



Title: Arkansas--An Oasis of Energy	
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Course: Earth Science, Environmental Science, Geology	Duration: Three to four 50 minute class periods: -Two to three classes for research and presentation of background knowledge -One 50 minute class period for presentations and assessment. (Depending on the group, some research could be done as homework.)
Grade: 9-12	
Objective: Students will research the five geologic energy sources in Arkansas (coal, gas, brine, lignite, oil). This will include where the resource is located, how it is formed, and uses of the resource.	
Summary of Lesson: The students will work in groups to become experts on one of the five energy sources naturally occurring in Arkansas. Students will create a public service announcement as a culminating project to share the information they have learned.	
Standards: Common Core State Standards, Arkansas State Standards, Next Generation	
CODE	STANDARD
CCSS.ELA-LITERACY.RST.9-10.7	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words
CCSS.ELA-LITERACY.RST.11-12.2	Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms
NS.5.ES.3	Evaluate long-range plans concerning resource use and by-product disposal for environmental, economic and political impact



HS-ESS3-4 Next Generation Science	Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.
HS-ESS3-2 Next Generation Science	Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.
<p>Teacher Excellence Support System (TESS):</p> <p>Domain 1d: By using the Arkansas Geological Survey website the teacher will demonstrate knowledge of resources.</p> <p>Domain 3b: Teacher will use questioning, prompts and discussion by posing probing questions to encourage high level thinking.</p> <p>Domain 3e: Teacher will demonstrate flexibility and responsiveness by allowing students choices in how they divide their group tasks and submit their culminating project.</p>	
<p>Instructional Strategies and Practices:</p> <p>Cooperative learning, technology-based instruction</p>	
<p>Bloom's Level: Highest Level Only</p> <p>Analysis and evaluation</p>	
<p>Materials and Resources:</p> <ul style="list-style-type: none"> • Arkansas Geologic Survey http://www.geology.ar.gov/home/index.htm • Computer with internet access • Art supplies, as needed for maps and illustrations (Can be supplied by students.) 	
<p>Formative Assessment:</p> <p>The teacher will monitor students as they are conducting research and pose probing questions to ensure students are taking their learning deeper. Descriptive feedback and self and peer assessment will also be utilized.</p>	
<p>Notes to Teacher:</p> <p>Students should have previous knowledge of fossil fuels as well as the rock cycle and geologic time scale. It might be helpful for the teacher to select groups based on the Kagan cooperative grouping model. Depending on the technology available at your school, teachers could encourage final projects to be anything from apps to blog pages. For a lower age group or lower ability group of learners the research could be focused on one specific resource and divided among the whole class. The classroom should be arranged so students can easily work in groups and freely collaborate.</p> <p><u>Key vocabulary:</u></p> <p>Conventional gas Unconventional gas Natural resources Coal</p>	



Lignite
Brine
Oil
Natural gas

Student Activity

1. Students will be divided into five to six groups (depending on the size of the class, natural gas can be divided into either wet and dry or conventional and unconventional).
2. Students will research the resource they have been given focusing on the following items:
 - a. Formation of the resource: diagram and explain the geologic process that created the resource, referencing the approximate time on the geologic time scale.
 - b. Location of the resource: create a map which shows the location of the resource in Arkansas, these could be created on tracing paper so a layered map could be created showing all of the resources students are investigating.
 - c. Commercial Use of the resource: groups will showcase the commercial uses of the product
 - d. Production: The actual production process for extracting and using the resource will be explained, being sure to mention any potential harm to the environment
 - e. Improvements: After becoming experts on the resource, its uses and production, students will present improvements on any step of the process to mitigate impact to the environment keeping cost/benefit analysis ratios in mind. Students should be encouraged to create models to explain their design changes.
- 3. Culminating Project:** Students will present their findings to the class in any media forum they desire. Students could be encouraged to make a Public Service Announcement sharing information they have learned with a community close to one of the resources, students could also be asked to reach out to a group or company involved in the mining process of their resource and share their design improvement idea(s).