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Goals and Materials

Goals

Kit users will:

- Identify different mining methods such as placer mining, hardrock mining and strip mining.
- Recognize the significance of mining in the development of South Dakota.
- Become familiar with historic events relating to mining in South Dakota.

Materials

1 Teacher's Resource binder
1 drill bit
1 mining deed
2 mining stock certificates
1 claim map
1 blasting cap tin
2 panning pans
1 5-ft blasting cap
1 12-ft blasting cap
1 core sample
1 trowel
1 miner's helmet
1 balance scale
1 carbide lamp
1 mining pick
1 blasting simulator
1 feldspar sample
2 Sioux quartzite samples
2 prairie agate samples
1 gold ore sample
1 rose quartz sample
1 mica sample
1 24k gold sample (small bottle)
1 container of iron pyrite (fool's gold)
1 bottle of BBs
6 mining process posters
21 photographs (in Resource Binder)

Photograph List

<u>Number</u>	<u>Description</u>
1	Three prospectors panning for gold, 1889
2	Downtown Lead, late 1800s
3	Timbering in Homestake Mine
4	Miners eating lunch in the Homestake Mine, 1907
5	Horse "Old Smoky" hauling ore cars 400 ft underground, 1908
6	Hearst Free Kindergarten, Lead, 1910
7	Miners using hydraulic drill equipment, 1911
8	Miners drilling holes overhead
9	Miners drilling in mine shaft
10	Mining coal by hand at Firesteel
11	Coal trucks at Firesteel
12	Diamond blasting pattern used at Homestake Mine
13	Blasting in Homestake Mine
14	Miner showing his broken eyeglasses
15	Driver standing on his truck buried by a cave-in at Firesteel
16	Comparing miners at Homestake
17	Firesteel workers digging out a coal seam
18	A coal seam at Firesteel
19	Firesteel area before coal mining began
20	Firesteel workers loading loose coal into a truck
21	Beginning reclamation work on an area mined for coal

Resource Paper

What is mining?

Mining is the extraction of minerals, ores, and fossil fuels from the earth. The Egyptians mined limestone for the outer layers of the pyramids. The Aztecs mined for gold to make ritual masks and jewelry. Minerals, ores, and fossil fuels have provided building materials, currency, jewelry, and fuel supplies to people all over the world.

What people mine for depends on what is needed. Granite is used for construction, copper for electrical wires, gravel for roads, and diamonds for laser beams. Precious metals such as gold and silver are used in jewelry. They were also once used as currency. Precious gems, such as topaz, emeralds, and rubies, are also used in jewelry. Oil and coal provide everything from charcoal for barbecues to gas for cars.

Types of Mining

There are four main types of mining:

1) Quarrying requires digging a large hole in the earth from which minerals and rocks can be extracted. This mining technique is used when the material being mined is abundant and relatively close to the earth's surface. Granite and limestone are quarried.

2) Strip-mining is the process of mining a specific layer of rock and minerals by first removing all the layers above the target layer. This is used when the mineral sought is in a layer at a specific depth below the surface. Coal, which forms in distinct layers, is often strip-mined.

3) Placer mining is small-scale surface mining used to find precious materials lying on top of the earth's surface. Panning for gold is an example of placer mining. Placer mining is useful for finding small quantities of precious materials. It is economical because it can usually be done by one individual. Other types of mining require many workers or advanced technology.

4) Hard-rock mining is simply mining underground. Shafts and tunnels are built to follow a *vein*, or mineral deposit between definite boundaries, but not at any specific depth. Gold forms in underground veins and is frequently mined using this method.

Prospecting

Prospecting is the act of determining where to mine for precious minerals and ore. Although it has been practiced since ancient times, not much is known about early prospecting. Early prospectors needed to protect their discoveries so they rarely shared the secrets of their trade. The methods used by prospectors in the American West were probably similar to those used by ancient prospectors.¹

Prospectors study the land to determine where precious minerals may be found. Most of the prospectors in South Dakota were searching for gold and silver so they developed techniques for finding those two minerals. They looked for igneous rock, such as granite. Granite is formed when molten rock below the earth's surface rises and cools. Gold can be found in igneous rock, so finding granite meant that gold could also be present.

Prospectors also looked for *mineralization*, or the presence of certain minerals, in an area. Quartz and brightly colored rock were both good indicators of an area's mineralization. Prospectors

¹ Otis E. Young, Jr., *Western Mining* (Norman, Ok: University of Oklahoma Press, 1970), 3-5.

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specifically looked for green, blue, or rusty brown stains on rocks. The green or blue stain was often caused by copper chlorides and carbonates and could indicate silver. The rusty brown stains came from hematite, a 'signpost of gold'. Most prospectors avoided metallic yellow because it usually signified iron pyrite, commonly known as fool's gold. Fool's gold is easily distinguishable from real gold because a slight tap from a hammer will flatten real gold but will shatter fool's gold into dust.²

Prospectors also used a crude chemical test to determine the presence of silver in a mineral sample. Otis Young describes the process:

The prospector collected sufficient particles to fill a spoon, dried them, and scraped them into a small cavity cut in a charcoal block. He covered the sample with a layer of bicarbonate of soda (baking soda), then used a blowpipe and candle flame to smelt the batch...This chemically reduced the mineral by driving off sulphur, chlorine, or carbonate, leaving a small metallic bead or button behind...A white metal bead could be rolled in slightly dampened salt, then exposed to the sun to show black streaks symptomatic of silver.³

The presence of other minerals such as iron, lead, copper, and nickel could also be determined by looking at the color of the bead.

Once a likely area for gold was identified prospectors searched for the *lode*, or vein of gold. If the lode was found the ore would be *assayed*, or chemically tested for gold content. If the assay showed it would be financially feasible to extract the gold the prospector filed a legal claim to the land and tried to sell the claim to a mining company. Prospectors sometimes salted a claim to make it appear more valuable by adding gold from another source to the assay sample. They might add carving shavings off gold coins or put gold dust from another claim into the sample.⁴

Quarrying

One of the most practical forms of mining is quarrying. Quarrying is defined as an open, or surface, excavation of rock that is used for a variety of purposes. It has been practiced for centuries. The Romans quarried stone to construct their famous road system. The Egyptians quarried materials the pyramids and the Sphinx. Much of the stone for the Giza pyramids was quarried on the Giza plateau itself.⁵

Quarrying has gone on in South Dakota since before statehood. Materials quarried in the Black Hills helped rebuild Deadwood after a fire destroyed the town in 1879. Quarrying in eastern South Dakota is still used to extract quartzite and granite. Mining Sioux quartzite is a multimillion dollar industry in Minnehaha County. Sioux quartzite is found primarily in Minnesota with branches in eastern South Dakota. It is valuable because of its hardness, uniformity, and attractive pink appearance. Quartzite is used for buildings and as crushed rock for paving South Dakota roads. The crushed quartzite gives South Dakota distinctive pink highways. The Dakota Granite Company in

² Young, *Western Mining*, 18-20.

³ *Ibid.*, 24.

⁴ *Ibid.*, 46.

⁵ Alice Padwe, "A to Z: The Egyptian Pyramid" (Washington, D.C.: Smithsonian Institution, Department of Anthropology, 1999), Accessed at <http://SaturnianCosmology.Org/> May 26, 2020.

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Milbank, located in northeastern South Dakota, operates an open pit granite quarry that provides construction material used statewide.

Strip Mining

Strip mining, commonly used to extract coal, involves removing layers of earth and rock in order to expose the coal beneath them. The material that is removed is called *overburden*. Environmental concerns about strip mining relate to the disruption of the soil from its natural formation. Such disruption may adversely affect vegetation and the natural balance of the water table. Steps can be taken to minimize such dangers. Overburden is replaced during reclamation.

Like quarrying, strip mining is a form of surface mining. Since miners do not have to dig deep underground surface mining is more economical and generally less hazardous than other types of mining. It is less dangerous than quarrying because workers are not exposed to harmful dust that can infiltrate the lungs of quarry workers. In South Dakota, Black Hills coal (lignite) was difficult to develop and mine profitably. This was the case in other parts of the state as well. The Firesteel Coal Company in the Timber Lake area was once home to a state coal mine but ceased operation in 1934.

Placer Mining

Mining in South Dakota often brings to mind the Black Hills Gold Rush. Not all Black Hills mining was done the same way. Two common procedures were placer mining and hard-rock mining. The difference between the two is that placer mining involved no *excavation* or deep digging into the ground. Gravel or other rock debris was picked up at the surface and gold was separated from the waste by panning or sluicing. This type of mining is often shown in the movies and television shows about the gold rush. In the movies, placer miners are men with the long hair and beards standing in shallow streams with metal pans searching for gold. Panning is an essential part of placer mining once gold is found. Watson Parker describes the process as follows:

The gravel to be washed was put into the pan, which was immersed in water. The prospector shook the pan and kneaded its contents, washing off the light dirt and throwing away the stones. The gold, if any, settled to the bottom along with any heavy metallic sands from the gravel. With a final dexterous twist of the pan the miner would spread its contents in a broad crescent across its bottom. At the convex edge appeared the flecks and flakes of gold which could then be removed with either a matchstick or a fingernail.⁶

Miners practiced placer mining only until surface sources of gold were exhausted. Hard-rock mining then became the only profitable mining procedure.

Hard-rock mining

Most of the miners who came to the Black Hills were equipped only for placer mining. Hard-rock mining required more men, greater personal risk, and more advanced equipment. The transition from placer mining to hard-rock mining happened only when placer mining no longer turned a profit, and the added expense and manpower required for hard-rock mining became worth the risk. Wealthy organizations or partnerships often funded hard-rock mining operations. George Hearst and his partners at the Homestake Gold Mine in Lead are an example.

⁶ Watson Parker, *Gold in the Black Hills* (Pierre, S.D.: South Dakota State Historical Society Press, 2003), 56.

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Companies would not risk the financial or physical investment in hard-rock mining without expecting to make a profit. The hard-rock mining organizations became successful over time. Companies improved transportation and communication facilities in the area around their operations. These improvements helped towns like Lead and Deadwood develop.

Value of Gold

What makes gold valuable? In ancient times gold was primarily used for decoration. Gold adorned prominent religious and culturally significant structures. It has been used for jewelry since about 3,000 B.C. and for wedding rings since the 9th century.⁷ Gold became a form of currency after the 9th century.

Gold is less important as currency today because few countries are on the gold standard. The chemical properties of gold make it valuable. Gold is extremely malleable and can be made into flat sheets. It can be drawn into fine wire and is very reflective. These properties allow gold to meet many demands in the technological world. It is used in buildings and on space satellites to reflect heat. Gold is used in medicines and dentistry and for the small wires in computer circuits.

Cyanide Process

Finding and extracting gold from the earth is only half of the mining equation. While some gold is pure, most is *alloyed* or combined with other metals or broken up into small particles and spread through a mixture of minerals and metals. Sometimes the gold particles are so fine that they cannot be seen with the naked eye. In cases like this, the *ore*, rock containing precious minerals or metals, is sent to mills where the gold can be extracted and melted down.

Refractory ore contains complex combinations of minerals and metals that make gold recovery very difficult. There are two types of refractory ore: red ore and blue ore. Red ore is refractory ore that has been *oxidized* or altered by combining it with oxygen. It turns red during the oxidation process because of the iron it contains. Blue ore is unoxidized refractory ore. It is found deep in the earth where it is not exposed to oxygen, and, therefore, remains bluish in color.⁸ Both ores were challenging to mill and no efficient or affordable technique existed for extracting the gold from them effectively. In 1885, three men, John S. MacArthur, William Forrest, and Robert W. Forrest, developed an inexpensive solution to the problem: the cyanide process.⁹

Not many solutions will dissolve gold. It is even resistant to the corrosive acids in a person's mouth which makes it good for dental work. Potassium cyanide dissolves gold easily and separates it from other metals and minerals. Mills in the Black Hills used the cyanide process to extract gold from refractory ores.

The cyanide process began by crushing the ore and roasting it. The hot crushed ore was stored in large holding bins that were dumped into leaching tanks where the cyanide solution was added. As the gold (and silver) dissolved into the cyanide, undesirable materials sank to the bottom of the leaching tank. A vacuum pump removed the gold-and-silver-bearing cyanide solution from the tank and the remaining waste was dumped into a nearby creek. Zinc boxes, boxes containing zinc

⁷ OceanaGold-Waihi, New Zealand. Quick Fact File: Gold http://www.marthamine.co.nz/schools/gold_sch.html.

⁸ Richmond L. Clow, *Chasing the Glitter: Black Hills Milling 1874-1959* (Pierre, SD: South Dakota State Historical Society Press, 2002), 19.

⁹ *Ibid.*, 114-115.

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shavings, separated the gold and silver from the cyanide. The zinc attracted the gold and silver and pulled them out of the cyanide solution. The cyanide solution was drained from the boxes and reused in the leeching tanks. The gold-and-silver-coated zinc shavings were put in a lead pan with sulfuric acid which dissolved away the zinc and left a black powder containing gold and silver. The powder could be melted down into gold-silver bullion.¹⁰

The cyanide solution worked well on red ore but not on blue ore. Blue ore contained very fine dispersed pyrite particles that interfered with cyanide's ability to extract the gold.¹¹ Other techniques were developed for recovering gold from blue ore but they were not cost effective. The cyanide process was a revolution in the mining industry in the Black Hills and world-wide.

Black Hills Gold Rush

The Gordon Party's 1874 arrival in the Black Hills is often considered the beginning of the Black Hills Gold Rush but there are previous events worth noting. The first gold documented in the Black Hills belonged to the Sioux Indians. This was acknowledged by Father DeSmet as he traveled into the area several times during the mid-1800s.¹² Another possible indication of early gold hunting in the Black Hills is the Thoen Stone. The stone documents the story of Ezra Kind and his companions who were seeking gold in the 1830s. According to the inscription on the stone after the party had found gold in 1834 all but one were killed by Sioux warriors. The authenticity of the stone has been questioned over the years but factual or not the story has become part of Black Hills lore.¹³

In 1874, General George A. Custer led an expedition into the Black Hills to explore the area and find possible fort sites. Unofficially the expedition was on the lookout for gold that was rumored to be found in the Hills. Expedition member Horatio N. Ross is credited with being the first to find gold at French Creek. Custer's expedition took place even though the Treaty of 1868 gave the land in western South Dakota, including the Black Hills, to the Sioux as a reservation. Once the rumor of gold in the Hills was confirmed it was all but impossible to stem the flood of prospectors into the area.

Following the confirmation of gold in the Hills towns such as Yankton, Bismarck, Cheyenne, and Sidney, Nebraska saw potential profit in supplying the miners. Cheyenne and Sidney's connections to the Union Pacific Railway helped their cause because the railroad made the Black Hills more accessible.¹⁴ As these towns competed, their newspapers publicized claims and often exaggerated findings to draw more miners. The promise of wealth was the biggest draw. Miners came from all over thinking that they were going to get rich in the Hills. Economic conditions outside the Hills stimulated the rush, too. Grasshopper swarms, low commodity prices, and an unstable market were hurting farmers and made mining seem like a viable alternative to working the land. Railroad workers and miners that had been laid off in other parts of the country were looking for new opportunities. The publicity the Black Hills received drew this labor force to the area.

¹⁰ Clow, *Chasing the Glitter*, 118-119.

¹¹ *Ibid.*, 26.

¹² George W. Kingsbury, *South Dakota: Its History and Its People* (Chicago: S.J. Clarke Publishing Co., 1915), 861.

¹³ Jessica Michak, "The Thoen Stone" (Deadwood, SD: Homestake Adams Research and Cultural Center, 2015), sdpb.org/blogs/images-of-the-past/the-thoen-stone/

¹⁴ Parker, *Gold in the Black Hills*, 40.

Life in a Gold Rush Town

In the early days of the Black Hills Gold Rush there was little crime. Veteran miners instilled in newcomers the unwritten law that each man's livelihood was not to be threatened. In the words of Watson Parker, "...a miner's claim, his tools, and his gold were inviolable, as safe when he went to town as if he'd remained to watch them."¹⁵ There were no courts in the early days to prosecute criminals. Miners relied on miner's courts and "personal security." As placer mining was replaced by the more business-like hard-rock mining, the legal system evolved from personal security into a system fully equipped with juries, judges, and plenty of lawyers.

Towns like Lead and Deadwood met the miners' needs. Deadwood was established on April 26, 1876, less than a year after gold was first discovered in Deadwood Gulch in September of 1875. The town provided miners with room and board, baths, medical remedies, and entertainment. This final amenity proved very lucrative for area business owners who offered food, drink, gambling, and stage shows. Other businessmen went into the service industry, opening bakeries and laundries. No matter what was being bought or sold, gold dust was the currency of choice. Business owners had scales on hand to determine the worth of gold dust brought in by miners.

Homestake

In April 1876, Moses Manuel and three partners, Fred Manuel, Henry Harney, and Alex Engh, located a promising claim near Lead which came to be known as the Homestake.¹⁶ The ore at Homestake needed to be crushed in order to retrieve the gold, and the Manuel brothers were unable to develop the property. In 1877, they sold Homestake to George Hearst and his two San Francisco business partners, James Ben Ali Haggin and Lloyd Tevis. It was the beginning of a legacy that would last until the mine's closing in 2001.¹⁷

Hearst had long been active in California mining communities and had the experience and expertise necessary to oversee the development of the Homestake Mine. One of the first hurdles Hearst faced was securing control of the Homestake ore vein. Hearst was convinced (correctly) that the Homestake vein was much larger than their 75-foot claim and he wanted to acquire all the adjacent claims. Hearst acquired mines through purchase, lawsuits, and political pressure. Hearst battled with one unwilling seller after another, buying several mines including the Golden Star, the Giant, the Highland, the Prince Oscar, the Old Abe, and the Homestake No. 2. Hearst and his partners also gained control of the Deadwood-Terra Mine, but one mine remained beyond their grasp, the Father De Smet.¹⁸

The owners of the Father De Smet Mine had reportedly refused \$700,000 for their claim. The Father De Smet, like the Homestake, was an extremely rich claim. Hearst and his partners launched a campaign to buy up De Smet stocks, but they weren't fast enough to gain control of the company. The two companies became bitter rivals, fighting over anything that might be a possible advantage to the other, including the "great water fight," a water rights dispute over the Whitewood Creek. Water is necessary for the smooth operation of mines and mills. After a lengthy legal and political battle, Homestake finally won control of the Whitewood Creek.¹⁹

¹⁵ Parker, *Gold in the Black Hills*, 143.

¹⁶ Duane A. Smith, *The Evolution of Homestake Mining Company* (Walnut Creek, CA: Homestake Mining Company, 2001), 21.

¹⁷ *Ibid.*, 22-23.

¹⁸ *Ibid.*, 34.

¹⁹ *Ibid.*, 35-36.

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Despite rivals like De Smet, and some community resentment, Hearst's development of the Homestake continued. The company went into the timber and coal business so that it could provide the resources it needed for its mining operation. They even built a small railroad to provide needed transportation. As Homestake prospered, its success became the financial basis for other mining operations, including the Butte Mine in Montana.

As Homestake expanded so did the town of Lead, which led to a problem. Lead was not a legal town. Portions of it were built on top of mineral land, most of which was owned by Homestake. Tensions rose as residents claimed land titles that legally belonged to Homestake. The company worried about mineral lodes and veins that might run beneath the town, and town residents worried that they might be evicted from their homes. In the early 1890s a compromise was reached. Homestake allowed the residents of Lead to have surface rights to their homes and buildings and would pay for any damage the company caused to those buildings during the mining process. They also agreed to give ninety-day notice if they needed a piece of land, and to pay for any damage they caused by removing the structure. Homestake essentially became the landlord of Lead.²⁰

Homestake was in many ways responsible for Lead's success. Homestake provide a staple in Lead's economy and contributed to the community in other ways. Under the leadership of George Hearst and his wife Phoebe, the Homestake Mining Company provided community resources including the first volunteer fire company and a company hospital to provide medical care for Homestake employees and their families. George Hearst built the Brick Store, a department store in Lead, and offered unlimited credit to miners and their families with no interest. Payments were simply deducted from the employee's wages.²¹

George Hearst had many reasons for his interest in the community's welfare centered on the efficient and smooth operation of his business. His wife Phoebe took a much more personal interest in her contributions to the community. Phoebe cared deeply about Lead's residents. She was responsible for the building and maintenance of the Hearst Free Public Library, which opened in 1894, and also started and maintained the Hearst Free Kindergarten. She opened a recreational building, donated to local churches, and sponsored a baseball team. When her husband died in 1891, Phoebe maintained her interest in Lead and the Homestake until her death in 1919.

That same year George and Phoebe Hearst's son, William Randolph Hearst, sold his share of the Homestake stock and ended the Hearst control of Homestake. The Hearst influence continued as the company worked to maintain the standards set by Hearst. Both Lead and Homestake were touched deeply by the Hearst legacy which continued long after George and Phoebe's deaths.

Homestake had its share of troubles through the years. It was shut down temporarily during World War II but devoted its surface departments to the war effort.²² Homestake also faced financial ups and downs, strikes, the environmental concerns of the public, and civil and women's rights issues. Over the years Homestake closed many old mines and invested in new ones throughout the United States and around the world. It held claims in several U.S. states, Canada, Peru, and most notably, a very successful mine in Australia. Homestake also diversified. The company no longer

²⁰ Smith, *Evolution of Homestake*, 72.

²¹ *Ibid.*, 68-74.

²² *Ibid.*, 114.

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mined purely for gold and silver. It catered to the needs of the modern industrial world, mining everything from lead and zinc to oil and uranium.

After 125 years of production, the Homestake Mining Company announced the closing of the Lead mine in 2001. Homestake began reclamation (environmental restoration of land and dismantling of structures) and on December 14, 2001, at 7:46p.m., the last ton of gold ore was mined at Homestake. That last ton was taken from the 1400 level of the mine, almost directly under the open cut and the spot where the original Homestake gold strike occurred. In June 2001, Homestake announced plans to merge with the Barrick Gold Corporation to form the second largest gold producer in the world.²³ The old Homestake mine site is now home to the Sanford Underground Research Facility. At the facility researchers learn more about the universe, underground life and the geology of the Black Hills.

Coal Mining in South Dakota

Although coal can be found in the Black Hills it is difficult to develop. The best coal mining in South Dakota took place in the Firesteel coal fields in the north-central part of the state. These fields were estimated to contain as much as 137,580,000 tons of coal. This area showed such promise the South Dakota Relief Agency started a strip-mining operation in a state-owned mine there in 1933. The mine proved ineffective as a state-owned investment and closed in 1934. Private and commercial owners mined in the area until 1969.

The first Firesteel coal may have been used by Native Americans as early as the 1880s. The first confirmed mining in the Firesteel coal fields was done by Andrew Traversie and William Benoist in 1907. They mined coal for personal use, although some was eventually sold. The first significant commercial operations began around 1911 with Fred Hammersly and Charles Lindt. Lindt's mine was considered as a potential site for a state-owned coal mine in 1920. The largest mining operation in the area, the Firesteel Coal Company, formed in 1923. This company employed over 60 men and shipped coal as far away as Iowa. Production climbed to over 40,000 tons a year, peaking with 53,743 tons in 1942. The company was unable to maintain that level of production and it plummeted to below 10,000 tons per year during the labor shortage created by World War II. Commercial mining in the area ceased permanently in 1969 and reclamation began in 1981.²⁴

Current Mining in South Dakota

Mine permits are required for the extraction and processing of minerals such as gold, silver, uranium, precious metals, coal, bentonite, dimensional stone and decorative stone. The mining of sand, gravel, rock to be crushed and used in construction, pegmatite materials, limestone, iron ore, sand, gypsum, shale or limestone used to make cement, or dredging for commercial resale requires a mining license from the state. Recreational mining, such as gold panning and mineral collecting that makes use of hand-held equipment such as picks, shovels, gold pans, sluice boxes, or metal detectors is exempt from permit requirements.²⁵

Mining remains an important part of the South Dakota economy. Gold production in the state has decreased since the Homestake's closing in 2001. While mining metallic commodities has declined, mining non-metallic industrial materials such as sand and gravel continues to be important.

²³ Smith, *Evolution of Homestake*, 7.

²⁴ The information for this section was provided by the Timber Lake & Area Historical Society, Timber Lake SD.

²⁵ <https://denr.sd.gov> Minerals and Mining Program. Accessed May 11, 2020.

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Sand and gravel can be found in nearly every county in the state and are used primarily for road construction. Sioux quartzite (mentioned above under quarrying) is also used for construction and is quarried in several locations in the southeastern part of the state.

Pegmatite mining for mica, feldspar, and rose quartz still takes place in the southern Black Hills. Limestone, shale, and gypsum are used in mixing cement, and dimension stone, such as granite, is mined by the Dakota Granite Company near Milbank. Milbank granite is used for both industrial and decorative purposes and is often shipped to international markets.

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Did You Know?

- Gold has the chemical symbol of *Au*, named after Aurora, the Roman goddess of dawn.
- The largest pure lump of gold weighed 156 pounds and was discovered in Australia.
- Sea water contains about one hundred times more gold than there is in human possession.
- The Mponeng gold mine in South Africa is the deepest operating mine in the world. The current operating depth of the mine is 2.38 miles below the surface.
- The ancient Egyptians produced sheets of gold leaf so thin that a pile only one inch high contained over 360,000 sheets.
- Miners at the Comstock Lode in California had troubles with notorious “black sand” which clogged their equipment. A few years later it was discovered that the “black sand” was actually silver granules.
- William Franklin, the founder of the Holy Terror gold mine near Keystone named it after his wife, in a fashion. When his wife would go looking for him in the local saloons and drag him out he would reportedly say to the other saloon patrons 'Ain't she a Holy Terror?'
- A corrupt prospector in California managed to fool a group of investors into purchasing a worthless mine by melting US silver dollars into fake nuggets and scattering them around the mineshaft. The scheme was exposed when a mine worker discovered “-ted States of” on the back of one of the fake silver nuggets.
- The ancient Egyptians valued silver more than gold because it was more difficult to mine and extract.
- Before digital cameras silver was used to make most types of film.
- Paul Revere, famous for his midnight ride, was a well-known silversmith.

Miner Superstitions

- Miners believed that accidents happened in threes.
- Miners believed that a man was likely to fall if his work clothes fell off their hook on the wall.
- Miners believed it was bad luck for a woman to enter a mine.
- Miners believed it was dangerous to whistle underground.
- Miners believed it was bad luck for a miner to drop his tools in a mine.
- Miners believed that if a candle fell from the tunnel wall or went out three times, something was wrong at home.
- Miners believed in Tommyknockers, small two-foot tall creatures on which all bad things were blamed. Tommyknockers got credit for the good things too. When the miners finished their lunch they would leave the last bite of food for the Tommyknockers. This was most likely due to the fact that the miners often ate meat and vegetable filled pies with their hands. Their hands could be very dirty and they didn't want to eat that last bite of pie.

South Dakota Minerals

Agate: many minerals in South Dakota are mined for construction and industry but gemstones are used for decorative purposes by collectors, jewelers, and other enthusiasts. One of the most well-known gemstones in South Dakota is the agate, a form of chalcedony marked by colored bands that flow concentrically like the rings of a tree trunk. The state gemstone is the Fairburn agate, a particularly beautiful variety. In a Fairburn agate the bands are extremely sharp and arranged perfectly parallel to one another. Agates are generally found in the Black Hills. Aside from being valued as a gemstone, agate is also used for items such as grinding tools.

Copper: Copper is found throughout the Black Hills and was a common by-product of gold mining. It is a very useful and important industrial metal. Its first use dates back as far as 10,000 years ago when it was used for tools and jewelry. In modern times it is used extensively in electric wiring and many types of transistors because of its conductivity and flexibility.²⁶ It is used to a lesser extent as jewelry, in important metal alloys, and as piping, building material, and currency. The South Dakota State Capitol Building's dome is made out of copper.

Feldspar: Feldspar is an abundant group of rock-forming minerals which constitute 60% of the earth's crust.²⁷ It is a silicate found in association with all rock types and is an essential constituent to most igneous rocks. In South Dakota feldspar is found in **pegmatites**, unique types of granite rock with large crystals, throughout the Black Hills. It comes in many different varieties which are used for numerous functions. Potassium or potash feldspars are used in the making of porcelain and glass. Other varieties, such as labradorite and Amazon stone, are known as plagioclase feldspars and are used for decorative purposes.

Gypsum: The name for gypsum comes from the Greek *gypsos*, which means chalk, plaster or cement. This is appropriate due to gypsum's appearance and its use in the production of these three things. It results most frequently from the evaporation of ancient sea water. Gypsum is the most common sulfate mineral, occurring many places and in a variety of forms.²⁸ Of these forms, alabaster is used for ornamental vases and boxes, satin spar is used in jewelry and ornaments, and Plaster of Paris is used in the manufacture of gypsum lath, wall board, casts, and molds.²⁹ Gypsum is prevalent in the Black Hills.

Lead: Lead is an important industrial metal that can be found in some places in the Black Hills. Lead has traditionally been used to make everything from piping to paint and batteries. It has been discovered that long exposure to lead ingestion can be toxic to humans. Since this discovery, other metals have slowly been replacing lead in many industrial products. Some products that still contain lead are stained glass, lead shot, batteries, and some industrial roofing materials. Lead is a very dense metal that resists radiation well. It is used to make the protective vests people wear when getting X-rays or radiation treatments.³⁰

²⁶ <http://www.phelpsdodge.com/products/copper/>

²⁷ "Feldspar," *Columbia Encyclopedia*, 6th ed. 2004. <http://www.encyclopedia.com/html/fl/feldspar.asp>. Aug. 4, 2004.

²⁸ "Gypsum," *Columbia Encyclopedia*, 6th ed. 2004. <http://www.encyclopedia.com/html/g1/gypsum.asp>. Aug. 4, 2004.

²⁹ Ibid.

³⁰ <http://www.webelements.com>

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Mica: Like feldspar, mica is also found in pegmatites, making this mineral common in the Black Hills. Mica is easily recognized by its shiny exterior and its perfect **cleavage**, or ability to be split or divided. This second characteristic allows mica to be split into leaves that are thinner than a sheet of paper. Mica is considered a soft mineral and is highly resistant to heat, making it good for a variety of industrial uses. It is used in things like gypsum wallboard, roofing, cement, paint, oil well mud, and rubber.³¹ Mica mining is a delicate operation because it is necessary to keep the crystals intact. In the production of sheet mica the mineral is stripped of rock and split two different times, once with a hammer and once with a knife. Sheet mica is used in insulating materials and as a resonating diaphragm in certain acoustic instruments.³²

Silver: Silver, like gold, is a precious metal found in the Black Hills. It is commonly used in jewelry and other ornamental objects because of its beauty. Silver has several other qualities that make it useful in industry as well. It is the most reflective metal known. This means that it can reflect 100% of the light that hits it. For this reason, the film coating on mirror backings in telescopes and microscopes is made of silver. Silver is also the best heat conductor of all metals, which makes it useful in solar panels. It has the highest conductivity as well and is needed to make batteries for devices that must be dependable, such as hearing aids, pacemakers, and devices used in space travel. Its most fascinating property is its ability to kill bacteria without injuring normal cells. Because of this property it is sometimes used in surgical tools and implants. Cotton gauze soaked in silver solution help intensive care burn victims survive and recover from their wounds. Silver compounds are also used to purify water.³³

Uranium: Uranium is found in some places in South Dakota and was at one time mined for industrial use. Uranium is a very dense, radioactive element. It is most commonly used in the United States' nuclear power plants as a fuel source. It is very efficient because one ton of uranium produces as much electricity as 16,000 tons of coal. During the Cold War uranium was used in the manufacture of nuclear weapons. Some types are used in medical treatments. Because of its high density, uranium is not easy to mine and transport. A one-gallon container of milk weighs about eight pounds, but that same container filled with uranium would weigh about 150 pounds, which is 1.6 times more dense than lead.³⁴

³¹ Hogan & Fouberg. 116.

³² "Mica," *Columbia Encyclopedia*, 6th ed. 2004. <http://www.encyclopedia.com/html/m1/mica.asp>. Aug. 4, 2004.

³³ <http://www.panamericansilver.com>

³⁴ <http://www.ne.doe.gov/uranium/facts.html>

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Includes activities, games, publications, and educational links.

<http://www.coaleducation.org>

A site with lesson plans, professional information, and fun and games for students.

<http://publications.newberry.org/k12maps/>

This site supplements its lesson plans with historic maps. Map 8, mining in South Dakota, should be of specific value.

Name _____

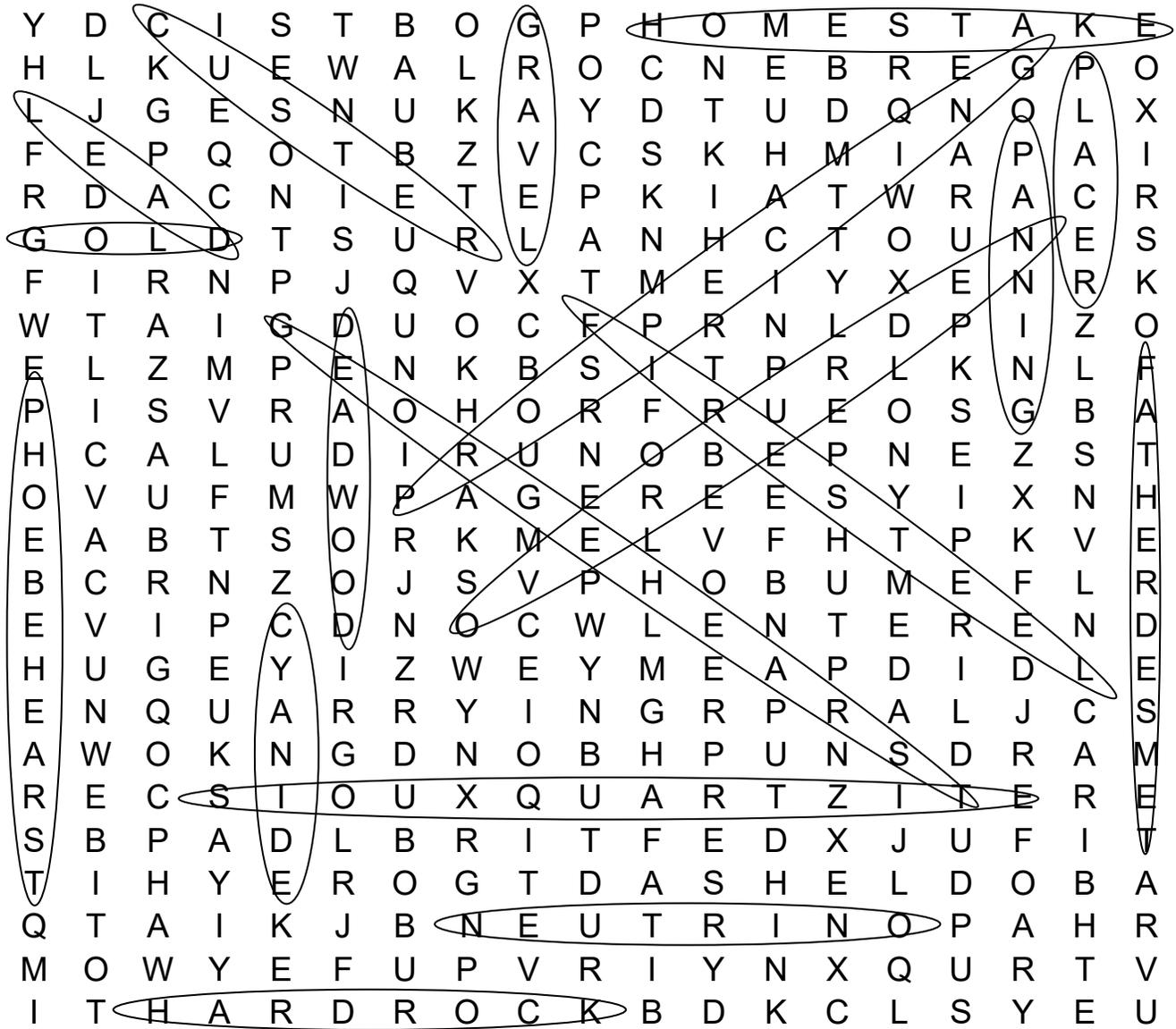
Word Find

Y D C I S T B O G P H O M E S T A K E
 H L K U E W A L R O C N E B R E G P O
 L J G E S N U K A Y D T U D Q N O L X
 F E P Q O T B Z V C S K H M I A P A I
 R D A C N I E T E P K I A T W R A C R
 G O L D T S U R L A N H C T O U N E S
 F I R N P J Q V X T M E I Y X E N R K
 W T A I G D U O C F P R N L D P I Z O
 E L Z M P E N K B S I T P R L K N L F
 P I S V R A O H O R F R U E O S G B A
 H C A L U D I R U N O B E P N E Z S T
 O V U F M W P A G E R E E S Y I X N H
 E A B T S O R K M E L V F H T P K V E
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 A W O K N G D N O B H P U N S D R A M
 R E C S I O U X Q U A R T Z I T E R E
 S B P A D L B R I T F E D X J U F I T
 T I H Y E R O G T D A S H E L D O B A
 Q T A I K J B N E U T R I N O P A H R
 M O W Y E F U P V R I Y N X Q U R T V
 I T H A R D R O C K B D K C L S Y E U

*Words may be found vertically, horizontally, and diagonally, not backward.

HOMESTAKE	FIRESTEEL	OVERBURDEN	PHOEBE HEARST
PLACER	CYANIDE	NEUTRINO	LEAD
SIoux QUARTZITE	DEADWOOD	QUARRYING	CUSTER
GEORGE HEARST	FATHER DESMET	BLACK HILLS	GRAVEL
HARDROCK	PANNING	GOLD	PROSPECTING

Word Find Key



*Words may be found vertically, horizontally, and diagonally, not backward.

- | | | | |
|------------------|---------------|-------------|---------------|
| HOMESTAKE | FIRESTEEL | OVERBURDEN | PHOEBE HEARST |
| PLACER | CYANIDE | NEUTRINO | LEAD |
| SILOUX QUARTZITE | DEADWOOD | QUARRYING | CUSTER |
| GEORGE HEARST | FATHER DESMET | BLACK HILLS | GRAVEL |
| HARDROCK | PANNING | GOLD | PROSPECTING |

Crossword Puzzle

Name _____

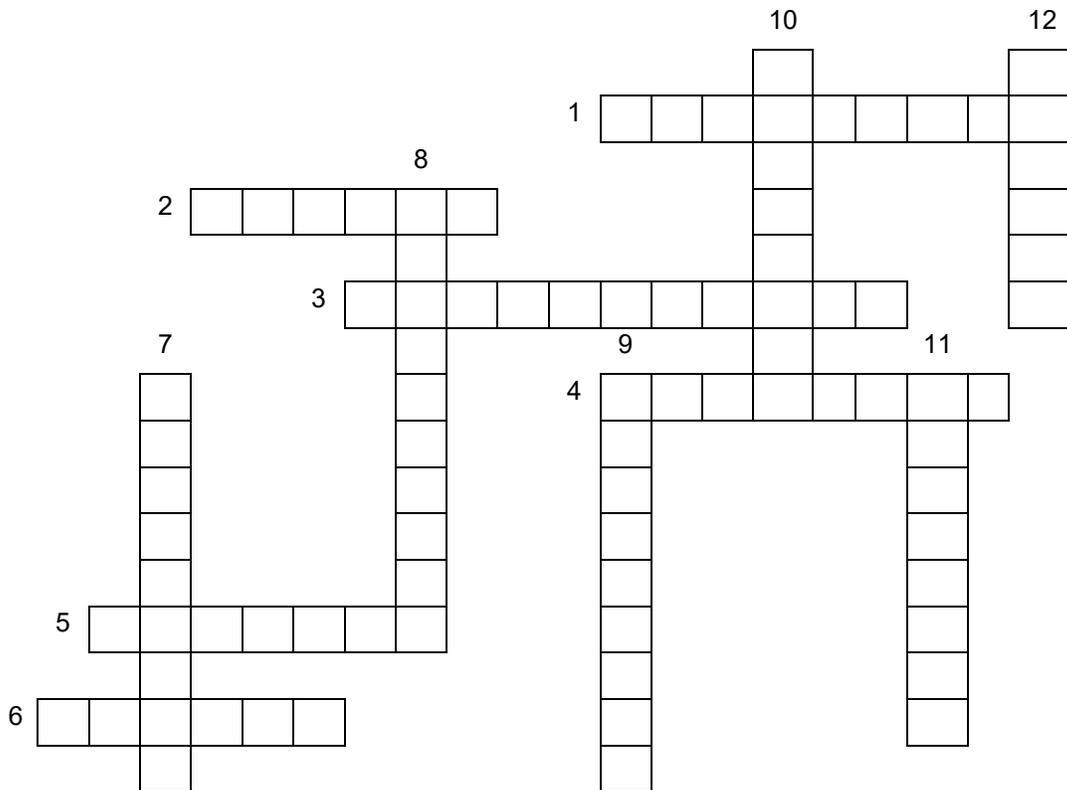
Homestake	Cyanide	Placer	Horatio Ross
Deadwood	Quarrying	Mining	Firesteel
Thoen Stone	Hardrock	Placer	Cheyenne

ACROSS:

1. Location of prominent coal mines in South Dakota, near Timber Lake
2. "Fool's Gold"
3. Reputed to be the first man to find gold in the Black Hills
4. The type of underground mining performed when surface mining is no longer profitable
5. A chemical that can be used to dissolve gold
6. The extraction of economically important minerals, ores, and fossil fuels from the earth.

DOWN:

7. An open, or surface, excavation of rock that is used for a variety of purposes
8. An object that provides evidence of miners in the Black Hills area during the 1830's
9. The oldest continually operating gold mine in the world
10. The most famous boomtown of the Black Hills Gold Rush
11. The nearest and most experienced outfitting center of the Black Hills
12. Type of surface mining performed with gold pans and sluice boxes



Crossword Puzzle Key

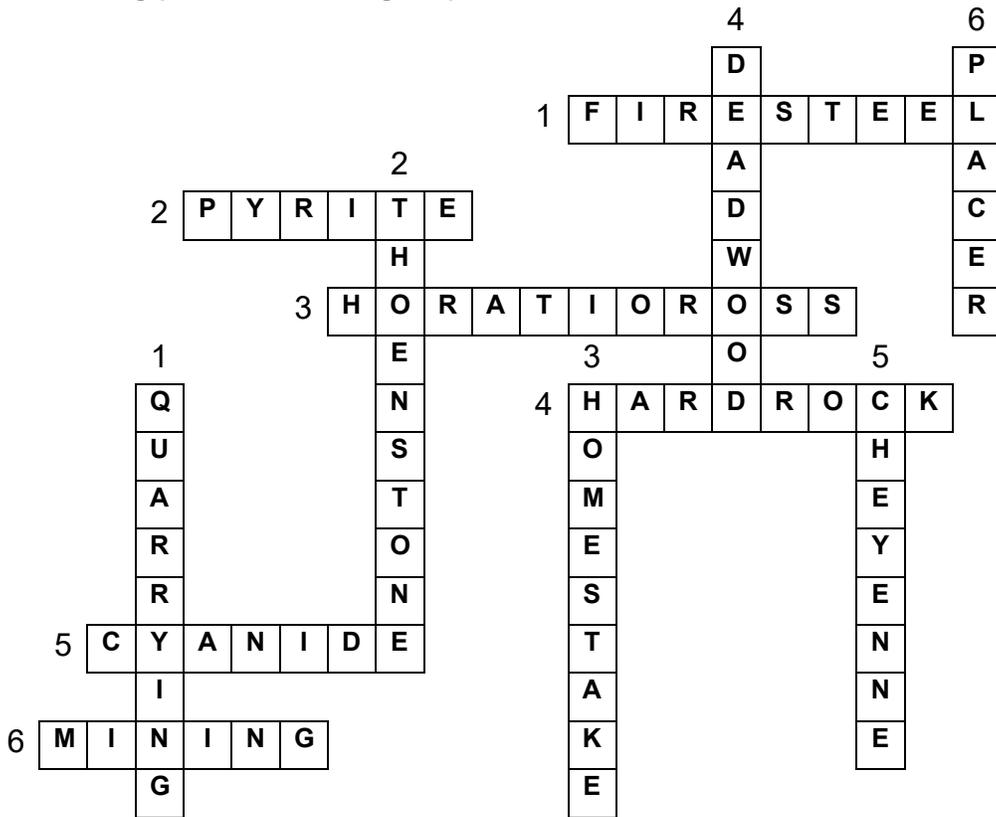
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5. The nearest and most experienced outfitting center of the Black Hills
6. Type of surface mining performed with gold pans and sluice boxes



Learning from Objects

Objectives:

- Participants will examine objects.
- Participants will draw conclusions based on direct observation.
- Participants will recognize that much information can be acquired about an object from direct observation.

South Dakota Social Studies Standards

K	1 st	2 nd	3 rd	4 th	5 th	6 th
K.G.6.1	1.H.1.2		3.H.2.3	4.H.3.1 4.H.5.2	5.H.2.4 5.H.5.2 5.G.2.3	

South Dakota English Language Arts Standards

K	1 st	2 nd	3 rd	4 th	5 th	6 th
K.SL.1a-b K.SL.2 K.SL.3 K.SL.6	1.SL.1a-b-c 1.SL.2 1.SL.3	2.SL.1a-b-c 2.SL.2 2.SL.3	3.SL.1b-c-d 3.SL.6 3.L.3	4.SL.1b-c-d 4.L.3	5.SL.1b-c-d 5.L.3	6.L.1 6.L.3

Timeframe: 30-60 minutes

Materials:

Included in kit

All objects

Object Identification Sheet

Why Learn from Objects?

There are many ways to learn about the world. One way is to listen and hear information – auditory learning. Another way to get information is by reading, watching a TV or video program, or looking at photographs – visual learning. This kit lets participants learn in another important way – by handling three-dimensional objects. This develops kinesthetic skills or learning by touch. Participants can see physically how objects are alike and how they are different. They can consider what use an object may have – is it a stand-in for something, like a live animal or a physical place? Is it an object that was made or used by people from a different culture? The kit’s written information, photographs and three-dimensional objects allow participants to practice various learning styles.

Activity Steps:

1. Arrange the participants so that it is easy to pass objects from one to another. Pass each object around one at a time, allowing the participants to handle and examine them.
2. While the participants are examining the objects, use the points below to start discussion about the materials, construction and history of the objects. Encourage the participants to share the visual and tactile information they get from the objects. You may ask each participant to consider a different aspect of the object – history, material, etc. Have the participants respond so the entire group can hear and enter into the discussion.

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3. After each object has been examined, share the information about each object on the Object Identification Sheet with the group.

Materials & Construction:

- Is it hard or soft?
- Is it light or heavy?
- Is it strong or fragile?
- What material is the object made out of? (wood, hide, stone, fur)
 - Is it made of something found in nature?
 - If it is natural, has it been changed by people? (cutting, sewing, mixing)

History & Function:

- Who might have made the object?
- What was it used for?
- Is this object still used today?
- Do we use something else today that does the same job?
- How is the object in the kit different from our modern object? How are they similar?
- Would you rather use the modern object or the object in the kit? Why?
- Was the object used for a special task or occasion or was it an everyday item?
- Does the object show signs of wear?
- Was the object worn on the outside or inside? Has it been changed by time or weather?
- Is there dirt on the object? If so, what kind and where is it located?
- Is any part of the object broken or missing?

Object Identification Sheet (Kit 1)

T-2004-050

Trowel: A trowel is a good tool for moving dirt and rocks when prospecting or panning for gold.

T-2004-122

Mining pick: This miner's pick is a modern example of the tool that would have been used by both placer and hardrock miners to remove rock.

T-2004-076, 077

Gold Pans: This type of pan is used to pan for surface gold in streams. Water and gravel are swirled around, and the heavy gold sinks to the bottom of the pan.

T-2004-113

Balance Scale: During the gold rush, miners used gold dust to buy things in stores. Merchants needed accurate scales to measure out gold dust the miners used for money. Miners rarely carried their own scales because it was often easier to use the available ones in town. This modern, pocket-sized balance scale works the same as older scales. A known weight is put on one of the balance pans and then whatever one wants to weigh is put into the other pan until the scale balances.

T-2004-107

Miner's Helmet: This helmet provided head protection for miners in the Homestake mine. There is a clip on the front for attaching a light.

T-2004-109

Carbide Lamp: Miners attached lights like this to their helmets for working underground. To make a carbide lamp work, a powder called calcium carbide went into the bottom part of the lamp's cylinder. Water went into the top of the cylinder. Inside the cylinder the water slowly dripped onto the powder, making a flammable gas that came through the spout in the center of the light. Lighting the gas with the striker next to the spout created a flame and gave light in a dark mine.

T-2004-054

Core Sample: A core sample is drilled from the rock where there may be gold. The core sample is *assayed*, or chemically tested, to see what minerals it contains. If pyrite or quartz are found, the core sample site may also contain gold.

T-2004-056

Drill Bit: Heavy, metal drill bits like this one were used on mechanized underground drills. Water was run through the hole in the center to keep the bit cool and lubricated as it cut into the rock. The water also kept the dust from the drilling down.

T-2004-058, 060

Blasting Caps: Blasting caps were used to set off explosions in the mine to remove ore for processing and to reveal more of the lode. Different sizes of blasting caps were used to time the detonations. 5-foot caps exploded sooner than 12-foot caps.

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T-2004-072

Blasting Cap Tin: A tin used to hold DuPont blasting caps, a brand commonly used in mining. These caps were attached to fuses and used to set off explosions in the mine.

T-2004-062

Mining Deed: This 1885 deed transferred a mining claim from John Costello to William L. Smith. Documents like this provided a paper trail for a mine claim, making it possible to keep track of who owned the property.

T-2004-064

Homestake Stock Certificate #6220: This Homestake Company stock certificate gave the purchaser a share in the company in June 1888. The stamp and holes punched in the bottom of the certificate show that this stock was cancelled in August 1888.

T-2004-065

Conners Tin Production Company Stock Certificate # 51: This stock certificate for a share of the Conners Tin Production Company was never used.

T-2004-074

Ruby Basin Claim Map 1900-1918: This map shows the mining claims that made up The Golden Reward Mine, The Mogul Mining Company, and Lundberg Dorr and Wilson Mining and Milling Company.

T-2004-086

24k Gold: The flakes in this bottle are pure (24k) gold. Placer miners hoped to find flakes of gold when they panned in the streams of the Black Hills during the gold rush.

T-2004-115

Iron Pyrite: Iron pyrite is commonly known as “fool’s gold.” Real gold and fool’s gold can easily be told apart by tapping them with a hammer. Real gold is soft and will flatten while iron pyrite shatters into dust when hit.

T-2004-080, 083

Sioux Quartzite: These pieces of Sioux quartzite (one polished and one unpolished) came from quarries near Sioux Falls. Sioux quartzite is used as a decorative building stone, and for highway construction. This is the rock that makes so many of South Dakota’s highways look pink because of the stone’s color.

T-2004-089, 092

Prairie Agate: These agates (one polished and one unpolished) are used as decorative pieces, mineral specimens, and gemstones. Agates are also used in items like grinding tools. A specific variety of agate, Fairburn agate, was designated South Dakota’s state gemstone in 1966. They can be found in the southwestern part of the state.

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T-2004-095

Feldspar: Feldspar is an abundant group of rock-forming minerals that make up 60% of the earth's crust. It is found in the Black Hills of South Dakota. Some varieties are used to make porcelain and glass.

T-2004-098

Rose quartz: Rose quartz is South Dakota's State Mineral. Although not particularly rare, it is found in only two other places in the world besides South Dakota, Maine and Brazil. Rose quartz is used for jewelry and as a tourist item.

T-2004-101

Ore: Ore is rock that contains valuable minerals. Iron pyrite, or fool's gold, and areas of color or *mineralization* can be seen in the ore. This mineralization can be an indicator of gold, but the ore would need to be *assayed*, or chemically tested, to find out if any gold is present.

T-2004-104

Mica: Mica is common in the Black Hills. It forms in thin layers that flake apart easily. When the thin flakes rub against hard stones around them, the flakes get ground into powder. This powder sparkled in the light and fooled many inexperienced prospectors into thinking they had found gold, much like iron pyrite did.

The blasting simulator (T-2004-111) and BBs are used for kit activities.

Preparing for the Rush

Objectives:

- Participants will determine the weight of gold samples using a scale.
- Participants will select products for a prospective gold rush within a specified budget.
- Participants will justify their selections based on usefulness and necessity.

South Dakota Social Studies Standards

K	1 st	2 nd	3 rd	4 th	5 th	6 th
K.E.1.1	1.H.1.2 1.E.1.2		3.H.1.1 3.E.5.1	4.H.3.1 4.H.4.1 4.H.5.2 4.E.1.1	5.E.1.1 5.E.5.1	

South Dakota English Language Arts Standards

K	1 st	2 nd	3 rd	4 th	5 th	6 th
K.SL.1a-b K.SL.2 K.SL.3 K.SL.6	1.SL.1a-b-c 1.SL.2 1.SL.3	2.SL.1a-b-c 2.SL.2 2.SL.3	3.SL.1b-c-d 3.SL.6 3.L.3	4.SL.1b-c-d 4.L.3	5.SL.1b-c-d 5.L.3	6.L.1 6.L.3

South Dakota Mathematics Standards

K	1 st	2 nd	3 rd	4 th	5 th	6 th
	1.OA.1 1.NBT.1 1.NBT.4	2.OA.1 2.OA.2 2.NBT.5 2.NBT.6	3.OA.7 3.MD.2	4.MD.2		

Timeframe: 60-90 minutes

Materials:

Included in kit

Ads from historic newspapers
 Preparing for the Rush supply list master
 Preparing for the Rush worksheet master
 Iron pyrite samples
 Scale
 Weights

Provided by instructor or participants

Pencil or pen
 Paper
 Paper bag

Background Information:

Many miners flocked to the Black Hills in the Gold Rush of 1874. Although many were outfitted in the frontier towns like Yankton, SD, or Sidney, NE, they quickly realized when they reached the Hills that gold dust was the currency of choice. In fact, the greenbacks that the miners had used in the frontier towns had less value because the gold dust could only be converted to greenbacks at a

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discount.³⁵ As a result, disagreements ensued between miners and store owners about what the value of gold dust should be. Originally set at \$20.00 an ounce, business owners and miners reached an agreement in 1879 to establish the value of gold dust based on its source. Deadwood dust brought \$17.10 per ounce, while the purer product from Rapid and Castle creeks brought \$18.25 an ounce.³⁶

The preceding information was important to miners because they needed certain products to survive. Many came to the Black Hills with salt pork, flour, sugar, tea, and coffee. They also came with mercury to help extract the gold. Altogether they spent about \$100.00 on supplies and another \$100.00 to ship them to the Hills. Once these provisions ran out the miners were forced to rely on area businesses to supply what they needed. These included mining tools like gold pans and shovels and cooking and eating utensils. A large amount of money was spent on entertainment and leisure activities in places like casinos and dance halls as well. A miner was successful not only on account of how much gold he found but also how he spent it.

Activity Steps:

1. Make copies of the Preparing for the Rush Supply List and Worksheet for each participant. This activity may be performed individually or in small groups.
2. Share the background information with the group and have them view the historic newspaper ads to get an idea of what was sold and how it was marketed.
3. Put the iron pyrite (fool's gold) from the kit into a paper bag and have each participant or group draw one piece.
4. Have participants or groups weigh the sample on the scale using the weights provided to counterbalance the sample. Have them record the weight and multiply the number of oz. by \$20.00. Although store owners would have based the value of gold on its source, here it has only one value: \$20.00 an oz.
5. Have participants imagine they are miners during the Black Hills Gold Rush. They must decide which goods to purchase in order to be successful. Items or services are chosen from the Preparing for the Rush Supply List. Participants can choose as many items as they can afford within their given budget. Have them keep a running total of their purchases on the Preparing for the Rush Worksheet.
6. After the participants have made all of their selections, each group or individual will take their list to the instructor who will act as the storekeeper. The instructor will weigh the group or individual's sample and determine if they have enough gold to pay the bill. If they do then the transaction is valid, if not then they have to omit one item at a time until they can afford the cost. If they are well below their budget the instructor can encourage them to buy more, especially if they have not met the minimum of each category.
7. When each individual or group has completed their purchases and have successfully stayed within the boundaries of their respective budgets, have each of them justify their choices during class discussion.

³⁵ Parker, Pg. 149.

³⁶ Parker, Pg. 150.

Preparing for the Rush Supply List

Entire personal outfit (choose at least 10)	Room and Board (choose 1)
Rubber ground sheet- \$3.00	2-3 room cabin- \$30.00 a month
Rubber hip boots- \$4.00	Boarding house w/food- \$56.00 a month
2 woolen blankets- \$5.00	Board w/out food- \$28.00 a week
rifle- \$15.00	(with board w/out food and cabin, must also buy)
pistol- \$5.00	4 lbs. of Flour 10¢ a pound
ammunition- \$4.75	3 lbs. of Bacon- 25¢ a pound
2 tin plates- \$1.00	2 lbs. of Butter- 40¢ a pound
dipper- \$0.75	2 dozen Eggs- 35¢ per dozen
knife- \$0.50	1 1/2 lbs. of Salted pork- 50¢ a pound
fork- \$0.50	4 lbs. Coffee- 20¢ a pound
large spoon- \$0.75	
4 towels- \$4.00	
1 box of matches- \$0.15	

Tools and Cookware (choose at least 5)	Luxuries and Amenities (optional)
Round-pointed steel shovel- \$2.25	Hotels- \$3.00 a day
Miner's pick- \$2.25	Restaurants and dining rooms-\$1.50 a day
Dutch oven- \$20.00	Calico wallpaper- \$7.50 for 5 sq. yards
Frying pan- \$1.50	
Tin pail- \$1.00	Medicine (choose at least 1)
Handsaw- \$2.50	Swayne's Tar- 1 can - \$1.00
Tent- \$10.00	Sarsparilla Pills - 1 box - \$0.85
Ax- \$1.25	
Rocker- \$4.00	Entertainment (optional)
Mercury- \$1.00	Opera House Ticket - \$1.50
Gold pan- \$2.00	Gambling - \$10.00
	Dance Hall Admission- \$0.75

Mining in South Dakota: A Living Timeline

Objectives:

- Participants will prepare a timeline including historic mining dates in South Dakota.
- Participants will demonstrate knowledge of events through speech.
- Participants will determine connections between state and national events in history.

South Dakota Social Studies Standards

K	1 st	2 nd	3 rd	4 th	5 th	6 th
K.H.1.1	1.H.1.2	2.H.1.1	3.H.1.1 3.H.1.2 3.H.2.1	4.H.1.1 4.H.2.2 4.H.3.1 4.H.4.1	5.H.1.1 5.H.1.2 5.H.3.1	

South Dakota English Language Arts Standards

K	1 st	2 nd	3 rd	4 th	5 th	6 th
K.SL.1a-b	1.SL.1a-c	2.SL.1a-c	3.SL.1b-d	4.SL.1b-d	5.SL.1b-d	6.SL.1b-d
K.SL.2	1.SL.2	2.SL.2	3.SL.6	4.SL.6	5.SL.6	6.SL.6
K.SL.3	1.SL.3	2.SL.3	3.L.3	4.L.3	5.L.3	6.L.3
K.SL.6	1.SL.6	2.SL.6				

Timeframe: Two 45-50 minute periods

Materials:

Included in kit

Living Timeline characters master

Historical Events master

All kit materials

Provided by instructor or participants

Butcher paper or construction paper

Crayons or markers

Scissors

Rulers or yardsticks

Tape

Costumes (optional)

Background Information:

The mining industry in South Dakota has done much to shape this state's history. The Black Hills gold rush was caused not only by the discovery of gold but also because the economic and demographic trends of that period dictated the mass migration. The Panic of 1873 left many farmers and workers in poor financial condition and projects like building the transcontinental railroad brought in immigrants that needed work after the last spike was driven in May of 1869. In studying history, it is important to understand that local or statewide events are part of a broader context. Actions occurring in one part of the world or country can have a lasting impact on people in other places. This activity helps participants learn about some of the important events and people in South Dakota mining and places those events in a broader historical context.

Activity Steps:

1. The first step is to create a timeline around the room. Have the participants draw a horizontal line across the length of the paper. Measure the sheet into five equal pieces with each piece representing a decade. Have them label and mark the decades on the timeline, and then mark the years in between. The events on the Historical Events sheet can be inserted by drawing vertical lines above or below the timeline from the mark representing the appropriate year (for events like wars mark both the beginning and ending years). Once the timelines sections are completed, hang them chronologically on the walls.

2. Split the participants into groups of three or four and assign each group a character. Once each group has its assigned character it should designate a speaker to portray that character. Each group should prepare an 8½x11 sheet of paper with the year and their character's name printed on it in large clear letters. Groups may choose (or have assigned) one member to read aloud the character's speech. The other members of the group can choose items from the kit to hold onto as props as they stand by their designated group speaker. The speaker may also hold a prop if they wish.

3. Have each group stand in front of the timeline year that matches their character's year. The designated speaker reads aloud the information about their character. The other groups serve as the audience.

4. After all the small groups have presented their character information have the entire group discuss what else was happening on the timeline. Did events happening outside of South Dakota have an effect on various character's choices and decisions? (example – war causing the mines to close).

Optional: Have speakers dress the part of their characters for the presentations in front of the timeline. Have the groups do research on their characters or the time they lived in to add to the presentation.

Historical Events Master

1800-1850

Louisiana Purchase-1803
Lewis and Clark Expedition-1804-1806
War of 1812-1812-1814
Monroe Doctrine-1823
Morse invents telegraph-1832
Texas Revolution-1836
The Trail of Tears-1838
Mexican War-1845-1848
Gold Discovered in California-1848

1850-1900

Civil War-1861-1865
Emancipation Proclamation-1863
President Lincoln Assassinated-1865
Alfred Nobel patents dynamite-1867
Transcontinental Railroad completed-1869
South Dakota becomes a state-1889
Wounded Knee Massacre-1890
Spanish-American War-1898

1900-1950

Wright Bros. flight-1903
Henry Ford introduces Model T automobile-1908
Panama Canal opens-1914
World War I-1914-1918
Great Depression-1929-1941
World War II-1939-1945
Attack on Pearl Harbor-1941
Cold War begins-1945

1950-Present

Korean War-1950-1953
President Kennedy is Assassinated-1963
Vietnam War-1965-1973
Moon Landing-1969
Fall of Berlin Wall, End of Cold War-1989
Persian Gulf War-1991
World Trade Center bombings-2001
Iraq War-2003

Living Timeline Characters master

“My name is **Don Carlos de Hault de Lassus**, I am the lieutenant governor of Louisiana. The year is 1804 and I have just received a letter from Régis Loisel mentioning that gold might be found in the Black Hills north of the Niobrara River.”

“My name is Ezra Kind. Seven of us came into these hills in 1833 to search for gold. All have died but me. They have been killed by Indians. I have lost my gun, have nothing to eat, and am being hunted by Indians. I am carving this into stone in hopes that someone will find it and learn of our story.”

“My name is **Father DeSmet**. The year is 1850. In my travels to the Dakota Territory I have encountered members of the Sioux Tribe with gold in their possession. The Sioux have told me that there is a ‘heap plenty of it’ in those hills.” I have advised them to hide what they find in hopes of keeping white settlers from the area.”

“I am a **Native American man**, a leader of the Sioux Nation. The year is 1857 and we are meeting at Lake Traverse to discuss how to protect ourselves from the threat of losing our land. In order to keep white miners from rushing to the area, we have adopted the policy that any Indians who show the gold of the Black Hills to white settlers will die, and those they show it to shall die along with them.”

“I am a **Native American woman**, a member of the Sioux Tribe. Our sacred home is located in the foothills of these Black Hills where we were forced to move many years ago. The year is 1875 and white miners are beginning to move in. They have broken the Treaty of 1868 and are threatening to take our land for the gold. ‘Long Hair’ and his men have fought our warriors. We are to join the Cheyenne under Sitting Bull to try to defeat them.”

“My name is **Horatio Ross**. I am a geologist who has traveled with General George A. Custer on an expedition from Fort Abraham Lincoln to the Black Hills. It is 1874 and I have found gold in French Creek, giving us hope that there will be more to find. We also hope to build forts in this region to keep an eye on the Sioux.”

“My name is **Annie Tallent**. I was the lone woman on the expedition into the Black Hills led by John Gordon in 1874. We came to the Black Hills in December of 1874 but were removed by the United States army in April of the following year. The land still technically belonged to the Sioux under the Fort Laramie Treaty of 1868.”

“My name is **Moses Manuel**. My brother Fred and I came to the Black Hills from the west after reading of General Custer’s exploits. White miners had been given access to the Black Hills by this time. We arrived in Custer in 1875 and were fortunate enough to discover gold on the Homestake Ledge on April 9, 1876. During the spring of that year we built a mill and took out \$5,000 worth of gold.”

“My name is **George Hearst**. It the year 1887 and I have just been elected to serve as a United States senator for the state of California. Ten years earlier my partners and I had purchased the Homestake mine in Lead. We also bought the claims of other miners around the Homestake in hopes of getting as much gold as possible from the investment.”

Mining in South Dakota

South Dakota State Historical Society Education Kit

“My name is **Phoebe Apperson Hearst**. The year is 1901 and the dedication of the Hearst Free Kindergarten has just been finalized. I have always been concerned with the welfare of the people of Lead and have contributed a library in addition to the kindergarten. Since the death of my husband George in 1891, I have been responsible for the Homestake and have done all I can to raise the quality of life for its workers.”

“My name is **Julius Engle**, and I am the owner of the Blue Thunder Gold Mine in the Black Hills. The year is 1914 and my partner Mr. Krupp and I are realizing the end of gold mining in this location is coming. After thirty-two years of hardrock mining we found promising gold-bearing ore only a few months ago but the ore cannot be milled profitably. With the Great War on the horizon we have been shut down by the government as are all mines that do not contribute to the war effort.”

“My name is **Sam Scherer**. The year is 1934 and I am taking over the failed state coal mine a mile southwest of Firesteel in north-central South Dakota. The state mine was intended to provide coal for the state’s needy residents during the Great Depression but was in operation for less than a year before it was closed.”

“The year is 1942. I have worked at the Homestake Gold Mine for five years but am now enlisting in the armed forces after the attack on Pearl Harbor on December 7, 1941. I had hoped to continue working at the mine during the war, but Order L-208 has been issued by the United States government which has suspended the operations of all non-war-related mines. Because I cannot work in the closed mine, I am fulfilling my patriotic duty and enlisting.”

“The year is 1965 and I am an employee at the Dakota Granite Works in Grant County in eastern South Dakota. This company has been in operation since 1925. The granite quarried in this county is shaped into monuments and used as building stone. It is popular because of its unique color, its adaptability, and its availability.”

“My name is **Diana Mathisrud**. The year is 1978 and I have become one of the first female workers in the Homestake Gold Mine. It has taken longer for women to find jobs in this field, in part because of an old superstition that it was bad luck to have a woman in the mine. Now some of us are mine laborers and we may be operating mining machinery in the future.”

“I work at a gravel pit in Lyman County in south-central South Dakota. Gravel and sand are the major non-metallic industrial mineral commodities found in the state. Gravel and sand can be found in almost every county. It is mostly used for road construction on gravel roads.”

“My name is **Jack E. Thompson**. I am the final Chairman and Chief Executive Officer of the Homestake mine in Lead, South Dakota. It is December 14, 2001 and the last ton of gold ore has been mined. It is the end of an era as the longest continuously operating gold mine in the world is closing its doors 125 years after the Manuel brothers discovered the Homestake Lead.”

Mining Phases Sequencing Activity

Objectives:

- Participants will identify the steps in mining from discovery of an ore deposit to creating a product with the mined mineral.
- Participants will place the steps in sequential order.
- Participants will discuss what each step requires and why it must be done in the order chosen.

South Dakota English Language Arts Standards

K	1 st	2 nd	3 rd	4 th	5 th	6 th
K.SL.1a-b	1.SL.1a-b-c	2.SL.1a-b-c	3.SL.1b-c-d	4.SL.1b-c-d	5.SL.1b-c-d	6.L.1
K.SL.2	1.SL.2	2.SL.2	3.SL.6	4.L.3	5.L.3	6.L.3
K.SL.3	1.SL.3	2.SL.3	3.L.3			
K.SL.6						

Timeframe: 30-45 minutes

Materials:

6 Mining Phases Posters

Background Information:

There is more to mining than just digging a hole in the ground. There are six phases in the mining process – exploration, mining, processing, manufacturing, consumption, and recycling. In this activity participants will learn what each phase entails and put the phases in the proper order.

Activity Steps:

1. Arrange the posters so the participants can see them easily. Put the posters in random order.
2. Have the participants brainstorm about what each phase might entail. Have them decide what order the posters should go in to show the entire mining process.
3. Share the information on each phase with the group. The information below is in the proper order. This information for each Phase is also found on the back of the posters.

1. Exploration Phase: Mining companies must find where the minerals are located so they know where to dig. They use a team of people who know how to test for minerals in the earth. The company must make exact maps of where they want to dig so they know who owns the land and who to ask for permission to mine.

2. Mining Phase: Mining companies get the minerals they want out of the ground in many ways. Some companies mine deep underground in a process called hard rock mining. Others use strip mines or quarries on the surface to collect the minerals. How a company mines is important because they must restore the land when they are done mining. They must clean the water, plant new trees, and return the area to its original state. This is called reclamation.

3. Processing Phase: Mined minerals do not come out of the ground clean and pure. They are often surrounded by unwanted waste rock. The mineral ore is processed by smashing it into small bits and treating it with chemicals to release the desired mineral from the ore.

4. Manufacturing Phase: Raw minerals by themselves are not very useful. Have you ever used a chunk of limestone? Companies buy raw minerals and use them to make everyday items like toothpaste and cell phones. Taking raw minerals and turning them into useable products is called manufacturing.

5. Consumption Phase: Consumption is when you buy the products made from mineral resources and use them! Every time you use the phone, ride in a car, brush your teeth, watch TV, or bake cookies, you are using minerals.

6. Recycling Phase: Once a mining company has used the minerals it has mined it must decide what to do with the waste materials. A mining company can't just dump the waste anywhere, so they look for ways to reuse the waste materials. This is called recycling. If the company can't find a way to reuse the waste it must find a way to dispose of it safely and legally.

4. Share with the participants and have them discuss minerals that are used in common objects like toothpaste. Did they know they were using minerals every day?

Household Minerals

There are lots of things in our homes that are made with the help of the mining industry. Below are some uses for commonly mined minerals:

Fluorite—Toothpaste

Silver Ore—Photographic Film

Quartz—Roof Shingles

Limestone—used to make Concrete and Carpets

Calcium Carbonate—Lipstick and certain types of ink

Mica—Paint

Clay—used to make Vegetable Oil and Microwaveable Containers

Pumice and Volcanic Ash—used in Kitty Litter

Gold Ore—used in Computers

There are 15 different minerals used to make automobiles, 35 different minerals used in the average television, and 42 different minerals used to make the telephone

Fire in the Hole! Blasting Patterns

Objectives:

- Participants will identify how blasting was part of the mining process.
- Participants will simulate the blasting process.
- Participants will consider the safety issues around blasting in the mining process.

South Dakota English Language Arts Standards

K	1 st	2 nd	3 rd	4 th	5 th	6 th
K.SL.1a-b	1.SL.1a-b-c	2.SL.1a-b-c	3.SL.1b-c-d	4.SL.1b-c-d	5.SL.1b-c-d	6.L.1
K.SL.2	1.SL.2	2.SL.2	3.SL.6	4.L.3	5.L.3	6.L.3
K.SL.3	1.SL.3	2.SL.3	3.L.3			
K.SL.6						

South Dakota Science Standards

K	1 st	2 nd	3 rd	4 th	5 th	6 th
		2-PS1-1	3-PS2-2			

Timeframe: 30-45 minutes

Materials:

Included in kit:

- Blasting area container
- Square dividers
- Photos 12, 13, 14
- Blasting caps and tins

Provided by instructor or participants:

- Duct tape or packing tape
- Sand
- Spoon (optional)

Background Information:

Using explosives to move rock is a common mining practice. Explosives are used in strip mines, hard-rock mines, and quarries. It might look easy but blasting in a mine is more complicated than drilling a hole, placing a charge, and lighting a fuse. Miners must take into account the strength of the explosive, the kind of material to be broken up and the amount of material to be moved. Using explosives is a difficult and dangerous job.

Mine blasting requires paying close attention to where the charges are placed and the order in which they are fired. If the charges are too close together, they will break up the rock too finely. If they are too far apart, the pieces will be too big. If the charges are fired in the wrong order the blast pattern will not be effective. In this activity the diamond pattern is used (Photo 12).

The diamond blast pattern is commonly used when blasting out stopes, or chambers in a mine. The pattern is set so the middle part is blown out first. With the middle part gone the *flyrock*, or debris, from the other layers has some place to go. This pattern makes the entire wall being blasted cave in on itself. To achieve this the charge in the middle blows first with the succeeding charges blowing in sequence from the middle to the outside.

Activity Steps:

1. Share the background information with the participants and show Photo 12 of the diamond blasting pattern. The blasting caps and tins may also be passed around at this point so that the participants can see the devices used to trigger each explosion.

2. Prepare the simulation part of the activity. Use the Blasting Area Container with square dividers. Each square represents a different blast. Doing three “blasts” gives participants an idea of how the diamond blasting pattern moves material in sequence. There is only one Blasting Area Container in the kit so the participants may need to be split into small groups so all can see what is happening in the container.

3. Place the container on a table with the participants gathered around it. Put a strip of tape on the underside of the container to plug the hole. Make sure the strip is long enough so that it covers the hole and extends beyond the edge of the container. This will make it easier to pull off. Once the hole is plugged, place the square dividers in their appropriate grooves. Make sure that the dividers are pushed down as far as they will go to ensure that there will be no sand leaking underneath them. With the dividers in place, begin filling the container with sand. When filling between the two dividers make sure that the smaller one is filled up to its top edge but not beyond it. When placing sand on the outside of the larger divider it is best to use a spoon to carefully apply the sand. Once all of the sand you are ready to begin “blasting.”

4. Unplug the bottom hole in the container by removing the tape. This simulates the first “blast” in the center of the diamond pattern. The sand should drain from inside the first divider only. Remove the first divider and the sand will between the dividers will drain – the second “blast” in the pattern. Remove the large divider and the remaining sand should drain out – the last “blast” in the pattern. This illustrates what happens during a diamond blasting pattern.

5. Repeat the blasting simulation with each group as needed. As a group, look at Photos 13 and 14. Discuss:

- Why was blasting dangerous work? What could go wrong? (Unexpected cave-ins and explosions, unfired charges, etc.)
- Why was it necessary to blast in a mine? (to move rock and get to the valuable minerals)

Panning for Gold

Objectives:

- Participants will recognize the steps in panning for gold and demonstrate them.
- Participants will analyze the process and evaluate its effectiveness.
- Participants will discuss challenges that come from panning gold for a living.

South Dakota English Language Arts Standards

K	1 st	2 nd	3 rd	4 th	5 th	6 th
K.SL.1a-b	1.SL.1a-b-c	2.SL.1a-b-c	3.SL.1b-c-d	4.SL.1b-c-d	5.SL.1b-c-d	6.L.1
K.SL.2	1.SL.2	2.SL.2	3.SL.6	4.L.3	5.L.3	6.L.3
K.SL.3	1.SL.3	2.SL.3	3.L.3			
K.SL.6						

South Dakota Social Studies Standards

K	1 st	2 nd	3 rd	4 th	5 th	6 th
	1.H.1.2 1.E.1.2		3.H.2.1	4.H.1.1 4.H.4.2	5.G.2.2	

South Dakota Mathematics Standards

K	1 st	2 nd	3 rd	4 th	5 th	6 th
K.MD.1	1.OA.1		3.MD.2	4.MD.2		

Timeframe: 60 minutes

Materials:

Included in kit

- 2 gold pans
- Pyrite and/or BBs
- Scale

Provided by instructor or participants

- Large wash tub or basin
- Gravel
- Water
- Large tarp
- Paper and pencil/pen

Background Information:

Many Black Hills miners were equipped only for placer mining, or mining just on the surface of the earth. Miners would congregate along riverbeds or other areas where gold might have drifted after being broken off of lodes or deposits by years of weathering and erosion. Gold panning was one of the ways placer miners found gold. Efficient miners could go through a pan in as little as 30 seconds so they could process large amounts of material in a day. Some miners made a good living panning for gold while others barely scraped by. Discovering gold was hard and greenhorn miners did not have the skills to pan for gold efficiently. Success as a placer miner depended on hard work, good panning techniques, and luck.

Activity Steps:

Before doing this activity, the instructor may want to have the participants watch a short video of panning for gold. One can be found on YouTube at https://www.youtube.com/watch?v=Hfn-rD_yxN4

1. If possible, set up this activity outdoors so water spills are not an issue. If setting up indoors, lay down the tarp and place the wash tub or basin on it. Put a pile of gravel next to the tub. Fill the tub $\frac{1}{2}$ to $\frac{3}{4}$ with water.
2. Split the group into smaller groups. Have each group weigh either 10-15 of the pyrite pieces OR a handful of the BBs on the scale. This will be the “gold” they pan. Write the gold weight down on their paper. Once weighed, have the first groups to pan put their gold in the bottom of the gold pans and cover it with gravel. Fill the pans $\frac{1}{3}$ to $\frac{1}{2}$ full of gravel.
3. Have one group work at a time and submerge their pan of gravel in the tub and let it sink to the bottom. Work the gravel with your hand to get rid of the dust, lift the pan out and dump some of the water leaving enough water in the pan to cover the gravel.
4. Tip the pan away from you at a slight angle and shake the gravel from side to side. This should settle the gold on the bottom of the pan under the gravel.
5. Dip the pan into the water at a 45° angle so the gravel is submerged. Pull the pan out at the same angle, dipping and removing the pan five times in a fluid motion. The water will carry off the large gravel pieces. Pick out any large rocks and repeat the dipping and removing the pan from the water until you are left with only small rocks and fine gravel – and the “gold” – in the pan.
6. Dip the pan at the 45° angle so water barely covers the gravel. Gently flip the bottom of the pan away from you as you lift it out of the water. Repeat this motion 5 times to remove all the large gravel pieces and leave only sand.
7. Dip the pan and get enough water to just cover the sand. Gently swirl the water in the pan. Swirling the sand should reveal the “gold”. Pick out the gold as the pieces show up. Weigh the gold and record the weight on their paper. Discuss:
 - Did all the gold get recovered in the panning process?
 - Is panning for gold an easy process? How about if you were doing it in cold stream?
 - Would the participants like to pan gold for a living? Why or why not?

Mapping Claims

Objectives:

- Participants will identify how mining claims were established.
- Participants will use this knowledge to establish their own mining claims.
- Participants will explain their reasoning for how they established their claims.

South Dakota English Language Arts Standards

K	1 st	2 nd	3 rd	4 th	5 th	6 th
K.SL.1a-b	1.SL.1a-b-c	2.SL.1a-b-c	3.SL.1b-c-d	4.SL.1b-c-d	5.SL.1b-c-d	6.L.1
K.SL.2	1.SL.2	2.SL.2	3.SL.6	4.L.3	5.L.3	6.L.3
K.SL.3	1.SL.3	2.SL.3	3.L.3			
K.SL.6						

South Dakota Social Studies Standards

K	1 st	2 nd	3 rd	4 th	5 th	6 th
	1.G.1.1	2.G.1.1	3.H.1.1	4.H.3.1	5.C.4.1	
			3.C.3.1	4.C.3.1	5.G.1.2	
			3.G.1.1	4.G.3.1		

Timeframe: 45-60 minutes

Materials:

Included in kit

Golden Gulch Map master
 Iron Pyrite (Fool's Gold) pieces

Provided by instructor or participants

Rulers
 Pencils
 Drawing Paper
 Large piece of drawing paper to create classroom claim map

Background Information:

Discovering gold in the Black Hills drew hundreds of miners to the area. All of them were hoping to find a good claim and strike it rich. They had to find a way to live and work together peacefully. Because there were no legal courts or law enforcement, the miners had to develop their own laws and means of settling disputes. Establishing mining claims was a method for deciding who had the right to work a piece of land and claim the gold found there. The miners set up a 'district' to form claim offices to record claims and miner's courts to deal with disagreements. Complaints about who owned a claim often came before the miner's court.

Recording the exact locations and boundaries of claims was no easy matter. Often a claim record simply gave the claim number, a short description of the area it was located in, estimated distances along its borders and notable landmarks. Other records were even less descriptive. The following is an example of an undetailed claim record:

Personally appeared before me James Andrews and recorded the undivided right title and interest to Claim Number 9, 'Above Bear Rock' of 300 feet for mining purposes. Recorded this 9th day of July 1875. (Watson Parker, Gold in the Black Hills, p. 61)

Mining in South Dakota

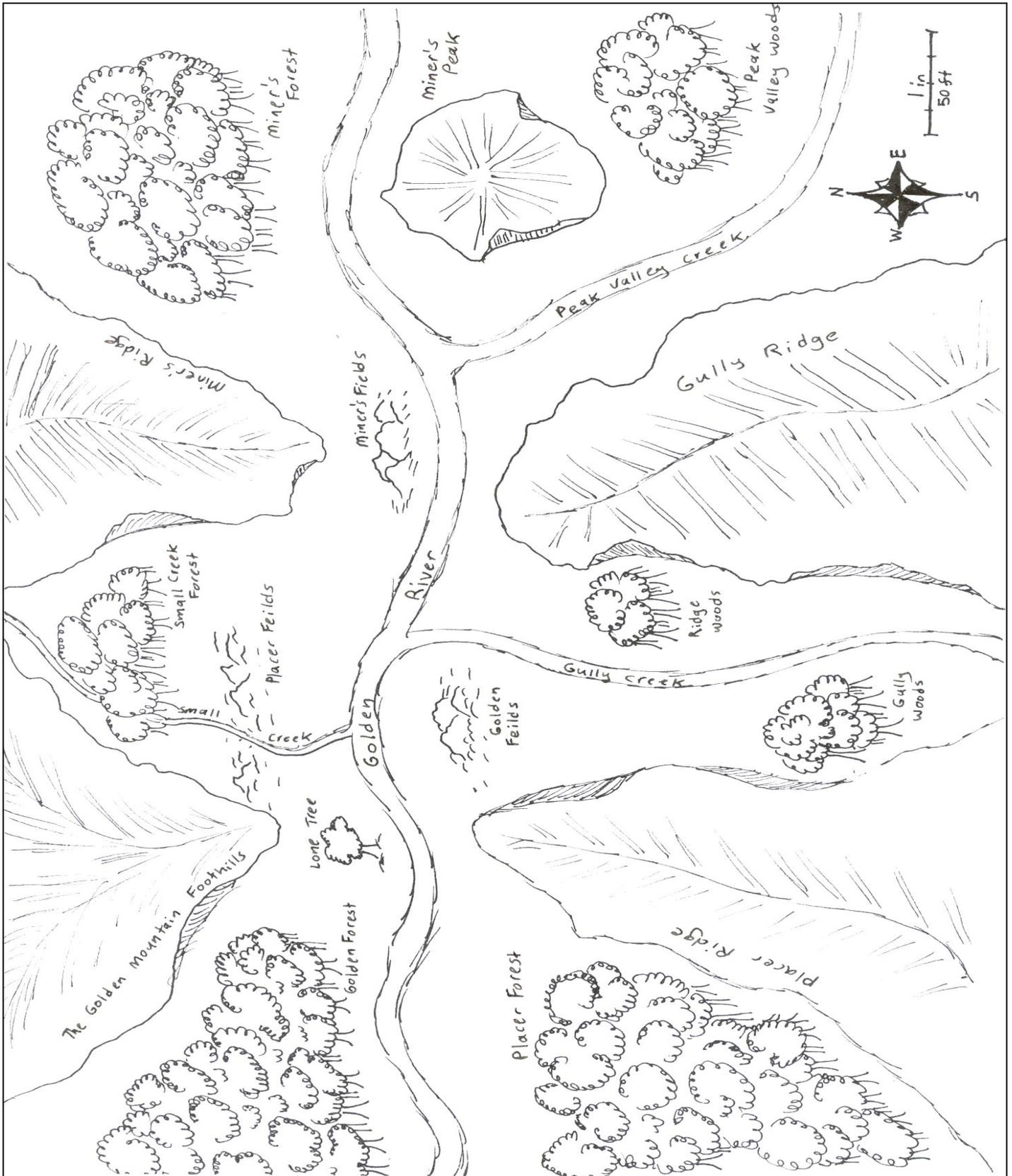
South Dakota State Historical Society Education Kit

Once recorded with the claims court, a paper copy of the claim deed was given to the claimant. With scant details on claims it was inevitable that disputes about claim borders and other issues came up. “Official” records did not keep disputes out of the miner’s court and occasionally led to violence as the parties involved could not come to a peaceful agreement. In this activity, participants will work together to stake claims on a map. The participants will also divide the classroom into claims and search for gold. Will everyone agree with the claim boundaries? Can everyone get everything they want? How will they settle disputes? (no violence, please!)

Activity Steps:

1. Share the background information with the participants. Hand out copies of the Golden Gulch Map and explain that they are prospectors who have entered the hills as a group who wish to divide Golden Gulch up into mining claims. The instructor uses one map to record all the potential claims.
2. Have each participant mark out the mining claim they want on their map and write a brief description of it. The instructor/participants transfers those claims to the instructor’s map. Are there overlaps? Discuss:
 - If two individuals claim the same location or part of the same location the group (working as a miner’s court) must decide how to settle the dispute. Physical fighting is NOT ALLOWED, but other methods could be used – drawing straws, having each claimant state their case orally and the group deciding whose story is most compelling, etc.
3. Have the participants divide the room up into mining claims. They may draw a map of the room on the large drawing paper to help them.
4. When the participants have staked their claims have them step into the hallway or face a wall with their eyes closed. The instructor will hide the pyrite from the kit randomly in the room. The instructor might opt to place one piece of pyrite directly on the border to two claims. Have the participants search their claims for the pyrite.
5. If there are any disputes as to whose claim the pyrite is on, the participants must decide how to solve the issue. Start a discussion. How would the miners have solved the issue? Should they flip a coin or have a trial? If real gold was on the line, would their decision change?

Golden Gulch Map



What Can You See?
 A Photograph Analysis Activity

Objectives:

- Participants will systematically analyze photographs to gather data.
- Participants will compare and contrast photographs.
- Participants will make inferences from photographic data.

South Dakota Social Studies Standards

K	1st	2nd	3rd	4th	5th	6th
	1.H.1.2	2.H.1.2	3.H.2.1 3.H.2.3	4.H.1.2 4.H.3.1 4.H.5.1 4.H.5.2	5.H.5.2	6.H.3.1

South Dakota Visual Arts Standards

K	1st	2nd	3rd	4th	5th	6th
K.VA.Re.8.1a	1.VA.Re.7.1a 1.VA.Re.8.1a		3.VA.Re.7.1a 3.VA.Re.8.1a	4.VA.Re.8.1a		

South Dakota English Language Arts Standards

K	1st	2nd	3rd	4th	5th	6th
K.SL.1.a-b K.SL.2 K.SL.3 K.SL.5 K.SL.6	1.SL.1.a-c 1.SL.3 1.SL.5	2.SL.1.a-c 2.SL.3	3.SL.1.b-c-d	4.SL.1.b-c-d	5.SL.1.b-c	6.SL.1.b-c

Timeframe: Determined by instructor. Set up as an activity center unit, participants work individually or in small groups.

Materials:

- Included in kit
- Photographs 3 and 9
- Comparing Photographs worksheet master

Background Information:

Two different photographs show mine interiors. In this activity, participants hone their observation skills as they search for both similarities and differences between the two images. One of the photographs shows the timbering or building wooden support structures called stopes in the Homestake Mine. The other photo shows two miners drilling holes with a hydraulic drill.

Activity Steps:

1. Make copies of the Comparing Photographs worksheet for the participants at the activity center.
2. Have participants view the two photographs and complete the worksheet.
3. Hold a group discussion where participants can share their observations and explain some of the similarities and differences they found in the photographs.

Comparing Photographs

Photograph 3	Photograph 9
List 3 things that are similar in each photo 1. 2. 3.	1. 2. 3.
List 3 things that are different between each photo 1. 2. 3.	1. 2. 3.

Write a short story about one of the photographs. (You may also use other photographs from the kit for this activity). Describe the characters, setting and what action is happening.