

GRADE 12 ENVIRONMENTAL SCIENCE: Nature Journal

Summary of Learning Opportunity		
<p>Students observe, document, and create entries for a Nature Journal as a part of an ongoing, course-long assignment. The purpose of the Nature Journals is for students to develop and practice skills of being naturalists and scientists. We explore how natural local spaces in our area change over time and make observations that connect to classroom content learning. During each visit we collect quantitative data by conducting a variety of water and air quality tests, and qualitative observations of biotic and abiotic systems. We also have a unique focus for each visit such as the water cycle, ecosystem services and air quality. I created a data collection sheet; students then use the data to create each weekly Nature Journal entry. At the end of the course, we compare the data and observations we have made during each visit to make connections, create questions, and form new understandings of our local environment.</p>		
Environmental Science 12	Curricular Competencies	<ul style="list-style-type: none"> • Collaboratively and individually plan, select, and use appropriate investigation methods, including field work and lab experiments, to collect reliable data (qualitative and quantitative) • Experience and interpret the local environment • Express and reflect on a variety of experiences, perspectives, and worldviews through place
	Content	<ul style="list-style-type: none"> • Water quality parameters and bioindicators • Land use and degradation • Land management

Literacy Connections	Instruction and Assessment	Competencies Developed, Practiced, and/or Assessed
LITERACY: Applies Understanding— Extracts ideas and information	1. I spent several lesson blocks introducing the concept of nature journals through examples, and building knowledge of the measurement tools, background concepts, and context (see text box on next page).	Express and reflect on a variety of experiences, perspectives, and worldviews through place
LITERACY: Applies Understanding— Synthesizes ideas and information	2. We went on our first nature walk. Afterwards, we collated all data and observations together and discussed their meaning/relevance.	Collaboratively and individually plan, select, and use appropriate investigation methods, including field work and lab experiments, to collect reliable data (qualitative and quantitative) Experience and interpret the local environment
LITERACY: Communicates— Presents ideas and information	3. Students complete the post-walk questions. They create their Nature Journal entry by collating their observations, thoughts and responses together.	Express and reflect on a variety of experiences, perspectives, and worldviews through place

Building Context

"The nature journal is not a new phenomenon in the history of scientific study, or, for that matter, in the history of education. It springs from an ancient tradition of record keeping: tribe, village, or parish records; farming ledgers; native people's accounts of the seasons and hunts; record of scientific expeditions; travel journals; accounts of investigations by self-taught naturalists; units of study in rural schools." - Clare Walker Leslie

A naturalist is someone who studies nature through observation. A scientist is someone who tries to determine how things work. Each of them asks questions, learn with their senses, notice details and record their observations in journals.

Measurement tools and resources we used:

- Binoculars - extend our observations
- Phone Cameras - record observations quickly
- Phone app: Seek/iNaturalist: for identification of plant and animals
- Thermometers: for temperature readings
- Secchi disk: used to measure water clarity
- Container to collect pond water: for water testing examination
- iNaturalist: identify organisms (<https://www.inaturalist.org/>)
- Google Image Search: identify organisms
- Freshwater testing kit: <https://waterrangers.ca/resources-for-individuals/freshwater-training/>
- Phytoplankton nets: collect organisms
- pH Test strips
- TDS meter: total dissolved solids
- Air Testing Monitor: particulates and carbon dioxide in air

Resources for building context and background:

Complete the Watershed Education Program:

<https://watershedcpr.canadiangeographic.ca/Our Planet | Fresh Water | FULL EPISODE | Netflix Our Planet | Biome tour of our freshwater Our Planet | How to save fresh water flow Our Planet | Explorable Globe>

Right: Teacher-created template for data and observation collection (continued on next page)

This is a protected wildlife habitat. Always stay on designated paths and be respectful of the areas that you are sampling. DO NOT go over the fenced areas. Choose one platform to collect samples from.

	Sample Site Observations
Location – Where is the sample site located on the map (label the map) → The date → Your name → Where you are → Time of day → The present weather conditions	
Abiotic factors at the sample site: - Sunlight - Heat - Water - Wind - Clouds, weather, air, gases - Rocks, sediment, dirt - Islands, logs, bird/bat boxes	
Biotic Factors at the sample site: - Organisms - Plants (moss, ferns, etc) - Animals (insects, birds, etc) - Fungi (mushrooms, shelf fungus, etc) - Protists (single celled organisms)	
Special notes about the sample site: (notable species present, how the sample was collected, difficulties in collecting sample, etc.)	

Phytoplankton Net Groups (collection container). Collect a sample of the water from the Lagoon. Describe the appearance of the water in your container (colour, contents, cloudiness, etc.)

Station A	Station B	Station C

Save your sample and bring it back to the classroom!!

Air Monitor Group – Classroom air quality

Classroom:	Before	After	Classroom:	Before	After
Air temperature			Particles		
PM2.5			CO ₂ (ppm)		
PM10			Humidity		

Water Testing Groups

Test	A	B	C	Notes:
Air temperature				**Use the outdoor Air Monitor**
PM2.5				**Use the outdoor Air Monitor** Fine particles are 2.5 micrometers in diameter or smaller. They are produced from combustion: vehicles, wood burning, etc.
PM10				**Use the outdoor Air Monitor** Course dust particles are 2.5-10 micrometers in diameter. Sources include crushing or grinding operations.
Particles				**Use the outdoor Air Monitor**
CO ₂				**Use the outdoor Air Monitor** Carbon dioxide is a greenhouse gas that is natural and harmless in small quantities. It is produced when we exhale.
Humidity				**Use the outdoor Air Monitor** Amount of water vapour in the air.
Water temperature				Use your digital thermometer and hold it in the water for 2 minutes.
Secchi depth				This measures water clarity. Lower the disc slowly until you cannot see it. Raise and lower it to find the exact point it disappears from view. Record your reading in meters.
pH				pH is important because it sets conditions for how easy it is for nutrients to be available (which can lead to algae blooms) and how easily things like heavy metals can dissolve in water (creating toxicity)
Conductivity				This measures the ionic content (calcium, bicarbonate, nitrogen, phosphorous, iron, sulphur and other dissolved materials) in a body of water by measuring the water's ability to conduct electricity.
Dissolved Oxygen				See Instructions: Colder water holds more oxygen than warmer water. Low levels could indicate more plants or animals, plant die off or pollution.
Test Strips: Important! Make sure your hands are dry. Dip strip in water. Remove after 2 seconds. Compare colours with the guide on the side of the bottle.				
Chlorine				Chlorine is the most commonly used disinfectant. 0-0.5 ppm: great, 1 ppm+ is worrying
Alkalinity				Alkalinity is water's capacity to neutralize acid or resist decreases in pH. Natural water's alkalinity is affected by soil, bedrock, plants and industrial waste. High alkalinity is NOT normally a sign of bad water quality.

Hardness		Hardness is related to alkalinity as they both measure calcium carbonate content. It also measures other ions in the water that do not necessarily neutralize acid. Hard water is high in dissolved minerals, including calcium and magnesium.
		Water Hardness: 0-20 ppm: soft 21-60 ppm: moderately soft 61-120 ppm: moderately hard 121-190 ppm: hard >180 ppm: very hard

Water Ranger Group:

- Post Water Ranger Data online for Station A: <https://app.waterrangers.ca/>
- Login: Password: ~~~~~

Lagoon Observations

1. Identify evidence of human activity, pollution & garbage contamination
2. Identify possible sources of land and water contamination
3. **Find the info board: Healing the land, cleaning the water.** What is the city trying to do to help clean up the land and water in the lagoon?
4. Include a diagram of the water cycle using the lagoon and surrounding area to explain how water moves through the air, land and bodies of water.

Classroom Observations: Using a dropper, suck up some of your water near the bottom of the jar where organisms may have settled. You may use any sample, just be sure to label it in your observations.

1. Put a small amount of water in the depression slide section. Place a cover slip over it.
2. Look at the drop of water through the microscope at 40x magnification (scanning objective). **Is there anything in the water? What do you see?** (Note—if you do not see anything on your slide, try another sample)
3. Once you find a living thing, **follow it closely and sketch it below. Try to identify it using the ID guide.** Try to find a producer and a consumer. **How can you tell the difference?**

Submit your data collection sheet and your Nature Journal on Teams or hand in paper copies.

Emerging (1)	Developing (2)	Proficient (3)	Extending (4)
Attempts a few of the elements of a nature journal.	Collects data and makes some observations.	Includes completed data collection sheet. Creates thoughtful and expansive observations and connections using a fusion of written and some visual expression.	Proficient + The Nature Journal synthesizes content using visual, digital and written elements (e.g. collage, mapping, cycles, sketches, typed or handwritten text, etc.). Pays careful attention to color, layout, texture, shapes, and balance to expand each entry.

Teacher's Reflection

Incorporating Literacy into a science class really helped me think about the critical thinking skills that students need to be naturalists and scientists. Literacy influenced the type of questions I included in my assignment. By using the Literacy Learning Progressions as a guide, I was able to improve my template and discussion prompts and make them more multi-faceted versus just based on science content, and really get at assessing the curricular competencies.

I tried to provide thoughtful questions that were more open-ended (rather than single answer content questions) during our class discussion. I believe that students were better able to demonstrate in-depth thinking and authentic observations of the environment and their interactions with it because of the focus on building and valuing multiple perspectives and ways of knowing.

Proficient Student Work

LOCATION
PLATFORM A
JANUARY 31ST, 2023

LAGOON
11:45-12:00PM
OVERCAST

NATURE JOURNAL #1

Evidence of Human Activity

While at the lagoon, I noticed a few things that are evidence of human activity. There were human footprints in the snow. There were a few pieces of trash on the ground, humans walking by, and school and houses surrounding the lagoon which are evidence of human activity.

Possible Sources of Land and Water Contamination

There were a few possible sources of contamination I noticed. There was a few pieces of garbage tangled around the shallow logs in the lagoon. Animal waste from the ducks into the lagoon is also another possible source of contamination to the water. Dog, bear, coyote, raccoon waste is a possible source of contamination to the land, as well as vehicles polluting the air by driving by.

Sample Site Observations

ABIOTIC FACTORS
Sun is covered
Very cloudy, low clouds
-1 degrees celcius
Logs in water
Water moving still & slow
Layer of frozen water
form of snow

BIOTIC FACTORS
Crows flying around
Small birds scattered in trees
2 ducks swimming
Humans walking
Trees are empty/minimal leaves
Grass and evergreens

Water Testing + Air Monitoring

Test	A	B	C
Air temperature	5.6	12.9	12.9
PM2.5	22	6.0	5.8
PM10	3.9	5.9	8.1
Particles	563	562	560
CO2			
Humidity	43%	43%	43%
Water temperature	4.8	2.0	3.0
Soil depth	10m	15m	20m
pH	6.6	6.5	6
Conductivity	µS		
Dissolved Oxygen	µ		

Test Strips: Important! Make sure your hands are clean before using the test strips.

Chlorine: 0
Alkalinity: 10

Classroom Observations

Water Flea

After observing the water through the microscope, I saw what looked like a little bug moving around. We identified it as a water flea by referring to the ID guide. Water fleas are consumers because they eat and consume things like us. I was able to identify it as a water flea by its curved antennae. The moving legs of the water flea helped me determine it was a consumer.

January 31st, 2023

Teacher's Observations and Assessment

The student was able to proficiently organize and present their data and observations in a way that expressed and reflected on their personal experiences and naturalist and scientific perspectives. I encouraged this student to further develop their synthesis of the quantitative data and provide further interpretation to what the data means for the study site.