Become an Earth Doctor (Upper) - Curriculum Connections

Suggested Grades: 5-12
Curriculum Connections: Earth Systems (Gr 5, 6), Living Systems (Gr 6), Interactions & Ecosystems (Gr 7), Plants for Food & Fibre (Gr 7), Freshwater & Saltwater Systems (Gr 8), Biodiversity (Gr 9), Environmental Chemistry (Gr 9), Energy and Matter in Chemical Change (Science 10), Changes in Living Systems (Science 20), Chemistry and the Environment (Science 30), Energy and the Environment (Science 30), Energy and Matter Exchange in the Biosphere (Biology 20), Ecosystems and Population Change (Biology 20),Thermochemical Changes (Chemistry 30)

Specific Learning Outcomes:

Grade 5

- *Earth Systems* - Students analyze climate and connect it to weather conditions and agricultural practices.

Grade 6

- *Earth Systems* - Students investigate climate, changes in climate, and the impact of climate change on Earth.
- *Living Systems* - Students investigate the characteristics and components of and interactions within ecosystems.

Grade 7

- *Interactions & Ecosystems* - Investigate and describe relationships between humans and their environments, and identify related issues and scientific questions; trace and interpret the flow of energy and materials within an ecosystem; describe the relationships among knowledge, decisions and actions in maintaining life-supporting environments.
- *Plants for Food & Fibre* - Investigate plant uses and identify links among needs, technologies, products and impacts; analyze plant environments, and identify impacts of specific factors and controls; identify and interpret relationships among human needs, technologies, environments, and the culture and use of living things as sources of food and fibre.

Grade 8

- *Freshwater & Saltwater Systems* - Analyze human impacts on aquatic systems, and identify the roles of science and technology in addressing related questions, problems and issues.

Grade 9

- *Biodiversity* - Identify impacts of human action on species survival and variation within species, and analyze related issues for personal and public decision making.
- *Environmental Chemistry* - Investigate and describe, in general terms, the role of different substances in the environment in supporting or harming humans and other living things; analyze and evaluate mechanisms affecting the distribution of potentially harmful substances within an environment.

Science 10

- *Energy & Matter in Chemical Change* - Identify chemical reactions that are significant in societies (decomposition of waste materials).

Science 20

- *Changes in Living Systems* - Describe the potential impact of habitat destruction on an ecosystem; explain that science and technology have both intended and unintended consequences for humans and the environment.

Biology 20

- *Energy and Matter Exchange in the Biosphere*
    - Discuss the influence of human activities on the biogeochemical cycling of phosphorus, sulfur, iron and nitrogen, e.g, feedlot operations, composting, fertilizer applications, waste and sewage disposal, vehicle and refinery emissions, acid deposition, persistent organic pollutants.
    - Discuss the use of water by society, the impact such use has on water quality and quantity in ecosystems, and the need for water purification and conservation, e.g., manufacturing and processing, petrochemical industry, agricultural systems, mining industry, domestic daily water consumption.
    - Analyze the relationship between heavy metals released into the environment and matter exchange in natural food chains/webs and analyze the impact of this relationship on quality of life.

    - Describe how human activities can have a disrupting influence on the balance in the biosphere of photosynthetic and cellular respiratory activities, e.g., fossil fuel combustion, forest destruction.
- *Ecosystems and Population Change*
    - Evaluate the impact that human activity has had, or could have, on the biodiversity in an ecosystem (e.g., wetlands management, land use, urbanization).
    - Research and develop a land reclamation strategy for a disturbed area, as a solution to environmental damage; e.g., open-pit mine, garbage dump, school yard reclamation (possible extension activity).

Science 30

- *Chemistry & the Environment*
    - Outline the chemical reactions (e.g., combustion reactions) that produce air pollutants (i.e., sulfur dioxide and nitrous oxides) that, when combined with water, ultimately result in acid deposition.
    - Describe impacts on the biotic and abiotic components of the environment caused by acid deposition; e.g., lowered pH in water systems, accelerated corrosion, metal leaching from bedrock, the impact of leached metals on plants and the food chain.
    - Identify organic compounds commonly considered to be environmental pollutants; i.e., hydrocarbons, organic waste, CFCs, polychlorinated biphenyls (PCBs), dioxins and furans.
    - Identify and explain how human activities and natural events contribute to the production of photochemical smog, the depletion of the ozone layer and increased concentrations of organic compounds in the environment; e.g., driving a car, use of CFCs, agricultural practices.
    - Explain how the introduction of environmental contaminants, i.e., herbicides, pesticides, dichlorodiphenyltrichloroethane (DDT), CFCs, SO2(g), CO2(g), particularly persistent organic pollutants (POPs), affects living systems globally
    - Describe technologies used to reduce the production and emission of chemical compounds that have the potential to harm the environment; e.g., activities related to internal combustion engines, smelting, pesticide production, sweetening of sour gas.
    - Describe alternatives to the use of chemical technologies; e.g., bioremediation for contaminated soil, biological controls for pests, biodegradable products.
- *Energy & the Environment* - Describe the environmental impact of developing and using various energy sources; i.e., conventional oil, oil sands, solar power, wind power, biomass, hydroelectricity, coal burning power, nuclear power, geothermal.

Chemistry 30

- *Thermochemical Changes* - Explain, in a general way, how stored energy in the chemical bonds of hydrocarbons originated from the sun.