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

Experience 1: Build and Test a Vivarium

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	This experience includes a Minds On activity and making and testing a vivarium.

	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. **A1.2** Ecosystem inquiry project - students design and build two mini "ecosystems" (e.g. grass seed, bean plant, etc.) and explore how a "human factor" (e.g. oil, soap, road salt, pesticides, etc.) affects the quality of the ecosystem. Support all students by providing scaffolded templates for the creation of these models. Some students may need to identify components of their local ecosystem, while others might be able to conduct independent

	A1.4 Demonstrate understanding of hand tools, machines, and D&T room safety protocols. Reinforce these safety protocols through spoken, written, and visual reminders to support all students in their understanding.  **A2.1** write and execute code in investigations and when modelling concepts, with a focus on automating large systems in action
Overview / Big Ideas/Fundamental Concepts	**Overview** Students will learn about interaction (action and reaction) through a series of experiments that help them see the impact of humans on ecosystems. They will use their observational and communication skills to identify short term and long term effects on living things. Through the use of coding skills, they could create humidity control devices and temperature reading devices for their vivarium. Students will also think critically about how the quality of water can cause the loss of biodiversity and can affect people differently based on their locations on the planet. **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) **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, A1.2**  **A1.2, A1.4**	Curiosity and Wonder in Science and Technology **Minds On** (30 to 50 minutes) **Outdoor Explorers** Students will make an inventory of biotic and abiotic elements in a quadrilateral with specific dimensions. They will have samples to pick up to document their work. Upon their return, research will show that the elements of their census are ecologically linked by interactions between species and soil type. The evaluation criteria will be co-constructed with the students according to the mode of presentation. There are grid templates available in our folder. See Appendix A: Outdoor Excursion for the Student Activity Guide. **If the course is online**: students will do a “show and tell" of the outdoor trip. **If the course is face-to-face**: it could be a gallery walk of the outdoor trip. **Experience 1** (30 to 40 minutes for set up, then 5 to 8 minutes maintenance bi-weekly) **Vivarium**

A2.1	The big idea is to achieve a mini autonomous ecosystem in a transparent container. The construction of the vivarium is mostly done by the students, the teacher only makes suggestions. Using samples collected on the outdoor trip, students will build 2 vivariums. See Appendix B: Instructions for Building a Vivarium for further details. The vivarium should have one marked as a reference item and one marked as the experimental item. These vivariums should be placed under the same conditions for a few days. That is to make sure they are similar before any experimental modifications are made. Once the autonomy of the vivarium is reached, students test the effects of pollution on some of the vivariums but one of them must serve as a control. The one marked as reference does not undergo change. See Appendix C: Human Impact Lab for details.. The evaluation criteria will be co-constructed with the students according to the mode of presentation. See Appendix D: Create a Laboratory Assessment Grid. **Extension**: students could use Microbites coding to control the humidity of their Vivarium. This MakeCode site provides the information. **If the course is online**: Students could do a virtual vivarium using sandbox-style software like Minecraft or mBloc5. **If the course is face-to-face**: Students could make a vivarium in a classroom or in a common space style maker room.
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 the Minds On land sampling (for each team): ● 1 m ruler or measuring tape ● string and 4 pegs ● scissors and spoons ● ziplock bags for samples

	For Experience 1 (the vivarium) (for each team): ● transparent large plastic container with a holes in the lid ● samples from expeditions ● small gardening shovel and gloves ● earth, rocks any other component from your regions ● small or miniature plants ● microbits to control the humidity ● warms, snails other regional insects ● students may use an aquarium if available
Timeline and Preparation	Time required for preparation – **Minds On** (30 to 50 minutes) **Outdoor Explorers** **At least a week before starting the Vivarium**, ● Ask students to provide the 2 containers that will be needed. Could be an empty pot of mayonnaise or other transparent unbreakable jars. ● Make sure the permission letters to exit school have been signed by the parents or tutors. ● Gather all the material for the vivarium into the class or the maker space to save time and prevent accidents. **Experience 1** (30 to 40 minutes for set up, then 5 to 8 minutes maintenance bi-weekly) **Vivarium** Time can be extended based on student engagement/interest/driving questions/inquiry
Safety Considerations	● Review with students appropriate behavior when going outdoor ● Review with students the appropriate use of technology. ● Review safety procedures for using live insects and plants for the Vivarium activity. ● Students should be wearing goggles and gloves when creating the Vivarium ● Students should be under adult supervision when attending and observing their vivarium 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 Mind 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 **They will also have to use writing for some of the lab work.** **1**. generate, gather, and organize ideas and information to write for an intended purpose and audience; **2**. draft and revise their writing, using a variety of informational, literary, and graphic forms and stylistic elements appropriate for the purpose and audience; **3.** use editing, proofreading, and publishing skills and strategies, and knowledge of language conventions, to correct errors, refine expression, and present their work effectively; **Mathematics:** when coding for the humidity control in the vivarium. They will also need to master a few basics of the arithmetic operation when doing the ecological footprints. Students will also have to use DATA analysis for the ecological footprint and the infographic. **Geography**: All ecosystems vary from region to region. Therefore, take advantage of the teams covered in geography to guide students during their inquiry. **Arts :** This is mostly for the infographic activity because it has to respect seven criteria while being pleasing to the eyes of others.
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: Outdoor Excursion

Small Excursion

In this activity, your team will have to observe an area of about 2 by 2 square meters in the field near the schoolyard or in a park near your school. Try to include a tree. Just like we talked in the classroom about ecosystems, you will have to take 2 almost identical samples of soil in the square meters you have chosen. Put them in your experimental dish and wrap in plastic to avoid losing your sample and its components..

1. Make a sketch of the area you observed.

2. Describe all the biotic and abiotic elements that you have observed.

Biotic elements	Abiotic elements

3. Describe all the interactions between the species that you have observed.

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4. In a table, write down the population of each species you have observed. Add more lines if necessary.

Species	Population

5. Starting from the information you have written in your table, mount a diagram of your choice. You can use specialized software on the computer or do it on grid paper. You will have to present your data to the class group or to the teacher.

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6. Predict what would happen if certain elements in the ecosystem you observed were absent (e.g., if the sun were absent, the plants would die and the herbivores would no longer be able to feed).

Element absent	Consequences

7. Use your samples collected on your trip to build 2 vivariums (see Appendix C: Vivarium Instructions). Your team should have one marked as a reference item and one marked as the experimental item. These vivariums should be placed under the same conditions for a few days. That is to make sure they are similar before you make any experimental modifications.

8. When your samples are stable, use the Human Impact Lab and design an experiment.

9. Self-assessment – My participation in the manufacture of vivarium

Making a vivarium required a certain degree of commitment. Check all statements that are true regarding your behavior during the activity.

- I used the equipment safely.
- I made sure to bury the roots of the plants.
- I watered the plants.
- I behaved well when hunting insects.
- I did not approach any harmful animals or plants.
- I made sure that the animals had something to eat in my vivarium.
- I made sure to close the lid of the vivarium before bringing it into the classroom.
- I washed my hands after the activity.

Write down your comments about your behavior in general.

If you've worked as a team, add comments about your level of collaboration for each of the following themes.

– task sharing:

– offer ideas:

– listen to suggestions:

– find compromises:

– the degree of participation:

Appendix B: Instructions for Building a Vivarium

Guide – Vivarium

Task

You have to design a vivarium and make it using the materials you can get at school and at home. When it is finished, you will have to make sure to take good care of the biotic elements that will be there.

Hardware

- ❑ clear plastic container with a lid (Ce can be an empty **container of** prepared salad bought at the grocery store.)
- ❑ scissors
- ❑ metal **spoon**
- ❑ Metal butter **knife**
- ❑ large butterfly net
- ❑ watering can filled with water

Gait

1. Meet with your team members as indicated by your teacher or teacher.
2. Find the necessary equipment.
3. As a class group, go outside near a wooded area.
4. Using the spoon, place sand and soil at **the bottom of the** container.
5. Using the butter knife, cut a piece of lawn to plant in your vivarium.
6. Using the butter knife or spoon, uproot small plants to plant them in your vivarium.
7. Adds branches, fallen leaves and rocks to the vivarium.
8. Water the plants with a little water.
9. Make small holes in the plastic lid.
10. Using the butterfly net, go hunting for insects.
11. Delicately place in your vivarium the insects found.
12. Make sure the insects have enough food.

13. Close the vivarium by putting on the lid.

Security measures

– Make sure you don't cut yourself with scissors by piercing the plastic lid.

– Do not cut yourself with the butter knife by digging into the ground.

– Do not approach pests: bees, wasps, red ants, mosquitoes, spiders.

– Do not approach harmful plants: ragweed, poison ivy, thorny plants.

– Don't eat berries or mushrooms you find outside.

– Wash your hands thoroughly after the activity.

Appendix C: Human Impact Lab

EXPERIENCE

formative

Human Impact!

sciences

Problem:

When there is an accidental chemical truck spill, derailed trains containing fuel or oil spill by drowning boats, they are all dangerous to the existing ecosystem. Take for example on the beach, every animal turns oily, and they can hardly get out of water. Worst, birds can't fly away anymore or eat decently! Do plants have a sense of surviving the pollution? Choose a chemical or a polluting substance available and allowed in your school. Design an experiment to find out the impact on your vivarium.

Hypothesis :

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Material:

- _____
- _____
- _____
- _____
- _____
- _____

Procedure:

1. _____

   _____

2. _____

   _____

3. _____

   _____

4. _____
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5. _____
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6. _____
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7. _____
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Observations:

START DATE: _____ END DATE: _____

Time ____ Date: _____

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Time ___ Date: _____

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Time ___ Date: _____

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Time ___ Date: _____

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Observations : (Print more if needed)

Time ____ Date: _____

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Time ___ Date: _____

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Time ___ Date: _____

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Time ___ Date: _____

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Discussion : Answer the following questions.

1. What plant grew better or faster? How do you know?

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2. Which conditions or factors favored that plant?

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3. What would you change to make this experiment work better?

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4. What are the sources of errors for this experiment?

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Conclusion :

_____

_____

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References: Ontario Science Curriculum
Thecnoscience CFORP.
Science North

Appendix D: Create a Laboratory Assessment Grid

Create a laboratory

Name :_____

	Level 1	Level 2	Level 3	Level 4
Knowledge and understanding				
Understanding of the elements under study •Plan	The student demonstrates **a limited understanding** of the elements under study.	The student demonstrates **a partial understanding** of the elements under study.	The student demonstrates **a good understanding** of the elements under study.	The student demonstrates **a thorough understanding** of the elements under study.
Thinking skills				
Use of planning skills •Plan	The student uses planning skills **with limited effectiveness**.	The student uses planning skills **with some efficiency**.	The student uses planning skills **effectively**.	The student uses planning skills **very effectively**.
Use of critical thinking and creative thinking processes •Analyzes and interprets	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 •Realize and grade •Communication and teamwork	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 •Realize and grade	The student uses conventions and terminology in the study **with limited effectiveness**.	The student uses the conventions and terminology in the study **with some efficiency**.	The student uses conventions and terminology in the study **effectively**.	The student uses the conventions and terminology in the 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**.

•Analyzes and interprets				