The practices of science and technological design support students in acquiring a better understanding of how scientific knowledge is produced and how solutions to practical problems are designed. Students engaging in scientific inquiry and design activities simultaneously use knowledge, skills, and attitudes, which deepens their understanding of concepts and provides exposure to the many approaches that are used in science and technology.

These practices are outlined in detail in *Kindergarten to Grade 4 Science: Manitoba Curriculum Framework of Outcomes*.

### SCIENTIFIC INQUIRY
- Asking Questions and Making Predictions
- Planning and Carrying Out Investigations
- Analyzing and Interpreting Data
- Obtaining, Evaluating, and Communicating Information

### DESIGN PROCESS
- Identifying and Defining Practical Problems
- Researching, Planning, and Choosing a Solution
- Constructing and Testing the Model or Prototype
- Evaluating and Optimizing the Solution

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**Science Practices Cluster 0 Outcomes**

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**Characteristics and Needs of Living Things**

- Needs of living things
  01 07 08 09 10 11 12
- Characteristics and behaviours of living things
  01 02 03 04 05 06 15
- Protection of the environment and of living things
  01 10 11 12 13 14

**The Senses**

- Role of the senses
  01 03 07 11 12 14 15
- Parts of the body involved with senses
  01 02 05 06 08 09
- Protection for our senses
  01 04 07 10 13 15

**Characteristics of Objects and Materials**

- Objects and materials
  01 02 03 05 08
- Characteristics of materials
  01 05 06 07
- Construction of objects by combining, joining, and shaping materials
  01 03 04 06 09 10 11

**Daily and Seasonal Changes**

- The Sun as a source of light and heat
  01 02 03 05 06 07
- Cycles and changes in our environment
  01 03 06 07 09
- Effects of daily and seasonal changes on living things
  01 04 08 10 11 12 13 14 15 16 17

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This *Grade 1 Science at a Glance* can be used in designing, planning, and assessing student learning for the year. It can be used as a planning tool to preview the content of the *Grade 1 Science curriculum*. It is organized by clusters and sorts learning outcomes into big ideas. The clusters are the context in which students develop knowledge and understanding of important ideas in science while actively engaging in science and technology practices, deepening their understanding of concepts as they experience how science is actually done.

This document can be used with the *Grade 1 Science Curriculum Overview* to plan clear and concise expectations for student learning. It can also be used to connect learning by making links to other subject areas.
Identifying and Defining Practical Problems

- Recognize a practical problem that can be solved through a simple design.
- With the class, specify limited criteria based on function that a possible solution must meet.

Researching, Planning, and Choosing a Solution

- Brainstorm, with the class, possible solutions to a practical problem and reach consensus on a possible solution.
- With the class, create a plan to solve the problem or meet the need, including steps to follow.

Constructing and Testing the Model or Prototype

- Construct an object or device to solve the problem or meet the need.
- With guidance, test the object or device with respect to the criteria.

Evaluating and Optimizing the Solution

- Identify and make improvements to the object or device with respect to the criteria.
- Propose and evaluate the solution to the initial problem.

Asking Questions and Making Predictions

- Ask questions that can be investigated.
- Make predictions based on classroom experiences.

Planning and Carrying Out Investigations

- Follow directions during explorations.
- Safely use tools and equipment.
- Make observations using senses, and record them using drawings and/or tally charts.

Analyzing and Interpreting Data

- Visually represent data using concrete-object graphs and pictographs (1:1 correspondence).
- Compare data and ask questions about data.
- Propose an answer to the question based on observations.

Obtaining, Evaluating, and Communicating Information

- Describe what was done and what was observed orally, in pictures, or with materials.
- Recognize that learning can come from careful observations.
- Access information from a variety of sources and recognize when it answers the questions asked.
### Science Practices

#### Scientific Inquiry

**Asking Questions and Making Predictions**
Science inquiry begins with a child’s sense of wonder about the world. Asking questions stimulates curiosity, promotes the development of ideas, promotes discussion, helps clarify concepts, and can lead to a deeper understanding of a concept. As students progress across the grades, their questions should become more relevant, focused, and sophisticated, which requires teaching effective questioning strategies and giving students opportunities to ask and refine their questions. Making predictions is also an important part of science inquiry. Using prior knowledge, observations, and reasoning, students develop ideas to predict possible answers to questions, rather than simply making random guesses.

#### Planning and Carrying Out Investigations
Throughout their schooling, students are expected to plan and carry out, with appropriate levels of support, investigations in the field or laboratory, working collaboratively as well as individually; investigations gradually become more systematic and require clarifying what counts as data and identifying variables that could affect an investigation. The data and observations that are collected are used to test existing understandings, revise them, or develop new understandings.

#### Analyzing and Interpreting Data
Student investigations produce data that must be displayed and analyzed in order to derive meaning. Because patterns and trends in data are not always obvious, a range of tools including tables, graphical representations, and visualizations are used to identify significant features and patterns in the data and to interpret the results of the investigation.

#### Obtaining, Evaluating, and Communicating Information
Students engage with multiple sources to obtain information that is used to evaluate the merit and validity of their claims, methods, and investigation designs. They develop facility with communicating ideas and information and ideas can be done in multiple ways: using tables, diagrams, graphs, models, and equations, as well as orally, in writing, and through extended discussions.

For more information about scientific inquiry and student expectations across the grades, consult *Kindergarten to Grade 4 Science: A Foundation for Implementation*.

#### Design Process

**Identifying and Defining Practical Problems**
Technological problem solving involves identifying and defining problems that need to be solved. In order to define a problem, students identify the goals or criteria (what the solution needs to have) as well as constraints (limitations such as available tools and materials, time, dimensions, etc.).

**Research, Planning, and Choosing a Solution**
Research can be necessary to better understand a problem and to identify possible solutions. Students conduct their own research and consider multiple possible solutions to a given problem. They can then choose the best solution by comparing each possible solution against the criteria and constraints that have been identified.

**Constructing and Testing the Model or Prototype**
Engineering uses models and simulations to analyze and test solutions to a problem. Students develop a plan to construct and/or test a prototype or model against the criteria and constraints that were identified.

**Evaluating and Optimizing the Solution**
Optimizing the design solution involves a process in which solutions are systematically tested and refined and the final design is improved by trading off less important features for those that are more important.

For more information about the design process and student expectations across the grades, consult *Kindergarten to Grade 4 Science: A Foundation for Implementation*.