

Inquiry Plan: Weather Phenomena in Grade 5 Science

Krista Belanger

University of British Columbia

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Context

The grade 5 classroom teacher is looking for assistance with resources and spearheading an inquiry unit on various weather phenomena (climate, greenhouse effect, clouds, and forecasting). Students will be asked to conduct research using a variety of texts (pictures, videos, digital text, and print text) to result in a final culminating project in the form of a presentation. The Teacher-Librarian is being asked to gather resources for students to use, at a variety of reading levels to suit students in the classroom.

Students in the classroom vary in reading abilities, from a Lexile level of >500 to 1100+. The classroom teacher understands that Lexile levelling does not apply the same way to nonfiction texts, so including a wider variety of text types will help reach students who may otherwise not have access to resources. The class itself includes twenty students (thirteen boys and seven girls), most of whom express enthusiasm for the Science discipline, and are eager to conduct an inquiry project. One student is on an Individualized Education Program (IEP), which includes the use of a reader when needed. Two students in the classroom have been diagnosed with Attention Deficit Hyperactivity Disorder (ADHD), one of whom is transitioning to another medication, which wears off after lunch. The grade 5 Science class takes place daily in the afternoon, typically between 1:30 and 2:20, which is when students have access to technology for research assistance as well as resources in the School Library Learning Commons, with the exception of Fridays.

The role of the Teacher-Librarian in this case will be to provide resources, assist students in accessing the resources, provide assistance in citing sources, and mentor students through the inquiry process. The classroom teacher and the Teacher-Librarian are both committed to meeting

weekly after school on Fridays to discuss progress on the students' projects before their weekly staff meeting. The anticipated duration for these projects will be four weeks, as there will be a break for Spring Break in between.

Foundations of Inquiry Already in Place

Students in this particular class have been practicing inquiry throughout the year in their science units. The classroom teacher has been conducting inquiry without the aid of the Teacher-Librarian, but would like to work together to strengthen the inquiry process and support students who have required additional assistance in the past. The classroom teacher recognizes that inquiry allows students to take on more responsibility over their learning. She has also worked with her students to recognize the paradigm shift which happens where students are the bearers of knowledge and the teacher is no longer the expert, but the facilitator (Harper and O'Brien, 2012, *How to put students in the driver's seat*, pg. 11). The classroom teacher is also aware that in previous years, students were taught that there was a "single correct answer" (pg. 12), and the teacher has been working with students to understand that there is more to learning than being able to regurgitate what was told to them.

Another aspect of foundations already in place is the celebration of "novelty and invention" (pg. 12) as students are regularly commended and congratulated for establishing new understandings and making new connections in their learning. Celebrating successes happens multiple times throughout a unit, and students regularly share their new learnings and understandings with the class. Before each inquiry period is conducted, the classroom teacher asks the class if there is anyone who would like to share something "mind blowing" they learned that stuck with them since the last inquiry period. This gives students an opportunity to refresh

their minds about what they learned, but also provides an opportunity to share and potentially help others through discussion.

In engaging in discussion with others, making suggestions, and having important learning conversations, students have become more invested in the inquiry process. Moreillon states, “A positive, safe, respectful, and responsive educational environment is a powerful component of the 21st-century learning landscape. It cultivates understanding and learning for all stakeholders—students, faculty, staff, and community” (*Learning that Sticks: Engaged Educators + Engaged Learners*, 2011, pg. 17). The classroom teacher provides multiple opportunities for students to experience positive feedback, and does not tolerate abusive behaviour in her classroom. The class has a sense of respect for one another because this class is honest about their experiences and their teacher treats them as adults, in how she talks to them and gives them responsibility.

Learning Outcomes

Topic D: Students learn about weather phenomena and the methods used for weather study. They learn to measure temperatures, wind speed and direction, the amounts of rain and snow, and the amount of cloud cover. In studying causes and patterns of air movements, students learn about the effects of uneven heating and cooling and discover the same patterns of air movement in indoor environments as are found outdoors. They also learn about human actions that can affect weather and climate and study the design and testing of clothing used as protection against the weather (Government of Alberta, Science Program of Study).

General Learner Expectations:

- 5–8 Observe, describe and interpret weather phenomena; and relate weather to the heating and cooling of Earth’s surface.
- 5–9 Investigate relationships between weather phenomena and human activity.

Students will be given choice between three specific learning outcomes which can be summarized into three categories: types and measurement of weather, how humans affect weather, and forecasting weather. By providing three broad categories, it is the hope that student presentations will demonstrate a variety of perspectives and generate more interest than one specific focus.

Specific Learning Outcomes:

- 5. Describe and measure different forms of precipitation, in particular, rain, hail, sleet, snow.
- 12. Recognize that human actions can affect climate, and identify human actions that have been linked to the greenhouse effect.
- 13. Appreciate how important it is to be able to forecast weather and to have suitable clothing or shelter to endure various types of weather.

Essential Questions to be Considered

This brainstorm list is a list of questions the class may come up with during a brainstorming session based on the required curricular understandings.

- How is weather measured?
- What types of weather exist in Alberta?
- What types of weather do not exist in Alberta?

- How do humans affect weather?
- What can humans do to have a positive affect on weather?
- How is weather forecasted?
- How does someone become a meteorologist?
- What is the greenhouse effect?
- How can we as Albertans help those who are homeless in extreme temperatures (hot and cold)?
- What clothing is best for when it is very hot? Very cold?

Desired Understandings

- Students will be able to describe and measure different forms of precipitation, in particular, rain, hail, sleet, snow.
- Students will recognize that human actions can affect climate, and identify human actions that have been linked to the greenhouse effect.
- Students will appreciate how important it is to be able to forecast weather and to have suitable clothing or shelter to endure various types of weather.

Key knowledge and skills students will acquire as a result of the unit

At the end of the unit, students will have curricular knowledge as demonstrated in the desired understandings section, however, they will also hone their research skills both through physical books as well as digital reference materials. Students will be able to conduct google searches, database searches, and utilize an index effectively. Students will also be able to expand on their ideas and confirm what they think they already know.

Inquiry Model: BCTLA’s The Points of Inquiry: Inquiry-Based Learning for Classrooms and School Libraries

Activities and structures are from the *BCTLA Points of Inquiry* document, pages 7-12.

Structure	Activities	Resources	Responsibility of the...
Connect-and-Wonder	Activate prior knowledge	<ul style="list-style-type: none"> • Chart paper • KWL Chart • Loose leaf • Activating videos (see Timeline for specific resources) 	Student and teacher
	Brainstorm		Student
	Ask questions		Student and teacher
	Predict/Hypothesize		Student
	Mind-mapping		Student
	Think-pair-share		Student
	Whole class discussion		Student and teacher
Investigate	Identify types of information needed	<ul style="list-style-type: none"> • List of resources / websites • Access to databases • Criteria for reliability • Resources with indexes • Cornell notes page • Mind map page • KWL Chart • Search term assistance 	Teacher-librarian
	Choose resources		Teacher-librarian and student
	Evaluate resources		Teacher-librarian and student
	Use graphic organizers to take notes		Student
	Skim/scan		Student
	Keyword search strategies		Teacher-librarian and student
Construct	Organize information	<ul style="list-style-type: none"> • Cornell notes pages • KWL chart • MLA or APA citation page (citationmachine.net) • Chart paper 	Student
	Merge information from a variety of sources		Student and teacher-librarian
	Work with others		Student
	Paraphrasing		Student, teacher, and teacher-librarian
Express	Choose an effective medium	<ul style="list-style-type: none"> • GSuite • Powerpoint • MovieMaker • iMovie • Printer • Drawing paper • Assessment outline • Rubrics 	Student
	Present information in a variety of formats		Student
	Give credit where credit is due (copyright)		Student
	Peer and self assessment		Student
Reflect	Self assessment using a rubric	<ul style="list-style-type: none"> • Rubric • KWL chart • Note paper 	Student and teacher
	Reflect on what worked and didn’t work		Student, teacher, and teacher-librarian
	Learning log		Student

The connect-and-wonder section of the BCTLA model of inquiry will be conducted at the beginning of the unit, as well as the beginning of each class period. The classroom teacher currently conducts activating activities where students are asked to share something that stuck with them since their last inquiry period. The teacher-librarian is able to assist in providing activating materials for the classroom teacher and engaging in dialogue with students about their inquiry topics.

The investigative phase will be conducted both in the classroom and in the school library learning commons. As there are two adults, it is easier for students to be working in multiple places, provided everyone is given the same lesson on research. This separation would make it easier for the classroom teacher and the teacher-librarian to focus on a smaller group at a time, and these groupings could be made based on curricular theme. Students may be taught note-making through Cornell notes, they may be instructed in searching databases or using Google effectively, and determining the reliability of sources.

The following phase is constructing, where students will take what they have learned to make meaning. This could include pooling information together in groups, comparing information, or making sense of the information gathered. This phase is important for both the students but also for the classroom teacher and teacher-librarian to be involved to ensure all students in a group understand the information others have gathered. This phase is also important because it allows students the opportunity to practice paraphrasing, as it is often a skill that is not explicitly taught at such a young age.

In the expressing phase, students will take their new understanding and demonstrate it in some kind of physical way. This could mean through a physical presentation, drawing, or using technology. Students are able to take ownership over what they have learned and determine the

best way to allow others to gain the same or a similar understanding about their topic. Consistent, reliable access to technology is very important for many groups in this phase. Some students may choose to film a presentation, where they would require a filming space which would be quieter. The classroom or school library learning commons may be a good fit for filming, depending on the needs of other students.

Finally, the reflection phase is important because it allows students to go back to their KWL charts, to fill in missing gaps, to elaborate on their learning, and brainstorm missed opportunities. In my own experience, students are more likely to be transparent and honest in a reflection after a presentation has been completed, versus before the presentation has been completed.

Students will know when they are ready to move onto the next phase when they feel as if they have completed the requirements for understanding. A check-in with the classroom teacher and teacher-librarian may be required in the form of a five-minute meeting, depending on the groupings. Evidence of a plan of action for the next phase would also be required.

Timeline for the Unit

Week 1: Connect-and-wonder

- Activating videos – these videos will be gathered by the classroom teacher and teacher-librarian for the purpose of brainstorming topics and questions for research. A variety of formats for activation materials will be available to provide access to learners who may struggle with reading, comprehension, or vocabulary.

- Kirkby, J. (2014). Cloudy climate change: How clouds affect Earth's temperature - Jasper Kirkby. [online] YouTube. Available at:
<https://www.youtube.com/watch?v=sDo7saKaEys> [Accessed 24 Feb. 2019].
- Fong, J. (2014). Climate change: Earth's giant game of Tetris - Joss Fong.
Retrieved from <https://www.youtube.com/watch?v=ztWHqUFJRTs>
- Crash Course. (2013). 5 Human Impacts on the Environment: Crash Course Ecology #10. Retrieved from <https://www.youtube.com/watch?v=5eTCZ9L834s>
- KWL chart – students will brainstorm together for a KWL chart, and they will only write down items they think they know, instead of what others think they know.
- Mind-mapping – students will practice making a mind map of possible things they know about their topic.

Week 2 + 3: Investigate

- Identify types of information needed – brainstorm with the class, the teacher-librarian will show students the different types of reference materials available, and give students links to different online reference materials. The teacher-librarian will also make available resources with different reading levels to add access to learners. The teacher-librarian will also set up the Wiki-Wand extension for those students who require it, as well as the Read&Write extension for those who are more auditory learners.
- Keyword search strategies – the teacher-librarian will work with students to determine effective keyword search strategies. The class will aim to find information about a German Shepherd, but they will first search ‘dog’, then they will search ‘fluffy dog’, then they will search ‘police dog’, and so on. Eventually, the idea that students will need to be specific in their searching will be important. They will also practice using indexes in

physical books. Students will also be given tutorials on how to use the extensions provided by the teacher-librarian to increase access for struggling learners, including Read&Write, Irlen Overlays, and Wiki-Wand.

- Choose resources – students will be given an opportunity to make a list of resources they may need to use. The teacher-librarian will also have physical copies of books available from the library. The next day, students will evaluate the resources they have chosen.
 - Wicker, C. (2003). Weather Instruments | Weather Wiz Kids. Retrieved from http://www.weatherwizkids.com/?page_id=82
 - Water Cycle. (2019). Retrieved from http://www.phschool.com/atschool/phsciexp/active_art/water_cycle/index.html
 - Furgang, K. (2012). National Geographic Kids Everything Weather: Facts, Photos, and Fun that Will Blow You Away. Washington, D.C.: National Geographic.
 - Malizia, D. (2018). A visual guide to weather and climate. New York: Rosen Publishing.
 - Krajnik, E. (2019). How Earth's landscape affects the weather. New York: Rosen Publishing.
 - Inhabit Education. (2019). Weather Words. Iqaluit.
 - The Weather Network. (2019). The Weather Network [IOs, Android, Blackberry]. The Weather Network.
- Evaluate resources – students will begin looking for accuracy, credibility, currency, and reliability of the resources they chose previously. They will use a rubric to determine if

they are to be considered accurate and reliable, see Appendix A. Students will work in groups to evaluate resources due to potential accessibility issues.

- Skim/scan lessons – students will use the resources they deemed credible, reliable, and accurate to determine if the resource meets their needs. They will skim and scan for words and terms related to their inquiry question. They will also be taught how to skim and scan online (by using ctrl + f) to find terms on a page. The lesson on keyboard strategies will be gone over again at this time.
- Use graphic organizers to take notes – students will use mind maps, Cornell notes, and different highlighting techniques of the text to gather their information. Students will colour-code their information according to the source to make their paraphrasing and citations easier.

Week 4: Construct

- Organize information – students will take the information they gathered in a group and organize the information into categories and to find similarities and differences.
- Merge information from a variety of sources – students will seek out other sources of information if the information gathered is limited to a three or four sources.
- Work with others – students will work together in their groups to determine how reliable their information is, and if there are any gaps of understanding in their essential question.
- Paraphrasing – students will colour-code the information according to their source to create citations. The classroom teacher and teacher-librarian will teach students about the importance of paraphrasing and citing sources. They will also go over the format with students.

Week 5: Express

- Choose an effective medium – the classroom teacher and teacher-librarian will make suggestions for technology presentation software/apps, as well as make recommendations for length of presentations for students.
- Present information in a variety of formats – the classroom teacher and teacher-librarian will meet with groups to determine the best format(s) for their presentation, as well as provide assistance and tutorials when needed.
- Give credit where credit is due (copyright) – the teacher-librarian will encourage students to use a bibliography, works cited, or reference section to their project and help with using the citationmachine.net website. A whole-class tutorial will also be given.
- Peer and self assessment – students will use a teacher provided rubric to assess themselves and their peers.

Week 6: Reflect

- Self assessment using a rubric – students will complete their own self-assessment and assessment of their project using a teacher-provided rubric.
- Reflect on what worked and didn't work – students will reflect at the end on what did and did not work in each phase of the inquiry process.
- Learning log – students will indicate in a log throughout the inquiry process what they have learned and experienced.

Assessment/Reflection Overview

The performance tasks students will undertake will be a group presentation of the material they have learned. Students will likely choose to use technology to make a video, a Google Slides presentation, a PowerPoint presentation, or a Prezi presentation. These are the formats that

this particular class is well aware of using, and can use the software with little to no guidance on the part of the classroom teacher or teacher-librarian. The key goals and understandings are as follows:

- Students will be able to describe and measure different forms of precipitation, in particular, rain, hail, sleet, snow.
- Students will recognize that human actions can affect climate, and identify human actions that have been linked to the greenhouse effect.
- Students will appreciate how important it is to be able to forecast weather and to have suitable clothing or shelter to endure various types of weather.

At the beginning of the inquiry unit, students will be given a choice of one of these three desired understandings. At the end of the inquiry unit, after the presentations are completed, students should be able to address each point of learning. How students will know that they have learned the material will be by filling out their KWL charts from the beginning of the unit, completing their own presentations, as well as completing their learning logs. Students will self-assess at the end of the unit to determine what learning has taken place. The classroom teacher and the teacher-librarian will know what students have learned based on the completed assessments (KWL chart and presentation) as well as formatively through observation during the inquiry process. Learning will also be assessed based on the increased research ability for students to use databases, to search effectively, and to create a reference or works cited list.

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http://www.phschool.com/atschool/phsciexp/active_art/water_cycle/index.html

Wicker, C. (2003). Weather Instruments | Weather Wiz Kids. Retrieved from

http://www.weatherwizkids.com/?page_id=82

Appendix A

<i>Criteria</i>	<i>Exceeds Expectations</i>	<i>Acceptable</i>	<i>Below Expectations</i>
Canadian Content (distance, weight, places, spellings)	All Canadian content	Some Canadian content, some American content	All American content
Images (digital, photographs, diagrams, graphs, charts)	Variety of images, photographs, diagrams, charts, colourful, at least two images per page	Some variety of images, some images are in black and white, less than two images per page	Very little images, one or no images per page
Appendix, glossary, or index	Present		Not present
Ease of use	Portable (usable outside of school), student-friendly usage	Somewhat portable (may rely on a reliable internet connection or being downloaded for offline use), somewhat clear headings	Not portable, must be used with a regular desktop computer, relies on IE or Silverlight, confusing navigation of the site or text
Accessible to a variety of students	Variety of Lexile levels, multicultural representations and Indigenous perspectives, accessible for students who need help reading the text, definitions are easy to find, contents are easily located and numbered or hyperlinked	Lexile levels may be standardized to grade level, passages or readings may vary slightly, little multicultural representation, little Indigenous perspective, limited ability to reach many students' needs, contents may be accessible but may be harder to find	Lexile leveling is standardized, one option for reading about a particular topic or idea, no multicultural representation, no Indigenous perspective, does not reach multiple students' needs, contents and themes are non-existent
Reliability	Sources are listed, publisher is reliable, trusted in the community	Sources are listed, publisher is reliable	Sources are not listed, publisher is unreliable
Accurate information (facts, words currently in use)	Information is current and accurate according to research and new findings	Information is somewhat accurate	Many pieces of information are inaccurate
Currency	Less than 3 years old	Less than 5 years old	More than 5 years old
Purpose	Clear, student-friendly	Clear, somewhat student-friendly	Not clear, not student-friendly
Curricular connections	Meets many curricular outcomes	Meets some curricular outcomes	Meets few/no curricular outcomes