

Integrating First Nations and Metis Content and Perspective

Grade 5

Physical Science – Forces and Simple Machines

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Rationale:

There are many ways to explore and learn about Forces and Simple Machines. It is important to integrate First Nations and Metis inventions and innovations into this unit study. The students will be able to learn more about the history of Saskatchewan and Canadian First Nations and Métis peoples.

The best way to deliver this unit is by incorporating the Aboriginal Way of Knowing. This is accomplished through experiential learning, hands-on experience, observation, and discussion. When you teach the concepts using First Nations and Métis inventions the students can see how these inventions and innovations have affected the lives of people in the past and people of today. These concepts are delivered in a way that allows the students to manipulate and work out problems internally and with the help of others. This can be done through direct intervention from others or from quiet observation of the task being performed.

Incorporating Medicine Wheel Philosophy

Spiritual

Students will begin to understand the origins of some simple machines and become aware of their affect on their lives.

Physical

Students will reconstruct simple machines and identify their practicality and discover ways in which they connect to machines used today.

Emotional

Which simple machines do they appreciate and not want to do without? How do these machines affect their everyday lives?

Mental

We should always be aware that Mother Earth is the provider of the materials we use to create various simple machines. As we use Mother Earth's resources we need to be mindful to take only what is needed and to take care of the materials we utilize to create the machines.

Deeper Understanding Questions

Following is a list of some of the bigger questions that could be explored throughout this unit, These questions are based on the understandings which originate from the Tipi Teachings and universal values that First Nations peoples deem imperative. For further understanding of Tipi Teachings go to “Four Directions Teachings” and select Cree Teachings by Elder Mary Lee. For further information on Universal Values go to Office of Treaty Commissioners website and look for [Treaty Essentials Learnings We Are All Treaty People from the Teaching Treaties Kits](#).

Respect - all things are created equally

Humility – humans are not above other things in creation

Happiness – the world is an interesting and beautiful place

Love – humans need to be encouraged to appreciate all things in the natural world

Kinship – we are related to and affected by all things in nature and by changes experienced by any parts of nature

Thankfulness – we are fortunate to live in such an interesting and beautiful place and we are privileged to be able to use things like rocks and minerals for our own use.

Examples of Deeper Understanding Questions for Simple Machines and Force

1. How can you show appreciation for the simple machines you use everyday and not take these items for granted?
2. How have simple machines changed the way in which people live? How are we dependant upon machines? How has it changed our lifestyle/employment opportunities?

Unit Outcomes

FM5.1 Analyze the effects of gravitational, magnetic, and mechanical forces, including friction, on the movement of objects

FM5.2 Investigate characteristics of simple machines, including levers, wheels and axles, pulleys, inclined planes, screws, and wedges, for moving and lifting loads.

FM5.3 Assess how natural and man-made forces and simple machines affect individuals, society, and the environment.

Suggested Resources:

<http://www.head-smashed-in.com/home.html>

<http://library.thinkquest.org/27344/archphy.htm>

The Inuit Thought of It Amazing Arctic Innovations by Alooook Ipellie with David MacDonald

Bruchac, M. J. (1988). *Keepers of the Earth*. Calgary: Fifth House Ltd.

Bruchac, M. J. (1988). Keepers of the Earth. In A. -N. Woodlands, *Gluscabi and the Wind Eagle* (p. 67). Calgary: Fifth House.

Campbell, M. (1976). People of the Buffalo. In M. Campbell, *People of the Buffalo-How the Plains Indians Lived* (pp. 40,41). Vancouver: Douglas & MacIntyre.

Cleaver, E. (1979). *The Fire Stealer*. Toronto: Oxford University Press.

Flatt, L. (2007). *Let's Go! The Story of Getting from There to Here*. Toronto: Maple Tree Press

Landon, R. (2008). *A Native American Thought of It - Amazing Inventions and Innovations*. Richmond Hill: Firefly Books.

MacDonald, A. I. (2007). The Inuit Thought of It. In A. I. MacDonald, *The Inuit Thought of It* (p. 23). Richmond Hill: Firefly Books Ltd.

Murdoch, D. (1995). Eyewitness Books. In D. Murdoch, *North American Indian*. Toronto: Dorling Kindersley Limited.

Rebus, A. (2008). Wonders of Canada. In A. Rebus, *Head-Smashed-In Buffalo Jump* (pp. 4,6,8, 17). Calgary: Weigl Educational Publishers Limited.

Ridington, R. &. (1978). People of the Trail. In R. a. Ridington, *People of the Trail*. Vancouver: Douglas & McIntyre Ltd.

Taylor, C. (1993). *How we saw the world*. Montreal, QC: Tundra Books.

Engaging Activities

- Set up a tipi and label the parts of the tipi that act as levers. Label the parts where direct force is applied. You could use a small model size or one that the students could actually sit in.
- Bring a bow and arrow into the classroom and have students try using different amounts of force (pulling the bow back farther and farther). This could also be accomplished using a slingshot.
- Label the parts of the bow and arrow and describe which parts affect how far the arrow goes. What acts as the spring, where is the energy stored, where is the potential energy transferred, where is the kinetic energy
- Students could make a model or large class diorama of a buffalo jump which would show what would happen to a buffalo as it went over the edge of the cliff. They could use an egg or an egg wrapped in cloth to demonstrate the result of the fall
- Go to <http://www.head-smashed-in.com/home.html> for a virtual tour of an actual buffalo jump
- Students can construct a sail to be put onto their canoe or boat they have previously constructed. They would then either blow into the sail or create wind with a fan
- Use a sailboat to demonstrate how the sails help propel the boat faster than rowing (compare the speeds)
- Have students research the modernization of the travois, toboggan, canoe, harpoon etc. and have them compare and contrast same.
- Investigate how a pulley system may have been used to lift up the tipi poles into place
- Investigate how a pulley system may have been used to lift the meat onto drying racks
- Complete the Catch the Wind Activities, Gluscabi & the Wind Eagle (Bruchac M. J., 1988)
- Have students use skis with wax and skis without wax and discuss results
- Students can create their own boats and see which boat is the best for each different condition (fast flowing river, ocean, calm pond etc.)

Outcome

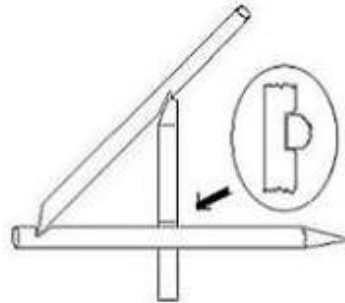
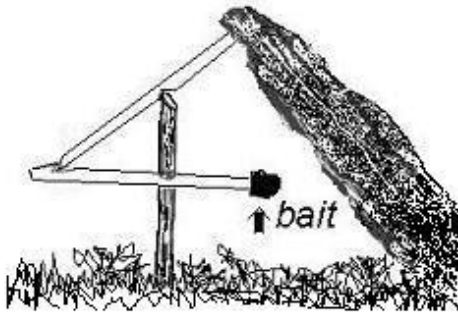
FM5.1 Analyze the effects of gravitational, magnetic, and mechanical forces, including friction, on the movement of objects.

Friction

- Bow and Arrows - The bow is a simple machine called a two-arm spring. The energy stored by the archer is in the bending of the bow. The potential energy is then transferred to the arrow in the form of kinetic energy when the archer releases the arrow. Velocity is determined by the force of the bow, the efficiency of the bow, and the mass of the arrow. In our simulation, these have already been calculated to increase simplicity. Of course, the higher the initial velocity the faster and further the arrow will travel.
 - Go to "How an Arrow Flies" <http://library.thinkquest.org/27344/archphy.htm> accessed on 02/07/2011
 - North American Indian pg. 38-39,46-47,60 (Murdoch, 1995)
- Use of Harpoon
 - The hunter held on to the long shaft when preparing to throw the harpoon from his kayak. When the harpoon hit the animal, the harpoon head on the fore-shaft stuck into the animal's body. The long shaft then separated from the fore-shaft. The wooden long shaft would float so the hunter would not lose it. The float prevented a dead animal from sinking to the bottom of the sea. (MacDonald, 2007)
 - A Leister (fish spear) was used in much the same way as the harpoon. The Leister
- Sleds pulled by dogs made us of Mud runners which allowed them to slide easily over the snow and ice as did ivory runners.
 - The Inuit Thought of It (MacDonald, 2007) page 13
- Paddles were used to propel a boat over the water and steer the boat in the proper direction. The paddle and water creates friction causing the boat(s) to move. The more force that is applied to the paddle the greater the result. (propelling forward or backward, or stopping the motion).
- Different styles of boats were designed using different materials, depending on what the boat was to be used for. The different designs and materials directly affected the amount of friction was created between the boat and the water. A boat designed to move swiftly (birch bark canoes) would have the least amount of friction between the water and the object.
 - A Native American Thought of It – Amazing Innovations pages 28-29 (Landon, 2008)
 - Birch bark canoes
 - Kayaks
 - Umiaks
 - Bull boats
 - Dugout canoes

Gravitational Pull

- A **Buffalo Jump** is an example of how gravitational force can act directly to cause an object to move. It is also an example of direct force on an object. (A group of hunters would frighten the buffalo herd and make it run toward a cliff. The buffalo at the front would try to stop at the edge, but the stampeding herd behind them would push them over the edge, killing them. This place is called a buffalo jump.)
 - <http://www.head-smashed-in.com/home.html> for a virtual tour of an actual buffalo hunt
 - Head –Smashed-In Buffalo Jump - (Rebus, 2008)
- The Inuit used a boat called an **Umiak** to transport tents, sealskin and caribou clothing, cooking equipment and tools. When there was wind, a sealskin sail could be used to help propel the Umiak
 - *The Inuit Thought of It* (MacDonald, 2007)
- Beaver Traps were used to capture beavers. Pictures of these structures can be found in People of the Trail. Page 22-23 (Ridington, 1978)
- Deadfall Trap - the deadfall trap works on the principle that when the bait is taken a weight falls on the prey. This live animal trap can be made to any size.



See

<http://www.wilderness-survival-skills.com/deadfalltrap.html> accessed on March 30, 2011 at 10:30 a.m.

Outcome

FM5.2 Investigate characteristics of simple machines, including levers, wheels and axles, pulleys, inclined planes, screws, and wedges, for moving and lifting loads.

First Nations and Metis technologies for Moving and Lifting Loads

- The Red River Cart - The key to the cart is its axle. It supports the entire weight of the cart and load and was the most likely part to fail. A cart typically went through four or five axles on a trip from Winnipeg to St. Paul. Many photos show spare axles tied to the rear of the cart, ready to replace ones which break. The cone-shaped ends of the axle slipped through a similarly shaped hole through the middle of each hub. A lynch pin through each end of the axle held the wheels on. The shafts rested on the axle in mortises cut not into the axle but into the shafts giving that weakest part greater strength. Some accounts suggest the axle was fixed to the cart with wet rawhide straps which, when dried, shrank and held the parts tight but more commonly the cart body was pinned to the axle with pegs angled down and in through the floor boards and the axle. This would make replacing the axle much easier. Go to Red River Carts http://www.info.co.clay.mn.us/History/red_river_carts.htm
- The Travois was a useful device for transporting goods over land. Two long poles were tied together near one end, and the poles were fastened to a dog. Wooden pieces running between the two poles made a platform for carrying goods. The back ends of the poles dragged along the ground. A Native American Thought of It (Landon, 2008)(page. 30).
 - There were different types of travois (horse and dog) that were used. People of the Buffalo. (Campbell, 1976)

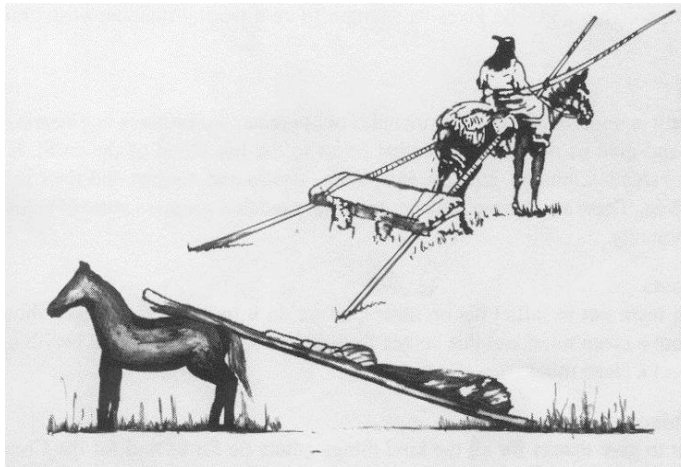


Image Retrieved from:

http://www.saskschools.ca/curr_content/careered/elementary/imgettlessons/architectureofthetipi/architectureofthetipi.html Accessed on April 26, 2010 at 10:00 a.m

- A tumpline was a strap or cord made of hide, which was attached to an object to make it easier for people or dogs to pull. People also used a tumpline to pull canoes over land when they wanted to avoid rapids. When used by a person, the tumpline was placed across the head, and the person

would lean forward while pulling. This helped to prevent injury to the shoulders when pulling a heavy load. A Native American Thought of It. (Landon, 2008) (page 31)

Setting up a tipi

- Setting up a tipi involves the use of levers.

“The construction of a tipi starts with tying together three of the poles at the skin's radius from their bases using a tripod lashing (**lashing** is an arrangement of rope used to secure two or more items together in a somewhat rigid manner). One end of this lashing rope is left dangling from the tie-point, long enough to reach the base of the poles.”

- Setting up a tipi also involves the use of direct force (A direct force is a force between things that are touching)

“These tripod poles are stood upright, with their unfastened ends spaced apart on the ground to form a triangle, each pole's base the skin's radius from its neighbours. A dozen more long poles are laid onto the three primary poles. Their upper ends rest on the lashing of the first three, and the lower ends are evenly spaced to form a circle on the ground which includes the original three poles. The lashing rope is then walked around the whole structure three times and pulled tight. This ties the placed poles to the tripod at the crown of the tipi.”

<http://www.absoluteastronomy.com/topics/Tipi>

Outcome

FM5.3 Assess how natural and man-made forces and simple machines affect individuals, society, and the environment.

- As the students are learning about the outcomes FM5.1 and FM5.2 have the students take the discussions further and connect how these inventions affected Aboriginal People. Also, the items can be used to assess the function and effectiveness of the materials used. For example, how did using different skis affect the lives of the people? How did the invention of the Red River Cart affect the lives of those who used it?

- The following legends explain a variety of forces from natural phenomena (e.g., earthquake, tornado, hurricane, and tsunami) on the natural and constructed environment.
 - Gluscabi and the Wind Eagle - Importance of wind (Bruchac, 1988)
 - How Thunder and Earthquake Made Ocean – how does Thunder help out in creating the ocean from the prairie? What are waves and how are they formed?
 - How Raven made the Tides – Tides are the result of the pull exerted on the oceans by the gravity of the sun and moon. (Keepers of the Earth, page 104) (Bruchac M. J., 1988)
 - How we saw the world: The First Tornado (Taylor, 1993)
 - The Fire Stealer (Cleaver, 1979)