

You have just been hired to serve as a summer intern for Congressman Paul Ryan, the chairman of the House Budget committee. As a congressional intern, your duty is to assist his staff and conduct research for the congressman.

Since the congressman is the primary legislator responsible for helping the President manage the nation's finances, he is very concerned with reducing the government's debt (which currently stands at over 55 trillion dollars!). <http://www.usdebtclock.org/>

To help improve the U.S. economy and stop the nation's debt from rising, Congressman Ryan has gotten permission from the Treasury Dept. to invest government dollars in the rare earth mining industry. This highly profitable business, currently dominated by China, produces the minerals necessary for the production of modern devices such as cell phones, laser instruments, and computers.

Your first task as an intern is to conduct research to help the congressman decide which rare earth mineral the U.S. government should invest in. Your findings will be presented to Congress and must be professionally prepared and thorough!

Remember! Your goal is to answer the following question: What rare earth element would you recommend the U.S. export to help reduce its national debt?

## PROJECT OVERVIEW

<b>Name of Project:</b>	<b>“Understanding the Periodic Table”</b>		<b>Duration: 3 (+) weeks</b>
<b>Subject/Course:</b> <b>Science</b>	<b>Teacher(s): Porterfield, Karalash, Karen Stapleton-Bower, Nesmith</b>		<b>Grade Level: 7<sup>th</sup> and 8<sup>th</sup></b>
<b>Other subject areas to be included, if any:</b>	<b>Language arts, social studies</b>		
<b>Project Idea</b> Summary of the issue, challenge, investigation, scenario, or problem:	Students will research a rare earth element to determine it's value/usefulness to the US economy.		
<b>Driving Question</b>	<p>You have just been hired to serve as a summer intern for Congressman Paul Ryan, the chairman of the House Budget committee. As a congressional intern, your duty is to assist his staff and conduct research for the congressman.</p> <p>Since the congressman is the primary legislator responsible for helping the President manage the nation's finances, he is very concerned with reducing the government's debt (which currently stands at over 55 trillion dollars!). <i>Show students:</i> <a href="http://www.usdebtclock.org/">http://www.usdebtclock.org/</a></p> <p>To help improve the U.S. economy and stop the nation's debt from rising, Congressman Ryan has gotten permission from the Treasury Dept. to invest government dollars in the rare earth mining industry. This highly profitable business, currently dominated by China, produces the minerals necessary for the production of modern devices such as cell phones, laser instruments, and computers.</p> <p>Your first task as an intern is to conduct research to help the congressman decide which rare earth mineral the U.S. government should invest in. Your findings will be presented to Congress and must be professionally prepared and thorough!</p> <p>Remember! Your goal is to answer the following question: <b>What rare earth element would <u>you</u> recommend the U.S. export to help reduce it's national debt?</b></p>		
<b>Content and Skills Standards</b> to be addressed:	<p>P.PM.07.11 <i>SWBAT identify the smallest component that makes up an element (atom).</i></p> <p>P.PM.M.2 <i>SWBAT understand that elements are composed of a single kind of atom that are grouped into families with similar properties on the periodic table. They will learn that each element has a unique set of physical and chemical properties such as boiling point, density, color, conductivity, and reactivity.</i></p> <p>S.RS.07.15 <i>SWBAT demonstrate scientific concepts through various illustrations, performances, models, exhibits, and activities.</i></p>		

		RCM.07.04 <i>SWBAT make text-to-text comparisons.</i>				
		WPS. 07.01 <i>SWBAT exhibit personal style and voice to enhance the written message in informational writing (e.g., emotional appeal, strong opinion, credible support).</i>				
		SCN.07.01 <i>SWBAT adjust their use of language to communicate effectively with a variety of audiences and for different purposes by using specialized language related to a topic and selecting words carefully to achieve precise meaning when presenting.</i>				
		(Others will also will be covered through the ELA’s integrated lesson plans.)				
		T+A	E		T+A	E
<b>21<sup>st</sup> Century Skills</b> to be explicitly <i>taught and assessed</i> (T+A) or that will be <i>encouraged</i> (E) by project work, but not taught or assessed:	Collaboration	X		Other: Social Literacy	X	
	Presentation	X				
	Critical Thinking:		X			
					<b>Presentation Audience:</b>	
<b>Culminating Products and Performances</b>	<b>Group:</b>	Poster or glogster graphic displaying information about the rare Earth element they recommend. Items to be included: name of element, where found in the US, what makes it valuable, is it safe, benefit to US economy, element qualities. <i>How will this work be presented to the Congressman or his proxy?</i>			Class:	x
					School:	x
					Community:	x
	<b>Individual:</b>	Students will write a persuasive essay in Language arts class trying to convince others why mining their element will be valuable to the US economy.			Experts:	
					Web:	
					Other:	
<b>PROJECT OVERVIEW</b>						
<b>Entry event to launch inquiry, engage students:</b>	<b>“Smarty Mining Activity” (Will include student worksheet)</b> 1. Students are given a packet of smarties. We will play a classroom activity about supply and demand with smarties. Students will be told that each color of smarty in their pack represents a specific type of mineral. (Review definition of “mineral” can be done at this time, if needed.) They will be asked to choose the one color of smarty that they feel is the most valuable out of their pack and state the reasoning behind their choice. (Review definition of “value”. This will reinforce the issue of supply/demand that has been discussed in					

<p>their social studies class.)</p> <p>2. Students will then be asked to “mine” one of their “valuable” smarties out of the package. (They can eat the rest!) Using the tools provided, they will attempt to break the smarty down into as small of a piece as possible. After approx. 5 minutes, the students will stop and observe their results. They will be asked the following: Could your smarty be broken into even smaller pieces? How? Could you reach a point where these methods will no longer work to break up the smarty particles? Will there come a point where you get to the smallest piece of smarty?</p> <p>Students are then informed that scientists have been looking for the smallest piece of matter for a long time! (Review definition of matter.) In fact, they have been searching for this answer for more than 2000 years! (Students will brainstorm some of the scientific names of these small particles.) In fact, in spite of all of the knowledge that has been discovered, scientists are <u>still</u> looking for the smallest pieces of matter. Throughout their investigations, they have found that there are certain substances that are more valuable than others. (Can they guess why??)</p> <p>3. Show video “China’s Rare Earth Monopoly” by AlJazeeraEnglish. (3 min., 41 sec.)  <a href="http://www.youtube.com/watch?v=4wPYbSjVrVQ">http://www.youtube.com/watch?v=4wPYbSjVrVQ</a></p> <p>4. After the video, discuss and record questions students raise. (Ex. Why are the minerals shown considered valuable? How could China’s monopoly on rare earth minerals affect the U.S.?)</p> <p>5. Next, pass out and read the driving question to students. After reading, complete “need to know” activity.</p> <p><i>(Note: If time allows, students can read the article “Rare Earth Materials And The Incompetence Of Debbie Stabenow” prior to the reading of the driving question. If not, the article can be read just prior to student research in ELA class to refresh purpose and review the driving question proposed.)</i> <a href="http://motorcitytimes.com/mct/2011/03/rare-earth-materials-and-the-incompetence-of-debbie-stabenow-d-mi/">http://motorcitytimes.com/mct/2011/03/rare-earth-materials-and-the-incompetence-of-debbie-stabenow-d-mi/</a></p> <p>Is the blog site reputable? Are there political biases embedded based on perception of the blogger’s political stance? Is there an alternative article or one that presents the opposite view so that students can explore for themselves diverse viewpoints?</p>					
<b>Assessments</b>	<b>Formative Assessments (During Project)</b>	Quizzes/Tests (quiz on atoms, quiz on periodic table)	X	Practice Presentations (in small groups)	x
		Daily starter activities	x	Notes	X
		Preliminary Plans/Outlines/Prototypes		Checklists (for project review)	x
		Rough Drafts	X	Concept Maps	x
		Online Tests/Exams		Mini labs (atoms, elements, periodic table)	X

	<b>Summative Assessments (End of Project)</b>	Written Product(s), with rubric: (IN ELA CLASS)	X	Other Product(s) or Performance(s), with rubric: POSTER AND PRESENTATION (IN SCIENCE CLASS)	X
		Oral Presentation, with rubric	X	Peer Evaluation NOT GRADED BUT COMPLETED	
		Multiple Choice/Short Answer Test	X	Self-Evaluation NOT GRADED BUT COMPLETED	
		Essay Test		Other:	
<b>Resources Needed</b>	<b>On-site people, facilities:</b>	Team members (ELA, social studies, special ed.), computer lab			
	<b>Equipment:</b>	Computers, ipads, projector, eno board			
	<b>Materials:</b>	Video Clip “China’s Monopoly on Rare Earth Minerals”, Article “ Rare Earth Minerals and the Incompetence of Debbie Stabenow”, copies of student worksheets for entry activity and minilabs.			
	<b>Community resources:</b>	Great Western Tech (rep. to send materials), EMU chemistry students???? <i>Congressman or his proxy</i>			
<b>Reflection Methods</b>	<b>(Individual, Group, and/or Whole Class)</b>	Journal/Learning Log (during unit)	X	Focus Group	
		Whole-Class Discussion	X	Fishbowl Discussion	
		Survey (end of unit)	x	Other:	

PROJECT TEACHING AND LEARNING GUIDE	
<b>Project: “Understanding the Periodic Table</b>	<b>Course/Semester: 7<sup>th</sup> grade Science, 2<sup>nd</sup> mkg period. 8<sup>th</sup> grade Science, 1<sup>st</sup> mkg period.</b>
<b>Knowledge and Skills Needed by Students</b> to successfully complete culminating products and performances, and do well on summative assessments	<b>Scaffolding / Materials / Lessons to be Provided</b> by the project teacher, other teachers, experts, mentors, community members
1. What is an atom? 2. What is the structure of an atom? (nucleus, protons, neutrons, electrons). Students will learn meaning of/relationship of “atomic mass” and “atomic number” to atomic structure.	→ <ul style="list-style-type: none"> <li>1a. Graffiti reading activity (using differentiated texts/diagrams.)</li> <li>1b. Indirect observation mini-lab (using small boxes, chopsticks, variety of small objects to place in boxes.)</li> <li>2a. Same as above.</li> <li>2b. Brain Pop video clips</li> <li>2c. Vocabulary flipbook</li> <li>2d. Concept map</li> <li>2e. “Atom family” song</li> </ul>
3.What is the periodic table? (History of the periodic table, versions of organization-Mendeleev, Alexander, modern) Knowledge of Families, groupings within the periodic table	→ <ul style="list-style-type: none"> <li>3a. Classification activities using ordinary objects, periodic table cells. Activities are individual, partner, and group.</li> <li>3b. Color groupings/families of periodic table</li> <li>3c. Notes (using powerpoint, texts)</li> <li>3d. Brain Pop video clip</li> <li>3e. “Element song” by Tom Lehrer</li> <li>3f. “Alien Periodic Table” class activity (guided instruction prior to activity using student worksheet)</li> <li>3g. “Design your own” periodic table activity.</li> </ul>
What is an element? (Properties of element, characteristics of elements, how atomic number/mass can be determined using periodic table.)	→ Same activities as 3a – 3f. (Term is introduced during atom week.)
Vocabulary and word choice	→ <ul style="list-style-type: none"> <li>In Science: vocabulary reinforced/taught using reading apprenticeship strategies, flipbook, card sorts (starters during 2 class periods)</li> <li>In ELA: Detailed on separate submission</li> </ul>
	2f. Build atom models: 2d, 3d.

P R O J E C T C A L E N D A R				
Project: "Understanding the Periodic Table"		Start Date: 2 <sup>nd</sup> Mkg Period (7 <sup>th</sup> grade), 1 <sup>st</sup> Mkg Period (8 <sup>th</sup> grade)		
M O N D A Y	T U E S D A Y	W E D N E S D A Y	T H U R S D A Y	F R I D A Y
P R O J E C T W E E K O N E				
Entry Activity "Need 2 Know" Class discussion	<u>"What is an atom?"</u>  a. Graffiti reading activity using differentiated texts/diagrams. b. Indirect observation activity.	Starter: Concept map  a. Brain Pop video clip b. Notes c. Vocabulary flipbook	Starter: "Atoms Family" song  a. Mini-Lab: Identifying atom parts, atomic number using petri dish models. b. Make an atom: draw or construct using stickers. Identify # of protons/neutrons/atomic mass/atomic number, nucleus	Starter: Vocabulary card sort  Activity: Make a 3d model of an atom (on computer or using given materials).  Research materials: encyclopedia, online resources, science texts
P R O J E C T W E E K T W O				
Quiz <u>Organizing the Elements/What is an element?</u>  a. Classification activity b. Element song	<u>History of Periodic Table</u>  a. Notes b. Identification/ Coloring of families/ Groups c. Construction of Alexander's model??	<u>History....(cont.)</u>  a. Brain Pop video b. Card sort activity: "How would <u>you</u> classify the elements?" w/justification	<b>Review:</b>  Guided Practice: Atomic Structure  Activity/Homework: Alien Element & the Periodic Table.	Project Review. Contracts  Speaker from MolyCorp to answer questions on rare earth minerals/their value. (If unable to come, rep. states he will send materials to review.)
P R O J E C T W E E K T H R E E :				

Mon: Quiz, Groups assign roles./ Tues.: Construct models, start research / Wed. – Thurs: Research, construct presentation./ Friday: finish construction, practice presentations./ TEST Mon. (Gallery walk presentations to take place on Tues.)

<b>Lesson Design:</b> Careful construction of lessons to remove barriers and provide access for all students.	<b>Checkpoints:</b> Includes
<p>“What is an atom?” = Graffiti reading activity using differentiated texts for student choice on topics of “Structure of atoms” and “Atom models”, video clip (“BrainPop”), vocabulary flipbook for study of content words, concept map, creation of atomic models (guided, independent) and (traditional materials vs. computer generated), traditional quiz.</p>	<ul style="list-style-type: none"> <li>✓ Multiple ways to represent information</li> <li>✓ Alternatives to text</li> </ul>
<p>“What is an element?/How are they organized?” = Mini-labs to reinforce understanding of classification using ordinary materials and elements, video clip (“BrainPop”), student exploration of various ways elements have been classified throughout history (Mendeleev, Alexander, modern), “Alien element” activity, traditional quiz/unit test, card sort activities to allow students to design their own periodic table.</p>	<ul style="list-style-type: none"> <li>✓ Support provided for text comprehension</li> <li>✓ Flexible technology-based materials, strategies and tools</li> </ul>
<p><u>Poster Project:</u> Students can create a traditional poster display or computer “glogster” collage. Research aids to include preselected websites, encyclopedias, science text, news articles, video clips (“China’s Monopoly on Rare Earth Elements”, “Periodic Table of Videos” by University of Nottingham), and ipads.</p>	<ul style="list-style-type: none"> <li>✓ Multiple ways for students show what they know</li> <li>✓ Conspicuous supports for learning new strategies</li> </ul>
<p>***ELA class will provide students with additional research time to gather information needed to complete poster project. However, not all students may be assigned to our team ELA teacher so plan has to allow for integration of these students into the PBL project. If this occurs in our schedule, groups will change from 2 to 4 members. One member (in ELA class with Bower will serve as team “expert” on mineral value, others will take on research roles to determine structure, element qualities, use, and mining safety.</p>	<ul style="list-style-type: none"> <li>✓ Mechanism for rapid feedback to learners</li> <li>✓ Active student-centered methods</li> </ul>
	<ul style="list-style-type: none"> <li>✓ Choice, Challenge, Novelty</li> </ul>
	<ul style="list-style-type: none"> <li>✓ Connected, relevant learning</li> </ul>



Evaluation: 4 Highest and 1 Lowest

Persuasive Writing on Element from Periodic Table that should be used as export to help reduce our National Deficit

Criteria	4	3	2	1
<b>The Claim</b> (Thesis)	Make a claim and explain why your element would be the best one to export and how it would help reduce our National Deficit	Makes a claim but doesn't explain	Claim is buried, confused and/or unclear	Doesn't say what argument or claim is
<b>Reasons in support of the claim</b> (Research-/ Rough Draft)	Give clear and accurate reasons to support your claim. (4-6)	Not enough reasons in support of claim, may have overlooked important reasons	Gave 1 or 2 weak reasons that don't support claim and/or irrelevant or confusing reasons	Did not give convincing reasons in support of claim
<b>Introduction</b>	Introduce your element and explain its uses in the economy. (Driving question should be addressed)	Did not discuss element in detail and/or how it would help reduce deficit	Was not clear on how element would be used by other countries, or how we would export it	Did not acknowledge or discuss element, exporting, economy or uses for element
<b>Organization</b>	Writing has a compelling opening (Introduction), three to five informative middle paragraphs and a strong persuasive conclusion.	Writing has a beginning, middle and end. It marches along but doesn't dance.	Writing is organized but sometimes gets off topic.	Writing is aimless and disorganized.
<b>Voice and Tone</b>	It sounds like you care about your argument(s). It shows you know about the element and how it can be used, and how that will add to United States profits.	Tone is okay, but paper could have been written by anyone. Need to tell more about why you believe your element will contribute to the reduction of U.S. debt. Show why you care.	Writing is bland or pretentious. There is either no hint of a real person in it or it sounds like you are a fake.	Writing is too formal or too informal. It sounds like you don't like the topic of the essay.
<b>Word Choice</b>	The words you use are from research and related to the topic. The words should also be striking but natural, varied and vivid. (Do not copy)	Made routine word choices. Did not use correct scientific vocabulary when it should have been used.	The words used are often dull or uninspired or sounds like you are trying too hard to impress.	Uses the same words over and over and over and over. Some words may be confusing to a reader.
<b>Sentence Fluency</b>	Sentences are clear, complete, and of varying lengths.	Well-constructed sentences with little variation	Sentences are sometimes awkward, and/or contain run-ons and fragments.	Many run-ons, fragments and awkward phrasings make essay hard to read.
<b>Conventions</b>	Use correct grammar, spelling, and punctuation.	Generally uses correct conventions. Have a couple of errors that should be fixed.	Enough errors in essay to distract reader	Numerous errors make paper hard to read