ALF ENGEN SKI MUSEUM 4TH GRADE FIELD TRIP CURRICULUM

Utah Olympic Park Tour

Location: Bus, Ski Jump, Bobsled Track, Pool, Theater Room

Objectives: Students will interpret a multiplication equation as a comparison; solve multi-step word problems posed with whole numbers; describe the cause-and-effect relationship between the speed of an object and the energy of that object; ask questions and make observations about the changes in energy that occur when objects collide; describe how and why humans have changed the physical environment of Utah to meet their needs; participate effectively in a range of conversations and collaborations; clearly summarize information presented in various formats; use age-appropriate language, grammar, volume, and clear pronunciation when speaking; determine or clarify the meaning of unknown and multiple meaning words and phrases, choosing flexibly from a range of strategies; and use context as a clue to the meaning of a word.

Materials: ski jumper figurine; K-point image poster

Steps: Tour guide will join the students on the bus and introduce students to the five winter sports at Utah Olympic Park (UOP): luge, skeleton, bobsled, ski jumping, and freestyle skiing. Let the students know that you'll be asking some questions during the tour, and that you'll ask a question and then wait 5 seconds before calling on a student. This way everyone has a chance to think about it and everyone gets a turn to talk.

Point out the Refrigeration Plant on the way, explaining how it takes a lot of hard work, pipes, and chemicals to freeze the bobsled track and create the ice on which the athletes slide. Ice on the track is maintained by hand. The Plant is capable of cooling the track temperature 80 degrees in a few hours. There are over 60 miles of pipe for less than a mile of track.

Track Facts:

- This is the second fastest track in the world (Whistler, Canada is the fastest)
- Track length: 8/10 mile
- Curve count: 15 (from bobsled/skeleton start)
- There is no Zamboni or machine to send down the track to plow the snow or smooth the ice; everything is done by hand. The track ice is 2" – 3" thick.
- The track ends with an uphill grade more than 100 meters in length. This is critical for safe stopping - especially for skeleton and luge athletes whose sleds have no brakes.
- The walls in some curves are up to 11 feet high

Ask: Why is the track covered in shades? (Wait 5 seconds, then call on a student.)

Answer: protection from sun & precipitation

Begin at the top of the K120 ski jump. Unload and allow for a restroom break.

Move to the ski jump and show the K-Point poster. The K-point is where the steepest part of the hill ends, and the slope starts to flatten out. The "K" stands for "kritisch," which means critical (point) in German. Explain that wind, temperature, and humidity affect where the athletes start. Explain how athletes put on their skis on the stairs and then slide out onto the bar/seat to their starting positions.

Ski Jumping Facts:

- UOP jumps are used in winter and summer (slippery, wet plastic Snowflex used).
- In the 2002 Olympics, the same ski jumper won gold on both the 120- and 90-meter hills. 120-meter = Big Hill (almost 400 feet); 90-meter = Normal Hill
- UOP also has 10-meter, 20-meter, 40-meter, and 64-meter jumps for kids.
- Women competed starting in the 2014 Winter Olympics (Sochi, Russia Games).
- Ski jumping is the second safest winter sport (after curling).
- Athletes reach speeds up to 50 mph when they take flight, but they're not very high off the ground.
- These are the highest ski jumps in the world; the top of the 120 is 7,240 ft above sea level.
- Jump scores are based on distance on or past the K-point, style, and landing.

Ask: Did you know the Winter Olympic Games will be returning here in 2034? We will have a lot of construction here to update the K120.

Load bus and move to the luge and bobsled tracks; show students the men's luge start.

Luge Facts:

- Sled weight: Approximately 50 pounds
- Luge is the fastest of all track sports
- Luge is one of the most dangerous of the winter Olympic sports
- Start in a seated position with special gloves that have spikes on the fingertips

Ask: How many people are on the sled together for the Doubles luge? (Wait 5 seconds, then call on a student.) Answer: two

Show students the bobsled/skeleton start. Explain how athletes begin their runs by sprinting down the ice while pushing their sleds. The initial push or "drop" from the starting point sets the bobsled in motion, converting potential energy into kinetic energy as it gains speed. Kinetic energy is the energy of motion. As the speed increases, so does the kinetic energy. In bobsled racing, higher speeds allow the sled to cover the track in a quicker amount of time. The kinetic energy gained from higher speeds helps the bobsled navigate or steer corners better and keep up speed on the straight areas.

Bobsled/Skeleton Facts:

- 4-Man bobsled weight: Approximately 600 pounds
- There is a two-man event and a two-woman event, and included in the 2022 Olympics for the first time was Woman's Monobob, which means one woman
- Skeleton sled weight: Approximately 100 pounds
- Skeleton was not an Olympic sport until 2002; the USA won Gold in both the Men's and Women's disciplines
- Athletes experience up to 5 times the force of gravity in some turns (5 Gs)

- Highest track in the world—around 7,322 ft above sea level

Ask: What do you think happens to the ice when a sled races down the track? (Wait 5 seconds, then call on a student.)

Answer: Parts slightly melt, or tiny pieces may break off, due to the heat energy from the metal scraping over the ice and the kinetic energy or movement of the heavy sled and people over the frozen surface.

Load back onto the bus and return to the bus loop at the museum.
Ask on the bus: Do you have any questions for me?

Bring students out to the railing so they can see the pool and single, double, and triple water ramps. Let them know kids their age start training on the other, smaller ramps.

Staying where the pool is still visible, show the students the ski jumper figurine.

Ask: What is this? (Wait 5 seconds, then call on a student.)

Ask: What do you think the words *single*, *double*, and *triple* mean on the jumps? (Wait 5 seconds, then call on a student.)
Answer: the number of inverts (somersaults) in the air

Ask: If this ski jumper did one somersault (demonstrate using the figurine), what would this be called? Answer: A Single
Ask: If this ski jumper did two somersaults (demonstrate using the figurine), what would this be called? Answer: A Double
Ask: If this ski jumper did three somersaults (demonstrate using the figurine), what would that be called? Answer: A Triple

Say: Raise your hand if you have ever jumped in a pool and done a belly flop.

Ask: How did it feel when your body collided with or hit the water? All that energy from your jump was transferred to your body parts when you collided with the water, so all the force of you hitting the water could transfer to your stomach if you did a belly flop. If you were a ski jumper, it could hurt your head, arms, and legs, as well.

Ask: How could we help skiers jumping in the pool water from getting hurt?
(Wait 5 seconds, then call on a few students for their ideas.)

Answer: Air tubes are in the bottom of the pool that make a stream of constant bubbles to protect the ski jumpers. The bubbles act like a cushion to protect you from the surface tension of the pool water. The bubbles break up that surface tension, which is a tightness that the water molecules have along the top of the water. It’s like the water is an invisible net and the bubbles break up the net.

Bring the students into the museum theater to split up for the other stations.

Station 1: Winter Wizards: Science of the Olympic Games

Location: Orientation Room

Objectives: Students will construct an explanation to describe the cause-and-effect relationship between the speed of an object and the energy of that object, and will use qualitative descriptions of the relationship between speed and energy such as fast, slow, strong, or weak; ask questions and make observations about the changes in energy that occur when objects collide; plan and carry out an investigation to gather evidence from observations that energy can be transferred from place to place by sound, light, heat, and electrical currents; design a device that converts energy from one form to another, identifying the initial and final forms of energy; conduct short research projects to build knowledge through investigation of different aspects of a topic; interpret information presented visually, orally, or quantitatively and explain how the information contributes to an understanding of the text in which it appears; describe overall structure using terms such as sequence, comparison, cause/effect, and problem/solution; explain events, procedures, ideas, or concepts in a historical, scientific, or technical text, including what happened and why; participate effectively in a range of conversations and collaborations, using age-appropriate vocabulary, on topics, texts, and issues; clearly summarize information presented in various formats and mediums and explain how the information pertains to the topic; use age-appropriate language, grammar, volume, and clear pronunciation when speaking or presenting; determine the meaning of words, phrases, figurative language, academic and content-specific words within a text; determine or clarify the meaning of unknown and multiple meaning words and phrases, choosing flexibly from a range of strategies; and use context as a clue to the meaning of a word.

Materials: *Science of the Winter Olympics: Slapshot Physics of Hockey* (4:19)
URL: https://www.youtube.com/watch?v=518mfZQPOhs, Which Type of Energy? Poster, hockey stick, plastic containers with different fabric bottom pieces (sock, foam, T-shirt, cardboard), blue tape, measuring tape.

Steps: In advance, prepare the station by opening the measuring tape on the floor and locking it so that students can measure the distance their pucks travel across the floor. *Note: Do not allow the kids to use the hockey stick*.

Show the video *Science of the Winter Olympics: Slapshot Physics of Hockey*.

Say: Let's review a couple of things from the video, and then we will conduct a fun experiment together.

Ask: Have you ever been told you have great potential? What does that mean? (Wait 5 seconds, then call on a student.)

Answer: Potential is the power or ability to do something in the future, before it happens. Maybe you have potential to be a great singer, or an Olympic skier, or an important leader someday.

Ask: Do you remember what the terms *potential energy* and *kinetic energy* mean from the video? (Wait 5 seconds, then call on a student.)

Answer: Energy is the ability to do work. In a hockey game, when Julie Chu is ready to hit the puck into the net, she brings her hockey stick backward. The stick holds *potential energy* right before she hits the puck. Just like when the ski jumper is at the top of the hill, or the bobsled is at the top of the track, or a bow string is pulled back before you shoot an arrow, the hockey stick has great potential for power when Julie brings it back, right before she hits that puck. Once her stick hits the puck, the potential energy transforms to *kinetic energy*. The stored possible energy in that hockey stick transfers to the other object, the puck. Kinetic energy is energy in motion, or actively used energy moving something. When an object moves, it has kinetic energy. The faster it goes, the higher its kinetic energy.

Show the *Which Type of Energy?* poster.

Ask: Can you guess which type of energy is shown in the first picture? How about the second picture? (Wait 5 seconds, then call on a student).

Answer: #1 is potential and #2 is kinetic.

Say: Now we are going to conduct a little experiment. Our challenge today is to design the best hockey puck that moves the farthest. I have a hockey stick here. I also have different types of fabrics under each of these pucks. I'm going to show you each of the fabrics under the pucks, and you guess which one will travel the farthest.

Ask: Which puck do you think will travel the farthest? Why? (various answers possible)

Ask: Are you ready to start the experiment? Who would like to stand next to the measuring tape? You will be in charge of measuring how far each puck travels and marking the floor with a piece of blue tape.

(Pull the hockey stick back *gently* to hit each of the pucks one at a time, then allow students to measure how far each one travels.)

Ask: Which puck traveled the farthest? Why? (Wait 5 seconds, then call on a student.) How would you have done this differently if you had another trial? (various answers)

Ask: Which type of energy was in the hammer before I let it hit the puck?

Answer: potential energy

Ask: Which type of energy was in the puck as it moved? Answer: kinetic energy

Collect all materials to prepare for the next group entering the theater.

Station 2: Silver Ore to White Gold

Location: Alf Engen & Joe Quinney Alcove

Objectives: Students will investigate the reasons why early explorers and frontiersmen came to the land now called Utah and determine how their contributions are relevant to Utahns today; explain how Utah's physical geography provided opportunities and imposed constraints for human activities between 1847-1896 (for example, agriculture, mining, settlement, communication, transportation networks); use primary and secondary sources to explain how Utah's economy has changed over time (for example, recreation, tourism, mining, information technology, manufacturing, agriculture, petroleum production); describe how and why humans have changed the physical environment of Utah to meet their needs (for example, reservoirs, irrigation, climate, transcontinental railroad); describe how the physical geography of Utah has both negative and positive consequences on our health and safety (for example, inversions, earthquakes, aridity, fire, recreation); explain continuity and change over time by comparing experiences of today's immigrants in Utah with those of immigrants in Utah's past; participate effectively in a range of conversations and collaborations, using age-appropriate vocabulary, on topics, texts, and issues; clearly summarize information presented in various formats and mediums and explain how the information pertains to the topic; use age-appropriate language, grammar, volume, and clear pronunciation when speaking or presenting; explain events, procedures, ideas, or concepts in a historical, scientific, or technical text, including what happened and why, based on specific information in the text; determine the meaning of words, phrases, figurative language, academic and content-specific words within a text; compare a primary and secondary source on the same event or topic; and interpret information presented visually, orally, or quantitatively and explain how the information contributes to an understanding of the text in which it appears.

Materials: Images of *Aerial Tramway* and *The Town Lift Today;* PCMR Friends of Mining History map; silver and copper ore; core sample; snowshoe; ski boot; helmet

Steps: Gather in the alcove—allow students to sit on the benches or the floor.

Say: Before we talk about what you see here in front of you, I have a question. Raise your hand if you've moved before, either to a new town or a new school. If you haven't, imagine moving to a new classroom or a new town. It can be exciting, but also a little bit scary because everything is different and new. Now, think about how people move to new places all around the world, just like you might move to a new classroom or town.

When people or even animals move from one place to another, it is called *migration*. People might migrate to find a better place to live, to be closer to their family, or to find new jobs. Sometimes, people migrate because they are escaping from a dangerous place. Other times, people might migrate to join their friends or family who are already in a new place. So, migration can be a big adventure where people start a new life in a new place. When people come *into* an area from another country, this is called *immigration.* People who move here from other countries are called *immigrants*.

Ask: Let's talk next about how people and cultures from all over the world connect with each other here in Utah. Raise your hand if you were not born in Utah. (Call on a couple of students who have raised their hands and ask, *where were you born?)*

Say: Most of the people living in Park City were not born here. This area was originally inhabited by the Ute and Shoshone, who used the land for hunting and gathering. Some of the earliest immigrants came here to create maps of the best routes through the mountains. Some came here to make money by hunting animals to sell their fur. In today's money, the fur trappers would get $100 for each beaver pelt, or fur. Some came here because they heard there might be valuable minerals such as gold or silver in the mountains. Some came here to spread their religious beliefs and to create missions.

Ask: How do you think people making maps was helpful to people in Utah today?

Answer: This would help us find water or food and help us avoid difficult or dangerous traveling routes.

Point out the Boom Town wall panel.

Say: Soldiers discovered silver here in 1864. Have you seen a piece of ore before? (Allow students to hold the ore—silver and copper—plus the core sample.) This core sample was how miners could check to see if there was enough silver in the little sample to bother digging and drilling further.

Point out the Silver Ore wall panel.

Say: From the late 1880s, Park City and some other areas close by were booming with money and activity, and many silver mines made millions of dollars. Immigrants from Ireland, England, and other places came to Park City to work in the mines. Immigrants from China came to Park City and cooked, did laundry, and cleaned the boarding houses where the miners lived.

Soon, it became very expensive to run the mines and to extract the silver out of the ore I just showed you. People were not making enough money to continue mining anymore. Park City soon became a ghost town.

Ask: What is a ghost town? (Wait 5 seconds, then call on a student.)

Answer: A ghost town is a town that once was busy with people but for various reasons, the people left, and it became empty.

Point out the Collins Lift wall panel.

Ask: How do you think the mountains of Utah became busy with people working here once again? (Wait 5 seconds, then call on a student.)

Answer: In 1938, a group of businessmen led by Joe Quinney had an idea. (Point out Quinney's photo on the wall.) Skiing was becoming more popular, and the snow in the

Wasatch Mountains was plentiful, fluffy and light. But people would have to hike to the top of the mountain in the snow, to then ski down.

Ask: How would *you* hike up a snowy mountain? (Wait 5 seconds, then call on a student.)

Show them the snowshoe and let them examine and touch the artifact.

Answer: They would have to use special shoes or equipment like this snowshoe so they wouldn't sink into the snow! But Joe Quinney and others knew some of the miners used the same equipment like the silver ore buckets to bring themselves to the top of the mountain. They used that idea and created the first chairlift and ski resort in Utah. They named the ski area Alta. Rides back then cost just 25 cents! (If asked, the first chairlift like this in America was at Sun Valley; Collins Chair at Alta was the second).

Ask: Guess who was the leader in charge of the ski school at Alta for 40 years? (Wait 5 seconds, then call on a student.)

Answer: (point to Engen's exhibit to the left and overhead so they can see his picture) Alf Engen! Alf Engen and his brothers were immigrants from Norway, where it is also cold and snowy. Alf held the record for ski jumping, which is explained in this area over here. Did you know that back then, skiers had equipment without much padding in the boots, so they got cold all the time? And they did not wear helmets.

Show the students the helmet. Say: Today, equipment looks a lot different!

Point out the White Gold wall panel.

Say: Skiing became a big business in Park City and was a way for people to make money again. Park City's first ski area was called Snow Park. Today we call it Deer Valley. Later, Treasure Mountain Resort opened. Today we call it Park City Mountain Resort.

Show the PCMR Friends of Mining History map.

Say: Did you know that the ski runs were created directly over many of the mining tunnels underground in Park City? You can ski up to some of the old mining buildings. Here is a map of some of the ski runs that run over the old mines underneath. Originally, the ore buckets that were used to bring heavy rocks downhill were also used by miners sometimes after work, when they had time to ski. But it was decided they were too dangerously high and not strong enough for skiers once the big ski resorts were built. Look at this example:

Show the images *Aerial Tramway* and *The Town Lift Today.*

Today some of the old towers used by the miners are still here. This Town Lift is near Park City's Main Street. Tourists use it to ski in the winter and hike in the summer.

Point out the Olympic Gold wall panel.

Remind students the Olympic Winter Games will be coming to Salt Lake City and Park City again in 2034. We are so excited to host the Games again! And did you know this will be the second time the Olympics is held here? The Olympics was first here in 2002 before you were born. When you go upstairs you can see a lot of Olympics artifacts and learn all about the Winter Games.

Take a minute before you go to the next station and look at the pictures here on the walls. Which one is your favorite, and why? I'll call on a couple of students to share if we have time.

Station 3: The Greatest Snow on Earth

Location: The Greatest Snow on Earth

Objectives: Students will examine maps of Utah's precipitation, temperature, vegetation, population, and natural resources; make inferences about relationships between the data sets; describe how and why humans have changed the physical environment of Utah to meet their needs (for example, reservoirs, irrigation, climate, transcontinental railroad); describe how the physical geography of Utah has both negative and positive consequences on our health and safety (for example, inversions, earthquakes, aridity, fire, recreation); participate effectively in a range of conversations and collaborations, using age-appropriate vocabulary, on topics, texts, and issues; clearly summarize information presented in various formats and mediums and explain how the information pertains to the topic; use age-appropriate language, grammar, volume, and clear pronunciation when speaking or presenting; determine the meaning of words, phrases, figurative language, academic and content-specific words within a text; determine or clarify the meaning of unknown and multiple meaning words and phrases, choosing flexibly from a range of strategies; use context as a clue to the meaning of a word; refer to details and evidence in a text when explaining what the text says explicitly and when drawing inferences from the text; interpret information presented visually, orally, or quantitatively and explain how the information contributes to an understanding of the text in which it appears; explain how an author uses reasons and evidence to support particular claims in a text; and conduct short research projects to build knowledge through investigation of different aspects of a topic.

Materials: two bowls, two sponges (one completely wet, one dry); glass of water (2")

Steps:

Begin at The Greatest Snow on Earth display.

Ask: Can you name a ski resort in Utah? (Wait 5 seconds, then call on one or more students. Allow time for as many answers as possible.)

Using one of the students' answers, show the resort on the map using the dial, and wait for the snowfall. Explain that the numbers represent the 5-day record, average snowfall, and actual snowfall from the last season at that resort.

Point out the display of the Greatest Snow on Earth license plates.

Ask: Why do you think our snow is called The Greatest Snow on Earth?
(Wait 5 seconds, then call on a student.)

Answer: Our snow is light and fluffy, making it very easy and fun to ski or snowboard. In other parts of the country, the snow is heavy and sticky.

Ask: Why do you think our snow is light and fluffy?
(Wait 5 seconds, then call on a student.)

Answer: Our snow is light and fluffy because it has less water content. Water content means how much water is in the snow.

Ask one student to pick up two sponges: one soaked with water and one dry.

Ask: Which sponge is heavier? And which sponge is more like the snow in Utah?

Answer: The sponges are just like snow. When they're filled with water, they're heavier. The dry sponge is more like Utah snow.

Show the students the Water Content touch screen map. Explain that location, weather, and geography all influence the water content of snow. Select Utah on the map and point out the snow column. Explain our snow is light and drier, like the dry sponge. Show the glass of 2 inches of water. We would need to pile up around 30 inches of Utah snow to get just 2 inches of water!

Ask: How tall is 30 inches of snow? (Allow a student to stand next to the measurement along the wall to demonstrate.)

Call on a student to help operate the Water Content display by touching a different region of the United States and comparing how much the column will rise or fall.

Say: Notice how the heavier snow with more water content is a lower column? Would anyone else like to try it? (Allow a couple minutes for students to interact with the display dials.)

Move to the Snowflake Science display.

Explain that temperature and humidity, or the amount of water in the air, affect the shape and design of snowflakes.

Say: I can give you a couple minutes to try out the different possibilities by turning the dials now. (Allow a couple minutes for students to interact with the display dials.)

Move to The Great Salt Lake Effect monitor and display.

Ask: Have you heard of the Great Salt Lake in Utah? Did you know that the Great Salt Lake affects our snowfall? This is sometimes called a lake-effect snowstorm. Listen while I read the first part. *The three critical ingredients for lake-effect storms are:*

We have three things needed, or ingredients like when you cook a recipe, for a lake-effect snowstorm like this.

Ask: Would someone who likes to read aloud raise their hand to help me read number 1? (Call on a student who volunteered. If no one volunteers, you can read it.)

#1: Cold air moving over a warm lake, typically approaching the region from the northwest. Point out the map on the monitor next, demonstrating step 1 (the white snowy-looking area).
Ask: Would someone who likes to read aloud raise their hand to help me read number 2? (Call on a different student who volunteered. If no one volunteers, you can read it.)

#2: A moist upstream air mass… Point out the map on the monitor next, demonstrating step 2 (the snow falling and the arrows are showing the moisture).

Ask: Would someone who likes to read aloud raise their hand to help me read number 3? (Call on a different student who volunteered. If no one volunteers, you can read it.)

#3: A trigger created by two land-breezes converging over the lake. Point out the map on the monitor next, demonstrating step 3 (the arrows).

Move to the Alf Engen awards case.

Say: Speaking of the "Greatest Snow on Earth," Alf Engen was one of those people who came to Utah to enjoy that fluffy, light powder!

Here are all the different awards and honors Alf Engen received during his life as a skier. Explain that Alf's family gave these trophies to us to keep safe in our museum so people from all over the world can come to see them. (Allow a couple minutes for students to look at the exhibit.)

Station 4: Avalanche Safety & the Geography of Utah

Locations: Alf Engen—King of the Hill awards case, Topographical Map, Park City Ski Patrol and Avalanche Maker exhibits

Objectives: Students will examine maps of Utah's precipitation, temperature, vegetation, population, and natural resources; make inferences about relationships between the data sets; describe how and why humans have changed the physical environment of Utah to meet their needs (for example, reservoirs, irrigation, climate, transcontinental railroad); describe how the physical geography of Utah has both negative and positive consequences on our health and safety (for example, inversions, earthquakes, aridity, fire, recreation); investigate the reasons why early explorers and frontiersmen came to the land now called Utah and determine how their contributions are relevant to Utahns today; explain how Utah's physical geography provided opportunities and imposed constraints for human activities between 1847-1896 (for example, agriculture, mining, settlement, communication, transportation networks) and how people changed the physical environment to meet their needs; use primary and secondary sources to explain how Utah's economy has changed over time (for example, recreation, tourism, mining, information technology, manufacturing, agriculture, petroleum production); participate effectively in a range of conversations and collaborations, using age-appropriate vocabulary, on topics, texts, and issues; clearly summarize information presented in various formats and mediums and explain how the information pertains to the topic; use age-appropriate language, grammar, volume, and clear pronunciation when speaking or presenting; determine the meaning of words, phrases, figurative language, academic and content-specific words within a text; determine or clarify the meaning of unknown and multiple meaning words and phrases, choosing flexibly from a range of strategies; and use context as a clue to the meaning of a word.

Materials: pointer; Utah map posters: #1 Relief, #2 Precipitation, #3 Vegetation; #4 Temperature; two beacons; probe; shovel

Steps: Begin at the topographical map and use the pointer. Help students orient themselves to our location and their school's city location. Explain on this map that north points to the left and that the buttons on the display show where all Utah's resorts are located.

Ask: Are there any ski resorts near Great Salt Lake? How about on the west side of Utah? Notice that the major resorts are within the mountains.

Ask: Let's talk about why people live in certain areas of Utah on some maps I have here. Can you name one thing that people need to live or survive? (Wait 5 seconds, then call on a student.)
Answer: Food, water, shelter, jobs or work opportunities, recreation or sports, etc. Show the smaller relief map poster #1 to the students.
Say: I have a smaller version of the big topographical map here. (You can also use the pointer to show areas of the large topo map.) Wasatch is a Ute word that means "mountain pass" or "low pass" and there was also a Shoshone chief named "Wahsatch."

Ask: Why do you think most of the people in Utah live on the front (left, west) side of the Wasatch Mountains, called the *Wasatch Front*, and some people live here in the Park City area, in the *Wasatch Back*?

Answer: A lot of those things you just said people need to live are located here.

Show the precipitation map poster #2 to the students.

Say: For example, look at this precipitation map. *Precipitation* means water that falls from the clouds, like rain or snow. There are many rivers that run down from the mountains and provide water from the snowmelt. We have water both in the Wasatch Front, and here in Park City, called the Wasatch Back. Notice where the dark blue color is showing on this map? These are the areas with the most water. Here in the mountains, it is usually snow!

Show the vegetation map poster #3.

Say: Here's another example. *Vegetation* means plant life. Remember you said people need food to live, right? In this map you can see where many plants and trees grow, because of that water. Don't forget animals and plants need water to live, too. If you eat meat, vegetables, fruits, and grains, these all require water to survive. All the trees give protection to people and animals and can be used to build shelter. The areas on the map without bright colors are mainly desert, where it is very difficult to live because there is less water or vegetation.

Show the temperature map poster #4.

Say: For people to enjoy recreation like skiing, snowboarding, snowshoeing or snowmobiling, we will need snow, right?

Ask: What kind of temperatures are needed for snow? Answer: cold temperatures

Say: Notice the same parts on the maps before, where many people live, also have the coolest temperatures. It is more comfortable to live in cooler temperatures, and this is where you will get more snow.

Say: Speaking of snow, sometimes we get so much snow, it causes a problem!
Move with students to the Avalanche Maker Game.

Ask: What are some safety concerns that you should always remember when you're skiing, snowboarding, snowshoeing, or snowmobiling in the snowy mountains?

Answer: Avalanche, freezing temperatures, running out of food/water, or getting lost without a map or GPS on a cell phone are all dangerous.
Say: Some of the terms we just talked about like temperature and precipitation, plus the wind, skiers, and snowmobilers, can all play a role in creating avalanches. Many other things can also cause an avalanche, so if you hear of an avalanche warning, do not go into that area until it is safe. Would you like to try the game?

Show students the Recoilless Rifle.

Say: Like you saw, sometimes we can use explosions to create an avalanche on purpose when there are no people around. This way an avalanche won't surprise us and won't hurt people. A rifle like this was one of the first ways we did this. Alf Engen's brother Sverre was one of the first pioneers of avalanche control in our mountains.

Show students the beacons, probe, and shovel and let them touch the objects. Look at all the safety equipment avalanche experts might use!

Say: Beacons are radio transceivers that pinpoint where you are. Beacons are simpler to use and more reliable than cell phones. Everyone heading out for the day wears a transceiver and turns it on before leaving the house. If someone in your group is covered by an avalanche, you can switch the transceiver to receive and quickly locate your friend's signal. The beacon can either send a message or receive a message.

Then you can use a probe, a collapsible pole like a tent rod, to determine the location and the depth of where a person is buried under the snow. Once located, you can use your third tool – a shovel – to quickly free your friend. *(from US Forest Service website)*

Option 1: Show students the Ski Patrol monitor and highlight a couple of the 15 safety items. Allow students time to interact with the exhibits.

Option 2: Conduct an avalanche beacon demonstration using the beacons, probe, and shovel, time permitting. Here are the steps:

1. Turn the two beacons on.
2. Show the students the display on each beacon. There should not be an error or low battery message. You may want to check this before the students arrive!
3. Let students know that electronic devices can interfere with proper beacon messaging, so all cell phones or earbuds must be on airplane mode or shut off.
4. Turn both beacons to "search." You will hear beeping, then silence.
5. Explain to students that you will now switch your beacon to "transmit." This is the setting you should use while you are enjoying your outdoor activities such as skiing or hiking. It means you are transmitting a signal that other people can find if you are hurt or stuck in the avalanche.
6. Tell students you will lead half the group around the corner. Remind the kids to keep their beacon on "search." Walk away 5 feet or more. Pretend an avalanche has happened and you are stuck. Tell the students they will have to find you.
7. Ask students if they hear any noise coming from your beacon. Are they receiving your request for help? "Am I transmitting, kids?" If not, they need to come find you until they hear a signal.
8. Remind them that they should always leave the beacon on "transmit" so they can be found. This is like a parent tracking your cell phone location, but you don't need cell phone service to do it! (*from Alaska Avalanche website*)

Station 5: Olympic Museum History

Locations: Upstairs Torch, Native Americans of Utah Eagle, Vonetta Flowers, Paralympics, DeeDee Corradini

Objectives: Students will explore efforts to preserve and maintain the culture of the Native American Sovereign Nations of Utah; use case studies to explain the impact of world and national events (such as World War II, Civil Rights Movements, and the Americans with Disabilities Act) on the 2002 Olympic Winter Games; explain the reasons for the lasting historical significance of an event in recent Utah history; describe how the physical geography of Utah has positive consequences (for example, on recreation); interpret information presented visually, orally, or quantitatively and explain how the information contributes to an understanding of the text in which it appears; determine the meaning of words, phrases, figurative language, academic and content-specific words within a text; explain events, procedures, ideas, or concepts in a historical, scientific, or technical text, including what happened and why, based on specific information in the text; clearly summarize information presented in various formats and mediums and explain how the information pertains to the topic; and participate effectively in a range of conversations and collaborations, using age-appropriate vocabulary, on topics, texts, and issues.

Materials: plush Powder, Copper, and Coal; Otto pins; Otto poster; U.S. relay route map

Steps: Begin by gathering at the torch. Show the students the mascots.

Ask: What is a mascot? (Wait 5 seconds, then call on a student.)

Answer: A person, animal, or thing used as a good luck charm, or as a symbol for a team or company (for example, Mickey Mouse for Disney, the Gecko for Geico, Mario for Nintendo).

Show the stuffed animals Powder, Coal, and Copper.

Ask: Why do you think these animals were selected as the mascots for the 2002 Olympic Winter Games? (Wait 5 seconds, then call on a student.)
Answer: The snowshoe hare's speed, the coyote's ability to climb the highest mountains, and the black bear's strength are in the Olympic motto of "faster, higher, stronger." Each animal wears a necklace featuring the animal he/she represents in the form of a petroglyph (rock engraving) of the Anasazi or Fremont people. These three animals were often the main subjects in Native American stories, passed on through the generations. Your teacher can read these stories with you on our website.

Ask: Can you guess why these names were selected?
(Wait 5 seconds, then call on a student.)

Answer: A snowshoe hare (Powder), a coyote (Copper) and an American black bear (Coal) were named after three of Utah's natural resources.
Ask: Have you heard of the torch relay? Why do you think this happens?

Answer: The torch relay, where different people bring the torch to the host country from one person to the next person, happens for four reasons:

1. It marks the beginning of the games that year.
2. It brings a message of peace and friendship to the people on the route.
3. The relay shows the beautiful landscapes and famous sites of the host country.
4. The torch design itself also shows different special things about the host country.

Say: Let me show you what I mean. (Point out features of the 2002 torch as you explain). This torch design has three types of silver. The older looking silver by the top represents the past. The shiny silver on the bottom represents the future. And the point where these two surfaces met, where the runner held the torch, was a bridge between the past and present.

It had a copper flame, since we have the biggest open copper mine in the world here in Utah. Have you seen it from the highway before? The motto for our Games was engraved on the handle: "Light the Fire Within." That is located here toward the bottom.

Show the students the 2002 Torch Relay map and point out the famous landmarks.

Ask: Can you guess any unique places where the Torch was carried in the past?

Answer: Well, a replica of the Olympic torch went up with astronauts into outer space. For safety reasons, the torch was not lit. The torch also went underwater with a scuba diver in the Great Barrier Reef in Australia. It used a flare that stayed lit in the ocean.

Move to the Native Americans of Utah eagle exhibit case.

Explain that the 2002 Opening Ceremony featured Native Americans from the five major Utah tribes; The Ute, Shoshone, Goshute, Paiute and Navajo or Dine (Pronounced: Yoot, Sho-SHO-nee, Go-Shoot, Pie-Yoot, and Nah-vah-ho or Dee-NEH.) Each major tribal leader greeted the athletes to the 2002 Winter Olympic Games in their own languages. Hundreds of members of each tribe followed their leader who was on horseback.

Move toward the opening between the cases to view the animal puppets.

Describe the opening ceremony as the big party held at the beginning of every Olympics. All the puppets here were used in the ceremony to represent animals found in our state.
Ask: What animals do you notice here? (Wait 5 seconds, then call on students.)
Answer: beavers, antelopes, wild horses, elk, and bison.

Move toward the Bobsleigh display with Vonetta Flowers. Remind students that certain events in history allowed more groups of people to participate in the Olympics. For example, point out that Vonetta Flowers became the first black athlete in *any* Winter Olympic sport from *any* country to win a gold medal. This happened right here at Utah Olympic Park on our bobsled track in 2002. This was the first time that women were allowed to participate in bobsledding in history, too.

Move toward the Paralympics exhibit.

Ask: Do you remember the three mascots of the 2002 Winter Games? Did you notice the large mascots when we looked at the animal puppets? Well, Otto the sea otter was the 2002 Paralympic mascot.

Show the students the Otto pins and poster.

Say: Otto represented one of the most powerful of all animals according to Native Americans. Otters were almost extinct long ago, meaning there were not many left. But they were successfully reintroduced into the wild by scientists, showing that even the largest setbacks in life can be overcome. Otto represents the Paralympic motto of “Mind, Body, Spirit.” The prefix “para” means *near* or *alongside of* the Olympics.

Remind students that there were always a few people who had disabilities in the Olympics. After World War II, larger numbers of veterans came home disabled and injured, but still wanted to participate in the Olympics. So, people encouraged the start of the Paralympic Games in 1948 in London, England for large numbers of athletes to participate together if they had physical disabilities. (If asked, the Special Olympics is different and is for athletes with intellectual disabilities.)

Show the students the Paralympic sled exhibit.

Ask: How is this equipment different than equipment for an able-bodied athlete?

Move toward the DeeDee Corradini exhibit.

Remind students that women could not always participate, either. Explain that DeeDee was once the Mayor of Salt Lake City and was one of the most important people to support women to compete in Olympic ski jumping, which finally happened in 2014. She also had a lot of other accomplishments including her work encouraging the Olympic Committee to hold the Winter Games here in Utah.

Say: Be sure to look at the Hometown Heroes exhibit when you go down the stairs. Explain that this case is changed when new Olympians from our area of Utah compete in the new Winter Games every four years. See if you recognize any of our locals!

Station 6: Olympic Museum Science & Math

Locations: Curling Stone, Women's Hockey Stick, Size it Up Ski Display

Objectives: Students will draw points, lines, line segments, rays, angles (right, acute, and obtuse), and perpendicular and parallel lines, and identify these in two-dimensional figures; classify two-dimensional figures based on lines and angles; identify line-symmetric figures and draw lines of symmetry; recognize angles as geometric figures that are formed wherever two rays share a common endpoint and understand concepts of angle measurement; measure angles in whole-number degrees using a protractor; recognize angle measures as additive and solve to find unknown angles; interpret a multiplication equation as a comparison (for example, interpret 35 = 5 × 7 as a statement that 35 is 5 times as many as 7 and 7 times as many as 5); solve multi-step word problems posed with whole numbers and having whole-number answers using the four operations construct an explanation to describe the cause-and-effect relationship between the speed of an object and the energy of that object; ask questions and make observations about the changes in energy that occur when objects collide; make a case for the lasting historical significance of an event in recent Utah history (2000–present) and create an argument for including it in a historical text; participate effectively in a range of conversations and collaborations, using age-appropriate vocabulary on topics, texts, and issues; clearly summarize information presented in various formats and mediums and explain how the information pertains to the topic; and use age-appropriate language, grammar, volume, and clear pronunciation when speaking or presenting.

Materials: whiteboards and markers (or paper and pencils); whiteboard erasers or damp paper towels; protractors; rulers; curling sheet (playing surface) poster; hockey stick

Steps: Begin at the Curling Stone.

Say: Did you know that math plays a big part in the Olympics? Let's look at a few examples! This is a curling stone. It can weigh up to 44 pounds. Would you like to try to lift it? Allow students to lift the stone.

Ask: Why is it smooth? Answer: This helps the stone move quicker on the ice.
Ask: What happens when this stone *collides with* another stone or hits the wall?
Answer: There is a lot of *energy traveling with the stone* when it hits another object. If this stone hits a stone from the other team, that *energy is often transferred* to the other team's stone, and their stone will typically move. *The faster the stone is travelling, the harder it hits the other stone, and the impact of that energy makes the other stone move faster.*

Say: In curling, athletes compete on an ice rink. We push this stone (or "throw the stone") across the ice and try to land it in the bullseye (or the center of "the house") on the other team's side of the rink.

Distribute whiteboards, markers, rulers, and protractors.

Say: Let's draw the curling rink on our whiteboards—you may sit down or stand up.

First, let's mark 4 points in the far corners of the whiteboard to draw the rink. A *point* is an exact location in a space. When we connect two points by drawing straight across with our rulers, this is called a *line*. Go ahead and connect the points along the top from the left to the right and draw the first line using your straight edge. Now draw the bottom line from the left point to the right point using your straight edge (Demonstrate).

Notice the two lines at the top and the bottom look like this: ________________

____

There is a name we use for lines like this that will never cross or intersect each other.
Ask: Do you know what these types of lines are called?
Answer: These are called *parallel lines*.
Say: Let's connect the other two parallel lines now from the top to bottom on each side. (Demonstrate)
Ask: Now we have formed what shape? Answer: A *rectangle*.
Ask: We have 2 sets of parallel lines here. This set top and bottom is approximately equal in length and the other set left and right is approximately equal in length.
What else can we call this shape?
Answer: This is also called a *parallelogram*. We have 2 sets of equal length lines that are parallel to each other. *Squares* are another example of a parallelogram.

Let's draw a line through the middle of the rink from the top to the bottom. We want the left and the right sides of the rink to be equal. On the ice, this looks like a dotted line (show the Curling Sheet playing surface poster).
Ask: How long is your rink from left to right? Let's measure it. It is about 12 inches, right? What is half of that number? It is about 6 inches. We don't have to be exact today; just approximate.

Say: Last, let's draw the two bullseyes where we try to land the curling stones when we play. The bullseye looks like this (show the Curling Sheet playing surface poster).

To do this, let's start by drawing two crosses with lines of equal lengths, one on each side of the paper. (Demonstrate and have them copy you.) Do you remember the *parallel* lines from before? Those lines will never cross. But *these* lines cross at a 90-degree angle. Ask: Do you want to measure the angle with your protractor to check? (Demonstrate how to set the protractor on top of the whiteboard to see the 90 degrees). A 90-degree angle looks like an "L." That's an easy way to remember it. This is also called a *right angle*. Ask: Do you see any other *right angles* on this ice rink? Answer: The corners of the ice rink, all four of them, are also *right angles*. Go ahead and check with your protractors if you'd like!

Last, we will draw two circles over the crosses to make the bullseyes. First, let's draw a small red one right over where the lines cross. Then let's draw a larger blue one right outside the red one. (Demonstrate and have them copy you). Ask: Did you know that a circle has four 90-degree angles in it, or 360 degrees total? If we look at one "L", that's 90 degrees. What if we added two "L"s of the circle? This would be 180 degrees. If we add all four parts of the circle, it adds up to 360 degrees. So, a circle=360 degrees.

Do you see how the left and right sides of the paper are the same, kind of a mirror image? You drew the dotted line separating two sides that are exactly the same. This is called a *line of symmetry.*

Let's look at the Women's Ice Hockey stick next. The hockey stick also has an angle. Ask: Is the hockey stick "L" larger or smaller than a right angle of 90 degrees? Raise your hand if you think it is bigger than 90 degrees. (allow for raised hands) Raise your hand if you think the hockey stick angle is smaller than 90 degrees. Let's measure the angle using a protractor now. It should be about 135 degrees. If the angle is larger than 90 degrees, it has a special name. It is called an *obtuse angle*. If the angle is smaller than 90 degrees, it is called an *acute angle*. I remember this because it sounds like the word "cute" because it's small, or cute.

Let's erase your boards and collect all the materials now. I want to show you one more way we use math in the Olympics before you go! (Put all materials back in the cart).

Move to the Size it Up exhibit.

Ask: Remember the ski jump from the Olympic Park tour outside? Ski jump skis are the widest and longest skis for any Olympic event. Why do you think the ski jump skis at the top here are larger or longer than the aerial skis at the bottom here?
Answer: The larger skis give a person more speed and lift in the air, like airplane wings.

Say: The Olympics rule say that jump skis must be no taller than 145% of a skier's height. This means the skis are about one and a half times your height.
Ask: Let's say you are 4 feet tall. What is a half of four? Answer: two.
Ask: What is four plus two? Answer: six
This means if you are a ski jumper who is four feet tall, your skis must be less than six feet tall. But long skis are not always the best. The longer the ski, the heavier it is, and the more lift you need to produce to stay in the air.

Ski jumpers like Alf Engen used a parallel stance. Ask: Do you remember what *parallel* means? Since the 1980s, ski jumpers have used a "V" stance in the air.

Point out the Olympian in the "V" stance on the wall.
The "V" lets skiers stay in the air longer, which helps them travel further distances, helping them win.

That's all the math for today!

Say (again): Be sure to look at the Hometown Heroes exhibit when you go down the stairs. Explain that this case is changed when new Olympians from our area of Utah compete in the new Winter Games every four years.