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| **Title** | Lesson 1: Sources of Energy |
| **Introduction** | This lesson introduces students to the idea that consumers use many types of energy to meet their needs, and each type of energy has specific characteristics along with advantages and disadvantages. Students use research techniques to become experts on a specific type of energy and then share that knowledge with others in the class using interactive technology. Students also become familiar with the terms renewable and non-renewable energy. |
| **Curriculum Alignment** | **Grade 8 Science Essential Standard 8.P. 2**—Explain the environmental implications associated with the various methods of obtaining, managing, and using energy resources.  **Grade 8 ELA Common Core Writing Standard 7—**Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.  **Grade 8 ELA Common Core Speaking and Listening Standard 5**—Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. |
| **Learning Outcomes** | Students will learn about types of energy, their uses, and advantages and disadvantages through online research. Students also categorize types of energy as renewable or nonrenewable. Their understandings will be displayed in an interactive poster format which is shared with students. |
| **Time Required and Location** | Students will need two 45 minute class periods or one block period to complete the exploration, conduct their research, and create their presentations. Amount of time for presentations will vary depending on the size of the class. In general, each presentation should be less than five minutes each. |
| **Materials Needed** | Materials needed Energy fact cards—1 set per pair of students  Access to Intermediate Energy Infobook, produced by National Energy Education Development Project (NEED), available at [www.need.org](http://www.need.org). (It is available online or in print form.)  Research questions—one set per pair of students or written on chart paper, board, or glog.  Rubrics for evaluating students (one for each pair of students)  Types of Energy chart –on transparency, written on board, or used electronically  Computer and data projector access  Scanner—optional  Paper and Pencil  Science notebooks (if you class uses this tool. If not, students can record answers on paper.)  Chart or poster paper, markers, crayons (optional)  **Technology resources**  Internet connection, needed for the duration of the lesson  Computers—one per pair of students, needed for the duration of the lesson. (Alternately, students can work in groups of four to minimize numbers of computers needed. If no computer access is available, printed Intermediate Energy Infobooks are available for purchase at [www.need.org](http://www.need.org) or the teacher can print the information from the website.)  Access to [www.need.org](http://www.need.org), needed for the duration of the lesson.  Access to [www.glogster.com/edu](http://www.glogster.com/edu) If access to this site is not available, students can present their information using chart paper or poster paper or using a program such as Powerpoint. This website is needed after students have conducted their research and are building and presenting their projects.  Data projector or interactive white board, needed for presentations. |
| **Participant Prior Knowledge** | Students should have an understanding of the concept of energy. They need not be able to repeat the scientific definition (energy is the ability to do work) but should be able to articulate that energy causes change or makes things happen. Students should also understand that energy has many different forms and can be transformed into other forms. To check for these understandings and scaffold if necessary, have a brief discussion with students about the following questions.   1. What is energy? 2. How and when do we use it? 3. Where do we get it? 4. What are some types you know about?   If students are unable to answer question 4, guide them to thinking about energy in their own bodies. This concrete example can help students to connect to the topic. |
| **Facilitator Preparations** | Complete these steps prior to implementing the lesson.Print and cut apart one set of Energy Fact cards for each pair of students See attached file for Energy Fact card reproducible and answer key.Review the website [www.need.org](http://www.need.org). Click on the link for Intermediate Energy Infobook to become familiar with the site students will use to conduct their research. Pay careful attention to the ten types of energy listed (biomass, coal, geothermal, hydropower, natural gas, petroleum, propane, solar energy, uranium (nuclear), and wind energy.)Decide if students will select their own partners or if you will pair them. If you pair them, assign a type of energy to each partnership. If students select their own partners, write the types of energy on slips of paper and allow students to draw their type of energy. If you have more than 20 students (10 pairs), more than one partnership will research the same type of energy.Make arrangements for students to have access to computers on research and presentation days.Make arrangements to have access to a data projector or interactive white board on presentation days.Prepare research questions for students to answer. These are listed in Model System directions.Prepare Types of Energy Chart. (See attached file). This can be photocopied for students, made into a transparency or chart, or prepared as a Powerpoint slide or Word document.If computer access is not available, printed materials can be obtained from [www.need.org](http://www.need.org) and students can complete the presentation using chart paper and markers.Obtain an account at [www.glogster.com/edu](http://www.glogster.com/edu) (Free accounts are available for educators.) Set up accounts for students in your class following the on-screen directions. Remember to print or write down user name, password, and URL information for students to use. You will only need to create one account for each pair of students.Print rubrics for evaluation. See attached file. |
| **Activities** | **Exploration**   * Give each pair of students a set of Energy fact cards. (Make sure you have cut them apart and shuffled them.) Ask students to match the type of energy to the matching energy fact without using any reference material. When students are satisfied with their matches, have them write this information in their science notebooks. (Alternately, you can give each student a set of cards which can be taped into the science notebook). * As a class, briefly discuss students’ choices. Do not give the correct answers to students at this point. The goal is for students to become familiar with some energy types and spark interest in the topic. * At the conclusion of the discussion, collect the fact cards. An easy way to store these is in snack size plastic bags.   **Model System**   * Assign a type of energy to each pair of students. (Types of energy to assign are biomass, coal, geothermal, hydropower, natural gas, petroleum, propane, solar, uranium, wind) * Explain to students that they will now become an expert on the type of energy they have been assigned. Let students know that they will present their expert knowledge to the class. * Direct students to [www.need.org](http://www.need.org) website. Utilize the Intermediate Energy Infobook link to find information about their assigned type of information. Using this website students should take note on the topics below, using their own words. (Write these on the board type up for students, or put into glog format as a model for students to use.)   Description/explanation of type of energy  Where it is found  What it is used for  Amount available  Impact on the environment  Is it renewable or non-renewable?   * Allow students time to gather information. About 20 minutes should be enough time. This is a good place to stop if your classes are 45 to 60 minutes long. * Explain to students that they will present their information to the class in the form of a glog, which is an interactive poster. Give each pair of students their log in information and have them log in. Explain the basics of a glog to students—wall, text, graphics, images. * Tell students the requirements for the glog.   + Information gathered about their type of energy. (See details above in bullet 3.)   + Two pictures that relate to their type of energy. Students may use the web to find images or they can scan in their own art if you have access to a scanner.   + A personal connection to the type of energy. Students should find a way that their type of energy relates to them. It can be a personal use of the type such as a propane grill or solar calculator, or even a trip to visit a hydropower dam such as at Niagara Falls. If students feel they don’t have any direct connection, allow them to use movie or TV experiences. * Allow students time to construct their glog. This usually takes about 30-45 minutes. Remind students to proofread and edit their glogs. Also remind students to practice their presentations with their partners, remembering to speak to the class and not the board or screen. * Present glogs. During this time, have members of the class take notes, focusing on advantages and disadvantages of each type of energy. Students can make a chart or graphic organizer to collect notes. If your students need more structure, you can create a graphic organizer for them. * During glog presentations, use the attached rubric to evaluate students.   **Content Wrap Up**  Once glog presentations are complete, make sure that students are able to identify each type of energy, a major use for it, at least one advantage and one disadvantage, and whether it is renewable or non-renewable. The attached Types of Energy chart answer key provides a summary of all types of energy, uses, and advantages and disadvantages. Accept all reasonable answers, even if they are not on the chart.  **Guided Practice**   1. Pass out Energy Fact cards again. Have students sort them again to see if their matches have changed. Write any changes in the science notebook with an explanation of why their matches changed. You may now share answers with students if you choose. 2. Have students sort the sources of energy into renewable and non-renewable categories.   Renewable sources are biomass, hydropower, geothermal, solar, and wind. Non-renewable are coal, petroleum, natural gas, propane, and uranium.). Use this activity as a formative assessment piece if you choose. |
| **Assessment** | Use the rubric from the glog and work samples from the guided practice as formative assessment of students’ understanding.For summative assessment, provide students with a blank Types of Energy chart (see attached). Have them fill in information about each type of energy including uses, advantages and disadvantages, and whether it is renewable or non-renewable. You can use the Types of Energy Chart answer key as a reference when checking students’ charts. Decide whether students can use the notes they collected during glog presentations as a reference. |
| **Critical Vocabulary** | |  |  | | --- | --- | | **Word** | **Definition** | | Energy | Comes in many different forms and causes changes in our bodies and world. | | Renewable energy | Can be replenished quickly (usually in less than 100 years) | | Nonrenewable energy | Cannot be replaced quickly. | |
| **Modifications** | For students with disabilities or ELL students, use the primary or elementary version of the Infobook or read aloud the information to the students.  More advanced students can use Internet search engines to find more information about their energy source, or requirements for the glogster can be expanded. |
| **Alternative Assessments** | For students with disabilities, the rubric can be modified so that students are not penalized for spelling or neatness. |
| **References** | Required website [www.need.org](http://www.need.org) This is the website for the National Energy Education Development Project. Please refer to the supplemental Resources section above for more information about this website.  Optional website [www.glogster.com/edu](http://www.glogster.com/edu) .This is the website for Glogster, which is an interactive media resource. Be sure to use the education (edu) section of the website with students as the regular glogster site may have graphics that are inappropriate for educational settings. |
| **Supplemental Information** | The National Energy Education Development Project (NEED) is a rich resource for information about energy. All documents are available online at [www.need.org](http://www.need.org) and can be photocopied for educational use. Resources are also available for purchase. This information is also updated yearly so it is as accurate as possible. You can use this site as a reference for yourself. The Introduction to Energy section found in the Intermediate Infobook is a good general reference.  One way to introduce the project and familiarize students with glogs is to present the criteria for the project on a glog that you create. That way you are modeling the task and you can gather some some troubleshooting tips for creating glogsters. |
| **Author Info** | Melaine Rickard  Turrentine Middle School, Alamance Burlington School System, Burlington, NC 27215  Grade 8 ELA and Science  19 years experience  NBCT in Science, AIG certified  This lesson was developed as a result of an externship experience with Dr. Lisa Grable, Precollege Education Deputy Director of the Science House. Dr. Grable directs the Young Scholars and Research Experience for Teachers program at the FREEDM center at NCSU. This program is sponsored by the NSF and gives students and teachers the opportunity to learn about renewable energy. My experiences included hands on activities at the Science House and FREEDM center, job shadowing of scientists and engineers, field trips to laboratories on NC State’s campus, and visits to industry sites such as Shearon Harris Nuclear Plant, UNC Cogen plant, and Progress Energy.  This lesson represents the fundamental understandings necessary to begin to think critically about energy choices and meet the demands of energy needs in the future.  For more information about the Science House of the FREEDM Center, go to <http://www.science-house.org/index.php/outreach-projects/freedm-outreach> |