Grade 7 Learning Experiences: Human's Impact on the Environment and Ecosystems

Experience 3: Case Study and Debate Regarding Human Impacts on the Environment.

Grade 7 Long Range Plan Model 1

In this STEM-based, engaging activity, students get to explore important ecosystem issues and apply learned concepts as new learning happens.

They will start by getting some fresh air to get soil samples from various sources around the school. (1 period of 50 minutes). Students will then conduct tests and experiments to evaluate the quantity and the quality of the living thing from their samples by comparing their findings with other classmates. (10 minutes per period for a few weeks)

Next, students will calculate their lifestyle footprint with the goal of being as reliable and honest as possible. Transferring the data by hand or by a computer program such as Google Sheets or Excel, they will compile all the class results. Combining and calculating how much land is needed for their actual lifestyle, students will make predictions. Relating the sustainable way of living and the importance of the pressure it's putting on ecosystems. (2 periods of 50 minutes)

Students will then explore how developments and exploitation of the land can impact the quality of available land in Ontario. This will be accomplished by studying before and after pictures of Hawkesbury, Ontario. They will then use their findings to make hypotheses or the causes that affected the water banks of Chenail Island. (1 period of 50 minutes). Then, in small groups, students will prepare a debate about the impact on the environment and economy of one human action. They will have to justify with facts and statistics so they will need time to research the subject. (2-3 periods of 50 minutes)

In the final step, students will explore how humans can help make conservation initiatives and garden restorations including indigenous contributions. They will then use any program of their choice based on what they would like to emphasize. They should present their findings in a one-pager of quality, infographic. (3 periods of 50 minutes).

Overview of learning experiences – why these activities	Students will then explore how developments and exploitation of the land can impact the quality of available land in Ontario. Big Idea: - Humans Impact - Environment and Ecosystems See Grade 7 Long Range Plan Model 1, March
Prior Knowledge / Prior Skill Set(s)	**Background Knowledge and concept (Teacher)** ● Knowledge of what has been explored in Grade 6 Biodiversity ● Knowledge of transferable skills. ● Understanding of the Learning For All Document ● Understanding of how to engage in the Engineering Design and Research process ● Understanding of safety procedures ● Understanding of block-based coding concepts and platforms like Microbit **Background Knowledge and concept (Students)** ● Knowledge of habitats and interactions between species ● Knowledge of different chemical cycle (water, carbon, nitrate) ● Knowledge of different life cycles (plants, fish, insects, mammals) ● Aware of safety behavior and procedures in case of accidents (example: no broken glass in a garbage bag) ● Aware of various collaboration strategies ● Knowledge of how to use technology for research and collaboration ● Ability to double check the facts before taking the data for granted. ● Prior knowledge of coding concepts (e.g. loops, timers, counters, and conditional statements) ● Prior knowledge and experience using basic block-coding and the use of Microbit
Strand A - STEM Investigation and Communication Skills	**A1.1** Identify various ways in which humans affect/impact their natural environment. **A1.5** Communicate ways through which we can promote positive, and mitigate negative, environmental interactions.

	 **A.3** Research how human activity is impacting SDGs 14 (Life Below Water) and 15 (Life on Land).  **A.3** Explore FNMI ways of knowing and practices and how they contribute to environmental sustainability.
Overview / Big Ideas/Fundamental Concepts	**Overview** Students will explore how developments and exploitation of the land can impact the quality of available land in Ontario. This will be accomplished by studying before and after pictures of Hawkesbury, Ontario. They will then use their findings to make hypotheses or the causes that affected the water banks of Chenail Island. (1 period of 50 minutes). Then, in small groups, students will prepare a debate about the impact on the environment and economy of one human action. They will have to justify with facts and statistics so they will need time to research the subject. (2-3 periods of 50 minutes) **Big Ideas** Every natural ecosystem needs water in order to reach biodiversity. Biodiversity provides benefits to all living things. Yesterday's solutions are today's problems. **Systems and Interactions** A system is a collection of living and/or non-living things and processes that interact to perform some function. A system includes inputs, outputs, and relationships among system components. Natural and human systems develop in response to, and are limited by, a variety of environmental factors. **Sustainability and Stewardship** Sustainability is the concept of meeting the needs of the present without compromising the ability of future generations to meet their needs. Stewardship involves understanding that we need to use and care for the natural environment in a responsible way and making the

	effort to pass it on to future generations no less than what we have access to ourselves. Values that are central to responsible stewardship are as follows: using non-renewable resources with care; reusing and recycling what we can, and switching to renewable resources where possible. **Automation** Automation involves implementing technologies to make systems run on their own, without further human intervention. Automation can facilitate and accelerate functions that are otherwise difficult, repetitive, or dangerous for human beings to perform. Coding and emerging technologies play an increasingly important role in controlling automated systems.
Learning Goals / Success Criteria	**Learning Goal:** We are learning about the human impact on ecosystems and why it is important to all life on earth. **Success Criteria** ● I can use characteristics to describe and classify living organisms ● I can identify, define, and explain all the characteristics of ecosystems (e.g. climate, species, populations, interactions) **Learning Goal**: We are learning about the contributions of emerging technology to solve diverse automated needs. **Success Criteria** ● I can explain why their contributions are important and needed to solve environmental problems. ● I can code a program that can read environmental changes such as temperature or humidity. ● I can predict some of the long term effects of emerging technology solutions. **Ministry of Education Key Points** **1. STEM Skills and Connections:** Perspectives and approaches that provide opportunities for students to investigate and apply concepts and skills from all areas of learning.

	2 Research and Experimentation Processes: Provides students with the scientific literacy skills needed to approach scientific questions that are becoming a part of everyday life. **4 Hands-on, Experiential Learning:** Includes hands-on, experiential learning opportunities to support classroom activities that encourage curiosity. **5 Coding:** Allows students to explore a wide variety of science and technology concepts and contexts through coding, while also learning valuable skills related to automation and control of systems. **8 Contributions to Science and Technology**: Showcases the important contributions made to science and technology by people with diverse lived experiences. Students also explore real-world issues by connecting scientific and technological knowledge systems and perspectives from various cultures, including connecting Indigenous sciences and technologies and Western science and technology. **9 Climate Change:** Students will develop the skills and knowledge needed to understand the causes and potential solutions and mitigation strategies related to climate change and other environmental issues, and how they can make the most environmentally responsible decisions possible, given the choices they have. **10 Food Literacy:** Skills and knowledge related to food literacy: from students developing an understanding of where food comes from and how it is grown and prepared to students investigating the importance of biodiversity in agriculture.

Learning Experience(s) **A1.1, A1.5** **A1.1, A1.5**	Curiosity and Wonder in Science and Technology **Experience 3A** (35 to 50 minutes) **The Flooding of Chenail Island of Hawkesbury:** Students look at the human impact on a larger scale. "Yesterday's solutions are today's problems" The construction of the Carillon Canal Lock and its hydroelectric generating station permanently flooded some land in the Town of Hawkesbury, Ontario. This town is about 30 kilometers west of the town of Carillon. Students examine two aerial maps of the Hawkesbury area, one from the year 1945 and the other from the year 1975 and document their observations. See Appendix A: The Flooding of Chenail Island of Hawkesbury - Student Handout, Answer Key and Photos. Suggested photos can be replaced with newer photos of the site. If teachers are comfortable using local pictures or First Nation territories that show similar degradations, they should make sure that they use reliable archives or websites. Students will be led to find solutions for current problems. Some careers in water treatment may be brought up to emphasize the clean water crisis even for isolated communities. They will also have to assess the impact of today's solutions over a longer period. (preparing for the debate) The evaluation criteria will be co-constructed with the students according to the mode of presentation. **Experience 3B** (35 to 50 minutes) **The Debate On Environmental Issues** "Today's solutions are tomorrow's problems" Students look at the human impact on a larger scale. Instead of looking back in time, they will have to predict the consequences of emerging technologies in the near future. This is a good opportunity to integrate Food Literacy by making sure that some groups choose it as their debate item. Students should also consider emerging technologies that might be used to reduce the human impact on ecosystems. To introduce students to different points of view, the students could be forced to defend a situation with which they

	disagree. By positioning them in another person's shoes, students will have to consider other perspectives. See Appendix B: The Debate on Environmental Issues - Notes for Teachers See Appendix C: The Debate on Environmental Issues - Student Activity Guide See Appendix D: Scientific Skills and Processes: The Debate Rubric

Science and Technology Expectations	**STRAND B. Life Systems - Interactions in the Environment** B1.1 assess the impact of various technologies on the environment B1.2 assess the effectiveness of various ways of mitigating the negative and enhancing the positive impact of human activities on the environment B2.8 describe how different approaches to agriculture and to harvesting food from the natural environment can impact an ecosystem, and identify strategies that can be used to maintain and/or restore balance to ecosystems **STRAND C. Matter and Energy - Pure Substances and Mixtures** C1.1 analyze the social and environment impacts of the use and disposal of pure substances found in technological devices, considering local and global perspectives C1.2 assess environmental and social impacts of different industrial methods used to separate mixtures
Science and Technology Vocabulary	Biodiversity Biomes Community Conditional Statements (coding) Ecosystem Engineering Process Habitat Impact Interaction Interrelationship interspecies Intertidal Zone Intrinsic Loops (coding) Research Process Species True or False (coding) Vivarium

Equipment and Materials	REQUIRED ● Antidote software ● Online collaboration software ● Coding software such as Micro:bit ● Presentation software such as Pretzi, Powerpoint or Canvas ● Electronic spreadsheet such as Excel or Google sheets ● Organizational diagram software such as SMART Ideas For Experience 3A The Flooding of Chenail Island of Hawkesbury: ● access to internet ● online notes software ● computer ● transparent plastic grid ● samples from the pictures in color if possible For Experience 3B For the Debate on Environmental Issues: ● access to internet ● online notes software ● online collaboration software ● computer
Timeline and Preparation	Time required for preparation – **Experience 3A The Flooding of Chenail Island of Hawkesbury** 35 to 50 minutes **Experience 3B For the Debate on Environmental Issues** 35 to 50 minutes
Safety Considerations	Refer to these STAO and OCTE Safety resources: Safety in Elementary Science and Technology (STAO) Safe Activity Foundations in Education Document (SAFEdoc) Science and Technology, Grades 1-8 (OCTE) Ontario Curriculum Program Planning – Health and Safety
Opportunities For Assessment	Assessment FOR is mostly at the beginning of the unit the Minds On. The outdoor activity provides an anchor for future references

	during the other activities. It also activates students' prior knowledge of nature and the interactions in their surroundings. Assessment AS is done throughout all activities, by discussion between students with the teacher, discussion between students and observations made during the hands-on periods. Assessment OF learning is mostly in activity 5 where students have to use what they have learned to suggest solutions for endangered species. The assessment grid is provided for the student's hand out. **According to the Ministry of Education Growing Success Document (2010) assessment is about improving student learning!** Assessment **FOR** Learning: Occurs frequently and in an ongoing manner during instruction, while students are still gaining knowledge and practicing skills and is used by teachers to monitor students' progress towards achieving the overall and specific expectations, so that teachers can provide timely and specific descriptive feedback to students, scaffold next steps, and differentiate instruction and assessment in response to student needs. Assessment **AS** Learning: Occurs frequently and in an ongoing manner during instruction, with support, modeling, and guidance from the teacher and is used by students to provide feedback to other students (peer assessment), monitor their own progress towards achieving their learning goals (self-assessment), make adjustments in their learning approaches, reflect on their learning, and set individual goals for learning. Assessment **OF** Learning: Occurs at or near the end of a period of learning, and may be used to inform further instruction and is used by the teacher to summarize learning at a given point in time. This summary is used to make judgements about the quality of student learning on the basis of established criteria, to assign a value to represent that quality, and to support the communication of information about achievement to students themselves, parents, teachers, and others Please use as a reference to the Ministy of Education documents assessment evaluation.

Instructional Strategies and Adaptability	Learning in an environment that is safe, respectful and inclusive (community building should be ongoing). Program Planning and Equity and Inclusion and CRP Teachers should adapt the lessons based on the needs of the students in their class. Please refer to the document. Learning for All Transferable Skills
Additional Supporting Resources	Science and Technology Curriculum Ministry of Education, Ontario site for more information Fundamental Concepts and "Big Ideas" in Science and Technology Exploring ecosystems in extreme climate condition Polar Quest 2 challenge: Technology in an extreme environment - Teaching Dossier - EducaPoles - International Polar Foundation's educational site Expo Science For Educators - Youth Science Canada | Sciences jeunesse Canada Free bilingual site about Canadian wildlife including invasive species and other habitat and biomes interesting material. (22) Hinterland Who's Who / Faune et flore du pays - YouTube Science North: Interactions in Ecosystems (scroll down to Interactions in Ecosystems Parts 1-5). Visual dictionary to help students visualize vocabulary English: IKONET.COM Exploring vertical agriculture for space ecosystems
Cross-Curricular Opportunities	**Language : Students will have to show communication skills when presenting their work.**

	- use speaking skills and strategies appropriately to communicate with different audiences for a variety of purposes
Future Opportunities / Next Steps	For those who finish faster than others, they should be encouraged to investigate coding like programming the Microbits to water the vivarium automatically when needed. https://makecode.microbit.org/# Students could explore the different biomes that are provided in Minecraft Education and compare the animals and plants of those different biomes. Students can explore STEM careers from Let's Talk Science. Students may want to organize a Science Fair within the school or for a larger audience (in the town's library or spring feast events)

Appendix A: The Flooding of Chenail Island of Hawkesbury - Student Handout, Answer Key and Photos

The Flooding of Chenail Island of Hawkesbury

The construction of the Carillon Canal Lock and its hydroelectric generating station permanently flooded some land in the Town of Hawkesbury, Ontario. This town is about 30 kilometers west of the town of Carillon. Examine two aerial maps of the Hawkesbury area, one from the year 1945 and the other from the year 1975. What do you notice? Compare what the town of Hawkesbury was like in 1945 with what it became in 1975 by writing your observations in the table below. When you're done, return the picture to your teacher.

Aerial photos of Hawkesbury in 1945 and 1975 Observing changes	
1945	**1975**

The Flooding of Chenail Island of Hawkesbury - Answer Key

The construction of the Carillon Canal Lock and its hydroelectric generating station permanently flooded some land in the Town of Hawkesbury, Ontario. This town is about 30 kilometers west of the town of Carillon. Examine two aerial maps of the Hawkesbury area, one from the year 1945 and the other from the year 1975. What do you notice? Compare what the town of Hawkesbury was like in 1945 with what it became in 1975 by writing your observations in the table below. When you're done, return the picture to your teacher.

Possible answers:

Aerial photos of Hawkesbury in 1945 and 1975 Observing changes	
1945	**1975**
There are two bridges.	There is one bridge.
The islands are bigger.	The islands are much smaller.
To the right, the properties are far from the shore.	To the right, the properties are on the edge of the shore.
There are fewer roads.	There are more roads.
On the left, there is water entering the land.	There is not really any water entering the land.
The islands have a lot of vegetation.	The islands seem bare.
There are rapids in several places in the river.	There are no rapids in the river.

…	…

What happened to the River?

Hawkesbury 1945:

What happened to the River?

Hawkesbury 1975:

Appendix B: The Debate on Environmental Issues - Notes for Teachers

The debate on environmental issues

Notes for teachers

Use the government site as it is constantly updated.
https://agriculture.canada.ca/en/canadas-agriculture-sectors/food-processing-industry/trends-and-market-analysis-food-processing-industry/emerging-food-products-processes-and-technologies-2020-2021

Before we begin the research for the debate:

- make sure you have read the article on the website so that you can explain the words that would be difficult for your students to understand.
- make sure to make accommodations for students with very high needs. For example: Find 2 arguments instead of 4 for the debate.
- enable the use of assistive technology for students in need of support

Focus on the 4 themes only

- Theme 1: Enhance Nutrition and Health Claims
- Theme 2: New Processing and Production Technologies
- Theme 3: Food Packaging
- Theme 4: Enhance Food Safety Technologies

Summary

Agriculture and Agri-Food Canada's (AAFC's) Food Industry Division (FID) periodically conducts a review of emerging trends and technologies in the sector. With a focus on emerging products, processes and technologies slated to hit the market in the next 3-5 years, particular consideration is given to those which could pose a challenge to Canada's current regulatory framework. This work is done in order for agri-food stakeholders to better manage their entry into the marketplace and for regulators to proactively anticipate their needs.

Appendix C: The Debate on Environmental Issues - Student Activity Guide

The debate on environmental issues

Team member names

Project proposal *(The team chooses only one of the projects.)*

Against or Not?

Theme 1: Improved nutrition and health claims

1.1 Innovation in meat proteins and alternatives. Example: Growing meat proteins in the lab

1.2 Functional foods/fortified foods with health benefits. Example: Adding protein to milk or cheese.

1.3 Personalized nutrition by genetic characterization. Example: Bloodtype B should not eat chicken.

1.4 Application of bioactive compounds to foods. Example: Adding probiotics to yogurts.

Theme 2: New production and processing technologies

2.1 Effective extraction and reuse of food by-products. Examples: Extracting proteins from insect exoskeletons.

2.3 Food Preservation Technologies. Example: Refrigerated truck to transport vegetables over long distances.

2.4 Phage technology and development of antibacterial products.

Theme 3: Food Packaging

3.1 Biodegradable packaging materials. Example: Cardboard packaging made from corn's leaves.

3.2 Packaging to improve traceability, shelf life and food safety. Example: Include a

microchip to track the product.

3.3 Anti-tampering packaging.

Theme 4: Improved Food Safety Technologies

4.1 Technologies that reduce contamination throughout the supply chain

4.2 Optimizing available data to create AI

4.3 Transparent processes that increase consumer confidence

4.4 Production practices of protective equipment and the sanitary food chain. Example: Have more UV filter in the pipes that carries liquids to be consumed.

☐ Other Specify your choice: ____

Role and Position *Choices (Each team member can only place their name in one box to define their role and position. There cannot be two people playing* the same role *and defending the same position. There will only be 3 occupied squares.)*

	Environmental position	**Economic position**	**Civic position**
Role of the entrepreneur			
Role of the citizen residing in the community			
Role of the mayor of the community			

Statement of position on the project *(for or against)* **and list of arguments**

Student Name:	Student Name:	Student Name:
❑ for ❑ against	❑ for ❑ against	❑ for ❑ against
– – …	– – …	– – …
Compromises and solutions		
Final team decision		

Appendix D: Scientific Skills and Processes: The Debate Rubric

Name:

Scientific Skills and Processes: The Debate

	Level 1	Level 2	Level 3	Level 4
Knowledge and understanding				
Knowledge of the topic being discussed	The student demonstrates **limited knowledge** of the subject under discussion.	The student demonstrates **a partial knowledge** of the subject under discussion.	The student demonstrates **a good knowledge** of the subject under discussion.	The student demonstrates **a thorough knowledge** of the subject under discussion.
Understanding of the topic under discussion	The student demonstrates **a limited understanding** of the topic under discussion.	The student demonstrates **a partial knowledge** of the subject under discussion.	The student demonstrates **a good knowledge** of the subject under discussion.	The student demonstrates **a thorough knowledge** of the subject under discussion.
Thinking skills				
Using critical thinking and creative thinking processes in debate	The student uses the processes of critical thinking and creative thinking **with limited effectiveness**.	The student uses the processes of critical thinking and creative thinking **with some efficiency**.	The student uses the processes of critical thinking and creative thinking **effectively**.	The student uses the processes of critical thinking and creative thinking **with great efficiency**.
Communication				
Expression and organization of ideas and information	The student expresses and organizes ideas and information **with limited efficiency**.	The student expresses and organizes ideas and information **with some efficiency**.	The student expresses and organizes ideas and information **effectively**.	The student expresses and organizes ideas and information **very effectively**.
Use of conventions and terminology under consideration	The student uses the conventions and terminology under study **with limited effectiveness**.	The student uses the conventions and terminology under study **with some efficiency**.	The student uses the conventions and terminology under study **effectively**.	The student uses the conventions and terminology under study **with great efficiency**.
Implementation				
Transfer of knowledge and skills to new contexts	The student transfers knowledge and skills to new contexts **with limited effectiveness**.	The student transfers knowledge and skills to new contexts **with some efficiency**.	The student transfers knowledge and skills to new contexts **effectively**.	The student transfers knowledge and skills to new contexts **with great efficiency**.