, journal articles, news reports, and books. Invite the school librarian to speak to the class about researching information.
3. Have students work in pairs or groups of three to investigate the various viewpoints. The groups can designate responsibilities for each member. For example, one student can be responsible for looking at Web sites and newspapers. Another student can research journal articles and books. Students can use various strategies to research viewpoints. Following is one approach:
 - Each group should find at least six sources of information on ethanol. Allow about a week for students to research the information. Out-of-class assignments may be necessary.
 - Ask the group to select two sources to investigate further. At this time, students can share their choices with you to make sure a diversity of resources are being investigated.
 - Have students use the **Ethanol Viewpoint Form** to summarize their findings. Review the different parts of the form. The “Viewpoint” is a one-sentence summary that succinctly states the author’s opinion. Students should use the “Additional or supplementary information” section to explain the reasoning or background behind the viewpoint. Ideally, students should cite scientific facts that were referenced within the source. The “Source” section

should include reference information to help the reader find the resource, but it also identifies who authored the resource. (Knowing if the author is a member of a certain organization or receives funding from a particular agency can provide insight into motivations or influences behind the viewpoint presented).

- Everyone in the group should read all the sources, but each group member can be responsible for drafting the **Ethanol Viewpoint Form** for one of the sources. They should then meet as a group and share their work and edit and revise the form together.
4. After the groups have investigated at least two different sources of viewpoints about ethanol, have each group present their findings to the class.
 5. When the students finish their presentations, have them post the **Ethanol Viewpoint Form** on the wall. Challenge the class to group similar or related viewpoints together. They can create a diagram similar to the one on the next page, where ethanol is in the center and the viewpoints are grouped around the center.

Closure

Have students summarize the various opinions presented in the diagram (Step 5). Were they aware of these different viewpoints before they conducted this research? Why do students think there are varying opinions?

Ask students to present their own viewpoints (compare to the survey conducted in the orientation). Do they find themselves agreeing with one or more of these viewpoints? Generate a list of questions about what else they would like to know about ethanol before they form an opinion.

Have students examine their energy use in relation to transportation.

NOTE: You can also conclude the activity with a debate on the pros and cons of using

ethanol. You can divide students into groups and assign them each a role to play (farmer, politician, feed company president, investor, etc.).

Assessment

Formative

- Did students use effective research strategies to identify a variety of different viewpoints about ethanol?
- By reading students' **Ethanol Viewpoint Forms**, can the reader quickly understand the viewpoint of the source?
- Were students able to group similar viewpoints together?

Summative

Have students write an informative article about ethanol and the various viewpoints involved. Encourage students to be objective and not to favor any viewpoint. Discuss the challenges with developing a paper of this format and the strategies they use to remain impartial. They can submit the article to the school newspaper or their local paper.

Extensions

Have students each pick a viewpoint and stage a debate.

Take students on a field trip to an ethanol production facility or invite staff from the facility to come be a guest speaker in the classroom.

Resources:

Ethanol Across America

www.ethanolacrossamerica.net/education.html

All About Ethanol

www.ethanol.org/

Renewable Fuels Association

<https://ethanolrfa.org/>

Growth Energy (America's Ethanol Supporters)

<https://growthenergy.org/>

Opposition to Ethanol

www.energyjustice.net/ethanol/



Viewpoints

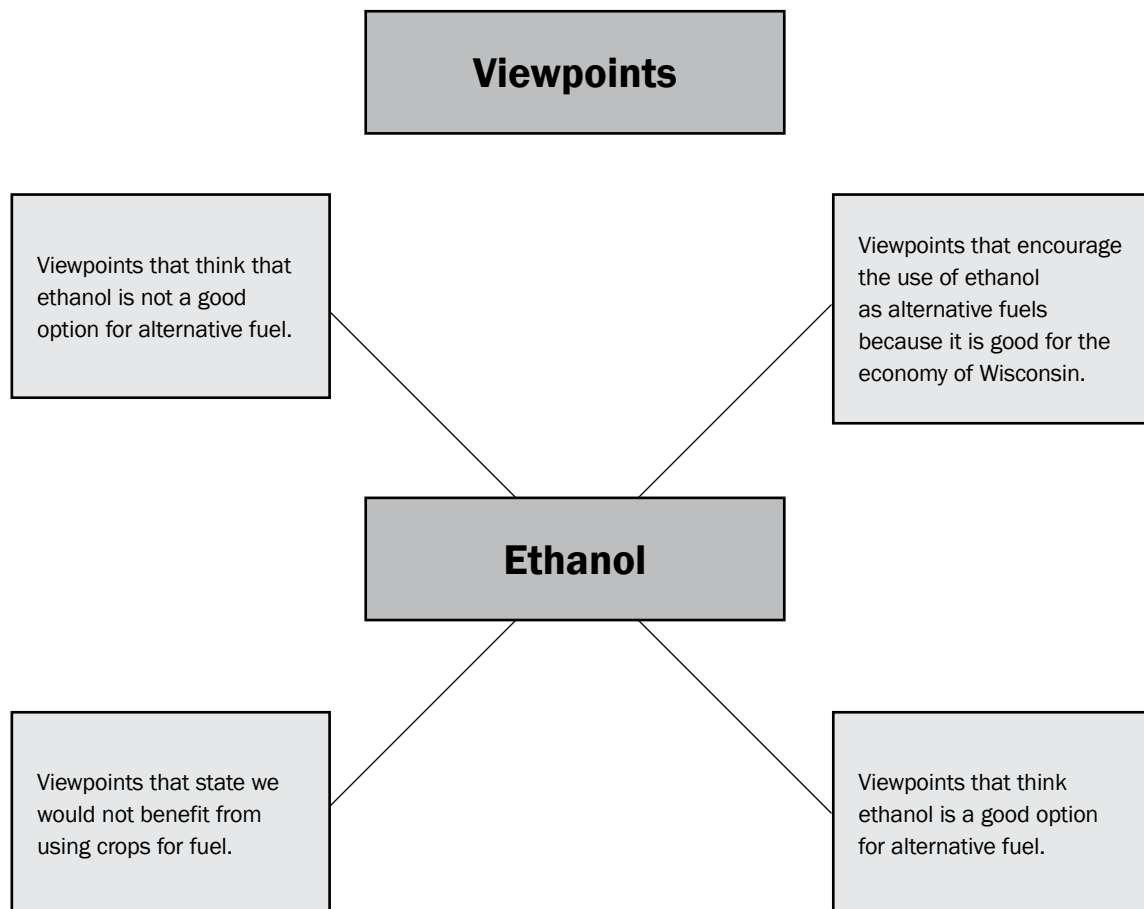
Pro-Ethanol Viewpoint

- Net Energy Value (NEV) is positive
- Good for Wisconsin's farming economy
- Low air pollutant emissions

Anti-Ethanol Viewpoint

- Net Energy Balance (NEB) is negative
- Not enough corn for food and/or feed
- More research needed

Ethanol—(Issues) Viewpoints that think there is not enough corn for food or feed. Viewpoints that think the Net Energy Balance is negative. Viewpoints that think the net energy balance is positive. Viewpoints that think there should be more research.





Ethanol Viewpoint Form

Viewpoint

Write a one or two sentence summary for the information in this source.

Additional or supplementary information

Source

Author or organization:

Title (of article or Web site):

Title of book or journal:

Date:

Other reference information (Web site address or volume number):