a WOW Lab BLUEPRINT Weather Station

Quebec - Achievements and Competencies

Learning Outcomes

Cycle 1 (Gr. 1-2)	Cycle 2 (Gr. 3-4)	Cycle 3 (Gr. 5-6)
Transformation of matter	Transformation of matter	Transformation of matter
Seasons	Meteorological systems and climates	Solids, liquids, and gases
Solids, liquids, and gases	Solids, liquids, and gases	Changes in matter
	Changes in matter	Transmission of energy
	Transmission of energy	Pressure

The Quebec Achievements and Competencies are based on the Progression of Learning Outcomes derived from the Quebec Education Plan set by the Ministere de l'Education, du Loisir et du Sport.

Specific Expectations

CYCLE 1 (Gr. 1-2)

EARTH AND SPACE

A. Matter
   3. Transformation of matter
      a. Describes different types of precipitation (rain, snow, hail, freezing rain)

Students will visit different weather stations where they can learn about precipitation. *Snowflakes*, *Stormy Day*, and *Creating Snow* are activities that teachers can use to engage students in discussions about precipitation and the many forms that it can take.

D. Systems and interactions
   4. Seasons
      a. Describes the changes to the environment throughout the seasons (temperature, amount of daylight, type of precipitation)
      b. Explains the sensations experienced (hot, cold, comfortable) with regard to temperature measurements

Students should be able to describe what is happening at the different weather stations. They can identify what season they believe those weather phenomena occur in, providing examples to justify their ideas. Students may also predict the sensations experienced for the weather phenomena demonstrated at each weather station and why they happen. For example, students may share that *A Windy City* would feel cold because strong winds would be felt, and *Over the Rainbow* may feel warm because the sun was necessary in order for the rainbow to appear.

F. Appropriate Language
1. Appropriately uses terminology related to an understanding of the Earth and the universe

Students are required to use the appropriate terminology throughout the activity (e.g. hot, cold, weather, snow, rain, hail, sun, precipitation, windy, lightning, thundering).

MATERIAL WORLD

A. Matter
3. Solid, liquid, gaseous state, phase changes
a. Distinguishes among the three states of matter (solid, liquid, gas)
b. Recognizes water in its solid (ice, snow), liquid and gaseous (steam) state
c. Describes the operations involved in changing water from one state to another (heating or cooling)

Students will determine the state of matter of the weather phenomena being observed at some of the stations. For example, at the *Stormy Day* station, water is a liquid, and at the *Blue Cloud* station, the water evaporates and becomes a gas. As students describe their observations of the weather stations, they should identify if phase changes occur and associate how those changes could occur due to different temperatures.

F. Appropriate Language
1. Appropriately uses terminology related to the material world

Students are required to use the appropriate terminology throughout the activity (e.g. solid, liquid, gas, hot, cold).

CYCLE 2 (Gr. 3-4)

EARTH AND SPACE

A. Matter
3. Transformation of matter
c. Explains the water cycle (evaporation, condensation, precipitation, runoff and infiltration)

Students will observe different types of precipitation at the *Snowflakes*, *Stormy Day*, and *Creating Snow* stations. They will learn about the formation of clouds at the *Blue Cloud* station. Teachers can use these activities to engage students in discussions about the water cycle.

D. Systems and interactions
6. Meteorological systems and climates
a. Makes connections between weather conditions and the types of clouds in the sky

Students should discuss the weather phenomena that is demonstrated by each activity. They should discuss the type of clouds that may be associated with each phenomena, providing evidence and reasons to justify their ideas.

F. Appropriate Language
1. Appropriately uses terminology related to an understanding of the Earth and the universe

Students are required to use the appropriate terminology throughout the activity (e.g. hot, cold, weather, snow, rain, hail, sun, precipitation, evaporation, condensation, run off, infiltration, lightning, thundering).

MATERIAL WORLD

A. Matter
3. Solid, liquid, gaseous state, phase changes
a. Distinguishes among the three states of matter (solid, liquid, gas)
b. Recognizes water in its solid (ice, snow), liquid and gaseous (steam) state
c. Describes the operations involved in changing water from one state to another (heating or cooling)

Students will determine the state of matter of the weather phenomena being observed at some of the stations. For example, at the *Stormy Day* station, water is a liquid, and at the *Blue Cloud* station, the water evaporates and becomes a gas. As students describe their observations of the weather stations, they should identify if phase changes occur and associate how those changes could occur due to different temperatures.

5. Changes in matter
a. Demonstrates that physical changes (e.g. deforming, breaking, grinding, phase changes) do not change the properties of matter

Students should describe the phase changes that occur at any of the weather stations. They will associate those changes with the appropriate temperatures that cause them. Students should understand that these changes are physical changes, not chemical ones, because phase changes do not produce new substances and thus, the properties of matter do not change.

B. Energy
2. Transmission of energy
g. Explains the motion of convection in liquids and gases (e.g. boiling water)

At the *Stormy Day* station, students will observe the cold blue water sinking as it is replaced by the hot red water. Teachers should engage students in discussions about why this is happening. Students should share their ideas and provide reasons to support their claims. Teachers should ensure that students understand what convection is, explaining how it occurs and why.

F. Appropriate Language
1. Appropriately uses terminology related to the material world

Students are required to use the appropriate terminology throughout the activity (e.g. solid, liquid, gas, hot, cold, steam, heat, freeze, phase changes, physical changes, matter, convection, vortex).

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CYCLE 3 (Gr. 5-6)

EARTH AND SPACE

A. Matter
   3. Transformation of matter
      d. Describes certain natural phenomena (e.g. erosion, lightning, tornado, hurricane)

Students will visit different stations to learn about different natural phenomena, such as tornadoes and thunder. In *Twist*, students can describe the movement of the water, comparing it to that of a tornado. Students should discuss what is observed at each weather station, explaining how and why they believe those phenomena occur.

F. Appropriate Language
   1. Appropriately uses terminology related to an understanding of the Earth and the universe

Students are required to use the appropriate terminology throughout the activity (e.g. hot, cold, weather, snow, rain, hail, sun, precipitation, evaporation, condensation, run off, infiltration, lightning, thundering, tornado, hurricane).

MATERIAL WORLD

A. Matter
   3. Solid, liquid, gaseous state, phase changes
      a. Distinguishes among the three states of matter (solid, liquid, gas)
      b. Recognizes water in its solid (ice, snow), liquid and gaseous (steam) state
      c. Describes the operations involved in changing water from one state to another (heating or cooling)

Students will determine the state of matter of the weather phenomena being observed at some of the stations. For example, at the *Stormy Day* station, water is a liquid, and at the *Blue Cloud* station, the water evaporates and becomes a gas. As students describe their observations of the weather stations, they should identify if phase changes occur and associate how those changes could occur due to different temperatures.

   5. Changes in matter
      a. Demonstrates that physical changes (e.g. deforming, breaking, grinding, phase changes) do not change the properties of matter

Students should describe the phase changes that occur at any of the weather stations. They will associate those changes with the appropriate temperatures that cause them. Students should understand that these changes are physical changes, not chemical ones, because phase changes do not produce new substances and thus, the properties of matter do not change.

B. Energy
   2. Transmission of energy
      g. Explains the motion of convection in liquids and gases (e.g. boiling water)

At the *Stormy Day* station, students will observe the cold blue water sinking as it is replaced by the hot warm water. Teachers should engage students in discussions about why this is happening. Students should share their ideas and provide reasons to support their claims. Teachers should ensure that students understand what convection is, explaining how it occurs and why.

C. Forces and motion
    4. Pressure
        a. Recognizes various manifestations of pressure (e.g. inflatable balloon, atmospheric pressure, airplane wing)
        b. Describes the effects of pressure on an object (e.g. compression, displacement, increase in temperature)

At the *Blue Cloud* station, students will use a bottle, along with a match and some water, to create a cloud. Through their observations, they will recognize that when the bottle is sealed and being squeezed, the pressure inside the bottle increases. Teachers can explain the relationship between pressure and temperature through this demonstration, explaining that when pressure increases, temperature also increases. Students can engage in discussions to explain how clouds are formed, explaining their understanding of the demonstration and relating it to the formation of clouds in the sky.

F. Appropriate Language
    1. Appropriately uses terminology related to the material world

Students are required to use the appropriate terminology throughout the activity (e.g. solid, liquid, gas, hot, cold, steam, heat, freeze, phase changes, physical changes, matter, convection, vortex, saturated, super-saturated, diffraction, pressure).

Strategies

EXPLORATION STRATEGIES

- Recalling similar problems that have already been solved
- Becoming aware of his or her previous representations
- Drawing a diagram for the problem or illustrating it
- Formulating questions
- Putting forward hypotheses (e.g. individually, as a team, as a class)
- Exploring various ways of solving the problem
- Anticipating the results of his or her approach
- Imagining solutions to a problem in light of his or her explanations
- Taking into account the constraints involved in solving a problem or making an object (e.g. specifications, available resources, time allotted)
- Examining his or her mistakes in order to identify their source
- Using different types of reasoning (e.g. induction, deduction, inference, comparison, classification)
- Using empirical approaches (e.g. trial and error, analysis, exploration using one's senses)

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STRATEGIES FOR RECORDING, USING AND INTERPRETING INFORMATION

- Using a variety of observational techniques and tools
- Using technical design to illustrate a solution (e.g. diagrams, sketches, technical drawings)
- Using different tools for recording information (e.g. diagrams, graphs, procedures, notebooks, logbook)

COMMUNICATION STRATEGIES

- Using different means of communication to propose explanations or solutions (e.g. oral presentation, written presentation, procedure)
- Using tools to display information in tables and graphs or to draw a diagram
- Exchanging information
- Comparing different possible explanations for or solutions to a problem in order to assess them (e.g. full-group discussion)