Grades
K-10

SCIENCE CURRICULUM *Big Ideas* ***about*** *Science*

This is a support document only.
Please refer to the curriculum to fully understand the intent and context.

Strand D.
Nature of Science

Nature of Science (NOS) learning outcomes address how science itself works and are organized according to **four big ideas ABOUT science**.

The NOS dimension explores the essence of science itself. The four NOS big ideas categories of learning outcomes—**Purpose, Method, Application,** and **Implication**—address the rationale, processes, uses, and ethics of science. A good education in NOS is an essential component of a scientifically literate society. NOS learning outcomes are presented in parallel with other learning outcome types, span four grade bands, and increase in complexity through Kindergarten to Grade 10.

PURPOSE	METHOD	APPLICATION	IMPLICATION
Grades 3 to 6, Grades 7 to 9, Grades 10 to 12	Kindergarten to Grade 2, Grades 3 to 6, Grades 7 to 9, Grades 10 to 12	Kindergarten to Grade 2, Grades 3 to 6, Grades 7 to 9, Grades 10 to 12	Grades 3 to 6, Grades 7 to 9, Grades 10 to 12
Science is about finding the cause or causes of phenomena in the natural world.	**Scientific explanations, theories, and models are those that best fit the evidence available at a particular time.**	**The knowledge produced by science is used in engineering and technologies to create products and processes.**	**Applications of science often have ethical, environmental, social, economic, and political implications.**
Science is a search to explain and understand phenomena in the natural world. There is no single scientific method for doing this; the diversity of natural phenomena requires a diversity of methods and instruments to generate and test scientific explanations. Often an explanation is in terms of the factors that have to be present for an event to take place as shown by evidence from observations and experiments. In other cases, supporting evidence is based on correlations revealed by patterns in systematic observation.	A scientific theory or model representing relationships among variables of a natural phenomenon must fit the observations available at the time and lead to predictions that can be tested. Any theory or model is provisional and subject to revision in the light of new data even though it may have led to predictions in accord with data in the past.	The use of scientific ideas in technologies has made considerable changes in many aspects of human activity. Advances in technologies enable further scientific activity; in turn, this increases understanding of the natural world. In some areas of human activity, technology is ahead of scientific ideas, but in others, scientific ideas precede technology.	The use of scientific knowledge in technologies makes many innovations possible. Whether or not particular applications of science are desirable is a matter that cannot be addressed using scientific knowledge alone. Ethical and moral judgments may be needed, based on such considerations as justice or equity, human safety, and impacts on people and the environment.

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Strand E. Scientific Knowledge

Knowledge learning outcomes contain core science knowledge and are organized according to **10 big ideas OF science**.

Scientific knowledge is essential to science literacy. Scientific knowledge learning outcomes, organized by big ideas of science, build knowledge via a clear Kindergarten to Grade 10 progression. The learning outcomes are open-ended in nature, adding flexibility meant to empower teachers, and to enhance the accessibility of curricular content to learners.

MATTER

Kindergarten, Grade 1, Grade 2, Grade 3, Grade 5, Grade 7, Grade 8, Grade 9, Grade 10

All matter in the universe is made of very small particles.

Atoms are the building blocks of all matter, living and non-living. The behaviour and arrangement of the atoms explains the properties of different materials. In chemical reactions, atoms are rearranged to form new substances. Each atom has a nucleus containing neutrons and protons, surrounded by electrons. The opposite electric charges of protons and electrons attract each other, keeping atoms together and accounting for the formation of some compounds.

FIELDS

Grade 3, Grade 4, Grade 7, Grade 8

Objects can affect other objects at a distance.

All objects have an effect on other objects without being in contact with them. In some cases, the effect travels out from the source to the receiver in the form of radiation (e.g., visible light). In other cases, action at a distance is explained in terms of the existence of a field of influence, such as a magnetic, an electric, or a gravitational field. Gravity is a universal attraction between all objects however large or small, keeping the planets in orbit round the Sun and causing terrestrial objects to fall toward the centre of Earth.

FORCE

Grade 3, Grade 5, Grade 6, Grade 10

Changing the movement of an object requires a net force to be acting on it.

A force acting on an object is not perceived directly but is detected by its effect on the object's motion or shape. If an object is not moving, the forces acting on it are equal in size and opposite in direction, balancing each other. Since gravity affects all objects on Earth, there is always another force opposing gravity when an object is at rest. Unbalanced forces cause change in movement in the direction of the net force. When opposing forces acting on an object are not in the same line they cause the object to turn or twist. This effect is used in some simple machines.

ENERGY

Grade 1, Grade 4, Grade 6, Grade 7, Grade 8, Grade 9

The total amount of energy in the universe is always the same but can be transferred from one energy store to another during an event.

Many processes or events involve changes and require an energy source to make them happen. Energy can be transferred from one body or group of bodies to another in various ways. In these processes, some energy becomes less easy to use. Energy cannot be created or destroyed. Once energy has been released by burning a fossil fuel with oxygen, some of it is no longer in a form that is as convenient to use.

EARTH SCIENCE

Grade 2, Grade 4, Grade 5, Grade 8, Grade 10

The composition of Earth and its atmosphere and the processes occurring within them shape Earth's surface and its climate.

Radiation from the Sun heats Earth's surface and causes convection currents in the air and oceans, creating climates. Below the surface, heat from Earth's interior causes movement in the molten rock. This in turn leads to movement in the plates which form Earth's crust, creating volcanoes and earthquakes. The solid surface is constantly changing through the formation and weathering of rock.

SPACE SCIENCE

Kindergarten, Grade 1, Grade 6, Grade 7, Grade 10

Our Solar System is a very small part of one of billions of galaxies in the universe.

Our Sun and eight planets and other smaller objects orbiting it comprise the Solar System. Day and night and the seasons are explained by the orientation and rotation of Earth as it moves around the Sun. The Solar System is part of a galaxy of stars, gas, and dust, one of many billions in the universe, enormous distances apart. Many stars appear to have planets.

LIFE SCIENCE

Kindergarten, Grade 3, Grade 5, Grade 8

Organisms are organized on a cellular basis and have a finite life span.

All organisms are made of one or more cells. Multicellular organisms have cells that are differentiated according to their function. All the basic functions of life are the result of what happens inside the cells that make up an organism. Growth is the result of multiple cell divisions.

LIFE SYSTEMS

Grade 1, Grade 2, Grade 4, Grade 7, Grade 10

Organisms require a supply of energy and materials for which they often depend on, or compete with, other organisms.

Food provides materials and energy for organisms to carry out the basic functions of life and to grow. Green plants and some bacteria are able to use energy from the Sun to generate complex food molecules. Animals obtain energy by breaking down complex food molecules and are ultimately dependent on green plants as their source of energy. In any ecosystem there is competition among species for the energy resources and the materials they need in order to live and reproduce.

GENETICS

Grade 2, Grade 6, Grade 9

Genetic information is passed down from one generation of organisms to another.

Genetic information in a cell is held in the chemical DNA. Genes determine the development and structure of organisms. In asexual reproduction, all the genes in the offspring come from one parent. In sexual reproduction, half of the genes come from each parent.

EVOLUTION

Grade 1, Grade 3, Grade 6, Grade 9, Grade 10

The diversity of organisms, living and extinct, is the result of evolution.

Biological evolution refers to the scientific theory that living things share ancestors from which they have diverged; it is sometimes called "descent with modification." Biological evolution also encompasses a range of mechanisms that cause populations to change and diverge over time, and include natural selection, migration, and genetic drift.

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