GRADE 7 SCIENCE *at a glance*

This ***Grade 7 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 7 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 7 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.

Science PRACTICES CLUSTER 0 OUTCOMES

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 both knowledge and skills, 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 *Grades 5 to 8 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/or Testing the Prototype or Consumer Product
- Evaluating and Optimizing the Solution

INTERACTIONS WITHIN ECOSYSTEMS

- **Ecosystems and their changes**
  01 02 03 04 05 06 07
  7-0-8d 8f 8g 9a 9b 9e 9f
- **The transfer of energy in ecosystems**
  01 08 09 10 11
- **The role of decomposers in ecosystems**
  01 12 13 14 15

PARTICLE THEORY OF MATTER

- **The particle theory of matter**
  01 03 04 05 06 13 14 15
  16 17 20 21 22 23
- **Temperature and energy transfer**
  01 02 07 08 09 10 11 12
- **Pure substances and mixtures**
  01 13 14 18 19
  7-0-8d

FORCES AND STRUCTURES

- **Internal and external forces**
  01 03 04 05 06 07 11 12
- **Shapes and components of structures**
  01 02 08 09 10 11 12

EARTH'S CRUST

- **Earth's structure**
  01 02 03 05
- **Erosion and weathering**
  01 04 09 10
- **Geological resource extraction and its impact**
  01 06 07 08 11 15
  7-0-8d 8e 8g 9e
- **Theories explaining continental movement and geological activity on Earth**
  01 12 13 14 15
  7-0-8b 9a 9b

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Curriculum Overview

REPORT CARD CATEGORIES

KNOWLEDGE AND UNDERSTANDING

Cluster 1 INTERACTIONS WITHIN ECOSYSTEMS

- Living things are dependent on their environmental interactions with other living things and with non-living factors; natural processes as well as human actions can have impacts on ecosystems.

  01 02 03 04 05 06 07
  7-0-8d 8f 8g 9a 9b 9e 9f

- Ecosystems are sustained by a continuous flow of energy, the main source of which is the Sun. Solar energy is transformed by producers into chemical energy through a process called photosynthesis. This energy is then transferred among producers, consumers, and decomposers.

  01 08 09 10 11

- Decomposers (which include micro-organisms) recycle organic matter from dead plant or animal matter and their waste products back into the environment.

  01 12 13 14 15

Cluster 2 PARTICLE THEORY OF MATTER

- Scientific theories provide explanations for observable phenomena; they become accepted by the scientific community when they are shown to be the best explanation for the phenomena. For example, many properties of matter can be explained using the particle theory of matter.

  01 03 04 05 06 13 14 15 16 17 20 21 22 23

- Temperature is a measure of the kinetic energy of particles in matter, while heat is the transfer of energy between objects due to the temperature difference between them.

  01 02 07 08 09 10 11 12

- Mixtures contain a combination of pure substances, which can be separated using a variety of techniques.

  01 13 14 18 19
  7-0-8d

Cluster 3 FORCES AND STRUCTURES

- Internal and external forces act on structures.

  01 03 04 05 06 07 11 12

- The shape of a structure and its components can increase its strength and stability.

  01 02 08 09 10 11 12

Cluster 4 EARTH'S CRUST

- Earth consists of a hot but solid inner core, a liquid outer core, a mantle, and a crust. The processes that occur within Earth and on Earth's surface form different types of rock.

  01 02 03 05

- Erosion and weathering cause changes in the landscape over time, breaking down rocks, soils, and sediments into smaller particles and moving them around.

  01 04 09 10

- Humans extract geological resources for many purposes including as sources of energy. All forms of resource extraction have economic, social, and environmental impacts.

  01 06 07 08 11 15
  7-0-8d 8e 8g 9e

- Scientific theories provide explanations for observable phenomena; they become accepted by the scientific community when they are shown to be the best explanation for the phenomena. For example, the theory of plate tectonics explains past and present geological processes on Earth (e.g., mountain formation, earthquakes, volcanoes, distribution of land and sea).

  01 12 13 14 15
  7-0-8b 9a 9b

SCIENTIFIC INQUIRY

Asking Questions and Making Predictions
1a 3a 9c

- Ask testable questions that lead to investigations.
- Make a prediction or hypothesis that identifies a cause and effect relationship between the dependent and independent variables.

Planning and Carrying Out Investigations
1b 3b 3c 4a 4c 4d 4e 4f 5a 5c 5d 5e 5f 9c

- Create a plan to answer a specific question.
- Identify independent and dependent variables, as well variables that should be held constant to ensure a fair test.
- Select and safely use tools to observe and measure.
- Make observations that are relevant, and record observations and data using an appropriate format.

Analyzing and Interpreting Data
6a 6b 6c 6f 7a 7b 7c 7h 9c 9d

- Represent data using appropriate graphs, and interpret and evaluate these and other graphs.
- Interpret patterns and trends in data, and infer and explain relationships.
- Draw a conclusion based on evidence that explains the results of the investigation and supports or rejects the prediction or hypothesis.
- Evaluate the methods used to answer a question, and identify potential applications of investigation results.

Obtaining, Evaluating, and Communicating Information
2a 2b 2c 7f 7g 8a 8b 8d 9c

- Communicate results and conclusions in a variety of ways.
- Distinguish between science and technology and describe how scientific knowledge and technologies have evolved over time.
- Access and review information from a variety of sources.

DESIGN PROCESS

Identifying and Defining Practical Problems
1c 3d 9c

- Identify and describe a practical problem that can be solved.
- Define the problem by developing criteria for evaluating a prototype or consumer product based on function, aesthetics, and efficiency, and by identifying constraints such as available materials, environmental considerations, time, or cost.

Researching, Planning, and Choosing a Solution
1d 2a 3e 7d 9c

- Identify various ways to solve a practical problem, and select and justify one to implement.
- Create a plan for the chosen solution, which includes materials, safety considerations, labelled diagrams, and steps to follow.

Constructing and/or Testing the Prototype or Consumer Product
4b 4c 4d 4e 5b 5c 9c 9d

- Construct a prototype.
- Test the prototype or consumer product with respect to the criteria and the constraints.

Evaluating and Optimizing the Solution
6d 6e 6f 7d 7e 9c

- Identify and make improvements to a prototype with respect to the criteria, and explain the rationale for changes.
- Evaluate the strength and weaknesses of a consumer product with respect to criteria.
- Propose and justify a solution to the initial problem.

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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 clearly and persuasively the method(s) used and the ideas generated. Critiquing and communicating ideas individually and in groups is a critical activity. Communicating 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 *Grades 5 to 8 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, cost, environmental impact, etc.).

At the Middle Years level, a second facet of the design process is introduced to students. The evaluation of consumer products does not involve the construction of a model or prototype, but rather simulates the decision-making process of a consumer when purchasing a product.

RESEARCH, PLANNING, AND CHOOSING A SOLUTION

Research can be necessary to better understand a problem and to identify possible solutions or to make the best choice. 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/OR TESTING THE PROTOTYPE OR CONSUMER PRODUCT

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 consumer product 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 or decision 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 *Grades 5 to 8 Science: A Foundation for Implementation*.

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