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| Snow White Becomes a Mining Engineer  StEm Lesson | Grade Level: 5 | |
| **Lesson Objective:** Help Snow White to become a successful mining engineer. She will need to remove the silicon overburden then separate the silicon (sand), salt, iron ore (filings) and phosphate (plastic beads). She will need to develop procedures for large-scale surface mining and procedures and tools for separating the minerals so they can be used in manufacturing.  **Students will be able to:**  • Use knowledge of characteristic properties to explain how each substance can be separated  from the mixture  • Analyze the relationship between their lab investigation and separation techniques in mining  • Explain how their lab investigation is a model for extraction techniques | **Benchmark Standards:**  SC.5.P.8.3  Demonstrate and explain that mixtures of solids can be separated based on observable properties of their parts such as particle size, shape, color, and magnetic attraction.  SC.5.P.8.2  Investigate and identify materials that will dissolve in water and those that will not and identify the conditions that will speed up or slow down the dissolving process.  Review:  SC.4.E.6.6  Identify resources available in Florida (water, **phosphate**, oil, limestone, **silicon**, wind, and solar energy). | |
| **Essential Question:**  How can mixtures be separated? | **Vocabulary:**  Mixture  Solution  Separate  Phosphate  Mining | **Vocabulary Activities:**  Students can create a foldable or poster showing types of mixtures and properties that can be used to separate them. |
| **Preparation Directions:**  Prepare plastic tubs containing a mixture of iron filings, sand, beads (that will float in water-but too small to pick out by hand), and salt – one tub for each group of 2-4 students.  **Engage:** Ask students who knows the story of Snow White. Tell or read a short version of the Snow White story. Use the rewritten ending in which Snow White becomes a successful mining engineer.  If possible students can read the original story during their reading block and rewrite an ending in which Snow White finds out the dwarves are not very good at mining and decides to help them out. She becomes a successful mining engineer and lives happily ever after.  **Procedures:**  Watch Phosphate Mining Video (AT 6 min.) <https://www.youtube.com/watch?v=KjmfpgBloAM>  Discuss the methods of extracting and separating mixtures the miners used in the video.  Explain that humans mine mineral resources to manufacture items we use every day. The extraction  process requires the separation of the unwanted minerals that make up the rock to get to the  good stuff we do want! There are several physical and chemical separation techniques that are  used to separate materials from Earth. Today students will explore some of these techniques.  Explain to students that they will be challenged to separate a mixture themselves using different  techniques. Each group of three students will be given a mixture of salt, sand, beads, and iron fillings.  Students will need to use available materials to separate the different mixture from one another. They must decide on a plan and write it down before touching any materials or the “mining site.”  Materials that are separated can be weighed or measured. The team that extracts the greatest amount of the most pure minerals wins the mining contract. | **Materials:**  Maker Space with a variety of materials such as:  • cups  • Paper towel  • Filter paper/ coffee filters  Assorted paper, recycled containers, etc.   * Plastic tubs containing a mixture of iron filings, sand, beads (that will float in water-but too small to pick out by hand), and salt   • Water  **Recommended Science Tools:**   * Magnets * Evaporation dish/ petri dishes * Beaker/measuring cup * Graduated cylinders * Scale * Funnel   \*A way to heat water is recommended and should be done by the teacher. ***Water should never be hot enough to scald skin.***  **Sample Questions:**  What tools can you create to help Snow White mine the mixture without touching it with hands? How will these tool models work?  How can you separate the mixture?  Will you/ did you create a solution from parts of this mixture?  Which substances dissolve in water? How can it be separated from the water once it is dissolved?  What are some of the physical properties of the substances in this mixture? (salt dissolves in water, beads float, iron is magnetic, sand sinks.)  What mixtures are found on Earth? | |
| **Assessment:** Observe which students were able to figure out the following procedures or create other procedures which were successful.  • Use a magnet to remove the iron  • Mix the remains with water, beads will float to the top, salt will dissolve  • Pour off the salty water, sand is left  • Evaporate the water, salt is left  Assessment questions:   1. What if your mixture included pepper? What additional step would you include to separate the   mixture?  2. What property enabled you to separate the sand from salt?  3. What separation techniques utilized the physical properties of the materials? | |
| **Additional Resources: Snow White fairy tale** | | |

**Snow White and the Seven Dwarfs**

Beginning By Brothers Grimm – New Ending by C. Angel Danger

It was in the middle of winter, when snow was falling around, that a certain queen sat working at her window, the frame of which was made of fine black ebony; and, as she was looking out upon the snow, she pricked her finger, and three drops of blood fell upon it. Then she gazed thoughtfully down on the red drops which sprinkled the white snow and said, “if only my little daughter may be as white as that snow, as red as the blood, and as black as the ebony window-frame!” And so the little girl grew up; her skin was a white as snow, her cheeks as rosy as blood, and her hair as black as ebony; and she was called Snow-White.

But this queen died; and the king soon married another wife, who was very beautiful, but so proud that she could not bear to think that anyone could be more beautiful than her. She had a magical looking-glass, to which she used to go and gaze upon herself in it, and say—

“Tell me, glass, tell me true!

Of all the ladies in the land,

Who is fairest? tell me who?”

And the glass answered, “You, Queen, are the fairest in the land” But Snow-White grew more and more beautiful; and soon, she was as bright as the day, and fairer than the queen herself. Then the glass one day answered queen, when she went to consult it as usual—

“You, Queen, may beauteous be,

But Snow-White is far lovelier than three”

*(new ending)*

When the queen heard this she turned pale with rage and envy; and calling to one of her huntsmen said, “Take Snow-White away into the wide wood and cut out her heart, that I may never see her more.” Then the huntsman led the little girl away. Snow White knew something was wrong so as soon as they were in the woods she ran away. Snow White had excellent survival skills and faired well in the forest. The wild beasts roared around, but none did her any harm. In the evening she came to a little cottage, and went in there to rest, for her weary feet would carry her no further.

In the little cottage she cooked and ate some of the wild roots and vegetables she had found and there she laid herself down and went to sleep.

In time, in came the masters of the cottage, who were seven little dwarfs that lived among the mountains, and dug and searched about for gold. The seventh dwarf saw Snow-White, and called upon his brothers to come and look at her; and they cried out with wonder and astonishment, and brought their lamps and gazing upon her, they said, “Good heavens! what a lovely child she is!” And they were delighted to see her, and took care not to waken her; and the seventh dwarf slept an hour with each of the other dwarfs in turn, till the night was gone.

In the morning Snow-White told them all her story. They said that she could stay as long as she needed to. Then they went out all day long to their work, seeking for gold and silver in the mountains. They came back empty handed and Snow White took pity on them. The next day while they were out she researched mining methods and what types of mineral deposits could be found where they were.

The queen, now that she thought Snow-White was dead, believed that she was certainly the handsomest lady in the land; so she went to her glass and said—

“Tell me, glass, tell me true!

Of all the ladies in the land,

Who is fairest? tell me who?”

And the glass answered—

“You, Queen, you are fairest in all this land;

But over the Hills, in the greenwood shade,

Where the seven dwarfs their dwelling have made,

There Snow-White is living;

and she Is lovelier far, O Queen, than you.”

Then the queen was very much alarmed; for she knew that the glass always spoke the truth, and she was sure that the huntsman had betrayed her. And as she could not bear to think that any one lived who was more beautiful than she was, she disguised herself as an old pedlar woman and went her way over the hills to the place where the dwarfs dwelt.

She knocked at the door and cried, “Fine wares to sell!” Snow-White looked out of the window, and said, “Good day, good woman; what have you to sell?” “Good wares, fine wares,” replied she; “laces and bobbins of all colors, delicious apples, fancy combs.” Snow White said “thanks, but no thanks.” I do not open the door for strangers. The spiteful queen stomped her feet, and went away home. She returned two more times in disguise, but Snow White was far too smart of a girl to open the door to stranger and pretended not to hear her at the door.

In the evening the seven dwarfs returned; and I need not say how sad they were because they had spent a whole day mining and had not found a single bit of gold.

Snow White felt very sorry for them and began share the research on mining techniques she learned with them. Soon they began to make a decent living in the mines. Snow White went off to a University and earned a degree in mining engineering. When she graduated there was a ball and a great feast in the land.

To the feast was invited, among the rest, Snow-White’s old enemy, the queen; and as she was dressing herself in fine, rich clothes, she looked in the glass and said,

“Tell me, glass, tell me true!

Of all the ladies in the land,

Who is fairest? tell me who?”

And the glass answered:

“You, are as lovely as glitter and gold.

Yet it is believed and often told,

Beautiful figures do not last forever.

A truly beautiful woman is intelligent and clever.

Snow White, of her life, takes the responsibility,

Nourishes her mind and polishes her personality.

‘The Beauty’ has now entered the engineering domain,

The most beautiful of 'Beauty’ uses her brain! ’

She Is lovelier far, O Queen, than you.”

When she heard this, the queen started with rage; but her envy and curiosity were so great, that she could not help setting out to see Snow White’s college graduation. And when she arrived, and saw Snow-White was happy, beautiful, and successful she choked with passion, and fell ill and died.

Snow-White came back to run the Dwarves Mining Company. They became ecologically friendly phosphate miners in Florida and they all became very rich. Snow White and the dwarves lived and reigned happily over that land, many, many years.

