

8<sup>th</sup> Grade Science

Teaching Time: 21 -80 minute classes (due to block scheduling) equivalent to 44 -45 minute classes or one quarter of school year.

## Standards Alignment:

Standard	Learning Goal	Objective(s)	Assessment(s)
<b>Science:</b> S.8.ESS.1 Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.	1,5	5	Essay; Activity: 6.1
S.8.PS.1 Develop models to describe the atomic composition of simple molecules and extended structures.	2	1,2	Activities 1.1, 5.1
S.8.PS.2 Gather and make sense of information to describe that synthetic materials come from natural resources and impact society.	1	3	Activities: 1.2, 1.3, 1.5, 5.3
S.8.PS.3 Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed.	2,3,4	2	Activity: 5.1, 5.2
S.6-8.ETS.1 Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, considering relevant scientific principles and potential impacts on people and the natural environment that may limit workable solutions.	6	4	Activities: 4.1, Pipeline Project
S.6-8.ETS.2 Evaluate competing design solutions using a systemic process to determine how well they meet the criteria and constraints of the problem.	6	4	Activities: 4.1, Pipeline Project
S.6-8.ETS.3 Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.	6	4	Activities: 4.1, Pipeline Project
S.6-8.ETS.4 Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.	6	4	Activities: 4.1, Pipeline Project
<b>Mathematics:</b> M.8.F.5 Describe qualitatively the functional relationship between two quantities by analyzing a graph. Sketch a graph that exhibits the qualitative features of a function that has been described verbally.	2,3,4	2	Activities: 3.1, 3.2, 4.2, 5.1, 6.1
M.8. SP.1 Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities.	2,3,4	2	Activities: 2.1, 2.2, 3.1, 3.2, 4.2, 5.1, 6.1
M.8. SP.2 Know that straight lines are widely used to model relationships between two quantitative variables.	2,3,4	2	Activities: 2.1, 2.2, 3.1, 3.2, 4.2, 5.1, 6.1

<b>Literacy:</b> S.6-8. L.1 Cite specific textual evidence to support analysis of science and technical texts.	1	5	Essay Analysis of Activities
S.6-8. L.2 Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.	5	5	Essay
S.6-8. L.8 Distinguish among facts, reasoned judgement based on research findings, and speculation in text.	5	5	Essay
S.6-8. L.11 Write arguments focused on discipline-specific content.	5	5	Essay; Analysis of Activities
S.6-8. L.15 Use technology, including the Internet to produce and publish writing and present the relationships between information and ideas clearly and efficiently.	5	5	Essay
<b>West Virginia Studies:</b> SS.8.H.CL6.2 Evaluate the sequence and analyze the impact of contemporary social, economic, and technological developments on people and culture in WV.	1,6	4	Pipeline Project; Activity: 6.1
SS.8.H.CL6.4 Examine the economic, social, and political impact of 20 <sup>th</sup> century events on WV.	1,6	4	Pipeline Project; Activity: 6.1
<b>Technology and Computer Science:</b> <i>Information and Communication:</i> TCS.6-8.1 Demonstrate and practice the ability to effectively utilize research strategies to locate appropriate digital resources in support of their learning.	5,6	4,5	Pipeline Project; Essay
TCS.6-8.2 Practice and demonstrate the ability to evaluate resources for accuracy, perspective, credibility, and relevance.	5,6	4,5	Essay
TCS.6-8.4 Explore real-world issues and problems and actively pursue an understanding of them and solutions for them.	5,6	4,5	Pipeline Project; Essay; Activities: 3.1, 3.2, 4.1, 4.2, 5.2, 5.3, 6.1
TCS.6-8.7 Communicate complex ideas clearly using various digital tools to convey the concepts textually, visually, graphically, etc.	5,6	4,5	Pipeline Project; Activities: 3.1, 3.2
<i>Computational Thinking:</i> TCS.6-8.9 Practice defining problems to solve by computing for data analysis, modeling or algorithmic thinking.	5,6	4,5	Activities: 2.1, 2.2, 6.1
TCS.6-8.10 Find or organize data and use technology to analyze and represent it to solve problems and make decisions.	5,6	4,5	Pipeline Project; Activities: 2.1, 2.2, 3.1, 3.2, 4.2, 6.1
TCS.6-8.11 Break problems into components parts, identify key pieces and use that information to problem solve.	5,6	4,5	Pipeline Project; Activities: 1.5, 3.1, 3.2, 4.2, 5.2, 5.3
<i>Digital Citizenship:</i> TCS.6-8.14 Demonstrate and advocate for positive, safe, legal, and ethical habits when using technology and when interacting with others online.	5	5	Essay
TCS.6-8.15 Demonstrate and advocate for an understanding of intellectual property with both print and	5	5	Essay

digital media-including copyright, permission, and fair use by creating a variety of media products that include appropriate citation and attribution elements.			
<i>Collaboration:</i> TCS.6-8.18 Use collaborative technologies to connect with others, including peers, experts and community members, to learn about issues and problems or to gain broader perspective.	5	5	Essay; Activity: 6.1; Pipeline Project
TCS.6-8.19 Determine their role on a team to meet goals, based on their knowledge of technology and content, as well as personal preference.	6	4	Pipeline Project
TCS.6-8.20 Select collaborative technologies and use them to work with others to investigate and develop solutions related to local and global issues.	6	4	Pipeline Project; Activities: 3.1, 3.2, 4.1
<i>Empowered Learning:</i> TCS.6-8.23 Actively seek performance feedback from people, including teachers, and from functionalities embedded in digital tools to improve their learning process, and select technology to demonstrate their learning in a variety of ways.	5	5	Essay
<i>Innovation and Design:</i> TCS.6-8.25 Engage in a design process and employ it to generate ideas, create innovative products or solve authentic problems.	6	4	Activities: 3.1, 3.2, 4.1; Pipeline Project
TCS.6-8.27 Engage in a design process to develop, test, and revise prototypes, embracing the cyclical process of trial and error and understanding problems or setbacks as potential opportunities for improvement.	6	4	Activities: 3.1, 3.2, 4.1; Pipeline Project
TCS.6-8.28 Demonstrate an ability to persevere and handle greater ambiguity as they work to solve open-ended problems.	6	4	Activities: 3.1, 3.2, 4.1, 5.2; Pipeline Project

### Learning Goals:

1. To research information and determine if the information is factual/evidence based or opinionated.
2. To use a model to demonstrate that structure and function are related.
3. To correctly model scientific principles through mathematical relationships.
4. To analyze graphical representations of data and apply that knowledge to extrapolate future trends.
5. Use evidence from research to take a position regarding the impact of increasing human population has on a natural resource.
6. To design and propose a solution to a real-world problem regarding the use of natural resources.

### Driving Question:

What is the future for fossil fuel energy for West Virginia?

### Justification:

Due to its geology, West Virginia has an abundant amount of natural resources. These resources range from the fossil fuel bituminous coal buried underground, to the freely flowing fresh water from many streams, to the deciduous and coniferous trees that grow on the mountains. Along with the harvesting and development of

these resources has come exploitation of West Virginia by outside sources. Students are often surprised to learn that West Virginia with its resources and power generation should be a financially thriving state but unfortunately this is not the case. The development of the Marcellus Shale to extract natural gas is providing a unique opportunity for the citizens of West Virginia. There are a large variety of good jobs that accompany this industry and the companies that support it desire to hire local. This unit will provide an opportunity for students to explore this industry, the careers that it offers, as well as put into practice their problem-solving skills. From the structure of the unit, the students will develop their team work and communication skills. As the students develop their knowledge of natural resources they see these resources identified in their local environment which makes their learning concrete.

Integration of the subject areas of STEM occurs throughout the unit as the students are actively engaged in the various activities. An example of this occurs in Activity 6.1 Human Population which is scaffolded just prior to the Human Impact Essay Assignment. To complete the activity the students must research online and collect data on the human populations of various countries (TCS.6-8.1, TCS.6-8.2, TCS.6-8.4, S.6-8.L.2, S.6-8.L.8). The students will then share their data with the class (TCS.6-8.18, TCS.6-8.20). Using this shared data, the students will construct a circle graph of the 20 highest populated countries and a bar graph of the population change of the top 10 most populous countries (M.8.F.5, M.8.SP.1, M.8.SP.2, TCS.6-8.9, TCS.6-8.10). From completing the research and constructing the graphs the students will have a deeper understanding of population growth. For the Human Impact Essay the student is to take a position to answer the question, "How has the increasing human population, which causes an increase in the use of natural resources, impacted Earth's systems?" Requirements of the essay are: research and cite three separate articles about their chosen resource and human population, construct a 5.3 graphic organizer, and write a rough draft of their argument (S.6-8.L.1, S.6-8.L.2, S.6-8.L.8, S.6-8.L.11, S.6-8.L.15, TCS.6-8.1, TCS.6-8.2, TCS.6-8.4, TCS.6-8.7). As part of the rough draft process, the students are to share their draft via Office 365 and provide constructive feedback to two of their peers (TCS.6-8.14, TCS.6-8.15, TCS.6-8.23). Because the Activity 6.1 is sequenced prior to the essay the student has a deeper understanding of how the human population has grown exponentially in the last 200 years. My choice of a written argumentative essay which must be supported by evidence and utilizing the Office 365 program provides a product that meets the Science and Literacy standards. The essay is also an assignment for their Language Arts class thus the students will also learn proper formatting and citation strategies.

The products I have chosen to complete the various activities such as: Excel graphs for Activities 5.1 and 6.1, written analysis for all activities, Human Impact Essay, and the Pipeline Project, demonstrate integration of the various subjects. The scaffolding of the activities moves from individual/pair to small group to classroom which serves to develop their collaborative/team work skills, so all members of the class can be successful. The student products are developed opposite this from constructing their analysis of the activities as a class via discourse (as a team) to small groups (roles on Pipeline Project) to individual (Human Impact Essay). Because the products are structured this way the students' self-efficacy increases which lends to deeper learning and greater success.

### **Measurable Objectives:**

The student objectives for the unit are:

1. *Construct* and *identify* atomic models of basic carbon compounds.
2. *Illustrate* the atomic arrangement of water and *describe* how the arrangement changes when heat is added or removed.
3. *Record* observations of a variety of petroleum products and *compare and contrast* those properties.
4. *Summarize* the engineering design process and *apply* those concepts to the Pipeline Project.
5. *Develop a logical argument* that is supported by cited evidence.

## Prior Knowledge:

Prior to this unit the students will have learned: atomic theory, elements, periodic table, periodic table trends, writing and balancing chemical equations, and Law of Conservation of Matter. The students will also know the procedures of effective group work and how to write a good analysis. They will have the skills to: determine if articles are fact or opinion based, collaborate with peers via sharing on Office 365, and construct graphs via Excel. The students are familiar with the online textbook Achieve3000 and how I assign the reading passages.

**Materials for Unit:** 1:1 Computers, please see materials list for the various activities

**Engage:** Show Sway <https://sway.com/84fKBL0EAInkScCB?ref=Link> Using attached narrative as a guideline.

**Explore:** The *activities* of the unit are scaffolded to build student knowledge toward the learning goals. As they work with other students and I engage in discourse with them, I will propose open-ended questions to support their inquiry process.

**Explain:** The written analysis of the activities will provide opportunities for students to convey their understanding of the concepts. The students will also be able to verbally communicate their understanding during the classroom discussion times.

**Elaborate/Extend:** Collaboratively, the students will be extending their understanding of the engineering design process as they complete the Pipeline Project. Individually, they will research about the impact the increasing human population has on Earth's natural resources.

**Evaluate:** Students will be evaluated formatively throughout the unit. Classroom discussion, both teacher-student and student-student, can provide feedback as toward progression to the learning goals. My observations of student behavior and discourse during the activity of Designing a Derrick Rig can inform me of the students' growth toward the engineering design concepts. These items are not graded but will provide me input so I may adjust the lessons. I do assign grades for formative assessments that are skill based or participatory. Accurately creating a graphical representation of data, both student-collected and researched, is a vital skill. Individual written analysis after completing the activities and discussion, that emphasizes application of the vocabulary, will also let me know if students are still struggling with concepts or have misunderstandings. There are three summative grade assignments for this unit. For the Pipeline Project the students will be evaluated individually via the Collaboration Rubric. Brief student-teacher conferences will occur at the end of the unit to review the collaboration rubric with the student to provide feedback to improve performance for the next unit. The Human Impact Essay is an individual assignment also assessed by a rubric. The End of Unit Exam is a comprehensive exam that is composed of a variety of types of questions including a performance task. This exam simulates the format of the state-wide assessment that students are required to take at the end of the school year.

## Lesson Procedures:

Please see the attached Unit Map and Lesson Plans for this class.

## Assessments/Rubrics:

Analysis of Activity Rubric

Pipeline Project Rubric (group)

Human Impact Essay Rubric

Pipeline Project Rubric (collaboration, individual)

**Lesson Materials:** Daily lesson plans contain links to videos and websites. Sample lesson is below.

Activities:

1.1 Carbon Compounds

- 1.2 It's a Gas
- 1.3 Biotic Materials
- 1.4 Listen & Draw Geologic Time
- 1.5 Geologic Puzzle
- 2.1 Baking Rocks
- 2.2 Porosity and Permeability
  
- 3.1 Sound Boards
- 3.2 Skewer Contour Mapping
  
- 4.1 Building a Derrick
- 4.2 Horizontal Drilling
  
- 5.1 Water Phase Change Lab
- 5.2 Standard Distillation
- 5.3 Investigating Petrochemical Products
  
- 6.1 Human Population Activity

# Science Lesson Plan

Maureen Miller

8<sup>th</sup> Grade Unit of Study: Structure and Properties of Matter/Human Impacts

Date: Thursday, 11/15/2018

**NGSS:** S.8.PS.1; S.8.PS.2; S.8.PS.3; S.8.ESS.1; S.6-8.ETS.1-4

**Differentiated Instruction** is integrated throughout the unit for all students to succeed.

- Readiness will be assessed through teacher observation and reassessment.
- Content is differentiated through a variety of resources with varying readability levels.
- Learning styles are accommodated because of the variety of visual presentations and hands-on opportunities.

**Modifications:** Assist students as needed; provide presentation materials (handouts); adjust assignment length and amount as needed per IEP

**Bases:** Communication Skills are modeled and reinforced daily for oral and verbal. Work Ethic is determined by participation in classroom activities, timely completion of in-class and online assignments, and use of planner. Assessment for Bases is made at end of each week.

**LIM:** Students have been assigned classroom roles to encourage the development of leadership and service to other characteristics. Emphasis is placed on positive and encourage behaviors both verbal and physical for all class members.

**Objectives/Essential Questions:** How has the human population grown over time?  
How has the human population put pressure on natural resources?

**Vocabulary Development:** population density, natural resources

**Resources:** materials for Activity 6.1 Human Population Activity

**Engagement Activity/Bell ringer:** Unit #2, #16

**Hands-on Activity:** 6.1 Human Population

**Application:**

1. Assign bell ringer and discuss.
2. Watch video clip: 7 Billion: How did we get so big? <https://www.youtube.com/watch?v=VcSX4ytEfcE>
3. Assign Activity 6.1, discuss and complete analysis.
4. Discuss Human Impact Essay Assignment format, rubric, etc. Permit students to choose resources.

**Technology:** tools to complete activities

6.1 Human Population

Objective: To create some graphs of the human populations over time, use the graph to extrapolate future population, and project how the population affects natural resources.

Materials: computers human population worksheet colored pencils  
Protractors rulers calculators

Procedures:

1. Students should be divided into 7 groups: North America, South America, Africa, Europe, China, India, and the rest of Asia.
2. Using the data sources, they are to research the population of their areas.
3. Students are to share their data with the class via jigsaw.
4. Each student is to create a circle graph of the population of the 20 highest populated countries via Excel.
5. Each student is to create a bar graph of the population change of the top 10 countries.

Data Sources:

- 1.) <https://data.worldbank.org/indicator/SP.POP.TOTL>
- 2.) <http://www.worldometers.info/world-population/#top20>
- 3.) <http://www.mlbgd.k12.pa.us/cms/lib/PA09000085/Centricity/Domain/85/Human%20population%20graph.pdf>

Analysis:

- How does the United States compare to the rest of the world in population terms (mathematically)?
- Which country contains most of the world's population (percentage)?
- Which country uses most of the resources (mathematically)?

Category	4	3	2	1
Spelling, Punctuation, and Grammar	One or few errors	Two to three errors	Four errors	More than four errors
Calculations	All work is shown, correct, and labeled.	Some work is shown, correct, and labeled.	Some work is shown and labeled.	No work is shown or mislabeled.
Appearance	Written or printed neatly in a complete paragraph.	Written or printed neatly.	Written or printed not in a complete paragraph.	Difficult to read, sloppy, or not in full sentences.
Conclusions	The relationship between the variables is identified along with trends or patterns. Illustrates a thorough understanding of the concepts of the activity.	The relationship between the variables is identified. Illustrates an understanding of most concepts of the activity.	The relationship is discussed but trends and patterns are not identified. Limited understanding of the concepts of the activity.	The relationship is not discussed, and/or an inaccurate understanding of the concepts is demonstrated.

Objective: The student is to take a position to answer the question “How has the increasing human population which induces an increase in use of natural resources, impacted the Earth’s systems?”

Outline of writing the essay:

- Present students with their resource options: coal, natural gas, oil, uranium, minerals/rocks, water, food
  - o Give students 30 sec. to brainstorm which they would like to research and have them come up to the board to choose
  - o Four in a group and once it’s filled no more students can choose that resource
- Discuss with students that they are going to write a paper about how human population is affecting their resource (could be positively or negatively). They will need at least 3 separate articles to write their argument.
- Construct a 5.3 graphic organizer for their essay using [www.readwritethink.org](http://www.readwritethink.org) submitted to instructor for approval.
- Write a rough draft from organizer on Office 365. The rough draft must be shared with three peers and the instructor. Each rough draft must have a minimum of nine constructive comments.
- Final essay is to be shared with instructor.

Argumentative Essay Rubric

Category	8	6	4	2
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Introduction	The introduction is inviting, states the problem, and provides an overview of the issue.	The introduction includes the problem and provides an overview of the issue but is not inviting to the reader.	The introduction is missing either the problem or the overview of the issue.	The introduction is missing.
Content	There is one clear, well-focused topic. The main idea stands out is supported by detailed information.	The main idea is clear, but the supporting information is general.	The main idea is somewhat clear but there is a need for more supporting information.	The main idea is not clear. There is a seemingly random collection of information.
Support	All supportive facts are reported accurately and cited correctly. Facts, statistics, and other evidence demonstrate thoughtful research.	Almost all supportive facts are reported accurately and cited correctly. It is obvious that the writer somewhat researched the topic.	Most supportive facts are reported accurately and cited correctly. But more research is needed to provide more facts, reasons, and evidence.	NO facts are reported, OR most are inaccurately reported OR cited incorrectly. It is obvious the writer did not research the topic.
Word Choice	Vocabulary from the unit is evident throughout essay. A variety of thoughtful transitions are used that clearly show how the articles are connected.	Vocabulary from the unit is used in most of the essay. Transitions clearly show how the articles are connected but there is little variety.	Vocabulary from the unit is present in the essay. Some transitions work well but connections among articles is unclear.	Few vocabulary words from the unit are used in the essay. The transitions among articles is unclear or nonexistent.
Conclusion	The conclusion clearly restates the problem and sums up the essay.	The conclusion somewhat restates the problem and partially summarizes the essay.	The conclusion is missing either the restatement of the problem or the summary of the essay.	The conclusion is missing.
Mechanics	There are no misspellings or grammatical errors.	There are three or fewer misspellings and/or grammatical errors.	There are four misspellings and/or grammatical errors.	There are more than four spelling or grammar errors.