



Lesson Seven: Measuring Up

Grade Level: 4th Grade

Time: 60-90 minutes

Essential Question: How can we be stewards of Wyoming's minerals and energy to benefit current and future generations?

Objective: Students will:

- Analyze the pros and cons of both renewable and nonrenewable energy resources.
- Express why it is necessary to use our energy resources wisely and incorporate a variety of energy resources into the production of energy.

Purpose: Students recognize the pros and cons of energy resources and that, as stewards, we must use all energy resources wisely since no single energy resource is sufficient to meet state, national, and global energy needs.

Required Materials/Resources:

- Energy Pro & Con sheets (one set for each student) - (sources 1-15)
- Energy Resource labels
- Masking tape
- Electronic devices for Padlet (www.padlet.com) **OR** sticky notes
- Poster paper
- Markers, colored pencils, etc.
- Chips, tokens, etc. (optional)

TEACHER NOTE:

This lesson is to help students understand that ALL energy sources have both pros **and** cons and that weighing pros and cons is a complex process. It is also important for students to have the opportunity to practice sharing their opinion, giving an explanation for it, and disagreeing with others in a safe and respectful environment.

TEACHER NOTE:

Save the Energy Pro and Con sheets for Lessons 8 and 10.

Suggested Teacher Preparation:

- Review Energy Pro & Con sheets.
- Use masking tape to create a pro/con/neutral line on the classroom floor.
- Label one end of the line CON, the opposite end PRO, and the middle as NEUTRAL.
- Post Energy Resource labels in different sections of the classroom.
- If using the Padlet option, create an account at www.padlet.com, and set up student electronic devices.
- Arrange student groups for steps 7 and 8.

Standards:

Science: 4-ESS3-1 (Explicit)

ELA: 4.L.6, 4.SL.1.d (Practiced/Encountered)


CVE: CV5.3.3 (Practiced/Encountered)

Vocabulary:

- **Con** - the unfavorable factors or reasons; disadvantages
- **Pro** - the favorable factors or reasons; advantages

Instructional Procedure/Steps:

1. Divide the classroom into six sections by labeling each area to represent one of the energy sources: nuclear, coal, natural gas, oil, wind, and hydro.
2. Say: **“Look at the energy resource signs posted around the room. When I say, ‘Go,’ move to the energy resource you think is best, and stand in that section of the room.”** At this point, the instruction is deliberately vague. After students have formed their groups, have students discuss why they selected the resource they did. Have one group spokesperson share out each group’s thinking with the whole class.

3.  Choose an energy resource for the whole class to work with: coal, oil, natural gas, nuclear, wind, or hydro. Pass out the Energy Pro & Con sheet for that energy resource. Say: **“Individually, you will now mark your sheet to show whether each fact is a pro, a con, or a neutral fact. Also, think about how important each fact is in considering the bigger picture of energy. The numbers located at the end of many of the facts are footnotes that provide source information. They don’t have any bearing on whether the fact is positive or negative.”** If necessary, define pro and con.
4. Once students have marked all facts on the selected sheet, direct students’ attention to the line in the middle of the classroom. Say: **“One end of the line represents that the energy resource is positive, and the other represents that the resource is negative. The middle of the line is neutral. You will use your individual evaluation of the pros and cons of the energy source to place yourself on the line. You can stand anywhere on the line.”**
5. Say: **“Place yourselves on the line to show whether you feel the energy resource is mostly positive, mostly negative, somewhat positive, etc.”** When all students have found a place on the line, ask a couple of students to share their thinking about why they chose the position they did.
- Possible strategies to use as students discuss their positioning:
 - Fold the line (Pros discuss with cons.)
 - Shift the line (Middle of the line goes down to one end or the other, so neutrals are matching with pros or cons.)
 - Chips in (Students are each given a predetermined number of chips. When a student wants to participate, he/she puts in a chip. When the student is out of chips, he/she is out of turns. All students are encouraged to spend all their chips.)




In this task, students will be engaged in the higher order thinking skills of evaluation through comparing and rating different facts. They then use that information to make an overall judgement about the pros and cons of various resources.

- 10-word summary (Students share a 10-word summary with a partner telling what they learned or why they are standing where they are. The number of words can change for different rounds of discussion.)
 - After students discuss, ask students if they would like to move based on someone else's argument, or tell students to go to a different spot on the line and justify an alternate point of view.
6. Repeat steps 3-5 using a second energy resource. If you started with a nonrenewable resource, pick a renewable one, or vice versa.
 7. When the whole group has repeated the procedure for a second resource, have students work in small groups to review, rate, and discuss two additional energy resources. Structure groups so that all four of the remaining resources are addressed by at least one group. Monitor discussions to ensure that students are actively listening to one another and disagreeing respectfully.
 8. End the lesson with a class discussion. Arrange students in groups of 4, so there is a mix of members who reviewed different energy resources in the preceding step. Pose the following questions, and ask the small groups to discuss:



In this task, students will be engaged in the higher order thinking skills of analysis.

- **“What did you learn as you did this activity?”**
-  **“Were there any resources that had only pros? Only cons? Why do you think that is?”**
- **“How did your thinking about energy resources change as we looked at the pros and cons of each?”**



- **“Do you think it’s realistic for us to try and use just one energy resource? What might be the benefit of using multiple resources? What might be the challenges?”**
- **“How does knowing the pros and cons of each energy source relate back to our essential question: How can we be stewards of Wyoming’s minerals and energy to benefit current and future generations?”**



In this task, students will be engaged in the higher order thinking skills of evaluation.

9. After giving small groups 5-10 minutes to discuss these questions, bring the whole class together to discuss the last two questions. Use the discussion as an opportunity to reinforce the complexity of the industries and of making stewardship decisions regarding the industries:

Again, ask:

- **“Do you think it’s realistic for us to try and use just one energy resource? What might be the benefit of using multiple resources? What might be the challenges?”**
- **“How does knowing the pros and cons of each energy source relate back to our essential question: How can we be stewards of Wyoming’s minerals and energy to benefit current and future generations?”**
- **“Is the energy resource you chose at the beginning of this lesson still your first choice?”**

10. Ask students to reflect on the lesson using one of the following options:

- Create a poster for students to post a sticky note with their “ah-ha” statements or take away messages. OR
- Use the app “Padlet” (a sample padlet is set up here: <https://padlet.com/andrea Hayden97/eak0hr17ltk0> password: energy). Once all students have posted their thoughts, you can print off the padlet and have a hard copy to post in the

classroom, use as student notes, use for teacher assessment info, etc.

Assessment: Collect students' Energy Pro & Con sheets and evaluate for understanding of pros and cons. (Keep these as they will be used again in later lessons.) Listen to the whole group discussion and review students' reflections to check students' understanding of the lesson concepts.

Possible extension activities:

1. Have students play "Power Up" from NASA: climatekids.nasa.gov/power-up/. (Source 16) This is a game where students are given the challenge of powering a city given a certain amount of money. They can try out different strategies. Teachers can instruct students to use different constraints (choose the cheapest, the most environmentally friendly, etc.) and then compare and contrast the outcomes.
2. Have students view "From Fossil Fuels to Renewables," a video made by a Wyoming high school student that was a national winner in C-SPAN's 2017 Student-Cam competition. It features Governor Mead, Senator Enzi, and a number of Wyoming scientists discussing energy in Wyoming. *Video length 7 minutes 43 seconds.* <https://www.c-span.org/video/?426777-1/fossil-fuels-renewables> (Source 17)

Credits/Sources:

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