

PROJECT REPORT

Northern Wyoming Community College District / National Science Foundation
Summer Energy Education Program 2012

Cindy Nestel
Summit Middle School
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TITLE

ARE ALL RARE EARTH ROCKS CREATED EQUAL?

SUMMARY

This lesson is to be a follow-up to lesson to one called "Which Rare Earth Element will be named "The Element of the Year"? This lesson is meant to be used as an integrated science-math activity. Students will analyze data about rare earth elements and read charts and graphs about the contents of rocks picked up in an area where REE will be mined in the future.

ENERGY CONTEXT

Rare earth elements are used in a variety of energy sources. They are a key player in the workings of green energy such as hybrid cars and wind turbines. REEs are also found behind the scenes in many of our modern technologies including lasers, batteries, x-ray machines and cell phones.

ANTICIPATED TIME REQUIRED

1 class period (45 minutes)

- Review what a REE is, where they are located on the periodic table of elements, how they can be used in energy 5 minutes
- Hand out and discuss data analysis activity 5 minutes
- Work in pairs to complete the assignment 30 minutes
- Discuss the answers 5 minutes

INTENDED STUDENT LEVEL

This activity could be for higher level 6th grade students, 7th or 8th grade students.

ASSUMED PRIOR KNOWLEDGE

This lesson will assume that students have prior knowledge of:

- The basics of atomic structure
- How the Periodic Table of Elements is arranged
- How to work well in a group setting
- What REEs are
- Where REEs are located on the periodic table
- Uses of REEs
- How to do basic math
- How to read a pie chart

LEARNING OBJECTIVES

- Calculate mass of REE in rocks and cost of rocks
- Identify correlations between size and cost of rocks
- Interpret and analyze rock data
- Evaluate the effectiveness of using a bubble graph
- Justify whether all of the rocks came from one original larger rock
- Recognize that not all REE have the same value or abundance
- Explain that not all REE are created equal. (expensive vs. valuable) – depends on how they will be used

MATERIALS

Each group of two will need a periodic table, a pencil and a calculator

INTRODUCTION / MOTIVATION FOR STUDENTS

I will be passing around various samples of REE collected from Wyoming for the students to look at. I will ask them to decide if they could tell which REE are inside of the rocks and which of the rocks are more valuable.

The students had just concluded lesson one where they researched a specific REE so their interest should be piqued at this point.

PROCEDURE

- Review what the student know about REE
- Divide the class into groups of 2 and hand out the worksheet. **(1_Student_REE_Data_Worksheet)**
- Have each group perform the calculations and answer the questions
- Go over the answers as a group. You may choose to have this be for points for just simply for discussion. **(2_Teacher_REE_Data_Worksheet_Answers)**

SAFETY ISSUES

None

TROUBLESHOOTING TIPS

You may want to load the worksheet as a template on the computer so students can set up equations to solve for the answers in the chart.

The short answers on the worksheet represent possible correct answers. There may be others that are also acceptable.

If you are not printing in color, you may want to change so there are different patterns on the pie graphs on page 2. You may also need to adjust the size of the bubble graph, so it can be more easily read.

ASSESSMENT

Pre-Activity Assessment

Question/Answer: Ask the students and discuss as a class:

- What does the saying “Don’t judge the book by its cover” mean?
- How could you tell what is inside of these rocks?

Prediction: Ask the students to predict:

- Which of these rocks that are being passed around are the most valuable?

Activity Embedded Assessment

Informal assessment will be taking place during the time when students are working on their calculations. The teacher should be going from group to group to check for understanding and answer questions that the students may have.

Post-Activity Assessment

- *Have the students write a paragraph explaining the answer to the question on the title of the activity:*

Are All Rare Earth Rocks Created Equal?

SUGGESTED EXTENSIONS

Students could do the math with pencil and paper and check it using a calculator, or they could set up equations and have the computer calculate the answers on the spreadsheet

Instead of providing the graphs, students could create their own from the spread sheet. They would need to determine which type of graph would be best.

Assign each group a different rock from the data table, and have them decide how the rock could best be used in industry, based on the contents of the rock. They would need to refer to previous knowledge gained from lesson one to be able to do this.

Students could examine the RER website and check out what is currently going on with RER, and how the mine is progressing.