SUPPLY AND DEMAND FOR NONRENEWABLE RESOURCES

Secondary

Stage 1 – Desired Results

Goals

Students understand the relationship between supply and demand for natural resources by creating a supply and demand relationship.

Understandings

Students will understand that:

- Nonrenewable natural resources are found throughout the world but are in limited supply.
- Humans play a large role in consumption of natural resources.
- Technology plays a role in finding resources and making them usable to us.
- There must be a balance between economics, the environment and social systems for the world's resources to continue to sustain our quality of life.

Essential Questions

Students will consider such questions as:

- Can renewable resources ever replace nonrenewable resources?
- What resources do we need to manage to ensure a sustainable future for ourselves and generations to follow?
- How can we balance environmental needs with economic livelihoods and social equity for all world citizens?

Knowledge

Students will know:

- Basic economic and geological terms: supply and demand, natural resources, economic resources, consumer, supplier, reserves.
- Correlations between consumer demand, economic viability and production of a resource.
- World reserves and world resources are different yet both hold keys to the availability of our future supplies.

Skills

Students will be able to:

- Compare and contrast the economics of supply and demand.
- Distinguish between world reserves and world demand, relative to natural resources.
- Evaluate conditions that give rise to the supply of a commodity and the demand for its use.
- Propose viable solutions to demand that exceeds supplies for a natural resource.

Stage 2 – Assessment Evidence

Performance Tasks

Students will:

- Participate in assigned role.
- Create a visual representation of one key understanding learned from the activity.

Other Evidence

Students will:

- Be on task with questions and related discussion.
- Use appropriate geological and economic terms when identifying and discussing nonrenewable resources.

Stage 3 – Action Plan

Materials Preparation

- 152 pennies (or other small objects, for example, beads) for each group of four students
- Print one copy of the "Data Record" for each group of four students (See last page.)
- Watch or clock with a second hand
- Name cards for each group of four students (optional but helpful): one each of Accountant, Consumer, Supplier, World Resources

Learning Activities

1. Read all instructions before beginning the activity.
2. Work in groups of four. Each person should assume one of the following roles: **Accountant, Consumer (world demand), Supplier (world reserves), World Resources**
3. Divide the pennies into two piles:
    - the **Supplier** (world reserves) is given 120 pennies, representing the total amount of reserves in the earth that is currently available for mining
    - the **World Resources** is given 32 pennies, representing resources that will become part of the Supplier's reserves as they are discovered by exploration and/or they become economically viable due to changes in technology and economic conditions (making them part of the reserves).
4. The ***consumer*** has no pennies at the beginning of the activity but will acquire pennies from the ***supplier*** as the ore is mined.
5. The ***accountant*** will initiate the activity at the 60-secondmark. When 15 seconds have passed, the ***world resources*** will add one penny to the ***supplier*** pile and will continue to add one penny every 15 seconds throughout the activity. (The **Supplier's reserves** will therefore increase by four pennies every minute.)
6. At the end of one minute and immediately after the ***world resources*** has added a penny, the ***consumer*** person removes one penny from the ***supplier's*** pile. For each subsequent minute of play, the ***consumer*** will remove twice the number of pennies as were removed the previous minute – i.e., remove two pennies at the end of minute two, four at the end of minute three, eight at the end of minute four, etc.
7. The ***accountant*** should complete the accompanying table as each minute passes.
8. The activity ends when there are insufficient ore reserves to meet the needs of the ***consumer***.
9. As the activity progresses, note changes in ***ore reserves***, the ***resource****s* and ***world demand****.*

Conduct a Socratic dialogue for students to reflect upon their experience. A potential question for the first round might be, *"How can we minimize worldwide demand for a nonrenewable resource that is fair and equitably applied to ALL people across the globe*?" The second group identifies the two most preferable ideas from round one and provides a rationale as to why those are the most feasible actions.

Students, individually or in small groups, (not to exceed three students per group), create a visual representation of one key understanding they learned from this activity. Suggestions include: create a 30-second PSA via audio or visual or combination, bumper sticker including at least one graphic (not to exceed 20 students), rack card for distribution at community events or any other activities that would indicate a commensurate level of applied knowledge.

Arizona Academic Standards Addressed

Science

Strand 1: Inquiry Process

Concept 1: Observations, Questions, and Hypotheses

Concept 3: Analysis and Conclusions

Concept 4: Communication

Strand 2: History and Nature of Science

Concept 2: Nature of Scientific Knowledge

Strand 3: Science in Personal and Social Perspectives

Concept 2: Science and Technology in Society

Social Studies

Strand 5: Economics

Concept 1: Foundations of Economics

Concept 2: Microeconomics

Concept 4: Global Economics

National Science Education Standards Addressed

Unifying Concepts and Processes

Evidence, models, and explanation

Change, constancy, and measurement

Science as Inquiry

Abilities necessary to do scientific inquiry

Understandings about scientific inquiry

Science and Technology

Abilities of technological design

Understandings about science and technology

Science in Personal and Social Perspectives

Population growth

Natural resources

History and Nature of Science

Science as a human endeavor

Nature of science

Historical perspectives

Data Record

Minutes Elapsed	**A. Total in Ore Reserves** (at start of each minute)	**B. Input from Natural World** (by minute)	**C. Subtotal in Ore Reserves** (A + B, at end of each minute)	**D. Output to Consumer** (by minute)	**Total in Ore Reserves** (C – D, at end of each minute)
1	**120**	**+ 4**	**124**	**- 1**	**123**
2	**123**	**+ 4**	**127**	**- 2**	**125**
3	**125**				
4					
5					
6					
7					
8					
9					
10					

Observations

What happened to:

1. The number of pennies removed by consumer as the minutes passed?

2. The total in ore reserves as the first minutes passed?

3. The total in ore reserves as more time passed?

Analysis

1. Explain why the total in ore reserves changed as it did. Relate this to a real-world situation.

2. What would have to happen to world demand to make the total in ore reserves reach a constant level?

3. The supply of pennies from the natural world is constant in this activity, and the real-world demand doubles every minute. How does this correspond to a real-world situation?

Conclusions

1. What does this activity illustrate about supply and demand for natural resources?

2. Give a real-world example of a problem that might arise as a result of a supply-and-demand situation.

3. Name three things that could be done to lessen supply and demand problems.