



Title: Fracturing - Is it all that it's cracked up to be?	
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Course: Environmental Science English	Duration: Five 40-minute class periods <ul style="list-style-type: none"> • Day 1 – preparation, expectations, objectives • Day 2 – read informational texts • Days 3-5 – write draft of an argumentative essay, self-edit, peer edit, and write final paper
Grade: 9-12	
Objective: To determine whether hydraulic fracturing is a safe and proven technology for extracting natural gas without causing harm to the environment. After reading informational texts and gathering evidence, write an essay addressing the question and argue whether 'fracking' is safe and effective and should be allowed. Support your position with evidence from the text(s).	
Summary of Lesson: Students will read the informational texts from the materials list or of their own choosing and then write an essay which addresses the question and argues whether fracking is safe and effective and should be allowed. Textual evidence will be used to support the writer's stand.	
Arkansas Standards:	
CODE	STANDARD
CCSS.ELA-Literacy.RST.9-10.1	Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.
CCSS.ELA-Literacy.RST.9-10.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.
CCSS.ELA-Literacy.RST.9-10.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.
CCSS.ELA-Literacy.RST.9-10.4	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.



CCSS.ELA-Literacy.RST.9-10.5	Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).
CCSS.ELA-Literacy.RST.9-10.6	Analyze the author’s purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address.
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.9-10.8	Assess the extent to which the reasoning and evidence in a text support the author’s claim or a recommendation for solving a scientific or technical problem.
CCSS.ELA-Literacy.RST.9-10.9	Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.
CCSS.ELA-Literacy.RST.9-10.10	By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently.
Writing Standards for Literacy in History/Social Studies, Science, and Technical Subjects 6–12	
CCSS.ELA-Literacy.WHST.9-10.1	Write arguments focused on discipline-specific content.
CCSS.ELA-Literacy.WHST.9-10.1a	Introduce precise claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that establishes clear relationships among the claim(s), counterclaims, reasons, and evidence.
CCSS.ELA-Literacy.WHST.9-10.1b	Develop claim(s) and counterclaims fairly, supplying data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form and in a manner that anticipates the audience’s knowledge level and concerns.
CCSS.ELA-Literacy.WHST.9-10.1c	Use words, phrases, and clauses to link the major sections of the text, create cohesion, and clarify the relationships



	between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.
CCSS.ELA-Literacy.WHST.9-10.1d	Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
CCSS.ELA-Literacy.WHST.9-10.1e	Provide a concluding statement or section that follows from or supports the argument presented.
CCSS.ELA-Literacy.WHST.9-10.4	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
CCSS.ELA-Literacy.WHST.9-10.5	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
CCSS.ELA-Literacy.WHST.9-10.6	Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.
CCSS.ELA-Literacy.WHST.9-10.7	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
CCSS.ELA-Literacy.WHST.9-10.8	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.
CCSS.ELA-Literacy.WHST.9-10.9	Draw evidence from informational texts to support analysis, reflection, and research.
CCSS.ELA-Literacy.WHST.9-10.	10 Write routinely over extended time frames (time for



	reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.
Content Standards	
NS.4.ES.1	Collect and analyze scientific data using appropriate mathematical calculations, figures and tables
NS.4.ES.3	Utilize technology to communicate research findings
SP.3.ES.2	Investigate the relationships between human consumption of natural resources and the stewardship responsibility for reclamations.
SP.3.ES.5	Evaluate the impact of different points of view on health, population, resource, and environmental issues: <ul style="list-style-type: none"> • governmental • economic • societal
SP.3.ES.9	Evaluate personal and societal benefits when examining health, population, resource, and environmental issues
SP.3.ES.10	Predict the long-term societal impact of specific health, population, resource, and environmental issues
Disciplinary Core Ideas:	
Core Idea ESS3	Earth and Human Activity
<p>By the end of grade 12. Resource availability has guided the development of human society. All forms of energy production and other resource extraction have associated economic, social, environmental, and geopolitical costs and risks, as well as benefits. New technologies and regulations can change the balance of these factors.</p>	
<p>Teacher Excellence Support System (TESS): Domain 2a: Creating an Environment of Respect and Rapport Domain 3a: Communicating with Students Domain 3b: Using Questioning and Discussion Techniques</p>	
<p>Instructional Strategies and Practices: Checking for understanding, guided notes, Cornell note taking, cooperative learning, modeling, scaffolding, reflection.</p>	



Bloom's Level: Highest Level Only
Analysis

Materials and Resources:

(These websites may change over time. If a website is no longer available, use key words and phrases to find more current resources.)

Fracking: Considerations for risk management and financing

<http://www.milliman.com/insight/insurance/Fracking-Considerations-for-risk-management-and-financing/>

Natural gas gold rush: Is your state next?

<http://usatoday30.usatoday.com/news/nation/story/2012-05-29/fracking-environment-gas/55845708/1>

Learn About Hydraulic Fracturing Fluids

<https://geology.com/energy/hydraulic-fracturing-fluids/>

Arkansas information on Fracking

https://ballotpedia.org/Fracking_in_Arkansas

(Example of a five paragraph essay)

<http://monroecollege.libguides.com/content.php?pid=369744&sid=3031245>

(Example of Scoring Rubric)

<https://hinessocialstudies.files.wordpress.com/2016/06/5-paragraph-essay-rubric.pdf>

Formative Assessment

Self-edit, peer edit, & write an argumentative essay

Notes to Teacher:

Students must have knowledge and understanding of a five-paragraph essay.

Make sure students understand teacher's expectations and how they will be evaluated on this experience.

Students will self and peer-evaluate and reflect on the process and their learning.



Student Activity

Day 1 (40 minutes):

- Explain the assignment:
You will read the informational texts from the materials list or those of your own choosing to collect evidence to argue whether or not “hydraulic fracturing” is proven technology for extracting natural gas without causing harm to the environment. You will then write a five paragraph essay defending your position, using the evidence you have gathered.
- Discuss with students the objective of a five-paragraph essay and the rubric for grading.
- Have an example posted and distribute a five-paragraph essay and rubric for students to reference.
- Model the technique of writing a five-paragraph essay.
- Practice using a simplistic text and a generic prompt.

Day 2 (40 minutes):

- Students read three texts, annotating as they read

Day 3 (40 minutes):

- Students will write a draft of their argumentative essay.

Day 4 (40 minutes):

- Students will self-edit and peer edit using supplied rubrics.

Day 5 (40 minutes):

- Students will write the final version of the argumentative essay. (Give students another opportunity to revise papers on their own time after a grade has been assigned.)