Smarter Science Better Buildings
Western Development Museum - Saskatoon

Workstation Guiding Questions – Pages 1 - 6

Heating and Cooling

Spend some time looking over the materials at the display. Use these questions to help focus your investigations.

1. List some reasons why ***cellulose insulation*** is an environmentally beneficial insulation choice.

2. ***Heat Pumps*** use electrical energy to move heat energy from one location to another. Look at the Heat Pump Diagram. Compare the size of the blue “electrical energy coming in” arrow to the size of the red “heat energy coming out” arrow. Explain what this tells you about how efficient the heating system is.

3. Name three things ***Beardy’s and Okemasis’ Cree Nation*** wanted to accomplish with their new homes.

4. In ***How Heat Moves,*** which home is warmer in winter? Which home uses the least amount of energy?

5. Set the ***thermostats*** in the display to 15ºC. If you set your thermostat at home back to 15ºC at night, how would this save energy?



Net Zero Home

Spend some time looking over the materials at the display. Use these questions to help focus your investigations.

1. List what makes up the ***building envelope***. Explain why it is important for the building envelope to be airtight and have good insulation.

2. ***Canada's National Energy Code:*** How much more energy efficient is tier 4 than the current Saskatchewan code?

List three actions that would increase a home's energy efficiency.

1. _____

2. _____

3. _____

3. Explain ***thermal bridging.*** How does the double-wall construction reduce it?

4.

$$Q = \frac{A \times DT}{R}$$

When you "turned down" the thermostat (DT), what happened to the power (Q), consumption of the house? Why?

5. How does energy use in our homes connect to ***climate change***? List some things we can do in our homes to act on climate change.

Lighting and Appliances

Spend some time looking over the materials at the display. Use these questions to help focus your investigations.

1. Look at the ***Innovative Design*** section: How does Daylighting use reflective materials to bring natural light into the interior of buildings and save energy?

2. The ***average Saskatchewan home*** uses a lot more electricity than the NET ZERO home. Name three ways the NET ZERO home uses less.

3. Look at the circle graph of ***household electricity use***. Check (✓) ways you think you and your family could make changes to save electricity.

Use LED lights	Turn out lights that aren't needed	Dry clothes on a clothesline
Use timers for lights and vehicle block heaters	Use a power bar to turn off phantom load	Unplug electronics not in use
Buy ENERGY STAR® appliances	Reduce Air Conditioner use by setting the thermostat to 24ºC or higher	Other:

4. Look at the ***light display***. Besides the exit lamp, which light bulbs use the least amount of power?

OPTIONAL *- Can be done in the classroom:*

5. ***Energy = Power x Time.*** If your lamp has two 15-watt bulbs, and you have them on for five hours, how much energy do they use?

   Energy (watt hours) _____ *= 2(15W) x 5hrs*

   Explain how reducing power (W) and time (hrs) can reduce overall energy use?



Water

Spend some time looking over the materials at the display. Use these questions to help focus your investigations.

1. How does the ***drain water heat recovery Powerpipe*** use ***conduction*** to save energy? Look at the large copper pipe on the left side of the display and the diagram to understand.

2. Explain how the ***rainwater system*** works. How is rainwater used?

3. How are wetlands used in the ***Logan Green Water Management System***?

4. Check (✓) ways you could ***save water*** in your home and at school.

Turn off the tap while brushing your teeth	Replace your old dishwasher with an ENERGY STAR® dishwasher	Take a shorter shower
Fix a leaking toilet	Turn off the tap after washing your hands	Install a low-flow showerhead
Collect rainwater to water your lawn/garden	Grow drought tolerant plants	Other:

OPTIONAL *- Can be done in the classroom:*

5. ***Shorter showers:*** If a showerhead has a flow rate of 6 litres/minute, calculate the amount of water used for a five-minute shower versus a 20-minute shower.

   6L/min x 5min = _____ L 6L/min x 20min = _____ L

   How much water do you save by shortening your showers from 20 minutes to 5 minutes?



Solar

Spend some time looking over the materials at the display. Use these questions to help focus your investigations.

1. What part of Canada has the highest ***annual photovoltaic potential***? Which region of Saskatchewan has the highest potential?

2. Try the ***solar panel*** display. How do the clouds affect how bright the lights are? Why?

3. Look at the ***Innovative Design*** section:
   - LightLeaf panels – where would these panels be installed?

   - Mitrex building integrated panels – what makes these solar panels innovative?

4. The ***Pesâkâstêw Solar Project*** powers 2,500 homes and eliminates more than 15,000tCO2e/year. List some benefits you think this project brings for the two First Nations involved.

OPTIONAL *- Can be done in the classroom:*

5. If your home uses 7,500 kWh/yr and the average solar panel produces 400 kWh/yr, how many panels do you need to produce enough electricity for your home? If you live in Saskatoon, check MyHEAT Solar to see the solar potential of your address.



Retrofits

Spend some time looking over the materials at the display. Use these questions to help focus your investigations.

1. Compare the ***EnerGuide® ratings*** of the historical and modern houses. What helped older homes use less energy? What helps modern homes use less energy?

2. Put your hands on the ***window display***. Which type of glass allows more heat to escape? Which window keeps more heat in? Explain how the window's design and construction reduces heat loss.

3. Try out the home retrofit samples like ***weather stripping, pipe and wall plate insulation***. Which could you use in your home and where?

4. List some benefits that the Prairie South School Division achieved by installing new windows and lighting in these Moose Jaw ***heritage schools***?

OPTIONAL *- Can be done in the classroom:*

5. ***Real Retrofit:*** The 2018 Energy Retrofits of the 1970s Split-Level reduced the home's energy use by about 40% (70 GJ/year). Calculate the reduction in greenhouse gas emissions from this home's retrofit. Use this calculation:

   70GJ/year x 50kgCO2/GJ = _____kgCO2/year reduction.

Smarter Science Better Buildings

WDM Saskatoon Exhibits Visit Guiding Questions – Pages 7 - 13

Use the map on page 13 to help locate these exhibits.

Move to the *A Saskatchewan Story* exhibit
First Nations' Log House, circa 1880

16 m^2 (172 sq feet) Energy Consumption 135 GJ / year



Notice the log house in this diorama. In parkland areas with bush and bluffs, houses were often built of logs. Trees were cut down, branches taken off and the bark stripped. Logs were etched at the corners to fit snugly as log upon log was stacked to make the walls. Spaces between the logs were filled with a plaster mixture of clay, straw and water.

1. Sometimes another natural resource was added to the plaster. What do you think was added?

_____

_____

2. Estimate the thickness of the walls in cm: _____

3. Where might air or water have leaked into this house? _____

_____

4. Can you spot the woman carrying pails of water? If you had to haul all of the water you use for washing and drinking, would you use less than you do today? Why or why not?

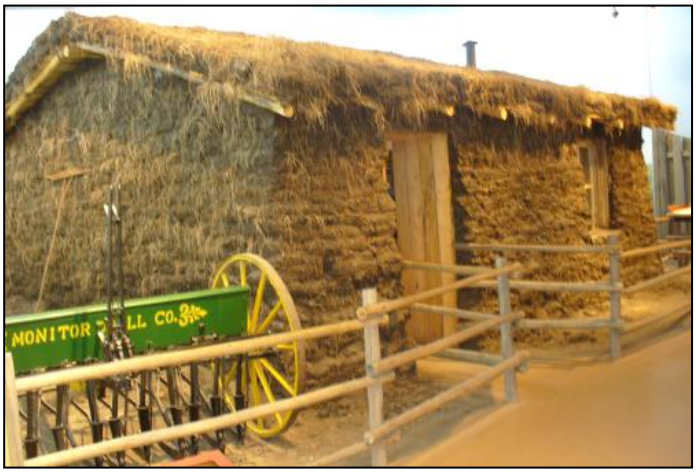
_____

_____

_____

Move to the *A Saskatchewan Story* exhibit
Settlers' Sod House, circa 1905

32 m^2 (344 sq feet) Energy Consumption: 479 GJ / year



Inside, the house measures 3.7 metres (12 feet) by 6 metres (20 feet). Around the house is an outhouse (in the mural), a wood pile and a water well. This house was built by Museum staff using photographs of sod houses to guide them. The sods were plowed from the edge of a slough. It took more than 350 sod blocks to build.

FYI….Did you know the nickname for a sod house is a "soddie"?

1. Where would settlers have gotten the sod for their houses?

_____

_____

2. Estimate the thickness of the sod house walls in cm: _____

3. How does this thickness contribute to keeping the inside of the sod house comfortable?

_____

_____

4. How was this sod house heated? _____

_____

_____

5. What provided light for this house? _____

6. How many panes of glass thick are the windows? _____



7. Find two places heat would escape from this house:

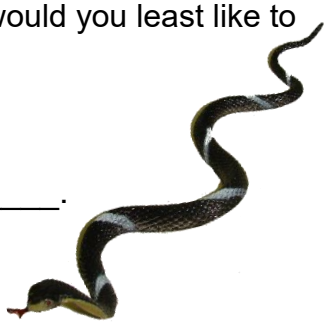
1. _____
2. _____

8. How did the family living in this house do their laundry? _____

_____

9. Life in a sod house sometimes included unexpected guests burrowing into the walls to keep warm. Can you think of three of these potential guests? Which one would you least like to see beside your bed in the morning?

1. _____
2. _____ The worst would be _____.
3. _____



Move to the *A Saskatchewan Story* exhibit – 1920s Fair Scene – Agricultural Fair Tent – Stationary Light Plant



Light plants consisted of three parts:

1. _____
2. _____
3. _____

Vocabulary: A **volt** measures how much "pressure" there is in an electric circuit. The higher the voltage, the more electrical current will flow.

1. How many volts did this plant produce? _____

2. What provided power for the light plant? _____

3. What could the light plant provide power to? _____

_____

Move to the *A Saskatchewan Story* exhibit – Eaton's Catalogue House – 1920s

1. Where were the building materials for this house ordered from? _____

2. Why would they have to order building materials?

_____

_____



Move to the *A Saskatchewan Story* exhibit Eaton's Catalogue House – 1930s

181 m^2 (1948 sq feet) Energy Consumption: 759 GJ / year

This is the same home from the 1920s. Harsh weather conditions in the 1930s have taken a toll on its appearance. Sometimes these homes were insulated with newspapers, horsehair or sawdust. Some of them had no insulation at all.

1. Look around, do you know what heats this house?

_____

2. Look at the lighting. What was used?

_____

3. How many panes of glass thick are the windows?

_____



4. Why are there newspapers along the window sills?

_____

5. What is the door made of? _____

Estimate its thickness in cm:_____

6. Find two places heat would escape from the house:

1. _____

2. _____

FYI…
Notice the hand pump in the kitchen for water.

The home's water came from a cistern or large container that collected rainwater for household use.

Move to the *A Saskatchewan Story* exhibit
Watch Rural Electrification in Action



FYI…
By the end of 1956, 40,000 of the province's farms (around 47 percent) were being served by power from the Saskatchewan Power Corporation.

Which home do you think would be the most comfortable in winter, the 1930s Eaton's House or the 1905 Sod House? Why?

_____

_____

_____

_____

Move to the *Fuelled By Innovation* (Straw Gas Car) exhibit

1. What does the Straw Gas Car use for fuel? _____
2. Where and when did the Straw Gas Car make its debut? _____
3. In 1919, University of Saskatchewan research into straw as a fuel ended. Why?

   _____

   _____

   _____

4. Sketch the straw gas car.

5. What crop is being used as part of a biodiesel mix to fuel Saskatoon buses today?

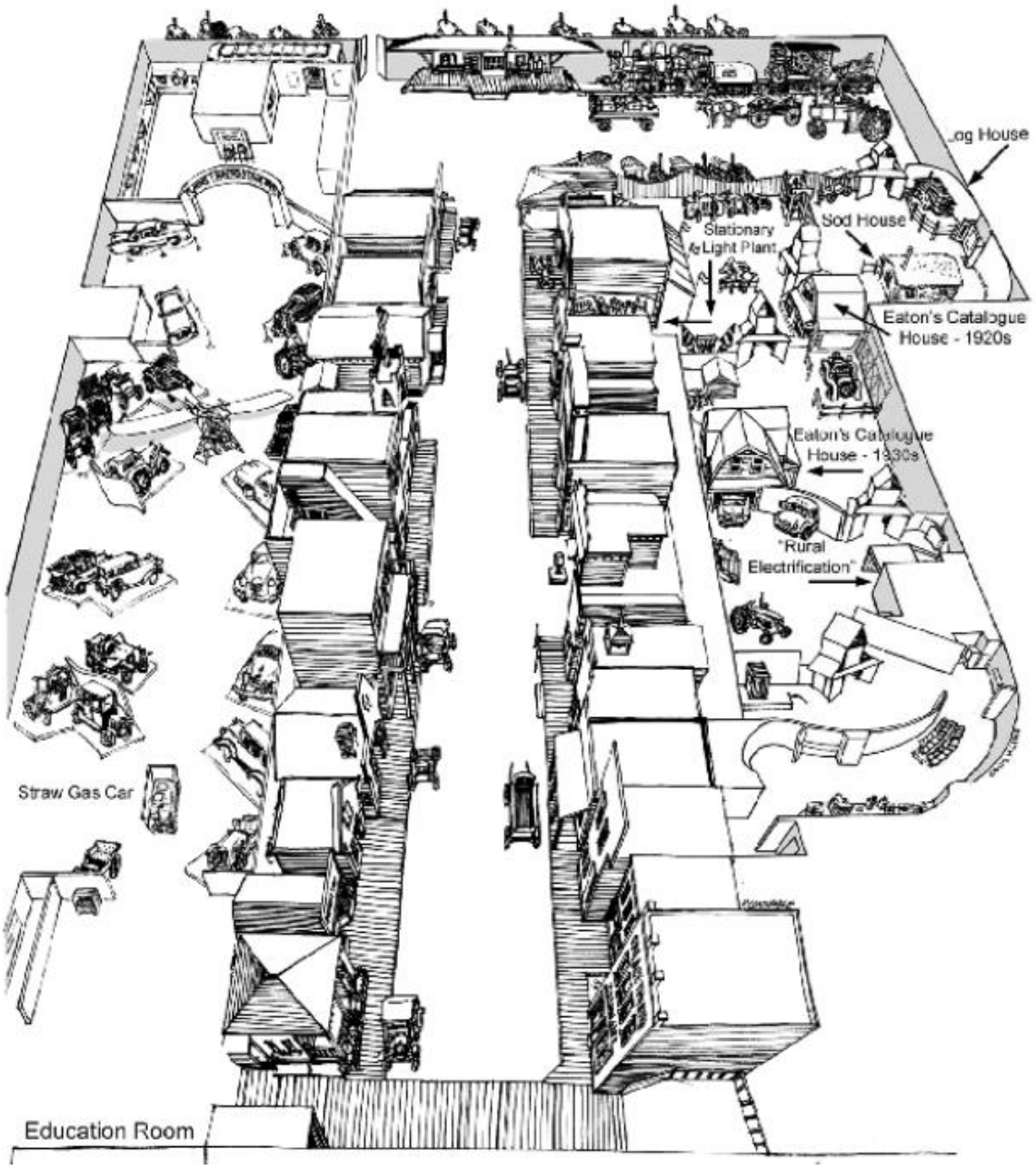
   _____

6. What three reasons led the city to adopt a biodiesel blend for its entire bus fleet?

   1. _____
   2. _____
   3. _____

← Did you know that this crop was developed in SK?




Log House
Sod House
Stationary
Light Plant
Eaton's Catalogue
House - 1920s
Eaton's Catalogue
House - 1930s
"Rural
Electrification"
Straw Gas Car
Education Room