



Utah Mining Association



Earth Science Curriculum

Developed by University of Utah Mining Engineering students for the Utah Mining Association

Piloted and refined by Alpine School District teachers

Minerals and Our Everyday Lives

Topic: Classification Systems	Estimated Length (minutes): 90 minutes
Standard 5 , Students will understand that structure is used to develop classification systems.	Objective: 1 , Classify based on observable properties

Description:

Students will understand that structure is used to develop classification systems. Other goals within this topic include the categorizing of nonliving objects based on external structures, comparison of living, once living and nonliving things, emphasizing the importance of observation in scientific classification and the demonstration of many various methods of classification. As part of learning classification techniques, a discussion on the composition of everyday materials and their sources leads into a lesson on the modern and sustainable mining industry. This discussion can focus on the production, engineering, basic principles or career options within the mining industry.

Required Materials/Resources:

- “How coal is formed...” (Video) <http://www.youtube.com/watch?v=TZS2Klye00A>
- “How do they do it?” (Video) <http://www.youtube.com/watch?v=yikdUuNOJzw>
- “Longwall mining explained” (Video) <http://www.youtube.com/watch?v=bXORrVmxwbM>
- “Surface coal mining explained” (Video)
<http://www.youtube.com/watch?v=2LQwxTm94Ps>
- “Ground Rules” YouTube Channel <http://www.youtube.com/watch?v=-eP6NP028gQ&list=PL31F52074D345CEA2>
- “Minerals Education Coalition” link <http://www.mineralseducationcoalition.org>
- “Common Minerals and their Uses” link <https://www.larsonjewelers.com/40-common-minerals.aspx>

Introduction & Discussion (Length: 30 minutes)

Classification of objects requires a basic understanding of the physical properties that make up those objects in addition to observed characteristics. The main goals within this section include basic classification techniques based on external structure (e.g., hard, soft), comparison of living, once living and nonliving things. Classification begins with objects familiar to the students and understanding what those objects are composed of. Not only will students learn scientific classification techniques but also the composition of everyday objects seen around us. Where do we get these objects? These objectives regarding classification can be met while simultaneously educating about the modern practices seen in the mining industry that provide the necessary resources for modern society. Modern practices of mining focus on providing resources while protecting and improving the environment.

■ Activity: “Item Classification”

(Length: 20 minutes)

The goal of this activity is to learn the basics of classification as well as the composition of the objects being classified. The focus should be on the various ways of classifying items i.e. color, shape, texture, size, use etc. There is not one correct way of classification but a discussion of logical methods of classification can be done on the board. The activity can be quickly created using everyday objects from the classroom in which similarities or differences can be found and recorded by the student. Group work is encouraged to enables discussion and cooperation. Following the group work, a classroom discussion of the various classification methods gives each group the opportunity to share their findings and techniques used to classify.

■ Activity: “That’s in my toothpaste?!?!?”

(Length: 20 minutes)

This activity focuses on the composition of everyday items seen at school and at home.

To begin the activity, watch the **“Ground Rules Video – Chapter 3 (1:36)”** which discusses the composition of common minerals and their importance in our daily lives. Following the video, lead a discussion on the composition of common everyday items and the importance of those items in society. The following table is an example of list that can be made of common objects. Additional minerals can be found at the **“Common Minerals and their Uses”** link.

Object	Minerals
Glass	Silica sand, limestone, talc
Cake/Bread	Gypsum, phosphates
Toothpaste	Calcium carbonate, limestone, fluorine
Baby Powder	Talc
Jewelry	Precious and semi-precious stones, gold, silver
Kitty Litter	Pumice, volcanic ash
Concrete	Limestone, gypsum, iron oxide, clay
Pots and pans	Aluminum, iron
Drinking water	Limetone, lime, salt , fluorite
Medicines	Calcium carbonate, magnesium, dolomite
Television	35 different minerals

▪ **Activity: “It’s all about minerals baby!”**

(Length: 20 minutes)

According to the Minerals Education Coalition as of 2018, Americans require **3.03 million** pounds of minerals, metals, and fuel in their lifetime. Each year the number is updated and an illustration known as the “Mining Baby” is created. Below is the illustration created for 2018 itemizing the various amounts of minerals, metals and fuels required by each American. Further discussion can be formed based on what the resources listed around the baby are used for.

Every American Born Will Need...



3.03 million pounds of minerals, metals, and fuels in their lifetime

Activity: “Pencil...mined or grown?”

(Length: 20 minutes)

Following the discussion on minerals in everyday life, focus on the composition of the simple #2 pencil. The goal of this activity is to differentiate between items that are grown vs. mined. Brainstorm with the class items that make up a pencil. Some items are obscure and need to be given and explained to the class. A common list is found below.

What is in a Pencil
graphite
wood
clays
soybean oil
latex
pumice
sulfur
calcium
barium
aluminum
copper
zinc
hematite
limonite

After a list has been created on the board, ask the class to identify whether the item is mined or grown. Divide the class into groups and assign each group an item to research. Provide necessary research tools to each group. Have the research focus on the item’s use(s), where the item is grown or mined and how that item is produced. Each group will be responsible for presenting the research information about their specific item.

Discuss with the class the complicated production process it is to produce a simple pencil. Tally the numbers of countries required to produce a single pencil. Take the time to discuss the production of more complicated items used every day such as televisions, cars, books etc.

Real World Application: (Length: 15 minutes)

After learning about the classification of nonliving, living and once living objects and the necessary minerals used in everyday objects it is important to understand from where and how these minerals are extracted.

Where do these minerals come from and how are they formed? (Example: Coal)

Mineral deposits are formed through varying earth processes and geological events over millions of years. One common example of mineral deposition is the formation of coal. The deposition of organic material combined with the tremendous overburden pressure of water or other rock material along with heat and time help in forming coal. The video, **“How coal is formed...” (1:06)** illustrates and describes the formation of coal.

How and why are these minerals extracted? (Example: Coal)

Coal is used to generate over 40% of the world’s electricity and is a vital resource for large industry. Modern coal mining utilizes a combination of hard work and heavy equipment to extract the coal. In the video, **“How do they do it?” (5:44)**, extraction of coal in an underground mine is explained. The video **“Longwall mining explained” (3:26)** explains the basics of a longwall and illustrates how a high volume of coal is removed in such a short amount of time. In addition to underground coal mines, coal is also mined on the surface of earth using large trucks and shovels called draglines. In the video, **“Surface coal mining explained” (4:14)**, a virtual tour of a surface coal mine helps to explain the details that go into creating a successful surface coal mine.

How safe is mining?

Through improvements in modern mining techniques and practices, mining has become an extremely safe industry. Every mining operation has safety as its number one value and focus over all others. Safety is something that needs to be addressed in all aspects of life. Take this opportunity to discuss potential safety hazards around the classroom as well as at home with the students.

What happens to the land after all the coal has been mined? (Reclamation)

Mines are required by law to have a reclamation plan in place prior to being able to mine. This requirement helps ensure that the land be returned to its original use after the mining has been completed. In the video, **“Surface coal mining explained” (4:14)**, reclamation is discussed. Post-mining images of a coal mine demonstrate the beauty that can be restored as mining has ceased. This is all part of sustainability and helping maintain the environment around us while providing the world with its necessary resources.

Career Opportunities in the Mining Industry

- Mining Engineer
- Geologist
- Surveyor
- Geo-technical Engineer

- Environmental Engineer
- Mechanic
- Accountant
- Chemical Engineer
- Biologist
- Metallurgical Engineer
- Industrial Hygienist