Observing Change

LESSON

GRADE LEVEL 4-9

CATEGORY Energy, Atmosphere & Climate

TOPIC Weather

LENGTH

- **Warm-up:** 30 minutes
- **Activity:** 10 - 30 minutes per walk, repeated two to four times over a period of two to six months
- **Wrap-up:** 30 minutes

Note: This activity works well if done concurrently with the lesson Weather Where We Live. Climate change impacts are further explored in the lesson Arctic Survivor.

MATERIALS

- Change Observation Card, one copy for each student
- Example Change Observation Card
- Clipboards, one for each student
- Notebook or duo-tang with paper, one for each student to create a Weather Journal
- Optional: Camera
- Optional: Plastic bag or other covering for clipboards in case of rain

HCTF Education

SETTING

- Schoolgrounds, neigbourhood, and/or local park
- Classroom

SUBJECT AREAS

Science, Social Studies, Language Arts

KEYWORDS

Change, season, weather, climate, climate change, erosion, drought

Overview

Students observe and describe the impact of weather on living and non-living things by predicting and observing changes over time in the schoolgrounds, neigbourhood or a local park. Journals, Change Observation Cards, and a student created scavenger hunt assist the students in noticing and describing changes. After gaining an understanding of weather related changes, the concepts of climate and climate change are introduced.

Introduction and Background

Changes in our environment are constantly taking place all around us, yet often go unnoticed because many occur in small increments. Over time, small changes accumulate and can result in noticeable differences. Learning to observe, measure, and consistently record change is an important step in recognizing how small changes over time can have significant impacts on the world we live in.

Weather refers to the overall atmospheric conditions in an area at any one time; weather is what we experience. It can vary significantly over a year due to expected seasonal shifts as well as over a few days or hours due to storms or other severe events. Typically, weather occurs within an expected range of values at any particular time; this is the climate of an area. Meteorologists use the term "normals" to refer to regularly occurring weather, or average weather, for a specific location. Occasionally, the weather is beyond the usual range of values; these are called "extreme events". Climate is what we expect to happen, including a few extreme events.

Weather can have a variety of impacts on the living and non-living components of habitats and ecosystems, creating a range of changes. For example, light rain provides essential water to growing plants while heavy rain can cause the erosion of soils. Conversely, a lack of precipitation can create drought conditions. Increasing temperatures in the spring can promote new growth in plants while

rapidly dropping temperatures can freeze water within rocks, breaking them apart and creating new soil. Wind often carries the pollen or seeds of many plants to new locations, while high winds enhance drought conditions or break tree limbs. Within each particular climatic region, or biogeoclimatic zone as they are referred to in British Columbia, these changes are expected and often necessary to maintain a healthy ecosystem. In other words, populations of organisms have adapted to the average weather, or climate, they live in.

Note that many larger changes, such as seasons, are predictable. Plants and animals in a particular biogeoclimatic zone are adapted to these changes in the abiotic (non-living) conditions. Though extreme weather events are less predictable and can have a significant impact on the habitat of individual plants and animals, most populations of organisms within an ecosystem are able to recover over time.

The current human-induced (anthropogenic) climate change is a result of changes in the composition of our atmosphere. Since the Industrial Revolution, human activities have steadily released small additional amounts of greenhouse gases, such as carbon dioxide, into the atmosphere. The accumulation of greenhouse gases beyond pre-industrial levels has led to an overall increase in the average global temperature. As many of Earth's natural systems are closely linked, even a subtle, small change in one system affects others. For example, a rise in the average global temperature has an affect on the global water cycle leading to shifts in regional climates. As the climate changes, habitats can be significantly altered, potentially resulting in reduced reproduction rates and decreasing population size for some organisms. If the changes occur too quickly, some species many not be able to adapt, especially those with long life spans and slow reproduction rates. This can lead to extirpation or extinction of those species.

*See the **Primer** for more information on biogeoclimatic zones, weather, climate change, and the impacts on ecosystems.*

Procedure

Set-Up

1. Copy enough Change Observation Cards so there is one per student for each walk. Alternatively, students can work in pairs or small groups.
2. Select an appropriate short walk in the schoolgrounds, neighbourhood, and/or local park. Ideally your route should:
   - be easily accessible so you can visit it three or more times over at least two seasons and/or after major weather events (e.g., first snowfall, major storms, etc.).
   - include areas with trees and shrubs, such as natural or landscaped parks, yards, and gardens. If leaving the schoolgrounds is problematic, plan the route so that the students can see the yards of houses or other such developments from the schoolgrounds. Try to include as much diversity of living and non-living things as possible.
   - have a safe gathering place at the turn-around point of the route where the whole class can meet and do part of the activity together before returning along the same route.
3. Enlist the help of parents, if desired. Inform the parents of the reason for the walks and provide instruction as to how they can specifically help the class during the walk by observing and pointing out changes, assisting with monitoring students, moving the group along, etc.
4. Walk along the chosen route and identify what living and non-living things may change over a period of a few months. Examples include trees and shrubs may lose or grow leaves, flowers, seeds and/or have broken branches; exposed ground/soil may become covered with new plant growth or eroded by rain run-off; and rocks and sidewalks may crack during cold periods.
5. Immediately prior to taking the students out on each walk, check the full route. Identify any new evidence of change and things that potentially will change, while also checking for any safety considerations.

Warm-up

1. Inform the students they will be going on a series of short walks over the next few months to predict and observe changes over time in living and non-living components of the local ecosystem. Explain how changes often occur very slowly over time and require careful observation. Show them the Change Observation Cards and describe the importance carefully recording their observations. Emphasize that their task is to practice predicting change and making careful observations as to what does or does not change over the monitoring period due the impact of weather.
2. Clearly distinguish between the process of change (e.g., the actual breaking of tree branch or growth of a butterfly), which they probably will not observe, and the evidence of change (e.g., a branch on ground below a tree or a caterpillar cocoon), which they will be able to observe. Not all of the changes they may observe will be related to weather.

3. To help the students become familiar with some of the changes they might observe and/or predict, conduct a whole class discussion. Ask the students to recall a major weather event in the past year. Invite them to share how this event impacted them. For example, some students may have been without power because of trees falling on power lines, others may have not been able to come to school due to snow or cold conditions, whereas others may recall having fun and the recreational advantages of lots of snow! Identify the weather conditions (wind, ice, heavy snow, cold temperatures, etc.) that lead to these impacts and write both the weather condition(s) and its corresponding impact(s) on the blackboard or on a flip chart.

4. Brainstorm and list the impacts on local plants, animals, and their habitats from the same weather event. Identify the impacts that both humans and non-humans experienced similarly. Explain that the populations of local, native plants and animals have adapted over thousands of years or more and thus are able to survive almost all weather events and seasonal changes that affect their habitat.

5. Next, ask the students to identify positive impacts or the benefits of weather (e.g., rain, warm temperatures, gentle winds, etc.). Stress the connection between usual, predictable weather conditions (i.e., weather normals) and healthy habitats and ecosystems. For example, rain and snow provides water; warm temperature promotes plant growth, providing food and shelter for many animals; wind disperses seeds and pollen.

6. Conduct a short discussion regarding how the students can show respect towards each other and their environment while on the walks. Encourage the students to create their own class "code of conduct", guiding them to include aspects such as moving quietly so they might hear animals and not scare them, talking in low voices and only when necessary, listening respectively to adults and each other, avoiding damage to plants and property by touching gently or not at all, etc. Post the list in the classroom and remind students of the code of conduct before each walk.

Activity

First Observation Walk: Baseline and Predictions

1. Hand-out the clipboards and pencils to students before leaving the classroom for the first walk. Include blank paper for the students to make rough notes on the first leg of the walk. Note if it is raining, slip the clipboards into a clear plastic bag that is big enough for students to put their hand inside and write, while still protecting the paper. Overhead or photocopy transparencies over the paper also work.

2. Explain to the students that the initial Observation Walk will provide baseline data as to how both living and non-living things appear on that day. During the first leg of the Observation Walk, the students are to explore and look carefully along the route for living and non-living things that might change over the next few months. Encourage students to use hearing, touch and smell as well as sight in detecting changes. As they are exploring, they should also consider the reasons why things might change. As the class returns along the same route, the students are to record their observations using the Change Observation Cards. Students can note their predications on the blank paper, or on the back of the observation card if desired.

3. Lead the students along the pre-determined route. Stop periodically to demonstrate what to do by pointing out examples of evidence of past changes such as broken branches, cracks in sidewalks or boulders, leaf buds, etc. Also, point out things that you predict might change. Check with the students as to what they have noticed and their predictions of change. Remind them that the predicted changes can be small or large; use your judgment in determining the scope of acceptable changes (e.g., a small twig breaking on a particular plant may be too small and detailed whereas a tree falling over may be too big and unlikely for the time span of this activity). Suitable examples include: trees and shrubs may lose or grow leaves, flowers, or seeds; puddles or streams may increase or decrease in size; the smell under a clump of trees may change; the number and/or type of insects may increase; the sound of a stream may change; dead tree limbs may break off; and hard clumps of soil may break apart.

4. At the gathering spot, hand-out the Change Observation Cards, before returning along the same route. Ask each student to choose nine things they observed along the route and that they predict will change over the next few months. Encourage students to try to choose different things from each other as well as have a mixture of living and non-living things.

5. Instruct the students to sketch each of their chosen things as the class returns along the route. Each sketch should fill one frame on the Change Observation Card. Show them the completed Example Change Observation

Card as a guide, noting how the nine things are a mix of living and nonliving things. Students can include a short written description within the frame if helpful. Parent helpers can help ensure safety, as students may become spread out during this part of the activity.

Alternatively, if time is limited, have students choose only three things and sketch them in the top row of the Change Observation Card. The remaining rows can be used to monitor any changes on subsequent walks in place of using another Change Observation Card.

6. Optional: Take photographs as you return along your walk route and post these in the classroom as additional visual reminders of the baseline information gathered during the walk.

7. Back in the classroom, ask students to list the things on their Change Observation Card in their Weather Journal and record their predicted change for each one. They should include what they predict the change will be and why it would occur. For example, leaves will fall off trees because of cooler temperatures in autumn.

Second Observation Walk: Checking Predictions

1. After approximately one month or after a major weather event, repeat the walk along the same route. Observe and note any changes, especially looking for the things that the students had predicted would change. Remember to encourage students to use their senses of hearing, touch and smell as well as sight when detecting changes.

2. On a new Change Observation Card (or on the same card for those using the alternative option) have the students sketch the same things chosen during their first walk, making sure to record the changes. Instruct the students to put a checkmark in the upper right hand corner of the sketch frame if a change has occurred. Again, if desired, they can describe the sketch (e.g., seed pods on shrub).

3. In the classroom, ask students to check their predictions from the first walk as recorded in their Weather Journal. Add a new entry stating if each prediction was observed or not. Students should include an explanation (e.g., "My prediction that the rose bush would have flowers was observed because it is spring."). Also, record any unexpected changes noted along the walk (or in general) and what may have caused the change. For example, a broken tree limb was noticed in the schoolgrounds, possibly due to heavy snowfall.

Third Observation Walk: Checking Predictions and Scavenger Hunt

1. Repeat the walk again, noting predicted and not predicted changes as done during the second walk.

2. To encourage students to notice more changes, have students swap completed Change Observation Cards with another person. Instruct the students to use the other student's Change Observation Cards as a type of scavenger hunt clue sheet. Ask the students, "Can they find the same living or non-living things? How are the things and their changes on the card they are now using similar or different from their own?"

Wrap-up

1. In the classroom, direct the students to share their Change Observation Cards for each walk with another student. The students should look for similarities and differences between the cards. Ask students to create categories for the changes observed (e.g., changes likely due to weather, changes due to human activity, changes due to animals, etc). Also, students should try to determine if the changes were predictable due to known weather patterns (e.g., leaves falling off leaves in autumn or flower buds in spring) or not as predictable (e.g., a large boulder splitting due to freezing ice, erosion channels along a slope after a large rainfall). Identify an example of each and record these in their Weather Journal.

2. As a whole class, discuss the range of observed changes by summarizing the data in a simple table. Use the categories identified by students and list examples of changes from the students. Identify the changes that were observed and the reasons why the change happened (i.e., the cause of the change; for example, erosion of soil due to trampling, broken limb due to high wind, dead plants due to lack of water, etc.). Note how there are some changes that are easy to predict and some that are not, highlighting how we as human rely on patterns to help us predict changes.

3. Ask the students, "What do you think the impact of weather might be on both the living and non-living things observed on the walk in ten years time? One hundred years?" Discuss the idea that small, incremental changes over time add up to significant changes. Ask the students, "What changes are more difficult to observe over a short time frame?" Lead a discussion about the challenges of detecting small changes and the need to take careful records over time. Provide an example of a

significant change in habitat over a period of time, for example, a small pond in a forest filling in and becoming a bog.

4. Ensure students understand the difference between weather and climate (i.e., weather is what we experience, climate is what we expect the weather to be). Review how populations of plants and animals are adapted to the climate in which they live and thus the range of weather experienced.

5. Introduce the concept of climate change. Help the students to understand that a change in our current global climate will mean weather that is not expected will occur in a particular area (i.e., biogeoclimatic zone) such as less rain or snow in winter or more high temperature days in the summer. Drawing on what they experienced and learned in this activity, briefly discuss the possible impacts of changing weather patterns in their region.

Note: *These concepts are further explored in the lessons* ***Arctic Survivor*** *and* ***Greenhouse Gas Game.***

Assessment

1. Assess each student's Change Observation Card(s) and Weather Journal. Look for appropriate predictions, accurate observations of evidence of change, and reasonable explanations of why the predicted change might occur. Students should demonstrate a basic understanding of the impacts of weather on living and non-living things.

2. Ask the students choose one change they observed during their walks and drawing an illustrated story (e.g., a comic strip or graphic story board) that recreates the observed impact. The story should show a series of small changes on either a living or non-living thing. Look for evidence that the student understands how weather has an impact on living or non-living things, and that small incremental changes over time can lead to a significant change.

3. Ask each student to write a summarizing paragraph in their Weather Journals by answering the questions, "What observed change was the most surprising to you?" and "Why was this surprising?" The students can use either one of their own observations or one made by another student in the class.

4. Have each student write a "Small Change, Big Impact" contract or pledge as to what they will do to positively affect the school and neigbourhood environment. Look for evidence of an understanding of how small lifestyle changes done on a daily basis can lead to significant positive impacts over time.

Extensions

1. Bring news reports of major weather events that have happened in the world. Discuss with the students the impact these events may have had on local habitats.

2. Discuss how humans can impact habitats in positive and negative ways (e.g., provide water for plants; create diverse habitats in gardens; remove native plants and in the process risk destroying habitat for native animals; pollute water and soil, etc.). Help the students to identify how to show respect for the environment and what actions they can take to positively affect the school environment. Examples include always put litter in garbage cans, walk/ run/play carefully and respectfully as to not to damage plants, and avoid hurting animals, including insects.

Change Observation Card

Name _____ Date _____

Example Change Observation Card