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Energy Resources [5th grade]

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UNDERSTANDING BY DESIGN

Unit Cover Page

Unit Title: Energy Resources

Grade Level: 5

Subject/Topic Area(s): Science/Energy Resources

Designed By: Lindsay Freres and Kristen Miceli

Time Frame: 8 days

School District: East Central I.S.D.

School: Salado Intermediate

School Address and Phone: 3602 South WW White, SA, TX 78222, (210) 648-3310

Brief Summary of Unit (Including curricular context and unit goals):

This unit is designed to guide students in the discovery of how sedimentary rock and fossil fuels are formed, what nonrenewable and renewable resources are, and how alternative energy can be both useful and harmful to our environment. Students will compute labs that show how sedimentary rock is formed and how this process is similar to the formation of fossil fuels. They will also discuss the different forms of alternative energy, stating both pros and cons for each. Students will use writing, illustration, and oral explanation throughout the unit. The final performance task will allow students to apply, explain, and reveal self-knowledge of the content by creating an exhibit about sedimentary rock and fossil fuels. Students will also be required to determine the best form of alternative energy to use to power the exhibit then explain why they think this is the best option for this San Antonio location.

Unit: Energy Resources
Grade: 5

Stage 1: Desired Results

Established Goals (Standards)

TEKS or Scope & Sequence

- 5.7 The student knows Earth's surface is constantly changing and consists of useful resources.
- 5.7A Explore the processes that led to the formation of sedimentary rocks and fossil fuels.
- 5.7C Identify alternative energy resources such as wind, solar, hydroelectric, geothermal, and biofuels.

Understandings

Students will understand that…

- Sedimentary rock and fossil fuels were formed in a very specific, time-consuming manner that cannot be easily replicated.
- Everyone is responsible for conserving the limited resources we have and better utilizing alternative energy resources.
- Alternative energy and fossil fuels have both positive and negative effects on the environment.

Essential Questions

- Why is learning about rock formation important?
- How do the processes of formation differ between coal, oil and natural gas?
- Which alternative energy resources are best for the environment? How about for San Antonio?
- What are the harmful effects alternative energy resources may have on the environment?

Knowledge

Students will know…

- Vocabulary: sediments, fossil fuels, compaction, cementation, alternative energy
- The processes that led to the formation of sedimentary rocks and fossils fuels.
- The difference between renewable and nonrenewable resources.
- The kinds of alternative energy resources we use today.

Skills

Students will be able to…

- *5.1* Conduct classroom and outdoor investigations following home and school safety procedures.
- 5.1A Demonstrate safe practices and the use of safety equipment as described in the Texas Safety Standards during classroom and outdoor investigations.
- *5.2* The student uses scientific methods during laboratory and outdoor investigations. *The student is expected to:*
- 5.2F Communicate valid conclusions in both written and verbal forms.
- *5.4* Use a variety of tools and methods to conduct science inquiry.
- 5.4A Collect, record, and analyze information using tools including hand lenses, graduated cylinders, and notebooks.

Stage 2: Assessment Evidence

Performance Task:
The Witte Museum has asked Salado students to help them create a new exhibit. Your task is to design a display that will educate San Antonio about the formation of sedimentary rock and fossil fuels. Your plan will include a layout or floor plan, displays or items you will include, and the things that visitors will learn by coming to your exhibit.

Once you have completed your design, you will decide how to power your exhibit. City Public Service (CPS Energy) is going to fund your project. In order for them to fully fund your exhibit, you must present them with a proposal outlining which form of alternative energy would be best to use and why. Be sure to consider your location when deciding on which energy resource you'll use.

Other evidence:
(quizzes, tests, academic prompts, self-assessments, etc.
note – these are usually included where appropriate in Stage 3 as well)

- Pre-assessment/Post-assessment
- Observation/Monitoring
- Ticket out the door
- Quiz (EduSmart)
- Think-Pair-Share
- Write-Pair-Share
- Venn Diagram

Stage 3: Learning Activities

(Steps taken to get students to answer Stage 1 questions and complete performance task)

Note: Check all links and websites prior to the day of instruction; some video clips or articles may require Adobe Flash Player or may be blocked by your district network.

Day 1: Begin by showing the class an image of the Grand Canyon (image and link attached). Ask, "How do you think this was formed?" (rubric attached) Students do a quick write in their notebook then briefly share out ideas with the class (pre-assessment). Teacher demonstrates how sediments are produced by rubbing two rocks together and collecting the sediments on a colored piece of paper under the document camera. Ask the students if they know what is being created on the paper. Discuss what happens when rocks are broken down by weathering (sediments created). Make the distinction between sedimentary rock and sediment. Students follow steps described by the teacher for the Layering Lab (see attachment). After completing the lab, students will illustrate their sedimentary rock model in their notebook (under the quick write), label it, and answer the following questions:
Which layer is the oldest? How do you know?
Which layer is the youngest? How do you know?
What can sedimentary rock teach us? (Write-Pair-Share)
(ask students to save the last six lines on the page for Day 2)

<u>Vocabulary</u>:
sediments: Small bits of rock, shells, and other materials.

Day 2: Hand out sentence chunks to groups of three to five students (template attached). Ask each group to put the chunks in order to form two different sentences. Monitor and observe groups as they work. Groups take turns standing up and reading one sentence out loud, holding up one chunk at a time as they read. After each group gets a turn to read, teacher attaches sentence chunks to the board with magnets or writes them on the board; students copy sentences into their notebooks (ask them to use the bottom of the page from Day 1). Tell the students that yesterday they learned how sedimentary rocks are formed; today we will talk about the natural resources that are produced in a similar process. Show clip of Yoda and Luke Skywalker in the swamp (great example of swamp-like environment: http://www.youtube.com/watch?v=7YkbgvRMpW0&feature=related). Introduce the term *fossil fuels* by asking if students remember what fossil fuels are. Show EduSmart clip on Natural Resources; use natural breaks in the clip to pose questions and check for understanding. Be sure to stress the following points:

- Coal is formed in swamp-like environments.
- Peat is the partially decomposed plant material.
- Oil and natural gases form in oceans and lakes.
- It takes heat, pressure, and time to make fossil fuels.

Students take the quiz at the end of the EduSmart clip. Introduce the Fossil Fuels How-to Book by reading an online example of how to make a peanut butter and jelly sandwich (http://www.wikihow.com/Make-a-Peanut-Butter-and-Jelly-Sandwich). Be sure to point out the level of detail required. Students form pairs and teacher assigns each partner either coal or oil/natural gas. Distribute instructions and rubric for Fossil Fuels How-to Book (attached). Students begin work.

Vocabulary:
fossil fuels: Nonrenewable resource formed from the remains of prehistoric plants and animals; these resources consist of coal, oil, and natural gas.
compaction: Sediment particles are pressed closer together as the weight of all layers pressed downward.
cementation: Sediment particles are held together by crystals that form in the spaces around the particles; this process holds all the compacted sediments together and completes the formation of sediments to rock.

Day 3: Students continue working on Fossil Fuels How-to Book. Ask students to read their finished book to their partner. They may use the books to complete the Venn Diagram, comparing and contrasting the formation of coal versus oil and natural gas (separate document).

Note: This unit is designed with 5th grade Science and Math teachers in mind (East Central I.S.D.). We will create time for students to build more content knowledge about the pros and cons of both traditional and alternative energy by supplying our ELAR partners with non-fiction reading pieces. This may include articles on fossil fuels or any of the five alternative energy sources sited within this unit. Fracking is a recent, controversial topic that would be great to include as well.

Visit the following website for articles that present the pros and cons to energy resources: http://alternativeenergy.procon.org/

Day 4: Pose the question "What resources can we use when we run out of coal, oil, and natural gas?" Show video clip on fracking (see end of Day 4 for a list of resources). Ask students to again consider the question asked before the clip (Think-Pair-Share). Teacher presents Alternative Energy Resources PowerPoint (separate document). Students use the information to create a foldable in their science notebooks (teacher resource pages for foldable attached. Distribute half sheets for ticket out the door (attached). Allow at least five minutes for students to write.

Online resources:
PBS "Gasland": http://video.pbs.org/video/1452296560/
CNN: http://www.cnn.com/video/
Video Clips on Fracking:
http://www.clipsyndicate.com/video/play/1362699/epa_studies_oil_gas_fracking?wpid=5435
Time magazine (The Fuss Over Fracking):
http://www.time.com/time/video/player/0,32068,876880045001_2062814,00.html

Vocabulary:
alternative energy: a source of inexhaustible energy (can be produced again and again), such as wind, solar, or geothermal energy.

Day 5: Introduce the Performance Task (assignment sheet and rubric attached). Read through the assignment, checklist, and rubric, then allow time for students to begin work.

If students need a review of some energy resource concepts, BrainPOP has the following topics under Engineering & Technology/ Energy Technology:

- *Biofuels*
- *Fossil Fuels*
- *Gas and Oil*
- *Wind Energy*
- *Solar Energy*

Day 6: Post-assessment
Note: Our district requires that we administer the same pencil and paper assessment CSCOPE for this unit; if you do not give a common assessment, use the pre-assessment from Day 1.

Day 7: Continue working on performance task. Finish and present.

Day 8: Finish presentations.

http://jacobelyacharjournalist.com/2012/05/17/jacobs-travels-the-grand-canyon-and-sedona-arizona/

Pre/Post-Assessment Rubric

Category	3	2	1
Heat	Includes heat and explains it correctly	Includes heat but explanation is missing	Does not include heat
Time	Includes time and explains it correctly	Includes time but explanation is missing	Does not include time
Pressure	Includes pressure and explains it correctly	Includes pressure but explanation is missing	Does not include pressure
Layers	Includes layers and explains it correctly	Includes layers but explanation is missing	Does not include layers
Sediment	Includes sediment and explains it correctly	Includes sediment but explanation is missing	Does not include sediment

Heat: Heat is required to remove moisture and cement layers together
Time: Layers are added over long periods of time and sedimentary rock isn't formed overnight.
Pressure: Pressure is required in order for the minerals in each layer to become solid rock.
Layers: Sedimentary rock is made up of layers of different sediments
Sediment: Small particles from the weathering of rocks are deposited in layers.

Layering Lab

Teacher Resource Sheet: Day 1

Materials:

- 2 large rocks, preferably limestone or something that will weather easily
- Sheet of colored paper
- Clear plastic cups, 1 per group
- Small Dixie cups, 3 per group
- Tray or paper plate
- 3 different sediments (i.e. red sand, sand, and pea gravel)
- Student notebooks
- Document camera and laptop

Prepare ahead of time:

- Rub rocks together and collect enough sediment to share a small amount with each group.
- Fill each of the three small Dixie cups for each group with a different type of sediment.
- Place one clear plastic cup and the three Dixie cups on either a tray or paper plate.

Teacher Directions:

- Tell the students that today they will be creating their own sedimentary rock model.
- Ask how the materials on their trays/paper plates can be used to accomplish this.
- Offer to get them started by pouring some of your sediment into each plastic cup.
- Tell the students that over another layer will be deposited on top of the original layer; ask students to choose one type of sediment from their tray and pour it into the clear plastic cup.
- Repeat the step above until all sediments have been added to the model.
- Show the picture of the Grand Canyon again and ask, " How is the model we created different from this picture?"; points to stress during discussion:
    - Layers are deposited over a long period of time
    - Heat and pressure remove moisture and cause the minerals in the sediments to harden
    - Models are not always an exact replica, but are a useful tool for achieving a better understanding of concepts in Science.

Sentence Chunks Template

Teacher Resource Sheet: Day 2

- Enlarge the sentences below (landscape format works best).
- Copy onto colorful cardstock (a different color for each sentence).
- Cut sentences into chunks (suggested chunks shown below).

Sentence #1:

- Sediments of sand and smaller particles (sometimes containing the remains of organisms) are gradually buried and are cemented together by dissolved minerals to form solid rock again.

Suggested chunks for #1:

- Sediments of sand and smaller particles
- (sometimes containing the remains of organisms)
- are gradually buried
- and are cemented together by dissolved minerals
- to form solid rock again.

Sentence #2:

- Coal, oil, and gas are called "fossil fuels" because they have been formed from the organic remains of prehistoric plants and animals.

Suggested chunks for #2:

- Coal, oil, and gas are called
- "fossil fuels" because they have been
- formed from the organic remains of
- prehistoric plants and animals.

Fossil Fuels How-To Book

Student Instructions and Rubric

- Create a how-to book that describes, step-by-step, the formation of:
  - COAL or OIL/NATURAL GAS (please circle one)

- Each process should be explained using complete sentences **and** illustrations.

- You may use any notes from class (this includes your notebook) or other classroom resources such as the Science textbook or ScienceSaurus.

Category	3	2	1
Knowledge	Includes all of the steps in coal or oil/natural gas formation.	Includes most of the steps in coal or oil/natural gas formation.	Does not include the correct steps in coal or oil/natural gas formation.
Grammar	Uses complete sentences.	Uses some complete sentences.	Did not use complete sentences.
Creativity	Very creative in title and story. Illustrations are colorful and Match the text.	Somewhat creative in title and story. Illustrations are colorful and somewhat match text.	Not creative in title or story. Illustrations are not colored and text do not match.

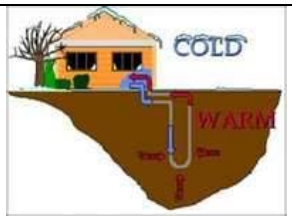
Alternative Energy Foldable Template (Outside)

card stock folded vertically; make four horizontal cuts to create five equal sections

Solar Energy
Wind Energy
Geothermal Energy
Hydroelectric Energy
Biofuels

Alternative Energy Foldable Template (Inside)

open foldable to reveal the inside

 Definition: Energy from the sun.	Pro: Free, does not require fuel, no pollution, safe Con: Expensive, requires a mostly sunny climate, the energy has to be stored
 Definition: Energy from wind.	Pro: Free, does not require fuel, no pollution Con: Does not work without wind, noisy, may kill birds
 Definition: Energy from the Earth.	Pro: Needs little or no fuel, little impact on the environment Con: May release dangerous gases, can't must be careful about where you build a power plant
 Definition: Energy from the movement of water.	Pro: Very reliable, water can be stored for future use (dams) Con: Expensive to build dams, causes upstream flooding
 Definition: Energy from plants and other organic wastes.	Pro: Reduces waste materials, cheap fuel Con: Creates greenhouse gases

Name: _____

TICKET OUT THE DOOR

I think the kind of alternative energy that is best for the environment is

_____

because _____

_____

_____

_____ .

Name: _____

TICKET OUT THE DOOR

I think the kind of alternative energy that is best for the environment is

_____

because _____

_____

_____

_____ .

Name: _____

Coming Soon at the Witte Museum: Natural Resources!

Part I:
The Witte Museum has asked Salado students to help them create a new exhibit. Your task is to design a display that will educate San Antonio about the formation of sedimentary rock and fossil fuels. Your plan will include a layout or floor plan, displays or items you will include, and the things that visitors will learn by coming to your exhibit.

Part II:
Once you have completed your design, you will decide how to power your exhibit. City Public Service (CPS Energy) is going to fund your project. In order for them to fully fund your exhibit, you must present them with a proposal outlining which form of alternative energy would be best to use and why. Be sure to consider your location when deciding on which energy resource you'll use.

Checklist:

_____ Name of exhibit

_____ Floor plan with displays, interactive stations, activities, videos, slideshows

_____ Key for floor plan, briefly describing the different areas in the exhibit

_____ At least five complete sentences explaining what your visitors will learn

_____ Form of alternative energy chosen

_____ Proposal for CPS Energy written

Category	4	3	2	1
Floor plan	A wide variety of displays, activities, and media are included in the floor plan; they are neatly labeled and described on a separate key.	A wide variety of displays, activities, and media are included in the floor plan; the labels and descriptions are unclear.	Only one or two displays or activities are included in the floor plan; they are NOT labeled or described on a separate key.	It is unclear what the exhibit will include and the floor plan is NOT labeled; no key is included.
Exhibit information	Five sentences are written and contain accurate, relevant information.	Three or four sentences are written and contain accurate, relevant information.	At least three sentences are written, but some of the information is incomplete or inaccurate.	Only one or two sentences are included.
Energy proposal	Identify and define alternative energy resources that will be used; proposal is persuasive and includes facts to support their plan.	Identify and define alternative energy resources that will be used; the proposal lack reasoning for why the resource should be used.	Identify the form of alternative energy but it is not defined; the reasons for why this energy source should be used are unclear.	Identify the form of alternative energy but it is not defined; there is no proposal included.
Grammar and neatness	Complete sentences are used throughout the project; work is neat and legible.	Most of the project includes complete sentences; work is neat and legible.	Most of the project includes complete sentences; work is messy and difficult to read.	Sentences are incomplete; work is messy and difficult to read.