***All About Winter Weather***

**NATURE Sunday Academy 2019-2020**

**Project Description:**

Students will investigate the properties and characteristics of winter hazards such as blowing snow and blizzards that impact the region.

**Project Objectives:**

Students will learn:

* Basics about interpreting weather maps
* The types and properties of winter storms that impact the region
* Why the region is the blizzard capital of the United States
* Characteristics of snowflakes and what conditions determine their properties.
* How optical phenomena like halos and sundogs form
* Impacts of blizzards and snow on the region

**Session Organization:**

11:00-11:30 Cultural connection/brief introduction (PowerPoint)

11:30-12:00 Blowing Snow Tank / Snowfall Measurements

12:00-12:45 Lunch

1:00-1:45 Weather Patterns that cause blizzards

1:45-2:30 Snowflakes and optical effects

2:30-3:00 Wrap up

**ND State Science Standards:**

K-ESS2-1: Use and share observations of local weather conditions to describe patterns over time.

K-ESS3-2: Ask questions to obtain information about the purpose of weather forecasting to prepare for and respond to weather.

3-ESS2-1: Represent data in tables and graphical displays to describe and predict typical weather conditions expected during a particular season.

MS-ESS2-5: Use data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions.

HS-ESS2-2: Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems.

HS-ESS3-1: Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.

**Materials and Equipment:**

* Worksheet including example weather patterns from historical blizzard events.
* Activity 1: aquarium, bucket, fake snow, ruler, hand-held fan, obstacles for tank.
* Activity 2: None needed.
* Activity 3: Prisms, 3d-printed snowflakes, flashlight.

**Activity I: Blowing Snow Tank**

**PowerPoint slides 5-8**

Step 1. Feel the two types of fake snow.

How are they dissimilar?

Which type do you think is more likely to blow?

What type would make a better snowball?

Step 2: Use the fan and attempt to blow the snow in the buckets.

Was your intuition correct? Why or why not?

Step 3: Level the snow in the tank and place objects. Making sure the lid is in place, use the fan to blow the snow around. Once it has drifted, stop.

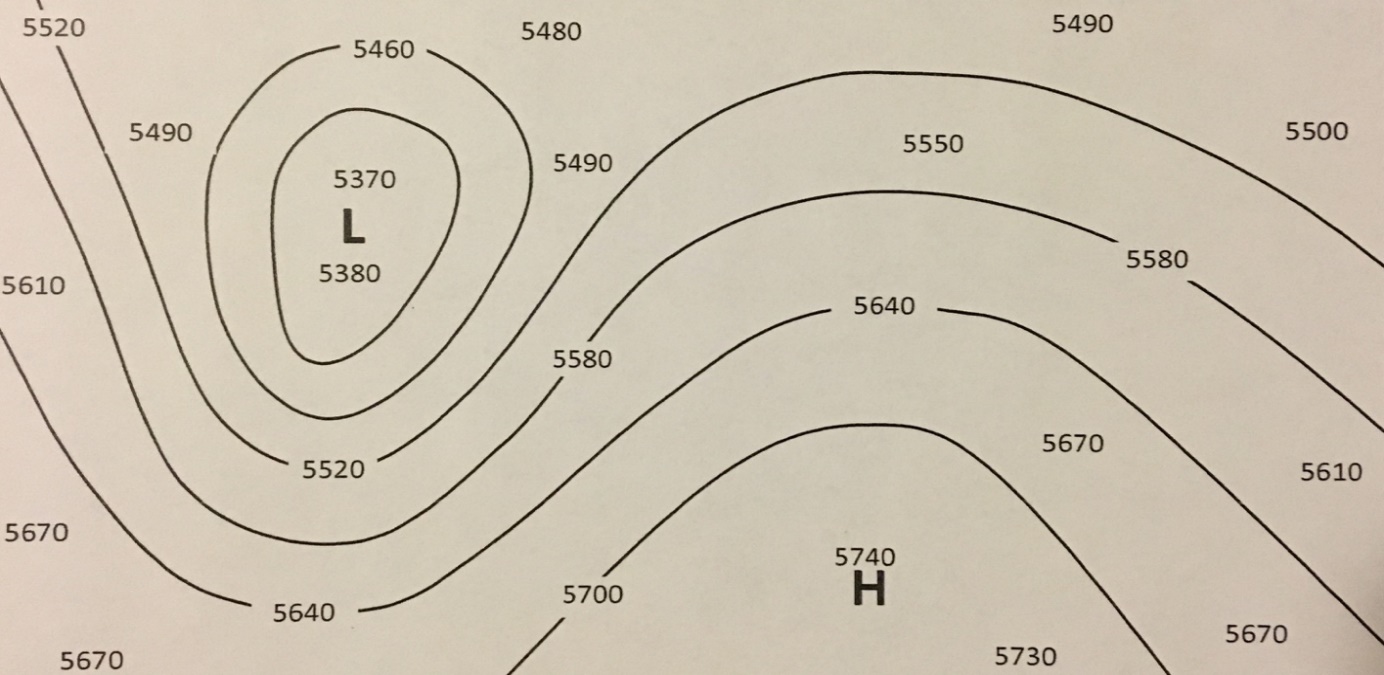
Step 4: Use a ruler and take a measurement of snowfall.

What range in snowfall was observed? What is truth? *(Observations will be written on the board)*

**Activity II: Blizzards and Weather Patterns**

**PowerPoint slides 10-20**

**Activity 2 - Part 1 - Weather Basics:**



A

E

D

C

B

F

1. Locate these features on the chart above. Larger numbers indicate higher pressure.

High Pressure System \_\_\_\_\_\_\_ Area of fastest Winds \_\_\_\_\_\_

Low Pressure System \_\_\_\_\_\_\_ Area of slowest Winds \_\_\_\_\_\_

Trough \_\_\_\_\_\_\_ Ridge \_\_\_\_\_\_

1. In the image above, what type of flow pattern is the jet stream: Meridional or zonal? \_\_\_\_\_\_\_\_

L

1. Locate the cold and warm front in the above low pressure system. Shade where you would expect snowfall.

**Cultural Activity (PowerPoint Slide 21)**

Discuss weather stories or legends that you have heard while growing up. How do these relate to the discussed weather patterns?

**Activity 2 - Part 2 – Blizzard Identification**

**PowerPoint Slides 22-31**

Using the weather maps attached at the end of the worksheet, circle the type of blizzard for each case.

Case 1: Colorado Low, Arctic Front, Alberta Clipper

Case 2: Colorado Low, Arctic Front, Alberta Clipper

Case 3: Colorado Low, Arctic Front, Alberta Clipper

Which case most likely had the most snowfall associated with it? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Which case may have occurred with blue skies overhead? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Which type of event was the Children’s Blizzard? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Winter Weather Safety (PowerPoint and discussion)**

**PowerPoint Slides 32-36**

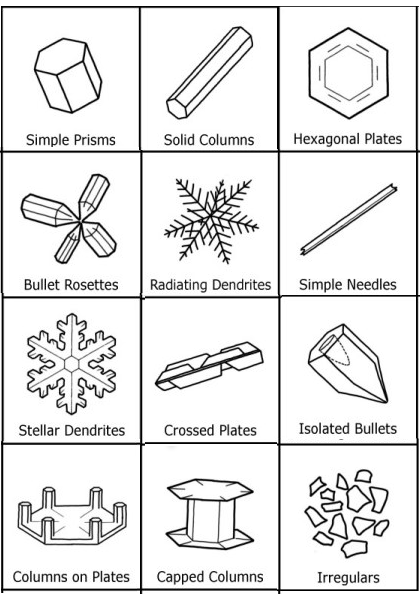
**Activity III: Snowflakes and Optics**

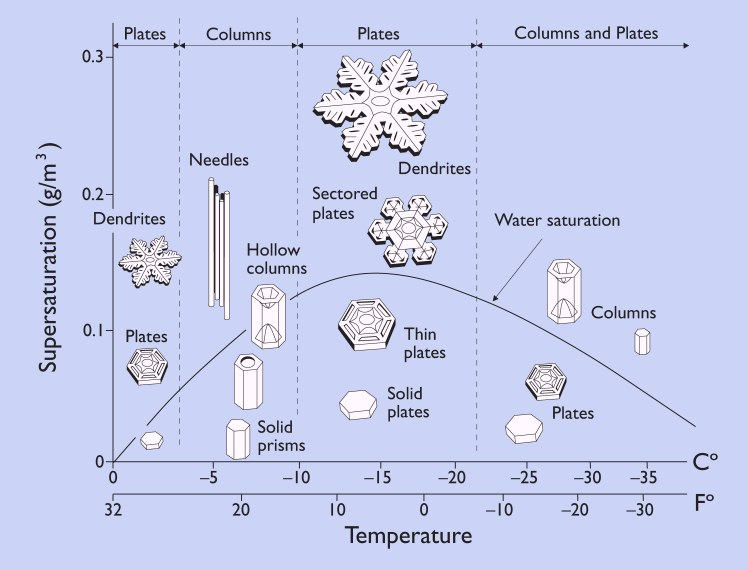
**PowerPoint Slides 38-45**

**Activity 3 - Part 1 – Crystal Matching**

Step 1: Investigate the shapes of the 3-D printed ice crystals

Step 2: Match them to the appropriate type to the table below:





**More humid**

**Less humid**

**Warmer**

**Colder**

1. What snowflakes occur when it is less humid and around 20 F?
   1. Are these snowflakes good for snowballs?

* 1. What type of blizzard may these snowflakes occur with?

1. What snowflakes occur when it is less humid and around -10 F?

* 1. Are these snowflakes good for snowballs?

* 1. What type of blizzard are these snowflakes in?

1. What snowflakes occur when it is more humid and around 0 F?
   1. Are these snowflakes good for snowballs?

* 1. What type of blizzard are these snowflakes in?

1. What snowflakes are the most common?
2. What are the snowflakes called that stick together?

**Activity 3 - Part 2 – Winter Optics**

Use prisms and lights to create optics.

1. How does the angle of light impact the optical phenomenon?

2. How is color separated?

**Wrap-Up & Discussion:**

*1. How were the concepts of STEM used in today’s activity?*

*2. What was the most successful idea you used in the activity?*

*3. What did you try in the activity that did not work?*

*4. Why do think it did not work?*