



# Nuclear Energy

## What's Your Reaction?

### About This Lesson

How do we find a solution to a complex problem? We need tools to help us better understand the various dimensions of a problem, what factors we must weigh in deciding whether a solution is good/viable or not, and where to find credible information to help us draw conclusions. In this lesson, students will obtain, evaluate, and critically discuss information about the highly-debated topic of nuclear energy. As citizens of the fictitious town of Solutionville, students must decide whether or not they support building a nuclear power plant in the community to replace coal as their source of electricity.

Students should enter into this activity having practiced how to critically evaluate sources of information, identify those that are credible, and defend a position with evidence. There are many excellent tutorials and activities available online that can be done in class or as homework. Choose from the short list below, or design your own!

- [KQED NOW Classroom: Making Informed Decisions and Critical Thinking](#)
- [Annenberg Classroom: The Credibility Challenge](#)
- [Acadia University Library: Credible Sources Count!](#)
- [Purdue University CERIAS: Site Credibility](#)

### Focus Questions

1. What types of factors should we consider when analyzing a potential solution to a problem?
2. Is nuclear power a 'good' or better alternative to burning fossil fuels?

### Learning Objectives

1. Students will gather, read, and synthesize information from multiple appropriate and credible sources to decide whether or not nuclear power should replace fossil fuels as the energy source in a fictitious community.
2. Students will practice weighing the benefits and drawbacks of a potential solution to a complex problem.

### Teacher Prep (10 minutes)

1. Print out one **Student Activity Guide** for each student.
2. Reserve tablets/laptops with internet access or a computer lab for your class.



Grade levels: 6-8

Total activity time: 60 minutes

### Materials needed:

- Video: **Nuclear Energy: Is Fission the Future?**
- Computer with internet access and projector
- Warm-up Slide
- Student Activity Guide (1 per student)
- Nuclear Energy Reading (1 electronic copy for reference)
- Laptops or tablets with internet access or a computer lab
- Sticky notes





## Activity (60 minutes)

### Warm-Up (15 minutes)

1. Display the **Warm-up Slide** on the screen so that students can read the following:

*Nearly 40% of food in the United States is wasted. Because producing food requires a lot of water and energy, it is not just the food that is wasted, but water and energy resources as well. Imagine that a school tries to reduce food waste in their own cafeteria by fining students who do not finish the food they buy for lunch. For every piece of food that is bought from the cafeteria and thrown away instead of being eaten, a student must pay \$1.00.*

2. **Agree/Disagree:** Establish one side of the classroom as the 'Agree' side and one as the 'Disagree' side. Have students stand up and walk to whichever side they identify with given the following prompt:

*Students should be fined for uneaten food bought from the school cafeteria.*

3. Choose students from both sides to defend their position, using the sentence frames 'I agree...because...' or 'I disagree...because...'. List some of their reasons on a chart on the board. For example:

I agree because...	I disagree because...
<i>students probably can't afford to pay fines, so they will be careful to not throw away food.</i>	<i>students will choose to bring their lunch more often from home, and the school will lose money.</i>
<i>students will be more selective and thoughtful about the food that they buy.</i>	<i>students might find other improper ways to dispose of food, such as hiding it or dumping it outside.</i>
<i>uneaten food is a waste of important resources, and students should be accountable for this.</i>	<i>students might eat too much because even though they are full, they don't want to pay a fine.</i>

4. After a brief discussion and some sharing, give students a chance to switch sides if they have changed their mind.
5. Ask for volunteers to propose an alternate solution to the issue. *Examples: Provide to-go container to students so they can save uneaten food, or make the plate sizes smaller so that students can't physically buy as much food.*
6. Popcorn style or in groups, have students brainstorm a list of information that would be helpful to have in order to weigh the pros and cons of a proposed solution to a societal problem (an issue that affects people). *Examples: Scientific data and evidence, thoughts, opinions, and concerns of the people affected by the issue and the proposed solution, expert advice and knowledge, models, etc.*





## Nuclear Energy Inquiry (45 minutes)

1. Introduce students to the premise of the activity:

*The (fictitious) town of Solutionville is trying to figure out a way to replace their current coal-fired power plants with cleaner and more sustainable energy sources. At a recent town meeting, it was proposed that the town build a nuclear power plant. As a voting citizen of Solutionville, you must decide whether or not you support building a nuclear power plant to provide energy and electricity to homes and businesses.*

2. Conduct an anonymous poll to determine how many residents of Solutionville (students in the class) currently support nuclear energy.

**Teacher Tip:** For a fast, easy, and anonymous poll, you can use clickers or a free app like [Socrative](#) which lets students vote using their smartphones, tablets, or a web browser. Apps like Socrative allow you to display the results of a poll to the class in real time.

3. Show students the video **Nuclear Energy: Is Fission the Future?** and discuss some of the benefits and drawbacks of nuclear energy presented in the video.
4. Divide students into groups of three. Hand out one Student Activity Guide to each student, and briefly go over the instructions. Give students about 30 minutes for research.
5. On the board, draw a chart of benefits and drawbacks of nuclear energy like the one in the **Nuclear Energy Reading**. Briefly discuss the difference between environmental, social/cultural, and economic dimensions.
6. Ask each group to write the benefits and drawbacks of nuclear energy on sticky notes (one per note) and to put them in the appropriate row/column on the board.
7. Discuss the class chart. Ask students to explain their thinking and to justify their points by citing the sources they read:
  - *Did you consider all three of these dimensions when conducting your research and analysis?*
  - *Do you think it is important or useful to consider all three of these dimensions in weighing a potential solution to a problem? Why or why not?*
8. Voting day! Hold a community vote on whether or not to build a nuclear power plant, then present the results of both the initial poll and final voting results to the students. Before taking the official vote, consider allowing one advocate from each side, if interested, to 'make their case' in front of the class; students can both practice listening for evidence and listening respectfully.

## Wrap-Up and Reflection

9. At the end of the lesson or for homework, have students write a reflection on what they learned:





- *How easy or hard was it to find credible information about nuclear energy? Did you find any opinions or arguments about nuclear energy that were not backed by evidence or good reasoning? If so, did you still consider them valid considerations?*
- *In your research, did you find more people or organizations supporting or more opposing nuclear energy, or did they seem to be equal? Why do you think this was/is?*
- *Did anyone change their mind between the initial poll and final vote? What made them change their mind, and why?*
- *Why is it important to be able to distinguish credible vs. non-credible sources of information?*
- *How could you encourage people to be more informed voting citizens? (E.g., social media campaign)*

## Additional Resources

- Examples of credible resources on nuclear energy:
  - [United States Nuclear Regulatory Commission website](#)
  - [U.S. Energy Information Administration: Nuclear & Uranium](#)
- [California Academy of Sciences Science News: Nuclear Fusion in Our Backyard](#)
- [KQED NOW Classroom: General Reading Comprehension Learning Activity](#)

## Connections to Standards

### NGSS Disciplinary Core Ideas (Grades 6-8)

- MS-ESS3.A: Natural Resources
- MS-ESS3.C: Human Impacts on Earth Systems
- MS-PS1.B: Chemical Reactions

### NGSS Science and Engineering Practices (Grades 6-8)

- Obtaining, Evaluating, and Communicating Information
- Engaging in Argument from Evidence

### Common Core English Language Arts

**Teacher Tip:** Consider picking one or two of the below to explicitly reference during the activity to reinforce how important they are as a skill that spans both science and language arts:

- **Grade 6:**
  - Trace and evaluate the argument and specific claims in a text, distinguishing claims that are supported by reasons and evidence from claims that are not.
  - Write arguments to support claims with clear reasons and relevant evidence.
  - Gather relevant information from multiple print and digital sources; assess the credibility of each source.
  - Draw evidence from informational texts to support analysis, reflection, and research.





- **Grade 7:**
  - Trace and evaluate the argument and specific claims in a text, assessing whether the reasoning is sound and the evidence is relevant and sufficient to support the claims.
  - Write arguments to support claims with clear reasons and relevant evidence.
  - Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source.
  - Draw evidence from informational texts to support analysis, reflection, and research.
- **Grade 8:**
  - Delineate and evaluate the argument and specific claims in a text, assessing whether the reasoning is sound and the evidence is relevant and sufficient; recognize when irrelevant evidence is introduced.
  - Write arguments to support claims with clear reasons and relevant evidence.
  - Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source.
  - Draw evidence from informational texts to support analysis, reflection, and research.

## Up Next in *Flipside Science Exploring Energy*:



### [Your Digital Footprint: Data and Energy Use](#)

Technology allows us to communicate almost instantaneously even though we may be miles apart from each other! But the networks and infrastructure that make this possible require energy. How energy-intensive are our emails, texts, and Snapchats? Learn more about your digital footprint in this short video.

