Alberta High School Environmental Curriculum Links

Science 24

Developed by the
Alberta Council for Environmental Education

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ADVANCING ENVIRONMENTAL EDUCATION IN ALBERTA

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INTRODUCTION & BACKGROUND

The purpose of these documents is to empower Alberta educators to integrate environmental and climate education into their classrooms. Each subject area is enriched with guiding questions that align with the Alberta curriculum, creating meaningful connections to nature and place-based learning, Indigenous knowledge systems and perspectives, and climate change across all units. Additionally, these documents offer related resources and activities with links that educators can use to gain further knowledge and incorporate into their lessons.

The curriculum link documents were carefully developed in collaboration with practicing teachers and an Indigenous consultant to ensure they are both practical and culturally responsive. These educators brought their classroom experience and insights to the project, helping to shape content that is directly applicable and impactful for students. The inclusion of an Indigenous consultant ensured that Indigenous knowledge systems and perspectives were thoughtfully and accurately integrated, providing a well-rounded and respectful approach to environmental and climate education. This collaborative process resulted in resources that are both relevant and enriching for educators across Alberta.

For additional resources and support, educators are encouraged to explore the ACEE Resources Hub.

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A NOTE FOR LINKS TO INDIGENOUS KNOWLEDGE SYSTEMS AND PERSPECTIVES

CREATED IN COLLABORATION WITH KORI CZUY, PHD.
INDIGENOUS/RELATIONAL SCIENCE CONSULTANT

The suggestions made and the activities recommended have been reviewed and considered with deep conversation, relationality, time, and respect. Kori recognizes that educators are required to introduce, include, and expand upon Indigenous Knowledges in addition to global ones, but also acknowledges the challenges of introducing these concepts in a good way. Both within this guide and in teaching practice, Kori recommends the following:

- First focus on the knowledges of the Land you are teaching on and relate the topics/subject to those lands.
- This also allows for local connections to more easily be created. All knowledges are connected to a Land, and originate from humans being in deep relationship with those Lands.
- All Indigenous knowledges should be cited both orally and written. Reference the Knowledge Keeper/Elder as well as which land they are connected with.
- This ensures relationality and allows for continued connections to that Land. This type of citation, although it seems strange at first when speaking it, also allows for authenticity of knowledge and protocols.
- When possible, teach about concepts in context, outdoors. Make the learning tangible and inquiry based, experiencing phenomena in real-time when possible. This is essential to grounding learners to a greater understanding of place.
- Example: can you contextualize where water is sourced from by visiting the main source, or a feeder source?

Across the curriculum, there is language around commodification, extraction, and a lack of reciprocity and connection with the natural world. This continues to reinforce the idea that everything on Earth that is not human is for humans to use without consequence, rather than a gift that must be acknowledged. Some suggested alternate terms are as follows:

- Conservation --> finding balance
- Solutions --> responses to
- Preserving/ preservation --> balance of the natural world
- Preservation is nearly impossible to achieve in the natural world, like conservation
- Exist --> thrive
- New species --> non-native or human-introduced
- Protect --> sustain
- Products/ resources --> gifts
- Produced --> harvested
- Emulating --> learning
- Invented --> created or originated for people (especially if the “invention” was influenced from plant or animal knowledge)

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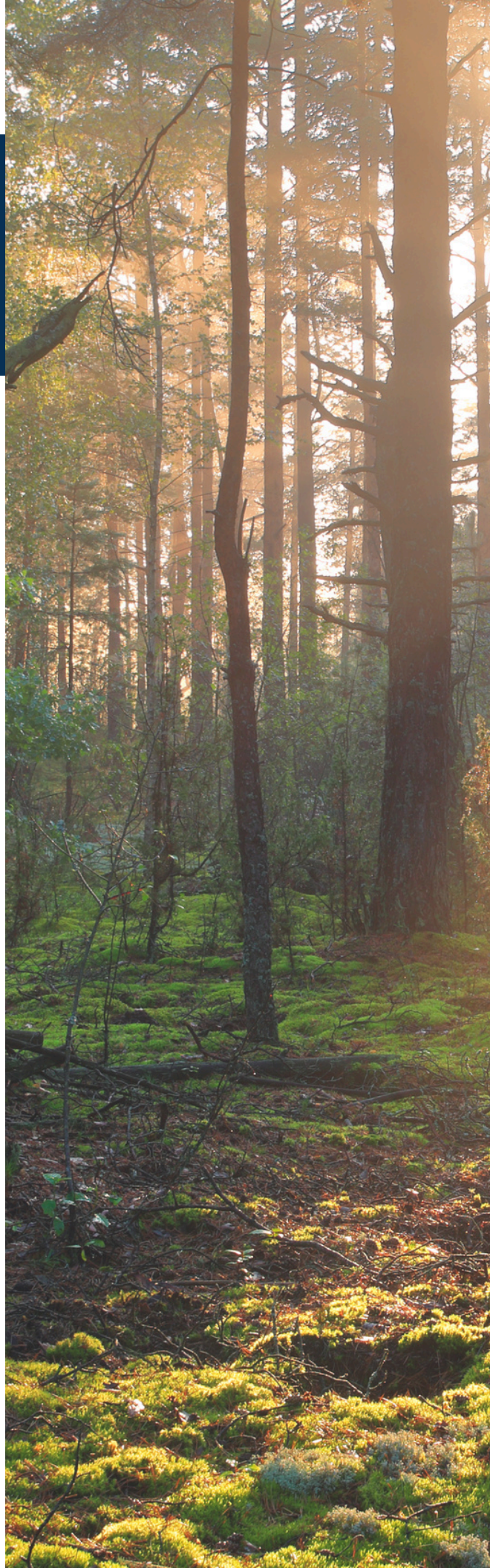

SCIENCE 24

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UNIT A

Application of Matter and Chemical Change

UNIT B

Understanding Common Energy Conversion Systems

UNIT C

Disease, Defence and Human Health

UNIT D

Motion, Change and Transportation Safety

SCIENCE 24: UNIT A

Applications of Matter and Chemical Change

Links to Nature & Place

1. Identify energy sources that use chemical reactions. Which of these are sustainable?
2. In what ways do decomposition reactions occur in nature?
3. How do chemicals inadvertently or intentionally enter the natural environment and become pollutants?
    a. What are the potential alternatives to these harmful substances?
4. What chemicals besides carbon dioxide impact the natural world?
    a. What are their effects on land, the air, and water?
5. How does the principle of conservation of mass apply to industrial processes like treating tailings ponds?
    a. How can understanding mass balance help create better ways to manage and protect the environment?

Links to Indigenous Knowledge Systems & Perspectives

1. What chemical reactions have been used by Indigenous Peoples? How have these processes evolved over time?
    a. Language often reflects the change that occurs. How do Indigenous languages reflect these changes?
    b. How are these teachings different in communities across Turtle Island?
2. How have Indigenous Peoples used chemical reactions to process hides? To preserve and process food? Which plants, animals, and trees taught this knowledge? (NOTE: To avoid pan-Indigenizing these teachings, it is strongly recommended to work with an Elder and/or knowledge keeper local to your community)

SCIENCE 24: UNIT A

Applications of Matter and Chemical Change

Climate Related Questions for Exploration

1. What are some examples of sustainable materials today, such as beeswax wraps and mushroom-based packaging?
    a. How have these materials replaced less sustainable alternatives?
2. How does upcycling help with environmental sustainability and resource conservation?
3. What are the major greenhouse gases, where do they come from, and how can we reduce their impact?
    a. What are the chemical formulas for the four main greenhouse gases?
4. How do alternative technologies contribute to the concept of drawdown?
    a. Use specific examples of alternative technologies and solutions to illustrate how they can help reduce greenhouse gas emissions and work towards achieving drawdown.

Resources & Activities

1. Canadian Geographic Climate Change Educator Resources
2. NASA Climate Change: Vital Signs of the Planet

SCIENCE 24: UNIT B

Understanding Common Energy Conversion Systems

Links to Nature & Place

1. How do green technologies convert, store, and use energy to create electricity? (Solar, hydro, wind, geothermal, etc.)
2. How do greenhouses use heat transfer to increase the growing season in Alberta?
3. How do plants convert solar energy?
4. What are the primary sources of energy production in Alberta? In Canada?
    a. How efficient is the collection of these energy sources?
    b. How efficient is the use of these energy sources?
5. How can we reduce energy consumption at home, school, and in our community?

Links to Indigenous Knowledge Systems & Perspectives

1. How do plants convert solar energy as a key part of their life cycle? How do people use the energy plants gift them? How can people give back to the plants?

SCIENCE 24: UNIT B

Understanding Common Energy Conversion Systems

Climate Related Questions for Exploration

1. In what ways can advancements in energy conversion technologies, such as improved battery storage or energy-efficient appliances, help reduce overall energy consumption and greenhouse gas emissions?
2. Discuss the role of energy efficiency in mitigating climate change. How do energy-efficient technologies and practices contribute to lowering carbon footprints and enhancing sustainability?
3. What are the potential environmental impacts of the materials and processes used to produce and dispose of energy conversion technologies, such as solar panels or wind turbine blades?
    a. How can these impacts be managed or mitigated?
4. Imagine Alberta has fully transitioned to renewable energy sources by 2050. Describe how this shift might transform the province in terms of its environment, economy, and daily life. Consider the impacts on air quality, greenhouse gas emissions, energy infrastructure, job creation, and community well-being. What challenges and opportunities might arise from this transition?

Resources & Activities

1. City of Calgary Solar Calculator
2. Inside Education Classroom Programs
3. Renewable Energy Backgrounder
4. Video: TED Ed: How much electricity does it take to power the world?

SCIENCE 24: UNIT C

Disease, Defence and Human Health

Links to Nature & Place

1. How have changes in environmental health affected human health?
    a. How is Alberta addressing environmental health concerns?
2. How can changes in climate and environment influence the spread of infectious diseases in Alberta? Provide examples of diseases that might become more prevalent due to changing environmental conditions.
    a. What strategies can be implemented in Alberta to enhance disease defence in the face of environmental changes?
3. Discuss the relationship between air quality and human health. How do pollutants from forest fires, fossil fuels and industrial activities impact respiratory diseases in Alberta?
    a. How does air pollution affect forests and wildlife?
    b. What changes can be made to improve public health outcomes?

Links to Indigenous Knowledge Systems & Perspectives

1. How does participation in ceremonies and connecting with the Land provide healing? How do people give back for these medicines?

SCIENCE 24: UNIT C

Disease, Defence and Human Health

Climate Related Questions for Exploration

1. How are the UN Sustainable Development Goals working to address human and environmental health?
2. How can urban planning and green infrastructure improve health outcomes in a changing climate?
3. What are the potential mental health impacts of climate change? Consider the effects of extreme weather events, displacement, and changes in the natural environment.
4. Evaluate the impact of agricultural practices on human health. How can sustainable farming methods contribute to both environmental health and the prevention of diseases related to pesticide use and food safety?

Resources & Activities

1. Alberta Capital Airshed Air Quality Educational Materials
2. Alberta Health Professionals for the Environment Patient Brochure
3. Alberta Health Services Environmental Public Health
4. Climate Atlas of Canada: Climate Change and Health Lesson
5. Edmonton & Area Land Trust Benefits of Nature
6. National Institute of Environmental Health Sciences: A Student Exploration of the Global Impacts of Climate Change on Human Health
7. R4R: Local Connections to Global Issues - Health
8. UN Sustainable Development Goals Explainers

SCIENCE 24: UNIT D

Motion, Change and Transportation Safety

Links to Nature & Place

1. Examine the concept of 'smart cities' and how advancements in transportation technology, such as autonomous vehicles and intelligent traffic management systems, can increase transportation safety while also reducing environmental impacts.
    a. What have different municipalities in Alberta done to advance their transportation technology?
2. What safety concerns are associated with electric and other alternative fuel-source vehicles, such as nuclear and bio-oil-powered vehicles?
    a. What are the safety and disposal concerns associated with the batteries used in electric vehicles, and how can these issues be addressed to minimize environmental impact and ensure safe handling?
3. How do our current transportation models affect the natural world? Consider aspects such as wildlife overpasses and underpasses, fencing, and efforts to rewild and redevelop infrastructure.
4. How can public transportation systems help increase safety and reduce the carbon footprint of urban areas in Alberta? Analyze the potential benefits and challenges of expanding public transit options.

SCIENCE 24: UNIT D

Motion, Change and Transportation Safety

Links to Indigenous Knowledge Systems & Perspectives

1. What types of travel did Indigenous Peoples use? How can everyone use Indigenous science and technology?
    a. Transportation varied across Turtle Island due to land and geography, in addition to the relationships with animals in various locations. How did the transportation vary because of this?
2. How was transportation originally sustainable throughout Turtle Island?

Climate Related Questions for Exploration

1. How do emissions from various modes of transportation, such as cars, trucks, and airplanes, impact air quality and contribute to climate change?
2. Analyze the environmental impact of constructing and maintaining transportation infrastructure, such as roads and highways. What sustainable practices can be adopted to minimize these impacts?
3. How can alternative energy sources and innovative transportation methods shape the future of vehicle design? Discuss the potential benefits and challenges of these advancements regarding safety, efficiency, environmental impact, and sustainability.

Resources & Activities

1. Edmonton Smart City and Calgary Smart City
2. Government of Alberta: Emerging Transportation Technologies
3. Government of Canada: Alternative Fuels for Transportation
4. Government of Canada: Zero-emission Vehicles
5. Public Transit Fact Sheet

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GET SUPPORT FROM ACEE

ACEE is committed to supporting teachers across Alberta by developing curriculum links between climate, sustainability, and our environment to the AB Programs of Study.

The ACEE team has specialized professional development offerings to enhance your classroom teaching experience. All workshops can be adapted to your location, desired length, and goals.

In addition to our workshops, the ACEE team offers personalized consultation services to help you integrate curriculum linked environmental education into your programs or classrooms.

To learn more:
abcee.org

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