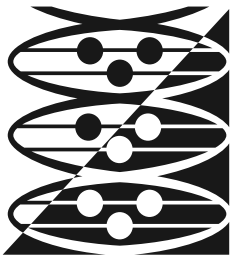

SCIENCE GRADE 5

From Integrated Resource Package 2005

BRITISH COLUMBIA
Ministry of Education

GBG 005

Acknowledgments

Many people contributed their expertise to this document. The Project Co-ordinators were Darlene Monkman, Pierre Gilbert, and Wael Afifi of the Ministry of Education, working with other ministry personnel and our partners in education. Important contributions were made by the Aboriginal Education Branch and Aboriginal Working Group. We would like to thank all who participated in this process, including members of the various focus groups that reviewed early drafts.

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This Integrated Resource Package (IRP) provides basic information teachers will require in order to implement Science K to 7. This document supersedes the *Science Kindergarten to Grade 7 Integrated Resource Package 1995.*

This IRP has been modified from the 1995 version in the following ways:

- fewer topics and thus fewer prescribed learning outcomes per grade level
- separation of the prescribed learning outcomes for Kindergarten, Grade 1, Grade 2, and Grade 3
- integration of science processes through all grades
- addition of Key Elements and Achievement Indicators
- improved support for planning and assessment
- alignment with the Pan-Canadian Common Framework of Science Learning Outcomes, 1997 (Council of Ministers of Education, Canada, http://cmec.ca/science/framework/)
- integration of Aboriginal content in the prescribed learning outcomes
- integration of Information and Communication Technology in the prescribed learning outcomes.

A variety of resources were used in the development of this IRP:

- British Columbia Science Kindergarten to Grade 7 IRP (1995)
- Pan-Canadian Common Framework of Science Learning Outcomes (1997), Council of Ministers of Education, Canada (http://cmec.ca/science/framework/)
- Science Curriculum Review Report (2001) http://www.bced.gov.bc.ca/branches/pser/whatsnew.htm#scrr
- Provincial science curricula
  - APEF (Atlantic Provinces Education Foundation)
  - Ontario
  - Manitoba
  - Alberta
- *Content Knowledge: A Compendium of Standards and Benchmarks for K-12 Education*, 3rd Edition (2000), Kendall, J. S. & Marzano, R.J. (http://www.mcrel.org/standards-benchmarks)
- *Atlas of Science Literacy* (2001), American Association for the Advancement of Science, Project 2061, National Science Teachers Association, Washington DC
- *Designs for Science Literacy* (2000), American Association for the Advancement of Science, Project 2061, National Science Teachers Association, Washington DC
- *Elementary Science Reference Cards*, David Penner, Gilbert Smith. BCTF Lesson Aide (1987)
- *Science K to 7 & Multi-graded Classrooms: A Supplement to the Science K to 7 Curriculum* (1997), Year A. Susan Martin, BCTF Lesson Aide.
- *Science K to 7 & Multi-Graded Classrooms – A Supplement to the Science K to 7 Curriculum* (1997), Year B. Susan Martin, BCTF Lesson Aide
- *Shared Learnings* (1998), Aboriginal Education Initiative, British Columbia Ministry of Education

> The information contained in this document is also available on the Internet at http://www.bced.gov.bc.ca/irp/irp.htm

The following paragraphs provide brief descriptions of the components of the IRP.

INTRODUCTION TO SCIENCE K TO 7

The Introduction provides general information about Science K to 7, including special features and requirements. It also provides a rationale for teaching Science K to 7 in BC schools, and specific considerations for program delivery.

This section also contains more specific information about the curriculum to guide educators in planning their program. Included are:

- a graphic overview of the course content
- curriculum organizers (and suborganizers as appropriate)—groupings for prescribed learning outcomes that share a common focus
- suggested timeframe for each curriculum organizer

PRESCRIBED LEARNING OUTCOMES

This section contains the prescribed learning outcomes, which are content standards for the provincial education system; they are the prescribed curriculum. They set out the required attitudes, skills, and knowledge—what students are expected to know and be able to do—for each subject and grade. Learning outcomes are clearly stated and expressed in measurable terms. All learning outcomes complete the stem, "It is expected that students will ...." In this section, prescribed learning outcomes are presented both by organizer and by grade.

STUDENT ACHIEVEMENT

This section restates the prescribed learning outcomes, along with information about classroom assessment and measuring student achievement, including sets of specific achievement indicators for each prescribed learning outcome. Achievement indicators are statements that describe what students should be able to do in order to demonstrate that they fully meet the curriculum expectations for the subject and grade level. Achievement indicators are not mandatory; they are provided to assist teachers in assessing how well their students achieve the prescribed learning outcomes.

This section further includes key elements, which provide guidance for teachers regarding the expected depth and breadth of the prescribed learning outcomes, including vocabulary, knowledge, and skills and attitudes.

CLASSROOM ASSESSMENT MODEL

This section contains a series of classroom units that address clusters of learning outcomes organized by topic or theme. The units have been developed by BC teachers, and are provided to support classroom assessment. These units are suggestions only—teachers may use or modify the units to assist them as they plan for the implementation of this curriculum.

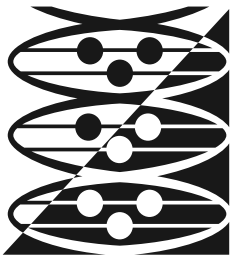
Each unit includes the prescribed learning outcomes, suggested achievement indicators, key elements, a suggested timeframe, a sequence of suggested instruction and assessment activities, recommended learning resources, selected relevant web sites, and sample assessment instruments.

LEARNING RESOURCES

This section contains general information on learning resources, and provides the titles, descriptions, and ordering information for the recommended learning resources in the Science K to 7 Grade Collection.

GLOSSARY

The glossary defines terms used in this Integrated Resource Package.



INTRODUCTION

This IRP sets out the provincially prescribed curriculum for science Kindergarten to grade 7. The development of this IRP has been guided by the principles of learning:

- Learning requires the active participation of the student.
- People learn in a variety of ways and at different rates.
- Learning is both an individual and a group process.

In addition to these three principles, this document recognizes that British Columbia's schools include young people of varied backgrounds, interests, abilities, and needs. Wherever appropriate for this curriculum, ways to meet these needs and to ensure equity and access for all learners have been integrated as much as possible into the learning outcomes, achievement indicators, instructional activities, and assessment activities.

Curriculum Overview

Rationale

The British Columbia Ministry of Education supports the statement that advancements in science and technology play a significant role in everyday life.

British Columbia also subscribes to the vision that all Canadian students, regardless of gender or cultural background, should have opportunities to develop scientific literacy.

Scientific literacy is an evolving combination of the science-related attitudes, skills, and knowledge students need to:

- develop inquiry, problem-solving, and decision-making abilities as citizens
- become lifelong learners
- maintain a sense of wonder about the world around them.

Diverse experiences in a Science program will provide students with many opportunities to understand their interrelationships among science, technology, and society that will affect their personal lives, their careers, and their future.

Goals for Scientific Literacy

These goals are in alignment with the four foundational statements from the Pan-Canadian Science Framework (Council of Ministers of Education, Canada, 1997) that delineate the four critical aspects of students' scientific literacy.

GOAL 1: Science, technology, society, and the environment (STSE)

Students will develop an understanding of the nature of science and technology, of the relationships between science and technology, and of the social and environmental contexts of science and technology.

GOAL 2: Skills

Students will develop the skills required for scientific and technological inquiry, for solving problems, for communicating scientific ideas and results, for working collaboratively, and for making informed decisions.

GOAL 3: Knowledge

Students will construct knowledge and understandings of concepts in life science, physical science, and Earth and space science, and apply these understandings to interpret, integrate, and extend their knowledge.

GOAL 4: Attitudes

Students will be encouraged to develop attitudes that support the responsible acquisition and application of scientific and technological knowledge to the mutual benefit of self, society, and the environment.

Curriculum Organizers

A curriculum organizer consists of a set of prescribed learning outcomes that share a common focus. The prescribed learning outcomes for Science K to 7 are grouped under the following curriculum organizers and suborganizers

- Processes of Science
- Life Science
- Physical Science
- Earth and Space Science

Processes of Science

Science, as a process, starts with students learning skills such as observing, classifying, predicting, inferring, and hypothesizing. It also includes scientific reasoning, critical thinking, and decision making. The combination of these skills within the science curriculum content enables students to develop their understanding of science. While these skills are not unique to science, they are important in the application of science to new situations.

There is no universal list of scientific process skills. Those identified in this curriculum are not intended to be a linear scope and sequence; instead, they suggest multiple ways in which learning science can be explored. At each grade level, two processes are introduced and then reinforced with the curriculum content in the subsequent grades; but teachers are expected to involve all of the skills their students are capable of using.

Teachers will know when the process skills are developmentally appropriate for their students. While this IRP has highlighted specific process skills for each grade, other skills could be actively developed and extended with students after the initial skills are introduced.

Process skills are best learned in hands-on activities where students engage in a problem-solving task while doing science. The hands-on model of learning science allows students to construct meaningful connections within the brain. In young children, process skills can be found in the natural practice of manipulating materials while asking questions and being curious. The names of the skills can be used and reinforced by teachers as students use and learn to apply these skills to science activities. The science process names will become familiar to students, enabling them to use the correct vocabulary when they explain their involvement in science and technology inquiries.

Life Science

This is the study of the diversity, continuity, interactions, and balance among organisms and their environments. By using the skills, processes, and attitudes of science, students extend their understanding of the living world and their place within it.

Physical Science

This is the study of matter and energy, and their interactions. By using the skills, processes, and attitudes of science, students build a foundation for their understanding of the physical world.

Earth and Space Science

This is the study of the universe and the structure of the Earth. By using the skills, processes, and attitudes of science, students develop an understanding of the forces, processes, and dynamic life-supporting qualities of the Earth.

Aboriginal Content in the Science Curriculum

The science curriculum guide integrates prescribed learning outcomes within a classroom model that includes instructional strategies, assessment tools and models that can help teachers provide all students with an understanding and appreciation of Aboriginal science. Integration of authentic Aboriginal content into the K to 7 science curriculum with the support of Aboriginal people will help promote understanding of BC's Aboriginal peoples among *all* students.

The incorporating of Aboriginal science with western science can provide a meaningful context for Aboriginal students and enhance the learning experience for all students. The inclusion of Aboriginal examples of science and technologies can make the subject more authentic, exciting, relevant and interesting for *all* students.

Numerous difficulties arise when trying to incorporate indigenous knowledge and world views into the western science classroom. The participants of the Ministry of Education Aboriginal Science meetings therefore suggest a model involving a parallel process, where Aboriginal and Western understandings exist separately, yet side-by-side and in partnership with one another. Each side is enriched by the contrasting perspective that the other brings to any discussion. Aboriginal peoples are calling for this type of relationship with Canadian schools in a

variety of settings (e.g., Ministry documents, science textbooks and curriculum materials, and teaching methods).

Traditional Ecological Knowledge and Wisdom (TEKW) is defined as the study of systems of knowledge developed by a given culture. It brings the concept of wisdom to our discussion of science and technology. TEKW tends to be holistic, viewing the world as an interconnected whole where humans are not regarded as more important than nature. It is a subset of traditional science, and is considered a branch of biological and ecological science. This knowledge with its characteristic respect for sustaining community and environment offers proven conceptual approaches which are becoming increasingly important to all BC residents.

Examples of TEKW science may be accessed through living elders and specialists of various kinds or found in the literature of TEKW, anthropology, ethnology, ecology, biology, botany, ethnobiology, medicine, horticulture, agriculture, astronomy, geology, climatology, architecture, navigation, nautical science, engineering, and mathematics.

Recognition of the importance of incorporating TEKW into environmental planning is evident in science-based reports and agreements in Canada and internationally. The Brundtland Commission report, *Our Common Future* (World Commission on Environment and Development, 1987), drew our attention to the contributions of traditional knowledge. In British Columbia, the report of the scientific panel for sustainable forest practices in Clayoquot Sound emphasizes TEKW and the importance of including indigenous knowledge in planning and managing traditional territories. The recognition of TEKW globally is explicitly addressed in international agreements including the Convention on Biological Diversity, Agenda 21, and UNCED '92, or the Earth Summit at Rio de Janeiro.

Organizing for Instruction and Assessment

Suggested Time Frame

The Kindergarten to Grade 12 Education Plan (1994) outlines the required areas of study for the primary and intermediate years and, as appropriate, indicates the recommended time allotments for each area of learning. In the primary years, teachers determine the time allotments for each required area of study and may choose to combine various curricula to enable students to integrate ideas and see applications of knowledge. Teachers are encouraged to exercise professional judgment when interpreting the suggested instructional time allotments provided here and in the Classroom Model units.

In grades 4 to 7, a minimum of 30% (285 hours/year, slightly more than 7 hours/week) of the total time in school is recommended for the study of science, mathematics, and technology. (see below).

The following chart shows the suggested estimated instructional time to deliver the prescribed learning outcomes for each Science curriculum organizer, Grade 1 to Grade 7. At the Kindergarten level, the suggested time is 50% of the amount outlined below for each organizer. These estimations have been provided as suggestions only; when delivering the prescribed curriculum, teachers will adjust the instructional time as necessary.

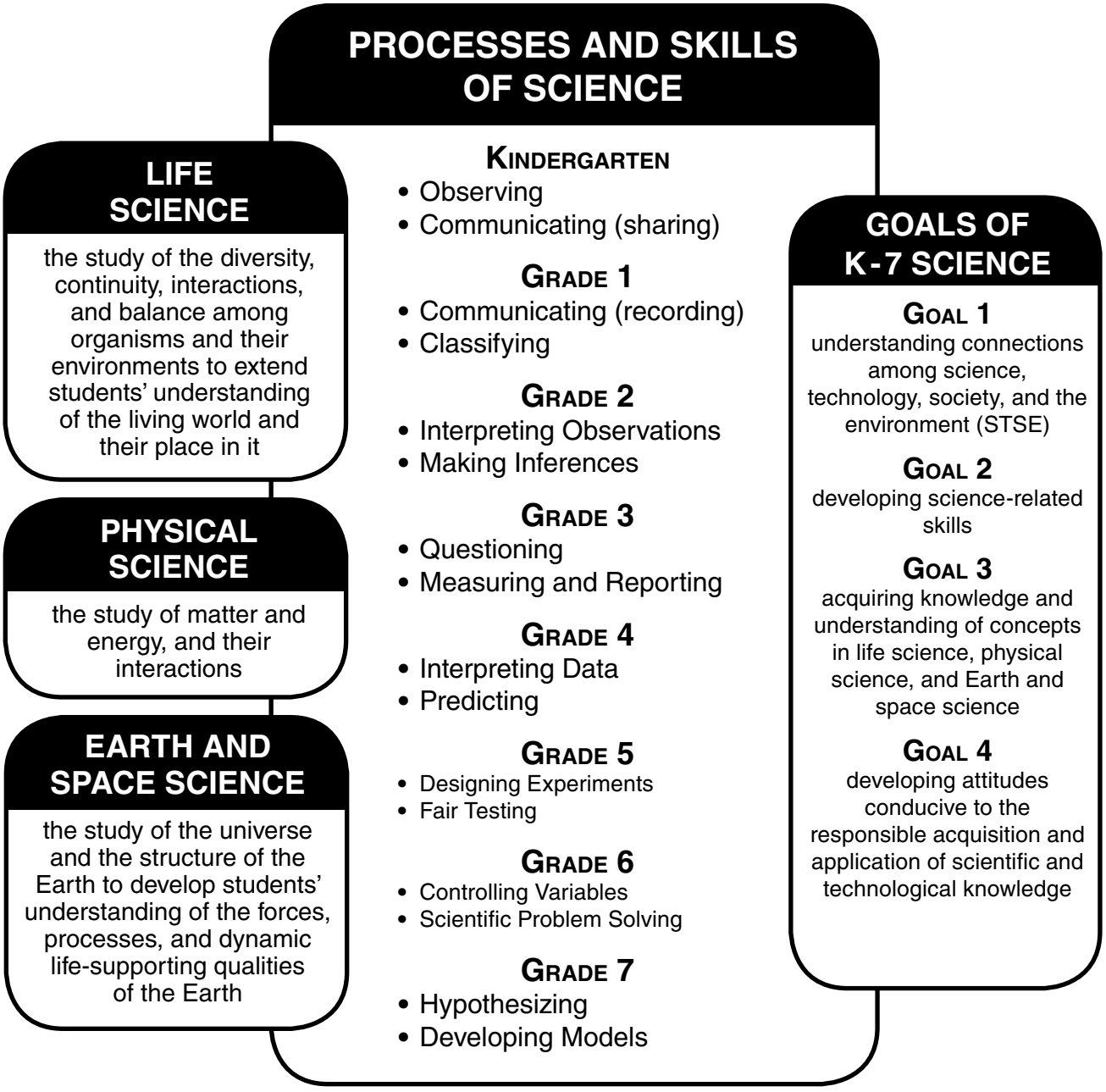
Curriculum Organizer	Suggested Time
Applications of Science	integrated with other organizers
Life Science	25-30 hours
Physical Science	25-30 hours
Earth and Space Science	25-30 hours

These estimated time allotments represent the amount of instructional time that has been recommended to meet the prescribed learning outcomes within each curriculum organizer. When delivering the prescribed curriculum, teachers may freely adjust the instructional time to meet their students' diverse needs. These estimated instructional times have been recommended by the IRP writers to assist their colleagues; they are suggestions only.

Science K to 7: Topics at a Glance

	Processes and Skills of Science	Life Science	Physical Science	Earth and Space Science
Kindergarten	• Observing • Communicating (sharing)	Characteristics of Living Things	Properties of Objects and Materials	Surroundings
Grade 1	• Communicating (recording) • Classifying	Needs of Living Things	Force and Motion	Daily and Seasonal Changes
Grade 2	• Interpreting Observations • Making Inferences	Animal Growth and Changes	Properties of Matter	Air, Water, and Soil
Grade 3	• Questioning • Measuring and Reporting	Plant Growth and Changes	Materials and Structures	Stars and Planets
Grade 4	• Interpreting Data • Predicting	Habitats and Communities	Light and Sound	Weather
Grade 5	• Designing Experiments • Fair Testing	Human Body	Forces and Simple Machines	Renewable and Non-Renewable Resources
Grade 6	• Controlling Variables • Scientific Problem Solving	Diversity of Life	Electricity	Exploration of Extreme Environments
Grade 7	• Hypothesizing • Developing Models	Ecosystems	Chemistry	Earth's Crust

GETTING THE MOST OUT OF THIS IRP



Considerations for Program Delivery

This section of the IRP contains additional information to help educators develop their school practices and plan their program delivery to meet the needs of all learners. Included in this section is information about:

- addressing local needs
- involving parents and guardians
- course requirements respecting beliefs
- establishing a positive classroom climate
- safety in the Science K to 7 classroom
- confidentiality
- inclusion, accessibility, and equity
- working with the school and community
- working with the Aboriginal community
- information and communications technology
- copyright.

Addressing Local Needs

The Science K to 7 curriculum includes opportunities for individual teacher and student choice in the exploration of topics to meet certain learning outcomes. This flexibility allows educators to plan their programs to meet the particular requirements of their students and to respond to local needs. It may be appropriate to allow for student input when selecting current and relevant topics.

Where specific topics have been included in the learning outcomes, the intent is for all students to have an opportunity to address these important issues. The inclusion of these topics is not intended to exclude any additional issues that may also be relevant for individual school communities.

Involving Parents and Guardians

The family is the primary educator in the development of students' attitudes and values. The school plays a supportive role by focussing on the prescribed learning outcomes in the Science K to 7 curriculum. Parents and guardians can support, enrich, and extend the curriculum at home.

It is highly recommended that schools inform parents and guardians about the Science K to 7 curriculum, and teachers (along with school and district administrators) may use various strategies to do so:

- Inform parents/guardians and students, via a course outline at the beginning of the course, of the prescribed learning outcomes for the course.
- Respond to parent and guardian requests to discuss course unit plans, learning resources, etc.

Course Requirements Respecting Beliefs

For many students and teachers, the study of some science concepts may lead to issues and questions that go beyond the immediate scope of curriculum (e.g., science is used to meet many industrial requirements, but industrial decision makers must consider factors other than scientific feasibility before adopting a particular process). The technological application of science in areas such as genetic engineering, human reproduction, and medical technology raises questions of ethics and values. Because these social questions arise, in part, from capabilities that science makes possible, they should be addressed. It must be made clear to students, however, that science only provides the background for what is hoped will be informed personal and social decisions. Teachers must handle these questions objectively and with sensitivity.

Reconciling scientific discoveries (for example, in genetic engineering) and religious faith poses a particular challenge for some students. While respecting the personal beliefs of students, teachers should be careful to distinguish between knowledge based on the application of scientific methods, and religious teachings and associated beliefs such as creationism, theory of divine creation, or intelligent-design theory.

Establishing a Positive Classroom Climate

Teachers are responsible for setting and promoting a classroom climate in which students feel comfortable learning about and discussing topics in Science K to 7. The following are some guidelines that may help educators establish and promote a positive classroom climate.

- Allow class members sufficient time and opportunities to become comfortable with each other before engaging in group discussion. It is important that the classroom climate encourage students to relate to one another in positive, respectful, and supportive ways. Be prepared to facilitate any potentially controversial discussions.
- Establish clear ground rules for class discussions that demonstrate respect for privacy, for diversity, and for the expression of differing viewpoints.
- Become familiar with:
  - relevant legislation (e.g., Human Rights Code; Child, Family and Community Services Act)
  - relevant initiatives (e.g., Safe, Caring and Orderly Schools: A Guide and Diversity in BC Schools: A Framework)
  - provincial and district policies and protocols concerning topics such as disclosure related to child abuse, and protection of privacy.

Further information about these policies and initiatives is available online:

BC Handbook for Action on Child Abuse and Neglect
http://www.mcf.gov.bc.ca/child_protection/pdf/handbook_action_child_abuse.pdf

Safe, Caring and Orderly Schools
http://www.bced.gov.bc.ca/sco/

Diversity in BC Schools: A Framework
http://www.bced.gov.bc.ca/diversity/diversity_framework.pdf

Human Rights Code
http://www.qp.gov.bc.ca/statreg/stat/H/96210_01.htm

Child, Family and Community Services Act
http://www.qp.gov.bc.ca/statreg/stat/C/96046_01.htm

Activities and discussion related to some of the topics in Science K to 7 may evoke an emotional response from individual students. Inform an administrator or counsellor when any concern arises, and ensure students know where to go for help and support.

Ensure that any external groups or organizations making a presentation to students have met the district's guidelines for presenting. There should be a direct relationship between the content of the presentation and the prescribed learning outcomes. Review any materials they may use, especially handouts, for appropriateness.

Safety in the Science Kindergarten to Grade 7 Classroom

Science education is an activity-based process that provides an exciting method of teaching and learning. However, experiments and demonstrations may involve inherent risks for both the teacher and the student.

Safety guidelines must be discussed with students. These safety guidelines must support and encourage the investigative approach generally and laboratory instruction specifically, while at the same time promoting safety in the classroom and laboratory. Encouraging a positive safety attitude is a responsibility shared among the board, school administrators, teachers, and students in every school district. The co-operation of all these groups helps develop a strong safety consciousness both inside and outside our schools.

Teachers are reminded especially of the potential risks associated with activities that involve extraction and analysis of human fluids or tissue. Before attempting these activities, they should consult the ministry's Science Safety Manual on the use of human tissue and fluid in science classrooms.

Another important aspect of in-school safety is the Workplace Hazardous Materials Information System (WHMIS). Through labelling, material safety data sheets, and education and training, WHMIS is designed to ensure that those using hazardous materials have sufficient information to handle them safely. Each school district should have an individual trained in WHMIS who can work with teachers to establish safe, well-ventilated classroom and laboratory working conditions.

To assist teachers in providing a safe science-learning environment, the Ministry of Education publishes the Science Safety Resource Manual, which has been distributed to every school. This resource is available online at http://www.bced.gov.bc.ca/irp/resdocs/scisafety.htm.

Confidentiality

The Freedom of Information and Protection of Privacy Act (FOIPPA) applies to students, to school district employees, and to all curricula. Teachers, administrators, and district staff should consider the following:

- Be aware of district and school guidelines regarding the provisions of FOIPPA and how it applies to all courses, including Science K to 7.
- Inform students of their rights under FOIPPA, especially the right to have access to their own personal information in their school records.
- Do not use students' Personal Education Numbers (PEN) on any assignments that students wish to keep confidential.
- Minimize the type and amount of personal information collected and ensure that it is used only for relevant purposes.
- Inform students that they will be the only ones recording personal information about themselves unless they have consented to teachers collecting that information from other people, including parents.

- Inform students why they are being asked to provide any personal information in the context of the Science K to 7 curriculum.
- Ensure that any information used in assessing students' progress is up-to-date, accurate, and complete.
- Inform students they can request that the school correct or annotate any of their personal information kept in records at the school.
- Be aware that parents' rights to have access to their children's personal information are limited to that which pertains to their child's progress. Ensure students are aware that their parents may have access to the work they create as part of the course.

For more information about confidentiality, refer to http://www.mser.gov.bc.ca/FOI_POP/index.htm

Inclusion, Equity, and Accessibility for All Learners

British Columbia's schools include young people of varied backgrounds, interests, and abilities. The Kindergarten to grade 12 school system is committed to meeting the needs of all students. When selecting specific topics, activities, and resources to support the implementation of Science K to 7, teachers are encouraged to ensure that these choices support inclusion, equity, and accessibility for all students. In particular, teachers should ensure that classroom instruction, assessment, and resources reflect sensitivity to diversity and incorporate positive role portrayals, relevant issues, and themes such as inclusion, respect, and acceptance.

Government policy supports the principles of integration and inclusion of students who have English as a second language and of students with special needs. Most of the suggested assessment activities in this IRP can be used with all students, including those with special and/or ESL needs. Some strategies may require adaptations to ensure that those with special and/or ESL needs can successfully achieve the prescribed learning outcomes. Modifications can be made to the prescribed learning outcomes for students with Individual Education Plans.

For more information about resources and support for students with special needs, refer to http://www.bced.gov.bc.ca/specialed/

For more information about resources and support for ESL students, refer to http://www.bced.gov.bc.ca/esl/

Working with the School and Community

This curriculum addresses a wide range of skills and understandings that students are developing in other areas of their lives. It is important to recognize that learning related to this curriculum extends beyond the science classroom.

School and district-wide programs—such as active schools, workplace safety, work experience, anti-bullying, and alcohol and drug education—support and extend learning in Science K to 7. Community organizations may also support the curriculum with locally developed learning resources, guest speakers, workshops, and field studies. Teachers may wish to draw on the expertise of these community organizations and members.

Working with the Aboriginal Community

The Ministry of Education is dedicated to ensuring that the cultures and contributions of Aboriginal peoples in BC are reflected in all provincial curricula. To address these topics in the classroom in a way that is accurate and that respectfully reflects Aboriginal concepts of teaching and learning, teachers are strongly encouraged to seek the advice and support of local Aboriginal communities. As Aboriginal communities are diverse in terms of language, culture, and available resources, each community will have its own unique protocol to gain support for integration of local knowledge and expertise. To begin discussion of possible instructional and assessment activities, teachers should first contact Aboriginal education co-ordinators, teachers, support workers, and counsellors in their district who will be able to facilitate the identification of local resources and contacts such as Elders, chiefs, tribal or band councils, Aboriginal cultural centres, Aboriginal Friendship Centres, and Métis or Inuit organizations.

In addition, teachers may wish to consult the various Ministry of Education publications available, including the "Planning Your Program" section of the resource, Shared Learnings (1998). This resource was developed to help all teachers provide students with

knowledge of, and opportunities to share experiences with, Aboriginal peoples in BC.

For more information about these documents, consult the Aboriginal Education web site: http://www.bced.gov.bc.ca/abed/welcome.htm

Information and Communications Technology

The study of information and communications technology is increasingly important in our society. Students need to be able to acquire and analyse information, to reason and communicate, to make informed decisions, and to understand and use information and communications technology for a variety of purposes. Development of these skills is important for students in their education, their future careers, and their everyday lives.

Literacy in the area of information and communications technology can be defined as the ability to obtain and share knowledge through investigation, study, instruction, or transmission of information by means of media technology. Becoming literate in this area involves finding, gathering, assessing, and communicating information using electronic means, as well as developing the knowledge and skills to use and solve problems effectively with the technology. Literacy also involves a critical examination and understanding of the ethical and social issues related to the use of information and communications technology. When planning for instruction and assessment in Science K to 7, teachers should provide opportunities for students to develop literacy in relation to information and communications technology sources, and to reflect critically on the role of these technologies in society.

Copyright and Responsibility

Copyright is the legal protection of literary, dramatic, artistic, and musical works; sound recordings; performances; and communications signals. Copyright provides creators with the legal right to be paid for their work and the right to say how their work is to be used. There are some exceptions in the law (i.e., specific things permitted) for schools but these are very limited, such as copying for private study or research. The copyright law determines how resources can be used in the classroom and by students at home.

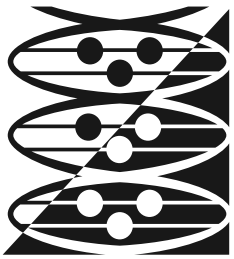
In order to respect copyright it is necessary to understand the law. It is unlawful to do the following, unless permission has been given by a copyright owner:

- photocopy copyrighted material to avoid purchasing the original resource for any reason
- photocopy or perform copyrighted material beyond a very small part—in some cases the copyright law considers it "fair" to copy whole works, such as an article in a journal or a photograph, for purposes of research and private study, criticism, and review
- show videotaped television or radio programs to students in the classroom unless these are cleared for copyright for educational use (there are exceptions such as for news and news commentary taped within one year of broadcast that by law have record-keeping requirements—see the web site at the end of this section for more details)
- photocopy print music, workbooks, instructional materials, instruction manuals, teacher guides, and commercially available tests and examinations
- show videotapes at schools that are not cleared for public performance
- perform music or do performances of copyrighted material for entertainment (i.e., for purposes other than a specific educational objective)
- copy work from the Internet without an express message that the work can be copied.

Permission from or on behalf of the copyright owner must be given in writing. Permission may also be given to copy or use all or some portion of copyrighted work through a licence or agreement. Many creators, publishers, and producers have formed groups or "collectives" to negotiate royalty payments and copying conditions for educational institutions. It is important to know what licences are in place and how these affect the activities schools are involved in. Some licenses may also have royalty payments that are determined by the quantity of photocopying or the length of performances. In these cases, it is important to assess the educational value and merits of copying or performing certain works to protect the school's financial exposure (i.e., only copy or use that portion that is absolutely necessary to meet an educational objective).

It is important for education professionals, parents, and students to respect the value of original thinking and the importance of not plagiarizing the work of others. The works of others should not be used without their permission.

For more information about copyright, refer to: http://cmec.ca/copyright/indexe.stm



PRESCRIBED LEARNING OUTCOMES

Prescribed learning outcomes are content standards for the provincial education system; they are the prescribed curriculum. They set out the required attitudes, skills, and knowledge—what students are expected to know and be able to do—by the end of the specified subject and grade. Learning outcomes are clearly stated and expressed in measurable and observable terms.

Schools have the responsibility to ensure that all prescribed learning outcomes in this curriculum are met; however, schools have flexibility in determining how delivery of the curriculum can best take place.

It is expected that student achievement will vary in relation to the learning outcomes. Evaluation, reporting, and student placement with respect to these outcomes are dependent on the professional judgment and experience of teachers, guided by provincial policy.

Prescribed learning outcomes for Science K to 7 are presented by grade and by curriculum organizer and suborganizer; however, this arrangement is not intended to imply a required instructional sequence.

Wording of Prescribed Learning Outcomes

All learning outcomes complete the stem, "It is expected that students will ...."

When used in a prescribed learning outcome, the word "including" indicates that any ensuing item **must be addressed.** Lists of items introduced by the word "including" represent a set of minimum requirements associated with the general requirement set out by the outcome. The lists are not necessarily exhaustive, however, and teachers may choose to address additional items that also fall under the general requirement set out by the outcome.

Conversely, the abbreviation "e.g.," (for example) in a prescribed learning outcome indicates that the ensuing items are provided for illustrative purposes or clarification, and are **not requirements that must be addressed.** Presented in parentheses, the list of items introduced by "e.g.," is neither exhaustive nor prescriptive, nor is it put forward in any special order of importance or priority. Teachers are free to substitute items of their own choosing that they feel best address the intent of the learning outcome.

Domains of Learning

Prescribed learning outcomes in BC curricula identify required learning in relation to one or more of the three domains of learning: cognitive, psychomotor, and affective. The following definitions of the three domains are based on Bloom's taxonomy (*Taxonomy of Educational Objectives,* Bloom et al., 1956).

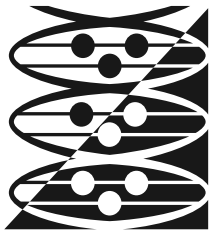
The **cognitive domain** deals with the recall or recognition of knowledge and the development of intellectual abilities. The cognitive domain can be further specified as including three cognitive levels: knowledge, understanding and application, and higher mental processes. These levels are determined by the verb used in the learning outcome, and illustrate how student learning develops over time.

- *Knowledge* includes those behaviours that emphasize the recognition or recall of ideas, material, or phenomena.
- *Understanding and application* represents a comprehension of the literal message contained in a communication, and the ability to apply an appropriate theory, principle, idea, or method to a new situation.
- *Higher mental processes* include analysis, synthesis, and evaluation. The higher mental processes level subsumes both the knowledge and the understanding and application levels.

The **affective domain** concerns attitudes, beliefs, and the spectrum of values and value systems.

The **psychomotor domain** includes those aspects of learning associated with movement and skill demonstration, and integrates the cognitive and affective consequences with physical performances.

Domains of learning and cognitive levels also form the basis of the Assessment Overview Tables provided for each grade in the Classroom Assessment Model.



Prescribed Learning Outcomes

By Curriculum Organizer

PROCESSES OF SCIENCE

Kindergarten
- use the five senses to make observations
- share with others information obtained by observing

Grade 1
- communicate their observations, experiences, and thinking in a variety of ways (e.g., verbally, pictorially, graphically)
- classify objects, events, and organisms

Grade 2
- use their senses to interpret observations
- infer the probable outcome of an event or behaviour based on observations

Grade 3
- ask questions that foster investigations and explorations relevant to the content
- measure objects and events

Grade 4
- make predictions, supported by reasons and relevant to the content
- use data from investigations to recognize patterns and relationships and reach conclusions

Grade 5
- identify variables that can be changed in an experiment
- evaluate the fairness of a given experiment
- describe the steps in designing an experiment

Grade 6
- manipulate and control a number of variables in an experiment
- apply solutions to a technical problem (e.g., malfunctioning electrical circuit)

Grade 7
- test a hypothesis by planning and conducting an experiment that controls for two or more variables
- create models that help to explain scientific concepts and hypotheses

LIFE SCIENCE

Kindergarten

- describe features of local plants and animals (e.g., colour, shape, size, texture)
- compare local plants
- compare common animals

Grade 1

- classify living and non-living things
- describe the basic needs of local plants and animals (e.g., food, water, light)
- describe how the basic needs of plants and animals are met in their environment

Grade 2

- classify familiar animals according to similarities and differences in appearance, behaviour, and life cycles
- describe some changes that affect animals (e.g., hibernation, migration, decline in population)
- describe how animals are important in the lives Aboriginal peoples in BC
- describe ways in which animals are important to other living things and the environment

Grade 3

- compare familiar plants according to similarities and differences in appearance and life cycles
- describe ways in which plants are important to other living things and the environment
- describe how plants are harvested and used throughout the seasons

Grade 4

- compare the structures and behaviours of local animals and plants in different habitats and communities
- analyse simple food chains
- demonstrate awareness of the Aboriginal concept of respect for the environment
- determine how personal choices and actions have environmental consequences

Grade 5

- describe the basic structure and functions of the human respiratory, digestive, circulatory, skeletal, muscular, and nervous systems
- explain how the different body systems are interconnected

Grade 6

- demonstrate the appropriate use of tools to examine living things that cannot be seen with the naked eye
- analyse how different organisms adapt to their environments
- distinguish between life forms as single or multi-celled organisms and belonging to one of five kingdoms: Plantae, Animalia, Monera, Protista, Fungi

Grade 7

- analyse the roles of organisms as part of interconnected food webs, populations, communities, and ecosystems
- assess survival needs and interactions between organisms and the environment
- assess the requirements for sustaining healthy local ecosystems
- evaluate human impacts on local ecosystems

Physical Science

Kindergarten
- describe properties of materials, including colour, shape, texture, size, and weight
- identify materials that make up familiar objects
- describe ways to rethink, refuse, reduce, reuse, and recycle

Grade 1
- demonstrate how force can be applied to move an object
- compare the effect of friction on the movement of an object over a variety of surfaces
- demonstrate and describe the effects of magnets on different materials

Grade 2
- identify the properties of solids, liquids, and gases
- investigate changes to the properties of matter when it is heated or cooled
- investigate the interactions of liquids and solids

Grade 3
- describe shapes that are part of natural and human-built structures (e.g., domes, arches, pyramids)
- compare the effects of different materials, shapes, and forces on the strength and stability of different structures
- conduct investigations into ways to improve the strength and stability of structures

Grade 4
- identify sources of light and sound
- explain properties of light (e.g., travels in a straight path, can be reflected)
- explain properties of sound (e.g., travels in waves, travels in all directions)

Grade 5
- demonstrate how various forces can affect the movement of objects
- demonstrate mechanical advantage of simple machines, including lever, wedge, pulley, ramp, screw, and wheel
- design a compound machine
- describe applications of simple and compound machines used in daily life in BC communities

Grade 6
- evaluate various methods for producing small electrical charges
- test a variety of electrical pathways using direct current circuits
- demonstrate that electricity can be transformed into light, heat, sound, motion, and magnetic effects
- differentiate between renewable and non-renewable methods of producing electrical energy

Grade 7
- conduct investigations into properties of matter
- classify substances as elements, compounds, and mixtures
- measure substances and solutions according to pH, solubility, and concentration

EARTH AND SPACE SCIENCE

Kindergarten
- demonstrate the ability to observe their surroundings
- describe features of their immediate environment

Grade 1
- describe changes that occur in daily and seasonal cycles and their effects on living things
- describe activities of Aboriginal peoples in BC in each seasonal cycle

Grade 2
- describe physical properties of air, water, and soil
- distinguish ways in which air, water, and soil interact
- explain why air, water, and soil are important for living things

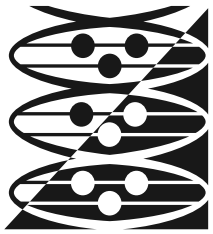
Grade 3
- describe characteristics and movements of objects in our solar system
- compare familiar constellations in seasonal skies
- demonstrate awareness of the special significance of celestial objects for Aboriginal peoples

Grade 4
- measure weather in terms of temperature, precipitation, cloud cover, wind speed and direction
- analyse impacts of weather on living and non-living things

Grade 5
- analyse how BC's living and non-living resources are used
- identify methods of extracting or harvesting and processing BC's resources
- analyse how the Aboriginal concept of interconnectedness of the environment is reflected in responsibility for and caretaking of resources
- describe potential environmental impacts of using BC's living and non-living resources

Grade 6
- explain obstacles unique to exploration of a specific extreme environment
- assess technologies used for extreme environments
- describe contributions of Canadians to exploration technologies

Grade 7
- compare the characteristics of the Earth's core, mantle, and crust, and describe the formation of rocks
- analyse the dynamics of tectonic plate movement and landmass formation
- explain how the Earth's surface changes over time



Prescribed Learning Outcomes

Grade 5

GRADE 5

Processes and Skills of Science

It is expected that students will:

- identify variables that can be changed in an experiment
- evaluate the fairness of a given experiment
- describe the steps in designing an experiment

Life Science: Human Body

It is expected that students will:

- describe the basic structure and functions of the human respiratory, digestive, circulatory, skeletal, muscular, and nervous systems
- explain how the different body systems are interconnected

Physical Science: Forces and Simple Machines

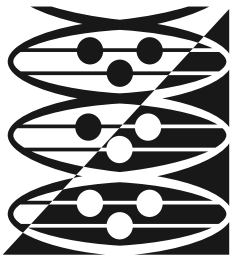
It is expected that students will:

- demonstrate how various forces can affect the movement of objects
- demonstrate mechanical advantage of simple machines, including lever, wedge, pulley, ramp, screw, and wheel
- design a compound machine
- describe applications of simple and compound machines used in daily life in BC communities

Earth and Space Science: Renewable and Non-Renewable Resources

It is expected that students will:

- analyse how BC's living and non-living resources are used
- identify methods of extracting or harvesting and processing BC's resources
- analyse how the Aboriginal concept of interconnectedness of the environment is reflected in responsibility for and caretaking of resources
- describe potential environmental impacts of using BC's living and non-living resources



STUDENT ACHIEVEMENT

This section of the IRP contains information about classroom assessment and student achievement, including specific achievement indicators to assist teachers in assessing student achievement in relation to each prescribed learning outcome. Also included in this section are key elements—descriptions of content that help determine the intended depth and breadth of prescribed learning outcomes.

CLASSROOM ASSESSMENT AND EVALUATION

Assessment is the systematic gathering of information about what students know, are able to do, and are working toward. Assessment evidence can be collected using a wide variety of methods, such as::

- observation
- student self-assessments and peer assessments
- quizzes and tests (written, oral, practical)
- samples of student work
- projects
- oral and written reports
- journals and learning logs
- performance reviews
- portfolio assessments.

Student performance is based on the information collected through assessment activities. Teachers use their insight, knowledge about learning, and experience with students, along with the specific criteria they establish, to make judgments about student performance in relation to prescribed learning outcomes.

There are three major types of assessment that can be used in conjunction with each other to support student achievement.

- Assessment **for** learning is assessment for purposes of greater learning achievement.
- Assessment **as** learning is assessment as a process of developing and supporting students' active participation in their own learning.
- Assessment **of** learning is assessment for purposes of providing evidence of achievement for reporting.

Assessment for Learning

Classroom assessment for learning provides ways to engage and encourage students to become involved in their own day-to-day assessment—to acquire the skills of thoughtful self-assessment and to promote their own achievement.

This type of assessment serves to answer the following questions:

- What do students need to learn to be successful?
- What does the evidence of this learning look like?

Assessment for learning is criterion-referenced, in which a student's achievement is compared to established criteria rather than to the performance of other students. Criteria are based on prescribed learning outcomes, as well as on suggested achievement indicators or other learning expectations.

Students benefit most when assessment feedback is provided on a regular, ongoing basis. When assessment is seen as an opportunity to promote learning rather than as a final judgment, it shows students their strengths and suggests how they can develop further. Students can use this information to redirect their efforts, make plans, communicate with others (e.g., peers, teachers, parents) about their growth, and set future learning goals.

Assessment for learning also provides an opportunity for teachers to review what their students are learning and what areas need further attention. This information can be used to inform teaching and create a direct link between assessment and instruction. Using assessment as a way of obtaining feedback on instruction supports student achievement by informing teacher planning and classroom practice.

Assessment as Learning

Assessment as learning actively involves students in their own learning processes. With support and guidance from their teacher, students take responsibility for their own learning, constructing meaning for themselves. Through a process of continuous self-assessment, students develop the ability to take stock of what they have already learned, determine what they have not yet learned, and decide how they can best improve their own achievement.

Although assessment as learning is student-driven, teachers can play a key role in facilitating how this assessment takes place. By providing regular opportunities for reflection and self-assessment, teachers can help students develop, practise, and become comfortable with critical analysis of their own learning.

Assessment of Learning

Assessment of learning can be addressed through summative assessment, including large-scale assessments and teacher assessments. These summative assessments can occur at the end of the year or at periodic stages in the instructional process.

Large-scale assessments, such as Foundation Skills Assessment (FSA) and Graduation Program exams, gather information on student performance

throughout the province and provide information for the development and revision of curriculum. These assessments are used to make judgments about students' achievement in relation to provincial and national standards. There is no large-scale provincial assessment for science K to 7.

Assessment *for* Learning	Assessment *as* Learning	Assessment *of* Learning
Formative assessment *ongoing in the classroom* • teacher assessment, student self-assessment, and/or student peer assessment • criterion-referenced—criteria based on prescribed learning outcomes identified in the provincial curriculum, reflecting performance in relation to a specific learning task • involves both teacher and student in a process of continual reflection and review about progress • teachers adjust their plans and engage in corrective teaching in response to formative assessment	Formative assessment *ongoing in the classroom* • self-assessment • provides students with information on their own achievement and prompts them to consider how they can continue to improve their learning • student-determined criteria based on previous learning and personal learning goals • students use assessment information to make adaptations to their learning process and to develop new understandings	Summative assessment occurs at *end of year or at key stages* • teacher assessment • may be either criterion-referenced (based on prescribed learning outcomes) or norm-referenced (comparing student achievement to that of others) • information on student performance can be shared with parents/guardians, school and district staff, and other education professionals (e.g., for the purposes of curriculum development) • used to make judgments about students' performance in relation to provincial standards

Criterion-Referenced Assessment and Evaluation

In criterion-referenced evaluation, a student's performance is compared to established criteria rather than to the performance of other students. Evaluation in relation to prescribed curriculum requires that criteria be established based on the learning outcomes.

Criteria are the basis for evaluating student progress. They identify, in specific terms, the critical aspects of a performance or a product that indicate how well the student is meeting the prescribed learning outcomes. For example, weighted criteria, rating scales, or scoring guides (reference sets) are ways that student performance can be evaluated using criteria.

Wherever possible, students should be involved in setting the assessment criteria. This helps students develop an understanding of what high-quality work or performance looks like.

Criterion-referenced assessment and evaluation may involve these steps:

Step 1	Identify the prescribed learning outcomes and suggested achievement indicators (as articulated in this IRP) that will be used as the basis for assessment.
Step 2	Establish criteria. When appropriate, involve students in establishing criteria.
Step 3	Plan learning activities that will help students gain the attitudes, skills, or knowledge outlined in the criteria.
Step 4	Prior to the learning activity, inform students of the criteria against which their work will be evaluated.
Step 5	Provide examples of the desired levels of performance.
Step 6	Conduct the learning activities.
Step 7	Use appropriate assessment instruments (e.g., rating scale, checklist, scoring guide) and methods (e.g., observation, collection, self-assessment) based on the particular assignment and student.
Step 8	Review the assessment data and evaluate each student's level of performance or quality of work in relation to criteria.
Step 9	Where appropriate, provide feedback and/or a letter grade to indicate how well the criteria are met.
Step 10	Communicate the results of the assessment and evaluation to students and parents/guardians.

Key Elements

Key elements provide an overview of content in each curriculum organizer. They can be used to determine the expected depth and breadth of the prescribed learning outcomes.

Note that some topics appear at multiple grade levels in order to emphasize their importance and to allow for developmental learning.

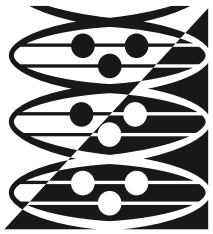
Achievement Indicators

To support teachers in assessing provincially prescribed curricula, this IRP includes sets of achievement indicators in relation to each learning outcome.

Achievement indicators define the specific level of attitudes demonstrated, skills applied, or knowledge acquired by the student in relation to a corresponding prescribed learning outcome. They describe what evidence a teacher might look for to determine whether or not the student has fully met the intent of the learning outcome. In some cases, achievement indicators may also include suggestions as to the type of task that would provide evidence of having met the learning outcome (e.g., a constructed response such as a list, comparison, analysis, or chart; a product created and presented such as a report, drama presentation, poster, letter, or model; a particular skill demonstrated such as interpreting data).

Achievement indicators are not mandatory; they are suggestions only, provided to assist teachers in assessing how well their students achieve the prescribed learning outcomes. Teachers are encouraged to modify and expand on these suggestions as required to address local needs.

The following pages contain the suggested achievement indicators corresponding to each prescribed learning outcome for the Science K to 7 curriculum. The achievement indicators are arranged by curriculum organizer and suborganizer for each grade; however, this order is not intended to imply a required sequence of instruction and assessment.



STUDENT ACHIEVEMENT

Grade 5

GRADE 5: PROCESSES OF SCIENCE

Key Elements: Processes of Science

Estimated Time: integrate with other curriculum organizers

Fair Testing

Before students undertake complex experiments, it is necessary that they learn to conduct a fair test of a single variable. For a test to be considered fair, all the experimental actions involved must be equally applied. All the conditions must be consistent and standardized. Standardizing the various conditions concerned with the test will allow only the intended influences to be observed. In practice, this means identical procedures must be uniformly performed while one variable is changed at a time. Accurate fair testing involves isolating variables, eliminating bias, repeating the results, and closely scrutinizing the intended question. The credibility of the experimental test is then judged in order to determine what really changed and why. Questions for test rigour include

- Is the experiment free of biased observations?
- Have all the variables been isolated?
- Did the experiment involve only one variable?
- Were the experimental results expected?
- Can other people repeat the experiments and get similar results?

Often, students can study a simple test and state how it might be unfair; but the ability to specify how a test is fair and how it ensures all outcomes have been equally determined is more difficult. At advanced levels of learning, fair testing includes controlled experiments with more than one variable and determining the independent and dependent variables. Later when designing experiments, students learn to check for bias, remove any chance influences, look for experimental errors, and determine whether the experimental question can be properly addressed before they start their investigations.

Designing Experiments

Designing experiments involves devising scientific investigations to test a prediction. The easiest means of checking a prediction is to ask a specific question that will confirm the predicted ideas. An experiment is a set of steps prepared or laid out to test a single question. It usually involves deciding how to conduct the investigation so the cause-and-effect properties are tested and directly measured. To ensure fair testing, all the experimental actions involved must be equally applied (planning and designing an experiment requires careful attention to these experimental actions). There are three main stages to most scientific investigations: ***purpose, procedures, results***. Designing an experiment includes setting up the experimental problem, identifying the variables to be tested, planning for needed equipment, using inference to predict possible outcomes, and devising a set of tests to be carried out on all the outcomes. Once the experimental design is completed, advanced students at this level may choose to execute the procedure stage carefully and communicate the results to their peers.

GRADE 5 PROCESSES OF SCIENCE

Prescribed Learning Outcomes	Suggested Achievement Indicators
It is expected that students will:	*The following set of indicators may be used to assess student achievement for each corresponding prescribed learning outcome.* *Students who have fully met the prescribed learning outcome are able to:*
• identify variables that can be changed in an experiment	❑ accurately list variables that can be changed in a given experiment (e.g., the amount, material, duration) ❑ outline an experiment where factors can be determined (e.g., toy car rally)
• evaluate the fairness of a given experiment	❑ accurately list variables in a given experiment that can be tested (e.g., running shoe tread) ❑ create a comprehensive report on the fairness of a given experiment
• describe the steps in designing an experiment	❑ identify several of the components in an experiment (e.g., PURPOSE: develop an experimental prediction, write a testable question, identify the variables, plan setup and equipment, predict possible outcomes, devise a set of tests PROCEDURE: conduct the investigation as planned, then collect the results. RESULTS: analyse the data and communicate the final conclusions) ❑ with teacher support, prepare an experimental plan that shows all the necessary components

Processes and Skills of Science							
Kindergarten	**Grade 1**	**Grade 2**	**Grade 3**	**Grade 4**	**Grade 5**	**Grade 6**	**Grade 7**
• Observing • Communicating (sharing)	• Communicating (recording) • Classifying	• Interpreting Observations • Making Inferences	• Questioning • Measuring and Reporting	• Interpreting Data • Predicting	• Designing Experiments • Fair Testing	• Controlling Variables • Scientific Problem Solving	• Hypothesizing • Developing Models

GRADE 5 LIFE SCIENCE: HUMAN BODY

Key Elements: Life Science

Estimated Time: 25 – 30 hours

By the end of the grade, students will have recognized how the main systems of the human body work together.

Human Body

The study of the human body is a general overview of the structures and functions of the basic body systems, with particular emphasis on the study of the function of four organs: the heart, the lungs, the brain, and the skin. Through research and investigation of some easily observable and measurable indicators of body functions, students discover ways that our bodies' systems work together.

Vocabulary

cells, organs, heart, blood vessels, veins, arteries, trachea, lungs, esophagus, stomach, intestines, liver, kidney, bladder, colon, brain, spinal cord, nerves, blood cells, nerve cells, bones, cartilage, ligaments, muscles, tendons, skin, sense organs, membrane, digestion, nutrient, oxygen, carbon dioxide, pulse, reflex

Knowledge

- body organs interact with each other to ensure survival in the environment
- the respiratory system consists of the nose, mouth, trachea, and the lungs
- the circulatory system consists of the heart, arteries, veins, capillaries, and blood
- the function of the circulatory system is to transport oxygen, carbon dioxide, nutrients, waste products, water, and messenger chemicals to and from cells in the body via the blood
- the skeletal system consists of bones, cartilage, and ligaments
- the function of the skeletal system is to provide protection and structure, and to enable movement
- the muscular system is composed of muscles and tendons
- the function of the muscular system is to enable locomotion and the function of the some other body systems (e.g., circulatory, digestive, skin)
- the digestive system includes the teeth, mouth, esophagus, stomach, small intestine, liver, (pancreas), and large intestine
- the function of the digestive system is to extract nutrients and water from the food we eat so that it can be carried to all the cells of the body
- the excretory system consists of the kidneys and bladder
- the function of the excretory system is to eliminate soluble waste chemicals and regulate the amount of water in the body
- the nervous system consists of the brain, the spinal cord, nerves, and sensory organs
- the function of the nervous system is to allow us to sense and react to our environment and to control the other systems in the body

Skills and Attitudes

- use measurement tools
- design and carry out experiments on the functions of body systems and record results
- draw conclusions about the function and interactions of body systems

GRADE 5 LIFE SCIENCE: HUMAN BODY

Prescribed Learning Outcomes	Suggested Achievement Indicators
It is expected that students will:	*The following set of indicators may be used to assess student achievement for each corresponding prescribed learning outcome.* *Students who have fully met the prescribed learning outcome are able to:*
• describe the basic structure and functions of the human respiratory, digestive, circulatory, skeletal, muscular, and nervous systems	❑ identify the organs and their functions in a human body system ❑ illustrate the human respiratory, digestive, circulatory, skeletal, muscular, and nervous systems ❑ with teacher support, conduct various experiments to safely measure and record the responses of the various systems (e.g., heart rate, lung capacity, and reaction time)
• explain how the different body systems are interconnected	❑ generate and answer several questions to investigate how body systems are integrated (e.g., How are the various systems connected to each other? Could one system live without the other systems? If not, why not?) ❑ demonstrate various ways in which body systems work together, using role plays, posters, and/or 3-D representations

GRADE 5 PHYSICAL SCIENCE: FORCES AND SIMPLE MACHINES

Key Elements: Physical Science

Estimated Time: 25 – 30 hours

By the end of the grade, students will have understood the relationship between forces and mechanical advantage in simple machines.

Forces and Simple Machines

In this study, students begin to understand the relationship between effort (applied force) and simple machines. By exploring and experimenting with a variety of objects, students develop understanding of the relationship between the mass and motion of an object and the force needed to change the object's direction, speed, and position. Through hands-on activities, students identify and understand the characteristics and uses of the simple machines. Students describe how the application of machines reduces the applied force required for people to do work. They also design and construct both simple and compound machines with a useful function.

Vocabulary

simple machine, lever, wedge, pulley, ramp, screw, inclined plane, wheel, axle, effort force, force, fulcrum, mass (weight), load, friction, work, compound machine, unbalanced forces, balanced forces, equilibrium

Knowledge

- unbalanced forces 'change' motion, while balanced forces 'maintain' the motion
- a pulling or pushing force can be measured with a spring scale
- friction is a force parallel to a surface that will result when an object makes contact with a surface
- surface texture can be rough, smooth, or slippery depending upon the material that is at the surface
- frictional forces, mass, surface texture, and the slope all can affect the movement of an object down a ramp incline
- simple machines change the effect of how much effort force is applied to the machine to do something useful
- simple machines include lever, wedge, inclined plane, screw, roller, axle, wheel, and pulley
- simple machines don't change the load (mass); they change the amount of effort used to move the same mass
- compound machines are combinations of simple machines (screw and screw-driver, scissors, teeter-totter, ladder-and-slide, shopping cart, wood-axe, door handle, hinge, travois, wheelbarrow, pencil sharpener, hand-drill, push-mower, typewriter, bicycle)

Skills and Attitudes

- observe the effort used to change the direction and motion of objects (balanced and unbalanced forces)
- measure amount of effort force "saved" by using a simple machine
- demonstrate curiosity and show inventiveness
- design an investigation to test and compare simple machines
- ensure fair testing when conducting an experiment
- identify and control variables in an investigation
- communicate in various media to show how simple machines work
- use materials and tools safely

GRADE 5 PHYSICAL SCIENCE: FORCES AND SIMPLE MACHINES

Prescribed Learning Outcomes	Suggested Achievement Indicators
It is expected that students will:	*The following set of indicators may be used to assess student achievement for each corresponding prescribed learning outcome.* *Students who have fully met the prescribed learning outcome are able to:*
• demonstrate how various forces can affect the movement of objects	❑ accurately describe the effects of increasing and decreasing the amount of force applied to an object (e.g., lifting a wooden block) ❑ compare the effects of friction on the movement of an object over a variety of surfaces (e.g., sandpaper, rug, smooth wood, chalk dust, gravel) ❑ with teacher support, design a fair test to see how an object's motion is affected by ramps with different surfaces, slope, length, and initial height
• demonstrate mechanical advantage of simple machines, including lever, wedge, pulley, ramp, screw, and wheel	❑ identify and classify everyday devices according to the six basic machines (lever, wedge, inclined plane, screw, roller, axle, wheel, and pulley) ❑ compare the advantages and disadvantages of various simple machines for identical tasks (i.e., choosing the right machine for the right job)
• design a compound machine	❑ identify the simple machine incorporated into the working parts of compound machines designed for a specific task (e.g., lifting, pulling, and carrying heavy loads) ❑ proficiently assemble a compound machine, illustrating in detail how it is constructed from a combination of simple machines
• describe applications of simple and compound machines used in daily life in BC communities	❑ give several examples of some common heavy machines that contain simple machines (e.g., fork-lift, grader, crane, log-loader) ❑ illustrate in detail how a combination of simple machines can be used to solve various problems in daily life ❑ describe the various ways in which Aboriginal peoples in BC have used machines to meet basic and artistic needs in their daily lives

GRADE 5 EARTH AND SPACE SCIENCE: RENEWABLE AND NON-RENEWABLE RESOURCES

Key Elements: Earth and Space Science

Estimated Time: 25 – 30 hours

By the end of the grade, students will have assessed the environmental considerations associated with the extraction and use of renewable and non-renewable resources.

Renewable and Non-renewable Resources

This study is an introduction to renewable non-renewable resources in British Columbia. Students learn how people harvest or extract, process, and use renewable and non-renewable resources. Students classify living and non-living resources as renewable or non-renewable and investigate effective uses of various resources. They consider issues of resource use from various perspectives and identify ways in which people use resources responsibly.

Vocabulary

The following list will be dependent on local resources:
ecosystem, local environment, water cycle, groundwater, surface runoff, leaching, biodegradable, natural resources, watershed, air-shed, conservation, recycling, extraction, harvesting, renewable, non-renewable, pollution (water/air/soil), equilibrium, resource, raw materials, solar energy, environmental impact

Knowledge

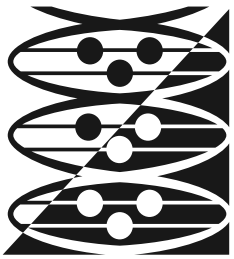
- all resources used by humans, including fuels, metals and building materials, come from the Earth
- many resources take thousands or millions of years to develop and accumulate; as such, they are considered non-renewable resources (e.g., fossil fuels, rocks and minerals)
- some resources are constantly available and are considered to be renewable resources (e.g., hydropower, sun, and wind)

Skills and Attitudes

- analyse data to determine if a resource is renewable or non-renewable
- investigate an environmental resource issue
- identify variables that will determine if a particular locally used resource is renewable
- resources should be used carefully, recycled, and conserved by humans whenever possible
- demonstrate socially responsible actions

GRADE 5 EARTH AND SPACE SCIENCE: RENEWABLE AND NON-RENEWABLE RESOURCES

Prescribed Learning Outcomes	Suggested Achievement Indicators
It is expected that students will:	*The following set of indicators may be used to assess student achievement for each corresponding prescribed learning outcome.* *Students who have fully met the prescribed learning outcome are able to:*
• analyse how BC's living and non-living resources are used	❑ with teacher support, analyse data and correctly classify BC's resources as renewable or non-renewable (e.g., renewable: salmon; non-renewable: copper) ❑ explain in detail various ways in which BC's resources are used (i.e., for commercial and/or recreational purposes)
• identify methods of extracting or harvesting and processing BC's resources	❑ illustrate several examples of resource harvesting or extraction (e.g., salmon, trees, oil, gas, water, copper, coal) ❑ trace a finished BC resource-based product (e.g., a tin of salmon, cedar basket, oil and gas) to its source
• analyse how the Aboriginal concept of interconnectedness of the environment is reflected in responsibility for and caretaking of resources	❑ illustrate in detail various ways in which Aboriginal peoples take care of the land and the resources ❑ explain, citing examples, how and why Aboriginal peoples' unique relationship with the environment demonstrates responsibility for the land and resources
• describe potential environmental impacts of using BC's living and non-living resources	❑ identify and describe a variety of solutions to address the issue of natural resource management in BC (e.g., conservation of resources through recycling) ❑ collect relevant data and coherently articulate various points of view on a local resource issue in BC



CLASSROOM ASSESSMENT MODEL

The Classroom Assessment Model outlines a series of assessment units for Science K to 7. These units have been structured by grade level and according to the curriculum organizers

- Life Science
- Physical Science
- Earth and Space Science

Processes of Science are integrated throughout the other three organizers. These units collectively address all of the prescribed learning outcomes for Science K to 7.

This organization is not intended to prescribe a linear means of course delivery. Teachers are encouraged to address the learning outcomes in any order, and to combine and organize the units to meet the needs of their students and to respond to local requirements. Some students with special needs may have learning outcomes set for them that are modified and documented in their Individualized Education Plan (IEP). For more information, see the section on Inclusion, Equity, and Accessibility for All Learners in the Introduction to this IRP.

Considerations for Instruction and Assessment in Science K to 7

It is highly recommended that parents and guardians be kept informed about all aspects of Science K to 7. For suggested strategies for involving parents and guardians, refer to the Introduction to this IRP.

Teachers are responsible for setting a positive classroom climate in which students feel comfortable learning about and discussing topics in Science K to 7. Guidelines that may help educators establish a positive climate that is open to free inquiry and respectful of various points of view can be found in the section on Establishing a Positive Classroom Climate in the Introduction to this IRP.

Teachers may also wish to consider the following:

- Involve students in establishing guidelines for group discussion and presentations. Guidelines might include using appropriate listening and speaking skills, respecting students who are reluctant to share personal information in group settings, and agreeing to maintain confidentiality if sharing of personal information occurs.
- Promote critical thinking and open-mindedness, and refrain from taking sides on one point of view.
- Develop and discuss procedures associated with recording and using personal information that may be collected as part of students' work for the purposes of instruction and/or assessment (e.g., why the information is being collected, what the information will be used for, where the information will be kept; who can access it—students, administrators, parents; how safely it will be kept).
- Ensure students are aware that if they disclose personal information that indicates they are at risk for harm, then that information cannot be kept confidential. For more information, see the section on Confidentiality in the Introduction to this IRP.

Classroom Assessment and Evaluation

Teachers should consider using a variety of assessment techniques to assess students' abilities to meet the prescribed learning outcomes. Tools and techniques for assessment in Science K to 7 can include:

- teacher assessment tools such as observation checklists, rating scales, and scoring guides
- self-assessment tools such as checklists, rating scales, and scoring guides
- peer assessment tools such as checklists, rating scales, and scoring guides
- journals or learning logs
- video (to record and critique student demonstration)
- written tests, oral tests (true/false, multiple choice, short answer)
- worksheets
- portfolios
- student-teacher conferences.

Assessment in Science K to 7 can also occur while students are engaged in, and based on the product of, activities such as:

- case studies and simulations
- group and class discussions
- brainstorms, clusters, webs
- research projects
- role plays
- charts and graphs
- posters, collages, models, web sites
- oral and multimedia presentations
- peer teaching
- personal pledges or contracts.

For more information about student assessment, refer to the section on Student Achievement.

Information and Communications Technology

The Science K to 7 curriculum requires students to be able to use and analyse the most current information to make informed decisions on a range of topics. This information is often found on the Internet as well as in other information and communications technology resources. When organizing for instruction and assessment, Science K to 7 teachers should consider how students will best be able to access the relevant technology, and ensure that students are aware of school district policies on Internet and computer use.

Teaching Science in Multi-Grade Classrooms

Teachers often have a multi-grade teaching assignment whereby it is necessary to teach all of the prescribed learning outcomes for the different grade levels in one classroom. Here are some suggestions

- teamwork with colleagues to develop a two-year alternating program with topics unique to the combined classrooms; topics can be designated for Year A (even) and Year B (odd)
- development of topics from commonalities within the prescribed learning outcomes
- selection of topics that would facilitate school planning and cross-grade articulation for students and teachers
- using an approach that integrates learning in other subject areas.

Contents of the Model

Assessment Overview Table

The Assessment Overview Table provides teachers with suggestions and guidelines for assessment of each grade of the curriculum. This table identifies the domains of learning and cognitive levels of the learning outcomes, along with a listing of suggested assessment activities and a suggested weight for grading for each curriculum organizer.

Key Elements

This section includes a brief description of the unit, identifying relevant vocabulary, knowledge, skills, and attitudes.

Suggested Timeframe

The suggested time indicates the average number of hours needed to address the prescribed learning outcomes identified in that unit; it does not necessarily indicate the time required to implement the suggested instructional and assessment activities listed.

Prescribed Learning Outcomes and Suggested Achievement Indicators

Each set of prescribed learning outcomes identifies the content standards for that unit. The corresponding achievement indicators provide additional information about the expected level or degree of student performance and can be used as the basis for assessment.

Suggested Planning and Assessment Activities

Planning and assessment activities have been included for each prescribed learning outcome and set of corresponding achievement indicators. Each suggested assessment activity directly corresponds to a particular planning activity as indicated by the order and arrangement of these activities.

A wide variety of planning (instructional) activities has been included to address a variety of learning and teaching styles. The assessment activities describe a variety of tools and methods for gathering evidence of student performance.

These strategies are suggestions only, designed to provide guidance for teachers in planning and carrying out assessment to meet the prescribed learning outcomes.

Recommended Learning Resources

This section lists the Science K to 7 recommended learning resources that relate to the specific learning outcomes in each topic. The resources listed do not necessarily relate to the suggested instruction and assessment. Teachers may choose to use these resources, or they may use other locally approved resources. See the section on Recommended Learning Resources in this IRP for more information.

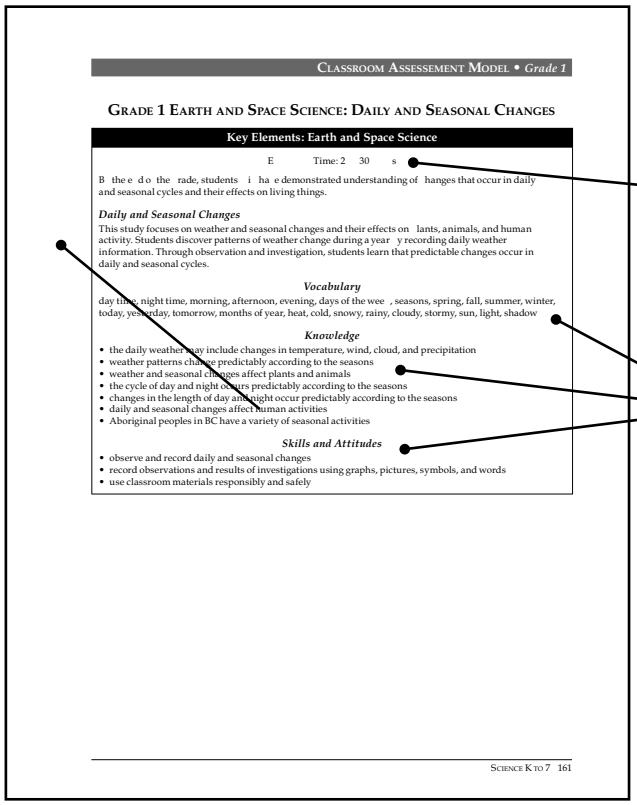
> As new resources are recommended, information will be posted on the ministry web site: http://www.bced.gov.bc.ca/irp_resources/lr/resource/consub.htm

Assessment Instruments

Sample assessment instruments have been included at the end of each unit, and are provided to help teachers determine the extent to which students are meeting the prescribed learning outcomes. These instruments contain criteria specifically keyed to one or more of the suggested assessment activities contained in the unit.

USING THE CLASSROOM ASSESSMENT MODEL

The following two pages illustrate how all the elements of the Classroom Assessment Model relate to each other



CLASSROOM ASSESSEMENT MODEL • *Grade 1*

GRADE 1 EARTH AND SPACE SCIENCE: DAILY AND SEASONAL CHANGES

Key Elements: Earth and Space Science

E Time: 2 30 s

B the e d o the rade, students i ha e demonstrated understanding of hanges that occur in daily and seasonal cycles and their effects on living things.

Daily and Seasonal Changes

This study focuses on weather and seasonal changes and their effects on lants, animals, and human activity. Students discover patterns of weather change during a year y recording daily weather information. Through observation and investigation, students learn that predictable changes occur in daily and seasonal cycles.

Vocabulary

day time, night time, morning, afternoon, evening, days of the wee , seasons, spring, fall, summer, winter, today, yesterday, tomorrow, months of year, heat, cold, snowy, rainy, cloudy, stormy, sun, light, shadow

Knowledge

- the daily weather may include changes in temperature, wind, cloud, and precipitation
- weather patterns change predictably according to the seasons
- weather and seasonal changes affect plants and animals
- the cycle of day and night occurs predictably according to the seasons
- changes in the length of day and night occur predictably according to the seasons
- daily and seasonal changes affect human activities
- Aboriginal peoples in BC have a variety of seasonal activities

Skills and Attitudes

- observe and record daily and seasonal changes
- record observations and results of investigations using graphs, pictures, symbols, and words
- use classroom materials responsibly and safely

SCIENCE K TO 7 161

Suggested Timeframe

The suggested time indicates the approximate number of hours needed to deliver the prescribed learning outcomes identified in the unit.

Key Elements

Key elements provide an overview of content in each curriculum organizer. They can be used to determine the expected depth and breadth of the prescribed learning outcomes.

Prescribed Learning Outcomes

Prescribed learning outcomes are arranged by suborganizer.

Suggested Achievement Indicators

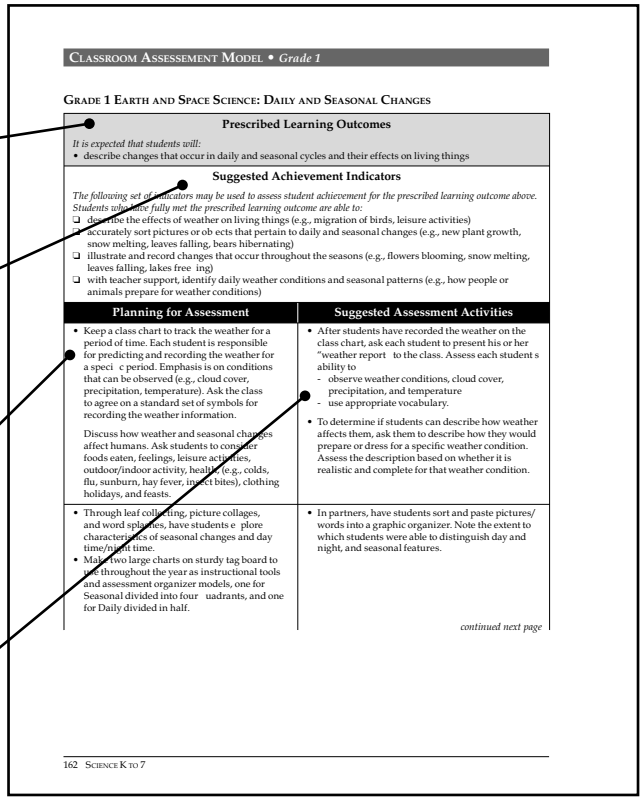
Each set of suggested achievement indicators corresponds to the prescribed learning outcomes for that suborganizer.

Planning for Assessment

This section is designed to provide guidance for teachers in helping students meet the prescribed learning outcomes.

Suggested Assessment Activities

Each suggested assessment activity directly corresponds to a particular planning activity as indicated by the order and arrangement of these activities.



CLASSROOM ASSESSMENT MODEL • *Grade 1*

GRADE 1 EARTH AND SPACE SCIENCE: DAILY AND SEASONAL CHANGES

Prescribed Learning Outcomes

It is expected that students will:

- describe changes that occur in daily and seasonal cycles and their effects on living things

Suggested Achievement Indicators

The following set of indicators may be used to assess student achievement for the prescribed learning outcome above. Students who have fully met the prescribed learning outcome are able to:

- ❑ describe the effects of weather on living things (e.g., migration of birds, leisure activities)
- ❑ accurately sort pictures or ob ects that pertain to daily and seasonal changes (e.g., new plant growth, snow melting, leaves falling, bears hibernating)
- ❑ illustrate and record changes that occur throughout the seasons (e.g., flowers blooming, snow melting, leaves falling, lakes free ing)
- ❑ with teacher support, identify daily weather conditions and seasonal patterns (e.g., how people or animals prepare for weather conditions)

Planning for Assessment	Suggested Assessment Activities
• Keep a class chart to track the weather for a period of time. Each student is responsible for predicting and recording the weather for a speci c period. Emphasis is on conditions that can be observed (e.g., cloud cover, precipitation, temperature). Ask the class to agree on a standard set of symbols for recording the weather information. Discuss how weather and seasonal changes affect humans. Ask students to consider foods eaten, feelings, leisure activities, outdoor/indoor activity, health (e.g., colds, flu, sunburn, hay fever, insect bites), clothing holidays, and feasts.	• After students have recorded the weather on the class chart, ask each student to present his or her "weather report to the class. Assess each student s ability to - observe weather conditions, cloud cover, precipitation, and temperature - use appropriate vocabulary. • To determine if students can describe how weather affects them, ask them to describe how they would prepare or dress for a specific weather condition. Assess the description based on whether it is realistic and complete for that weather condition.
• Through leaf collecting, picture collages, and word splashes, have students e plore characteristics of seasonal changes and day time/night time. • Make two large charts on sturdy tag board to use throughout the year as instructional tools and assessment organizer models, one for Seasonal divided into four uadrants, and one for Daily divided in half.	• In partners, have students sort and paste pictures/ words into a graphic organizer. Note the extent to which students were able to distinguish day and night, and seasonal features.

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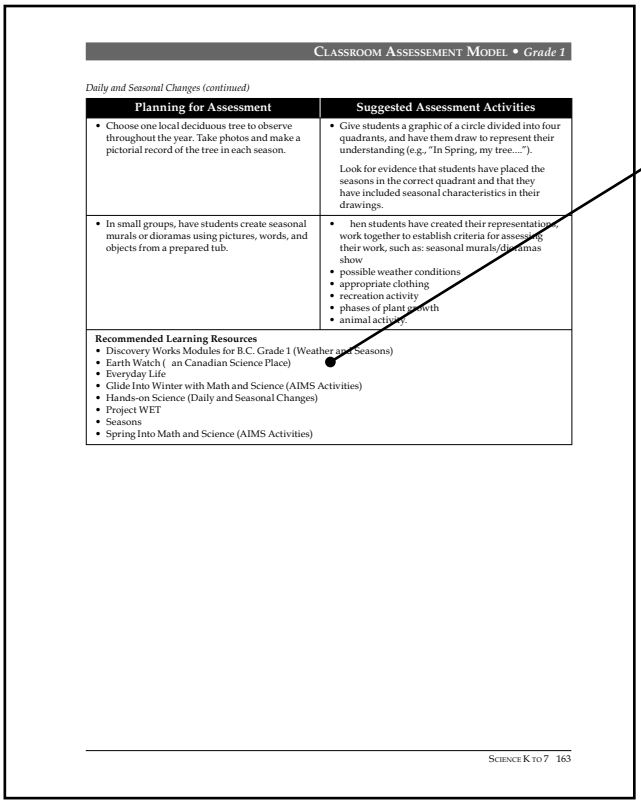
162 SCIENCE K TO 7



CLASSROOM ASSESSEMENT MODEL • *Grade 1*

Daily and Seasonal Changes (continued)

Planning for Assessment	Suggested Assessment Activities
• Choose one local deciduous tree to observe throughout the year. Take photos and make a pictorial record of the tree in each season.	• Give students a graphic of a circle divided into four quadrants, and have them draw to represent their understanding (e.g., "In Spring, my tree...."). Look for evidence that students have placed the seasons in the correct quadrant and that they have included seasonal characteristics in their drawings.
• In small groups, have students create seasonal murals or dioramas using pictures, words, and objects from a prepared tub.	• hen students have created their representations, work together to establish criteria for assessing their work, such as: seasonal murals/dioramas show • possible weather conditions • appropriate clothing • recreation activity • phases of plant growth • animal activity.
Recommended Learning Resources • Discovery Works Modules for B.C. Grade 1 (Weather and Seasons) • Earth Watch (an Canadian Science Place) • Everyday Life • Glide Into Winter with Math and Science (AIMS Activities) • Hands-on Science (Daily and Seasonal Changes) • Project WET • Seasons • Spring Into Math and Science (AIMS Activities)	

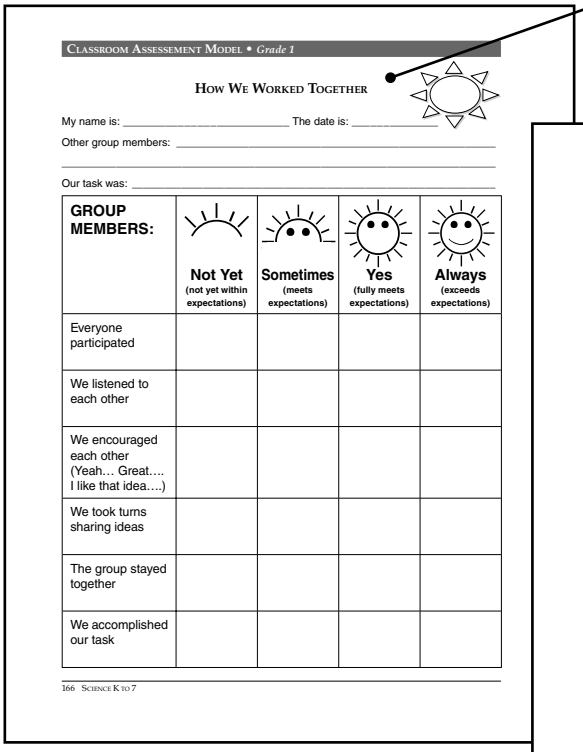
SCIENCE K TO 7 163

Recommended Learning Resources

This section lists the recommended learning resources that relate to the specific learning outcomes in each suborganizer or cluster of learning outcomes. See the section on Learning Resources in this IRP for more information.

Assessment Instruments

Sample assessment instruments are provided at the end of each unit, and contain criteria specifically keyed to one or more of the suggested assessment activities contained in the unit.



CLASSROOM ASSESSEMENT MODEL • *Grade 1*

HOW WE WORKED TOGETHER

My name is: _____ The date is: _____

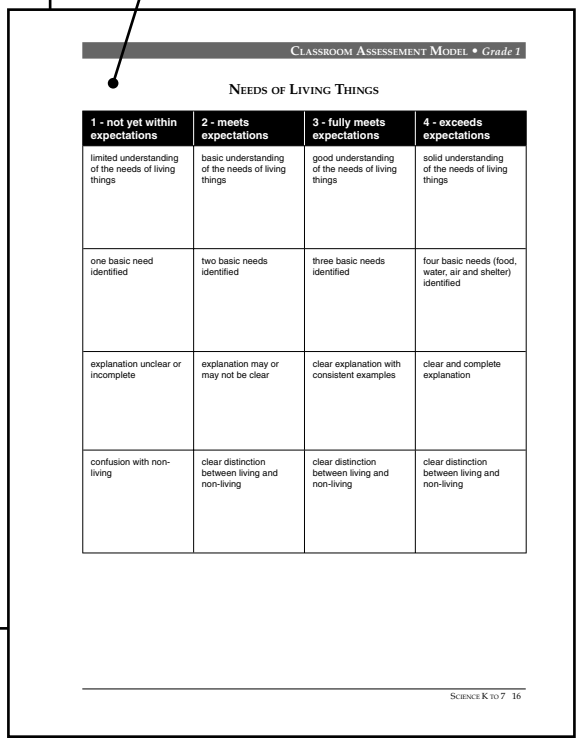
Other group members: _____

_____

Our task was: _____

GROUP MEMBERS:	Not Yet (not yet within expectations)	Sometimes (meets expectations)	Yes (fully meets expectations)	Always (exceeds expectations)
Everyone participated				
We listened to each other				
We encouraged each other (Yeah... Great.... I like that idea....)				
We took turns sharing ideas				
The group stayed together				
We accomplished our task				

166 SCIENCE K TO 7

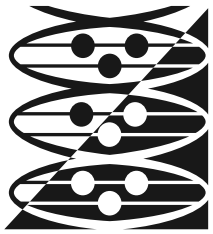


CLASSROOM ASSESSEMENT MODEL • *Grade 1*

NEEDS OF LIVING THINGS

1 - not yet within expectations	2 - meets expectations	3 - fully meets expectations	4 - exceeds expectations
limited understanding of the needs of living things	basic understanding of the needs of living things	good understanding of the needs of living things	solid understanding of the needs of living things
one basic need identified	two basic needs identified	three basic needs identified	four basic needs (food, water, air and shelter) identified
explanation unclear or incomplete	explanation may or may not be clear	clear explanation with consistent examples	clear and complete explanation
confusion with non-living	clear distinction between living and non-living	clear distinction between living and non-living	clear distinction between living and non-living

SCIENCE K TO 7 16



Classroom Assessment Model

Grade 5

Assessment Overview Table for: Grade 5

The purpose of this table is to provide teachers with suggestions and guidelines for classroom-based formative and summative assessment and grading of Science K to 7.

Curriculum Organizers	Suggested Timeframe	Suggested Assessment Activities	Suggested Weight for Grading	Number of Outcomes	Number of Outcomes by Cognitive Level *		
	Average # of hours				K	U & A	HMP
Processes Of Science	Integrated	Integrated	Integrated	3	2		1
Life Science	25-30	• quiz • model • written report • chart • presentation	33⅓ %	2	1	1	
Physical Science	25-30	• science log • written report • presentation • summative project • demo • model • drawing	33⅓ %	4	1	2	1
Earth And Space Science	25-30	• chart • presentation • self/peer assessment • debate • mind map • role play • oral summary	33⅓ %	4	1	2	1
Totals	75-90		100 %	13	5	5	3

* The following abbreviations are used to represent the three cognitive levels: K = Knowledge; U& A = Understanding and Application; HMP = Higher Mental Processes

GRADE 5: PROCESSES OF SCIENCE

Key Elements: Processes of Science

Estimated Time: integrate with other curriculum organizers

Fair Testing

Before students undertake complex experiments, it is necessary that they learn to conduct a fair test of a single variable. For a test to be considered fair, all the experimental actions involved must be equally applied. All the conditions must be consistent and standardized. Standardizing the various conditions concerned with the test will allow only the intended influences to be observed. In practice, this means identical procedures must be uniformly performed while one variable is changed at a time. Accurate fair testing involves isolating variables, eliminating bias, repeating the results, and closely scrutinizing the intended question. The credibility of the experimental test is then judged in order to determine what really changed and why. Questions for test rigour include

- Is the experiment free of biased observations?
- Have all the variables been isolated?
- Did the experiment involve only one variable?
- Were the experimental results expected?
- Can other people repeat the experiments and get similar results?

Often, students can study a simple test and state how it might be unfair; but the ability to specify how a test is fair and how it ensures all outcomes have been equally determined is more difficult. At advanced levels of learning, fair testing includes controlled experiments with more than one variable and determining the independent and dependent variables. Later when designing experiments, students learn to check for bias, remove any chance influences, look for experimental errors, and determine whether the experimental question can be properly addressed before they start their investigations.

Designing Experiments

Designing experiments involves devising scientific investigations to test a prediction. The easiest means of checking a prediction is to ask a specific question that will confirm the predicted ideas. An experiment is a set of steps prepared or laid out to test a single question. It usually involves deciding how to conduct the investigation so the cause-and-effect properties are tested and directly measured. To ensure fair testing, all the experimental actions involved must be equally applied (planning and designing an experiment requires careful attention to these experimental actions). There are three main stages to most scientific investigations: ***purpose, procedures, results***. Designing an experiment includes setting up the experimental problem, identifying the variables to be tested, planning for needed equipment, using inference to predict possible outcomes, and devising a set of tests to be carried out on all the outcomes. Once the experimental design is completed, advanced students at this level may choose to execute the procedure stage carefully and communicate the results to their peers.

Grade 5 Processes of Science

Prescribed Learning Outcomes	Suggested Achievement Indicators
It is expected that students will:	*The following set of indicators may be used to assess student achievement for each corresponding prescribed learning outcome.* *Students who have fully met the prescribed learning outcome are able to:*
• identify variables that can be changed in an experiment	❑ accurately list variables that can be changed in a given experiment (e.g., the amount, material, duration) ❑ outline an experiment where factors can be determined (e.g., toy car rally)
• evaluate the fairness of a given experiment	❑ accurately list variables in a given experiment that can be tested (e.g., running shoe tread) ❑ create a comprehensive report on the fairness of a given experiment
• describe the steps in designing an experiment	❑ identify several of the components in an experiment (e.g., PURPOSE: develop an experimental prediction, write a testable question, identify the variables, plan setup and equipment, predict possible outcomes, devise a set of tests PROCEDURE: conduct the investigation as planned, then collect the results. RESULTS: analyse the data and communicate the final conclusions) ❑ with teacher support, prepare an experimental plan that shows all the necessary components shown

GRADE 5 LIFE SCIENCE: HUMAN BODY

Key Elements: Life Science

Estimated Time: 25 – 30 hours

By the end of the grade, students will have recognized how the main systems of the human body work together.

Human Body

The study of the human body is a general overview of the structures and functions of the basic body systems, with particular emphasis on the study of the function of four organs: the heart, the lungs, the brain, and the skin. Through research and investigation of some easily observable and measurable indicators of body functions, students discover ways that our bodies' systems work together.

Vocabulary

cells, organs, heart, blood vessels, veins, arteries, trachea, lungs, esophagus, stomach, intestines, liver, kidney, bladder, colon, brain, spinal cord, nerves, blood cells, nerve cells, bones, cartilage, ligaments, muscles, tendons, skin, sense organs, membrane, digestion, nutrient, oxygen, carbon dioxide, pulse, reflex

Knowledge

- body organs interact with each other to ensure survival in the environment
- the respiratory system consists of the nose, mouth, trachea, and the lungs
- the circulatory system consists of the heart, arteries, veins, capillaries, and blood
- the function of the circulatory system is to transport oxygen, carbon dioxide, nutrients, waste products, water, and messenger chemicals to and from cells in the body via the blood
- the skeletal system consists of bones, cartilage, and ligaments
- the function of the skeletal system is to provide protection and structure, and to enable movement
- the muscular system is composed of muscles and tendons
- the function of the muscular system is to enable locomotion and the function of the some other body systems (e.g., circulatory, digestive, skin)
- the digestive system includes the teeth, mouth, esophagus, stomach, small intestine, liver, (pancreas), and large intestine
- the function of the digestive system is to extract nutrients and water from the food we eat so that it can be carried to all the cells of the body
- the excretory system consists of the kidneys and bladder
- the function of the excretory system is to eliminate soluble waste chemicals and regulate the amount of water in the body
- the nervous system consists of the brain, the spinal cord, nerves, and sensory organs
- the function of the nervous system is to allow us to sense and react to our environment and to control the other systems in the body

Skills and Attitudes

- use measurement tools
- design and carry out experiments on the functions of body systems and record results
- draw conclusions about the function and interactions of body systems

Grade 5 Life Science: Human Body

Prescribed Learning Outcomes

It is expected that students will:

- describe the basic structure and functions of the human respiratory, digestive, circulatory, skeletal, muscular, and nervous systems

Suggested Achievement Indicators

The following set of indicators may be used to assess student achievement for each corresponding prescribed learning outcome. Students who have fully met the prescribed learning outcome are able to:

- ❑ identify the organs and their functions in a human body system
- ❑ illustrate the human respiratory, digestive, circulatory, skeletal, muscular, and nervous systems
- ❑ with teacher support, conduct various experiments to safely measure and record the responses of the various systems (e.g., heart rate, lung capacity, and reaction time)

Planning for Assessment	Suggested Assessment Activities
• Provide students with information on the heart, lungs, skin, and brain.	• To check that students can identify and describe the functions of the heart, lungs, skin, and brain, have each student devise one question for each. Assign peers to attempt the questions, comment on appropriateness, and suggest improvements. Publish the edited questions and then select several to act as a written assessment tool to be given to the class as a whole.
• Have the class brainstorm all the words they associate with body systems.	• Have each student "sort and predict" in a chart all the brainstormed words according to the appropriate body system. Ask students to self-correct the chart as they carry out further activities by moving or adding words to the appropriate body system (e.g., some might add liver to the digestive and circulatory systems).
• In groups, have students outline their bodies on a large sheet of paper. Ask groups to find, identify, and label the appropriate places of different organs that belong to the basic body systems, using books, the Internet, posters, or videos. • Have student groups make 3-D models of body organs and systems and describe how they function (e.g., use bottles for stomachs, old pantyhose for intestines, balloons for bladder, old combs for teeth).	• Look for evidence that student models use - logical organization - reasonable representations - show major organs. Consider the extent to which students work effectively together and use learned vocabulary.

continued next page

Human Body (continued)

Planning for Assessment	Suggested Assessment Activities
• Set up a series of learning stations where students work collaboratively and safely to investigate and conduct experiments on body systems. Ask students to - measure and record heart rate before and after some mild exercise (e.g., jumping jacks) - measure and record lung capacity by exhaling through a tube inserted into a container of water - measure and record reaction time by having one student grab a ruler dropped vertically by another student over several trials - test and record skin responses to hot and cold by having students dip one hand into hot and cold water for 30 seconds before immersing both in room temperature water.	• When conducting investigative experiments, consider the extent to which students - ask appropriate questions (e.g., "How can I make my heart beat faster?" "What happens to my skin in hot and cold water?" "How fast can I catch a ruler?") - gather and set up materials - follow a logical procedure that is fair and consistent - collect and clearly organize data - draw reasonable conclusions and be able to communicate them (e.g., oral class presentations, science journal entries) - work collaboratively with others (e.g., listening, encouraging each other, sharing observations).
• Revisit students' original brainstorm of body system words to add to their initial sort-and-predict charts.	• Have students choose three or more words they moved or added and justify in writing why they did so (i.e., tell what they learned). Assess responses to the following types of questions: - I moved _____to _____ system because... - I learned that the _____ is important because... - One thing I found interesting/amazing about the _____ (system/organ) was... - I would like to learn more about the _____ (organ/system) because...

Recommended Learning Resources

- The Amazing Body for Students Series
- Circulatory and Respiratory Systems
- From Head To Toe (AIMS Activities)
- Hands-on Science (The Human Body)
- The Real World Science Series (The Skeletal and Muscular Systems; The Digestive & Excretory System; Respiratory and Circulatory System; The Brain and Nervous System)
- Science & Technology 5 (The Human Body)
- What's Inside Your Body?

Grade 5 Life Science: Human Body

Prescribed Learning Outcomes

It is expected that students will:

- explain how the different body systems are interconnected

Suggested Achievement Indicators

The following set of indicators may be used to assess student achievement for each corresponding prescribed learning outcome. Students who have fully met the prescribed learning outcome are able to:

- ❑ generate and answer several questions to investigate how body systems are integrated (e.g., How are the various systems connected to each other? Could one system live with the other systems? If not, why not?)
- ❑ demonstrate various ways in which body systems work together, using role plays, posters, and/or 3-D representations

Planning for Assessment	Suggested Assessment Activities
• Using learned vocabulary, ask students to describe how different systems are interconnected by linking parts and functions, such as - heart/lung/oxygen—CO_2 exchange - brain/nerve—message - tendons and ligaments/bones—movement - veins/arteries—circulate.	• Have student groups share how they linked the words. Consider the extent to which student presentations show a logical sequencing of words (e.g., muscles connect bones so that a body can move; lungs provide O_2 to the blood, which is pumped by the heart).
• Have students complete vocabulary word wheels for the various organs they study, divided into six sections plus a centre circle. The circle asks the question, "What is the system?" Each of the six sections asks the following questions - To which system does it belong? - To which system is it connected? - Is there only one system or many? Why? - What is the system's main job? - Could we live without it? If so, how? - What does it need to work well?	• Ask students to assess each other's word wheels for accuracy and clarify of information. Encourage students to provide each other with help completing their wheels if necessary.

Recommended Learning Resources

- The Amazing Body for Students Series
- Circulatory and Respiratory Systems
- From Head To Toe (AIMS Activities)
- Hands-on Science (The Human Body)
- The Real World Science Series (The Skeletal and Muscular Systems; The Digestive & Excretory System; Respiratory and Circulatory System; The Brain and Nervous System)
- Science & Technology 5 (The Human Body)
- Thinking Connections: Concept Maps for Life Science
- What's Inside Your Body?

GRADE 5 PHYSICAL SCIENCE: FORCES AND SIMPLE MACHINES

Key Elements: Physical Science

Estimated Time: 25 – 30 hours

By the end of the grade, students will have understood the relationship between forces and mechanical advantage in simple machines.

Forces and Simple Machines

In this study, students begin to understand the relationship between effort (applied force) and simple machines. By exploring and experimenting with a variety of objects, students develop understanding of the relationship between the mass and motion of an object and the force needed to change the object's direction, speed, and position. Through hands-on activities, students identify and understand the characteristics and uses of the simple machines. Students describe how the application of machines reduces the applied force required for people to do work. They also design and construct both simple and compound machines with a useful function.

Vocabulary

simple machine, lever, wedge, pulley, ramp, screw, inclined plane, wheel, axle, effort force, force, fulcrum, mass (weight), load, friction, work, compound machine, unbalanced forces, balanced forces, equilibrium

Knowledge

- unbalanced forces 'change' motion, while balanced forces 'maintain' the motion
- a pulling or pushing force can be measured with a spring scale
- friction is a force parallel to a surface that will result when an object makes contact with a surface
- surface texture can be rough, smooth, or slippery depending upon the material that is at the surface
- frictional forces, mass, surface texture, and the slope all can affect the movement of an object down a ramp incline
- simple machines change the effect of how much effort force is applied to the machine to do something useful
- simple machines include lever, wedge, inclined plane, screw, roller, axle, wheel, and pulley
- simple machines don't change the load (mass); they change the amount of effort used to move the same mass
- compound machines are combinations of simple machines (screw and screw-driver, scissors, teeter-totter, ladder-and-slide, shopping cart, wood-axe, door handle, hinge, travois, wheelbarrow, pencil sharpener, hand-drill, push-mower, typewriter, bicycle)

Skills and Attitudes

- observe the effort used to change the direction and motion of objects (balanced and unbalanced forces)
- measure amount of effort force "saved" by using a simple machine
- demonstrate curiosity and show inventiveness
- design an investigation to test and compare simple machines
- ensure fair testing when conducting an experiment
- identify and control variables in an investigation
- communicate in various media to show how simple machines work
- use materials and tools safely

Grade 5 Physical Science: Forces and Simple Machines

Prescribed Learning Outcomes

It is expected that students will:

- demonstrate how various forces can affect the movement of objects

Suggested Achievement Indicators

The following set of indicators may be used to assess student achievement for each corresponding prescribed learning outcome. Students who have fully met the prescribed learning outcome are able to:

- ❑ accurately describe the effects of increasing and decreasing the amount of force applied to an object (e.g., lifting a wooden block)
- ❑ compare the effects of friction on the movement of an object over a variety of surfaces (e.g., sandpaper, rug, smooth wood, chalk dust, gravel)
- ❑ with teacher support, design a fair test to see how an object's motion is affected by ramps with different surfaces, slope, length, and initial height

Planning for Assessment	Suggested Assessment Activities
• Use Toy Blocks, sewing thread, and hand-held spring gauges to measure push and pull effort forces. Tie the thread around one block and the end of the thread to the spring gauge. Holding the spring gauge, lift the block by pulling gently on the thread. With the block now hanging from the thread, read the measurement on the gauge.	• Students should predict and record the results for each activity. Look for evidence of - proper use of equipment - willingness to make/record a prediction - ability to provide a reason for the prediction - willingness to record a result contrary to a prediction - ability to reflect on reasons for different (or same) results
• After trying one thread and one scale and one person, add people. For a two-person pull, lift opposite to each other around the block. Take a reading of pulling force shown on the scales. Have students try it with three, four, and five people to see the effort forces changes fractionally by the number of people equally pulling on the block to lift it. Compare readings to the one-person lifting measurement.	• Students should measure the two-person pull used to lift the block, being careful to pull equally around the block from two attachment points. Students should be able to notice a 50% change in pulling force as measured on the gauge. They are comparing this with the one-person lift/pull. Students could show their understanding by coming up with a fractional answer for the number of people pulling. Students are measuring balanced forces at the moment the block is stationary in the air, their hands are not moving, and the spring gauges are reading a steady number.

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Forces and Simple Machines (continued)

Planning for Assessment	Suggested Assessment Activities
• Using spring scales, ask students to compare the force needed to slide a measured mass/load (e.g., a book) up a ramp. Vary the nature of the surfaces texture (e.g., a smooth clay tile, a piece of sandpaper, piece of rug, smooth plastic). Take different readings using a spring scale to measure the amount of effort force used to slide the mass up the ramps.	• Look for evidence that students have followed the proper procedure for organizing and conducting an experiment: - asking a question - identifying the variable that will change (surface of the ramp) - identifying other variables that will stay the same (load, slope) - measuring, using the appropriate tool (spring scale) - recording trial results in a logical manner (chart) - drawing conclusions that reflect the question.
• Design a fair test for a toy car gravity race. Have students test how different slopes, surfaces, or car weights (mass) affect their moving energy (momentum) and the distance finally travelled by the toy car. • As an advance exploration, have students design and fair test how sports-balls drop and bounce against different textures of floors. (rug, tile, concrete, wood) What is being investigated is the main difference surface friction has on the returning upward bounce. • Have students drop a ball using a standard height (e.g., 1 metre) to represent the force. They then describe the bouncing results. They must use the same ball for each surface (other students can use different balls for theirs). Sports-balls have differing compositions (rubber, leather, plastic) and therefore will have different upward bounces. Students should measure as many components as they believed are involved (size, weight, height, etc.). Caution: this investigation must be very carefully standardized, as many unseen variables are involved. (e.g., The elastic surface of the balls, the weight of the ball, the height of the drop and the height of the first return bounce, the quality or flatness of the floor). What should be changed is the type of floor face the balls drop onto, so they will bounce differently.	• As well as meeting the criteria for organizing and conducting experiments (see above), consider the extent to which students have identified all the variables involved and decided which variables to control. Use peer assessment for fair testing. Some criteria for students to consider include - My partner helped to set up a fair test by _____ _____. - My partner had a good idea when _____. - We worked well together because _____. - We need to work on _____ to improve our test. - We need to work on _____ to improve how we work together. • The preceding criteria can be put in a checklist and used throughout the unit. See also the assessment tool, "My Science Investigation—Drop the Bouncing Ball" located at the end of the Classroom Model • When assessing students' conclusions, look for details about surface texture and MORE or LESS friction. They should also note that the height of the upward bounces is telling them some important fact about the investigation.

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Forces and Simple Machines (continued)

Recommended Learning Resources

- Hands-on Science (Simple Machines)
- OceanNews
- Putting it in Motion (Pan Canadian Science Place)
- Science Answers
- Science Detective™ Beginning: Higher-Order Thinking, Reading, Writing in Science
- Science & Technology 5 (Forces on Structures)
- Science, Please! (Parts 1 & 2)
- Simple Machines
- A World in Motion: The Design Experience

Grade 5 Physical Science: Forces and Simple Machines

Prescribed Learning Outcomes

It is expected that students will:

- demonstrate mechanical advantage of simple machines, including lever, wedge, pulley, ramp, screw, and wheel

Suggested Achievement Indicators

The following set of indicators may be used to assess student achievement for each corresponding prescribed learning outcome. Students who have fully met the prescribed learning outcome are able to:

- ❑ identify and classify everyday devices according to the six basic machines (lever, wedge, inclined plane, screw, roller, axle, wheel, and pulley)
- ❑ compare the advantages and disadvantages of various simple machines for identical tasks (i.e., choosing the right machine for the right job)

Planning for Assessment	Suggested Assessment Activities
• Review the previous work on simple machines by making sure the vocabulary is understood. Check prior knowledge of forces including balanced and unbalanced, plus the concept that a simple machine has effort (force) going into the machine and the machine is putting out (output) a changed force.	• Use observations and discussion to determine the students' understanding.
• Have examples of simple machines to show students, encouraging them to use learned vocabulary to describe the following - screw (screw-top jar lid; wood screw) - wedge (doorstop, nail) - pulley (yo yo, fishing reel) - lever (tweezers, scissors, shipper's dolly) - wheel (toy car, steering wheel) - axles (hinges, blinds, AV screen) - inclined plane (stairs, ramp).	• Give students parts from a child's construction kit or find equipment from the science supply room. Have students fabricate and show one of each sample machine : - lever - wedge - inclined plane - screw - axle and wheel - pulley. Each machine can be submitted for assessment to the teacher or a partner. Alternatively, students can make labelled drawings of each simple machine and submit to a partner or the teacher for assessment.
• Take students on a walk (inside or outdoors) to see how many simple machines they can find. Be mindful that most wheels have bearings inside the axle and therefore are a compound machine. • Set up a machine ID table, using a variety of household gadgets and tools. Have students practise identifying the simple machines in each object and the job they do.	• In their science logs, have students make labelled drawings of their discoveries and describe their experiments with simple machines. Look for - appropriate scientific vocabulary used - diagrams properly labelled - explanations provided as to how simple machines work. - appropriate procedures followed - predictions and hypotheses made and tested - results recorded.

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Forces and Simple Machines (continued)

Planning for Assessment	Suggested Assessment Activities
• Set up stations that allow students to operate or manipulate simple machines such as levers, wheel and axle, wedges and screws, pulleys, and inclined planes to test how they make work easier. • Follow up by making effort comparison between different sizes of the same simple machine (e.g., three sizes of screwdriver, three lengths of scissors, three types of nail pulling levers) Determine the effort to use when operating these simple machines. Use the same test items for each. For the screw, use all screwdrivers (i.e., 2" #8), cut the same card-paper along a straight line with all the scissors, and finally try pulling out the same size common nails (i.e., 3" flat-head, half embedded in wood) with the nail pullers.	• Develop a comparison system for the students or work with them to develop their own table. Remind them that to fair test they have to keep most of the parts identical. The table or chart should contain - columns or rows for one size of machine - columns or rows for each test item - a quality for measuring the item (e.g., screw: how many hand turns) - student effort rating (e.g., easy, medium-easy, hard, or no difference) - conclusion specifying which machine would be best for the tested item - evidence in their thinking that shows they can relate the best device for other possible situations with different items than the ones investigated. (e.g., small nails with smaller diameters, thinner paper for cutting, different types of screws).

Recommended Learning Resources

- Hands-on Science (Simple Machines)
- Putting it in Motion (Pan Canadian Science Place)
- Science Detective™ Beginning: Higher-Order Thinking, Reading, Writing in Science
- Science & Technology 5 (Forces on Structures)
- Science, Please! (Parts 1 & 2)
- Simple Machines
- A World in Motion: The Design Experience

Grade 5 Physical Science: Forces and Simple Machines

Prescribed Learning Outcomes

It is expected that students will:
- design a compound machine

Suggested Achievement Indicators

The following set of indicators may be used to assess student achievement for each corresponding prescribed learning outcome. Students who have fully met the prescribed learning outcome are able to:

❑ identify the simple machine incorporated in the working parts of compound machines designed for a specific task (e.g., lifting, pulling, and carrying heavy loads)

❑ proficiently assemble a compound machine, illustrating in detail how it is constructed from a combination of simple machines

Planning for Assessment	Suggested Assessment Activities
• Have students examine items from around the school that they believe show a simple machine in operation. (e.g., can opener, scissors, paper cutter, playground slide, flat tongs for trash, dust pan, and flag pole rope) • Using the previous machines, compare these to another set of devices found around the school, which show combinations of simple machines. (e.g., spring-loaded door, drawers, door hinges, roller blind, stage rope/curtain/hooks, freight dolly, mop squeeze rinse, trash picker with trigger grip and a dusk bucket on a pole). • Have students prepare a compare and contrast sheet or a KWL using these items. • Discuss how these examples combine and work with levers, pulleys, ramps, screws, wedge, wheels, incline plane.	• When assessing students initial compare and contrast focus on early understanding only. In particular look for - alignment of matched items by similar function, (i.e., trash picker, dust bin) - correct naming of simple machine part (i.e., lever, pulley etc.) - ability to explain the machine's function and necessity. • After discussion, all students should be able to name the basic machine parts in the school examples: levers, pulleys, ramps, screws, wedge, wheel and axle, incline plane
• Have students use the following process to design an imaginary compound machine - start with an idea and provide a reason or necessity for the invention - the machine should move an object (load) horizontally and vertically - identify the simple machines parts that make up the compound machine by the purpose they serve - draw a design on paper - label the parts on paper - (optional) build a labeled working model - identify difficulties and suggest improvements to the design.	• When assessing students' compound machines, consider the extent to which students have - followed various steps of the design process - designed a machine that consists of more than one interconnected simple machine - designed the machine to move the object (load) upward - designed the machine to move the object (load) a horizontal distance - demonstrated creativity or originality - shown understanding and are able to explain the machine's function - matched the machine with the task.

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Forces and Simple Machines (continued)

Planning for Assessment	Suggested Assessment Activities
• Conduct a close look at some heavy equipment machinery in your neighbourhood. If possible, arrange a field-study to visit an industrial equipment site. Focus on the levers and wheels on machines and the way these work together. Also look at the large hand-tools used to repair these machines. (Note: at this level of understanding hydraulics are not explained. All large machines use hydraulic pistons and pumps to move their levers and wheels)	• Assess student understanding by looking for their ability to - use correct vocabulary - identify how one simple machine is connected to another - describe how movement and motion of the one machine is transferred into the next simple machine (e.g., rotation into pulling – for a fishing reel). - demonstrate, using labelled diagrams, how human power is applied to the machine setup to make it work.

Recommended Learning Resources

- Below Zero
- Hands-on Science (Simple Machines)
- Putting it in Motion (Pan Canadian Science Place)
- Science Detective™ Beginning: Higher-Order Thinking, Reading, Writing in Science
- Science, Please! (Parts 1 & 2)

Grade 5 Physical Science: Forces and Simple Machines

Prescribed Learning Outcomes

It is expected that students will:

- describe applications of simple and compound machines used in daily life in BC communities

Suggested Achievement Indicators

The following set of indicators may be used to assess student achievement for each corresponding prescribed learning outcome. Students who have fully met the prescribed learning outcome are able to:

- ❑ give several examples of some common heavy machines that contain simple machines (e.g., fork-lift, backhoe, grader, crane, log-loader)
- ❑ illustrate in detail how a combination of simple machines can be used to solve various problems in daily life
- ❑ describe the various ways in which Aboriginal peoples in BC have used machines to meet basic and artistic needs in their daily lives

Planning for Assessment	Suggested Assessment Activities
• Have students identify several methods and machines using human power for - lifting a load upward - lowering a load downward - lifting and swinging a load sideways - pulling a heavy load up a ramp - moving a very heavy load a short distance (e.g., a rock with a lever). • Have students identify where the fulcrum is located on several types of machines with lifting arms. • Common machines will have hydraulic oil systems, which are not simple, but all will be attached to a simple machine that students will be able to recognize.	• When beginning to look at common machines students must be able to name where a lever is hinged, how it is pushed or pulled, and how it does work. • On machines with hydraulic pistons, ask students to explain how the hydraulics are attached to a simple machine (i.e., as enhancements).
• Present students with a specific problem-solving situation (e.g., how to transport a person in a wheelchair up or down a flight of stairs). Have them provide possible solutions using simple machines. The project task is to design an emergency exit machine for an injured person needing to go down the stairs and outside a door. The design must incorporate two or more simple machines.	• When assessing student solutions, consider - whether the students have given a logical explanation of their solution - the simplicity and elegance of solution - the compatibility of machine for the task - whether the solution uses at least two simple machines - whether the solution uses three or more simple machines interconnected - whether the solution removes the person safely down the stairs - whether the solution gets the person outside the door.

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Forces and Simple Machines (continued)

Planning for Assessment	Suggested Assessment Activities
• Have students investigate simple and compound machines used by Aboriginal peoples (e.g., hunting and/or fishing techniques, building canoes and/or Red River carts, creating and/or raising poles). • Ask students to research how Aboriginal peoples used, or continue to use, machines (simple and compound), and how adaptations, if any, have been made to meet needs; for example - snowshoes to snowmobiles - hand thrashing to horse-drawn mower to ploughs - cedar canoes to power boats - hand-made shelter to machines used to build homes.	• Establish with students specific criteria for investigating, drawing, and labelling an Aboriginal machine, such as - identified resources used in making the machine and its purpose - indicated why a particular machine was chosen - showed how the machine was/is used - drawings and labels are accurate and appropriate. • Have students prepare a report to the class (e.g., posters complete with pictures showing "Then and Now"). Establish general criteria for assessing reports, posters, articles, etc., such as - use of at least three resources - use of scientific vocabulary - clear comparisons between then and now. Alternatively, ask students to complete a Know Wonder Learn (KWL) chart or concept map of what they have learned.

Recommended Learning Resources

- OceanNews
- Putting it in Motion (Pan Canadian Science Place)
- Science Detective™ Beginning: Higher-Order Thinking, Reading, Writing in Science

GRADE 5 EARTH AND SPACE SCIENCE: RENEWABLE AND NON-RENEWABLE RESOURCES

Key Elements: Earth and Space Science

Estimated Time: 25 – 30 hours

By the end of the grade, students will have assessed the environmental considerations associated with the extraction and use of renewable and non-renewable resources.

Renewable and Non-renewable Resources

This study is an introduction to renewable non-renewable resources in British Columbia. Students learn how people harvest or extract, process, and use renewable and non-renewable resources. Students classify living and non-living resources as renewable or non-renewable and investigate effective uses of various resources. They consider issues of resource use from various perspectives and identify ways in which people use resources responsibly.

Vocabulary

The following list will be dependent on local resources:
ecosystem, local environment, water cycle, groundwater, surface runoff, leaching, biodegradable, natural resources, watershed, air-shed, conservation, recycling, extraction, harvesting, renewable, non-renewable, pollution (water/air/soil), equilibrium, resource, raw materials, solar energy, environmental impact

Knowledge

- all resources used by humans, including fuels, metals and building materials, come from the Earth
- many resources take thousands or millions of years to develop and accumulate; as such, they are considered non-renewable resources (e.g., fossil fuels, rocks and minerals)
- some resources are constantly available and are considered to be renewable resources (e.g., hydropower, sun, and wind)

Skills and Attitudes

- analyse data to determine if a resource is renewable or non-renewable
- investigate an environmental resource issue
- identify variables that will determine if a particular locally used resource is renewable
- resources should be used carefully, recycled, and conserved by humans whenever possible
- demonstrate socially responsible actions

Grade 5 Earth and Space Science: Renewable and Non-renewable Resources

Prescribed Learning Outcomes

It is expected that students will:

- analyse how BC's living and non-living resources are used

Suggested Achievement Indicators

The following set of indicators may be used to assess student achievement for each corresponding prescribed learning outcome. Students who have fully met the prescribed learning outcome are able to:

- ❑ with teacher support, analyse data and correctly classify BC's resources as renewable or non-renewable (e.g., renewable: salmon; non-renewable: copper)
- ❑ explain in detail various ways in which BC's resources are used (i.e., for commercial and/or recreational purposes)

Planning for Assessment	Suggested Assessment Activities
• Brainstorm resources in British Columbia. Establish criteria for determining whether a resource is living (e.g., breathes, grows, uses energy) or non-living (none of the above examples).	• Use T-charts to classify the brainstormed resources as living or non-living. Encourage students to use criteria developed for appropriate classification. Check for understanding by reviewing T-charts.
• Ask students to choose one resource and identify possible uses (e.g., trees: furniture, houses, paper, fuel, recreation; petroleum: fuel, plastics, clothing, cosmetics).	• Have students construct word splashes or mind maps in small groups. Post student work and have groups do a gallery walk to review each other's work. Ask students to write on a blank piece of paper beside each group presentation suggestions on what could be added. Student self-assessment of the gallery walk could address questions/statements such as - How helpful were the suggestions I gave? - Based on my gallery walk, now I know how/why _____ is used/is an important resource. (summarize) - Questions I have about _____ are: _____ (give two or three). - I will find out about (question #?) by _____ (action plan).
• As a class, participate in local environmental education programs (e.g., salmonid enhancement, Project Wild, Project Tree, Project Wetlands, Project Oceans).	• Most environmental education programs have developed assessment tools (e.g., Project Wild: salmonid enhancement).

Recommended Learning Resources

- Backyard Biodiversity and Beyond
- Forests in Focus
- OceanNews
- Our Resources (Pan Canadian Science Place)
- Project WET
- Salish Sea
- Salmonids in the Classroom
- Urban Stewards
- The Watershed Works

Grade 5 Earth and Space Science: Renewable and Non-renewable Resources

Prescribed Learning Outcomes

It is expected that students will:

- identify methods of extracting or harvesting and processing BC's resources

Suggested Achievement Indicators

The following set of indicators may be used to assess student achievement for each corresponding prescribed learning outcome. Students who have fully met the prescribed learning outcome are able to:

- ❑ illustrate several examples of resource harvesting or extraction (e.g., salmon, trees, oil, gas, water, copper, coal)
- ❑ trace a finished BC resource-based product (e.g., a tin of salmon, cedar basket, oil and gas) to its source

Planning for Assessment	Suggested Assessment Activities
• Have students choose a BC product and research how it is developed, and create a flowchart. For example, copper wire: ore extracted, crushed, and concentrated; sent to smelter and melted into bars; sent to manufacturers and made into wire, sheets, and pipes; sent to distributors, or sent to retailers such as hardware stores where the product is purchased. Students may wish to contact, for example, mining companies, local manufacturers, and/or the appropriate government ministry.	• Design with students a scoring guide to assess flowcharts. Criteria could include - uses appropriate vocabulary - is organized in a logical sequence - includes primary processes or main ideas - shows details for all parts of the process.
• Have students create diagrams or participate in simulations to illustrate examples of extraction (e.g., extraction—chocolate chip cookie mining). For example, in a chocolate cookie simulation, students use paperclips to "mine" chocolate "ore" from a cookie "claim" they have purchased (monopoly money).	• Ask students to assess their own performance in the simulation according to pre-set criteria (e.g., amount of chocolate mined; value of chocolate; cost of the tools [paperclips] and claim [cookie]). • Have students compare what they did in the game to the actual extraction process. Criteria for assessment would include completion of each step in the process. Students then create an overview of the process, with a figurative representation, an explanation, an analogy, and two questions to find out more about the process.

Recommended Learning Resources

- Forests in Focus
- Kokanee of British Columbia
- Our Resources (Pan Canadian Science Place)
- Salmonids in the Classroom
- Urban Stewards
- The Watershed Works

Grade 5 Earth and Space Science: Renewable and Non-renewable Resources

Prescribed Learning Outcomes

It is expected that students will:

- analyse how the Aboriginal concept of interconnectedness of the environment is reflected in responsibility for and caretaking of resources

Suggested Achievement Indicators

The following set of indicators may be used to assess student achievement for each corresponding prescribed learning outcome. Students who have fully met the prescribed learning outcome are able to:

- ❑ illustrate in detail various ways in which Aboriginal peoples take care of the land and the resources
- ❑ explain, citing examples, how and why Aboriginal peoples' unique relationship with the environment demonstrates responsibility for the land and resources

Planning for Assessment	Suggested Assessment Activities
• Discuss with students how Aboriginal peoples demonstrate pride and ownership of resources from the land (e.g., choosing to use only a part of a tree, so as to not kill it; only fishing for their family's needs; using all parts of the moose, or deer, so as not to waste it. Then, invite First Nations speakers to share their perspectives on the terms "living" and "non-living."	• Have students prepare questions to ask the speakers. Consider the extent to which students - show curiosity and respect - ask relevant and appropriate questions - demonstrate understanding of the Aboriginal concept of interconnectedness of the environment - identify ways in which Aboriginal peoples demonstrate care and responsibility for the environment.
• Have students explore controversial issues that are pertinent to First Nations people (e.g., a mining company comes into a small community—the First Nations community is concerned that their stores of fish will be depleted, and the water source may be contaminated; a logging company wants to clear-cut an area in a First Nations community—the First Nations people consider the trees sacred and necessary for various wildlife). Ask students to prepare and present written arguments using the RAFT strategy **R**: Role of Writer—Who are you? **A**: Audience—To whom is this written? **F**: Format—What form will it take? a letter, a poem, a journal? **T**: Topic + strong verb—What important topic have I chosen? Choose a strong verb to describe your intent	• Have students discuss the pros and cons from the point of view of the First Nations community, the mining company, or the deer population. Observe levels of student participation and willingness to listen to other points of view. Then have them write a statement summarizing a chosen point of view. Consider whether students have - identified needs and concerns of this point of view - expressed sensitivity to all points of view.

Recommended Learning Resources

- Cycle of Life/Recycle Handbook for Educators
- Once Upon a Seashore
- Our Resources (Pan Canadian Science Place)
- Salish Sea
- The Watershed Works

Grade 5 Earth and Space Science: Renewable and Non-renewable Resources

Prescribed Learning Outcomes

It is expected that students will:

- describe potential environmental impacts of using BC's living and non-living resources

Suggested Achievement Indicators

The following set of indicators may be used to assess student achievement for each corresponding prescribed learning outcome. Students who have fully met the prescribed learning outcome are able to:

- ❑ identify and describe a variety of solutions to address the issue of natural resource management in BC (e.g., conservation of resources through recycling)
- ❑ collect relevant data and coherently articulate various points of view on a local resource issue in BC

Planning for Assessment	Suggested Assessment Activities
• Have students investigate ways of conserving resources through the practice of reduce, reuse, recycle by setting up a school- or community-based program (e.g., paper recycling/use reduction; can/bottle/juice box recycling; water conservation).	• Monitor student-generated conservation programs by tracking effectiveness (e.g., amount of paper saved; money earned from can/bottle/juice pack box). Have students develop a checklist on constitutes a successful program.
• Collecting information from a variety of sources, have students debate a resource issue. Pro and con positions should be extended to include perspectives of Aboriginal peoples, impact on local jobs and the economy, environmental quality, living resources, and politics. Students should use a problem-solving or decision-making model to help them decide the issue, and write letters communicating the class results to key individuals in the community.	• Ask students to work together to debate the pros and cons involving the extraction or use of a BC resource. Look for evidence that students - define/clarify the problem - gather, analyse, and interpret information available - synthesize information into a concise representation - contribute to group problem solving and decision making - understand that the use of BC resources affects local ecosystems as well as communities - are able to make decisions based on responses, pro and con.

Recommended Learning Resources

- Backyard Biodiversity and Beyond
- Cycle of Life/Recycle Handbook for Educators
- Forests in Focus
- Kokanee of British Columbia
- Once Upon a Seashore
- Our Resources (Pan Canadian Science Place)
- Project WET
- Project WILD
- Salish Sea
- Urban Stewards
- The Watershed Works

MY SCIENCE INVESTIGATION—DROP THE BOUNCING BALL

This assessment tool can be used when teaching students various ways an effective science investigation can and should be conducted (e.g., determine if students have addressed what is needed; know how to proceed; understand the importance of predicting; examine variables; make fair observations; and draw relevant, conclusions). Although this scoring guide is written for dropping a bouncing ball, it can be used with other science investigations.

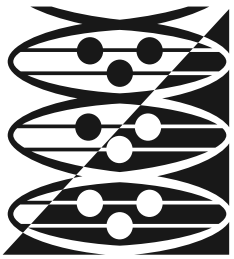
	1 (not yet within expectations)	2 (meets expectations)	3 (fully meets expectations)	4 (exceeds expectations)
Predicting	has difficulty predicting and/or prediction not reasonable given purpose of investigation	understands what a prediction is but may need to be encouraged to propose one and to record before proceeding	willing to make and record logical predictions for investigation (e.g., "I predict this hard floor will bounce less than the soft floor)	able to make accurate predictions without any assistance.
Organizing	little or no evidence of awareness or attempts to organize data in a logical manner	approaches organizing for investigation in an "as needed" manner (i.e., does not consistently plan ahead for how data will need to be organized/presented)	shows ability to consider how to organize data prior to undertaking investigation and how to proceed (e.g., prepare an empty chart or table)	organizes well, plans ahead, and adds new categories for organizing data
Identifying variables	little or no thought given to other variables that might affect investigation, even when questioned or encouraged	understands that a variable is something that can be changed/controlled but may not be able to identify all other possible variables	recognizes the main variable (e.g., force) as something changeable	recognizes that other changes could be considered variables (e.g., type of ball, bouncing surface)
Manipulating variables (modifying the testing)	does not change investigation to consider other variables for testing does not recognize need for more trials	carries out investigation for required variable (e.g., height, weight, floor textures) may not recognize that variables need to be tested more than once,	does not need to be encouraged/directed to test or consider other variables	investigates different variables (e.g., distance, size, materials, surfaces) and organizes collected data accordingly recognizes some variables are difficult to control
Recording observations	minimal recording of what is observed; no organization to data	records what is observed but may be reluctant to record observations contrary to predictions	records what is observed honestly	accurately records what is observed fairly, even when predictions are disproved (i.e., results don't match)
Drawing conclusions	does not provide a clear conclusion. may remark on the effort they applied but does not refer to the science concepts	conclusion only restates the recorded results and observations	conclusion reflects science understanding within context (forces effect the bounce) and gives some reason for results based on observed evidence.	completes investigation with logical conclusions that reflect ability to match the evidence, the data collected, and the observations made. makes a comprehensive report that shows scientific understanding of the concepts of forces, friction, and fair tests

Teacher:

- **1** = not yet within expectations
- **2** = meets expectations
- **3** = fully meets expectations
- **4** = exceeds expectations

Student:

- **1** = needs to be better
- **2** = okay
- **3** = quite good
- **4** = best expectations



LEARNING RESOURCES

This section contains general information on learning resources and provides the titles, descriptions, and ordering information for the recommended learning resources in the Science K to 7 Grade Collection.

What Are Recommended Learning Resources?

Recommended learning resources are resources that have undergone a provincial evaluation process using teacher evaluators and have Minister's Order granting them provincial recommended status. These resources may include print, video, software and CD-ROMs, games and manipulatives, and other multimedia formats. They are generally materials suitable for student use, but may also include information aimed primarily at teachers.

Information about the recommended resources is organized in the format of a Grade Collection. A Grade Collection can be regarded as a "starter set" of basic resources to deliver the curriculum. In many cases, the Grade Collection provides a choice of more than one resource to support curriculum organizers, enabling teachers to select resources that best suit different teaching and learning styles. Teachers may also wish to supplement Grade Collection resources with locally approved materials.

What Kinds of Resources Are Found in a Grade Collection?

Learning resources in a Grade Collection are categorized as either comprehensive or additional. Comprehensive resources provide a broad coverage of a significant number of the learning outcomes. Additional resources are more topic-specific and support individual curriculum organizers or clusters of outcomes.

The ministry updates the Grade Collections on a regular basis on the ministry web site http://www.bced.gov.bc.ca/irp_resources/lr/resource/gradcoll.htm

Please check this site for the most current list of recommended learning resources in the Grade Collection for each IRP.

How Can Teachers Choose Learning Resources to Meet Their Classroom Needs?

Teachers must use either:

- provincially recommended resources
  OR
- resources that have been evaluated through a local, board-approved process.

Prior to selecting and purchasing new learning resources, an inventory of those resources that are already available should be established through consultation with the school and district resource centres. The Ministry also works with school districts to negotiate cost-effective access to various learning resources.

Information about Ministry initiatives to support resource acquisition can be found at: http://www.bced.gov.bc.ca/irp_resources/lr/resource/res_main.htm

What Are the Criteria Used to Evaluate Learning Resources?

The Ministry of Education evaluates learning resources that support BC curriculum, and that will be used by teachers and/or students for instructional and assessment purposes. Evaluation criteria focus on content, instructional design, technical considerations, and social considerations.

Additional information concerning the review and selection of learning resources is available from the ministry publication, *Evaluating, Selecting and Managing Learning Resources: A Guide* (Revised 2002) http://www.bced.gov.bc.ca/irp/resdocs/esm_guide.pdf

What Funding is Available for Purchasing Learning Resources?

As part of the selection process, teachers should be aware of school and district funding policies and procedures to determine how much money is available for their needs. Funding for various purposes, including the purchase of learning resources, is provided to school districts. Learning resource selection should be viewed as an ongoing process that requires a determination of needs, as well as long-term planning to co-ordinate individual goals and local priorities.

SCIENCE K TO 7 GRADE COLLECTIONS

The Science K to 7 Grade Collection chart for each grade lists the recommended learning resources by media format, showing links to the curriculum organizers. The chart is followed by an annotated bibliography. Teachers should check with suppliers for complete and up-to-date ordering information. Most suppliers maintain web sites that are easy to access.

Web Sites

Due to their transitory nature, web sites are not typically evaluated as part of the provincial evaluation process. However, in some cases, the Internet is the most up-to-date source of information relevant to students in Science K to 7. As with all supplementary resources, local approval is required before use. Teachers should preview the sites in order to select those that are appropriate for use by their students, and must also ensure that students are aware of school district policies on Internet and computer use.

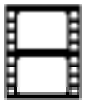
MEDIA ICONS KEY

The following icons identify the media formats of the recommended resources in the annotated bibliographies of the Grade Collections. Not all media formats are found in each Grade Collection.

Audio Cassette

CD-ROM

DVD



Film

Games/Manipulatives

Kit

Multimedia

Music CD

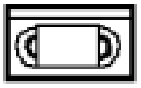
Print Materials

Print Series

Record

Slides

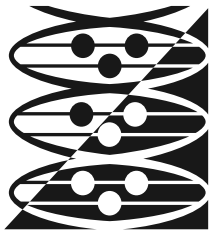
Software



Video

Video Series

Web Site



LEARNING RESOURCES

Grade 5

SCIENCE – GRADE 5
GRADE COLLECTION

Current as of December 2005. For latest updates go to
http://www.bced.gov.bc.ca/irp_resources/lr/resource/gradcoll.htm

	Life Science	Physical Science	Earth and Space Science
	Human Body	***Forces and Simple Machines***	***Renewable and Non-Renewable Resources***
Comprehensive Resources			
There are no comprehensive resources for Grade 5 Science			
Additional Resources – Print			
Backyard Biodiversity and Beyond, 1999 Edition			✓
Below Zero		✓	
Cycle of Life/Recycle Handbook for Educators			✓
Forests in Focus			✓
From Head To Toe (AIMS Activities)			
Hands-On Science: Simple Machines		✓	
Hands-On Science: The Human Body			
Kokanee of British Columbia			✓
Once Upon a Seashore			✓
Our Resources (Pan Canadian Science Place)			
Project WET			✓
Project WILD			✓
Putting It In Motion (Pan Canadian Science Place)			
Salish Sea			✓
Salmonids in the Classroom			✓
Science Detective™ Beginning: Higher-Order, Thinking, Reading, Writing in Science			
Thinking Connections: Concept Maps for Life Science	✓		
Urban Stewards			✓
The Watershed Works			
A World in Motion: The Design Experience		✓	

Indicates satisfactory to good support for the majority of the learning outcomes within the curriculum organizer.

✓ Indicates support for one or more learning outcomes within the curriculum organizer.

Indicates minimal or no support for the prescribed learning outcomes within the curriculum organizer.

	Life Science	Physical Science	Earth and Space Science
	Human Body	***Forces and Simple Machines***	***Renewable and Non-Renewable Resources***
Additional Resources – Print Series			
Science Answers Series		✓	
Science & Technology 5		✓	
Additional Resources – Video/DVD			
Circulatory and Respiratory Systems	✓		
Science, Please!		✓	
Simple Machines		✓	
Additional Resources – Video/Series			
The Amazing Body for Students Series	✓		
The Real World Science Series	✓		
What's Inside Your Body?	✓		
Additional Resources – Multimedia			
OceanNews		✓	✓
Additional Resources – Kit			
British Columbia's Mountain Pine Beetle	✓		✓

The Amazing Body for Students Series

General Description:
Bones & Muscles, *Eyes*, *The Senses* are part of the Amazing Body for Students Video Series. *Bones & Muscles* is a 9-minute video that is a contemporary presentation of bones, muscles and how they work together. The visuals are well paced, engaging and use the latest in close-up, real-life photography. They also make connections to other body systems. *Eyes* is a 10-minute video that uses close-up photography to examine the parts of the eye, how it functions, and how images are transmitted to the brain. *The Senses* is a 13-minute video that presents information on the senses (sight, hearing, touching, smelling and tasting) in the first sequence. The second sequence highlights the link between taste and smell. The images are close-up, real-life and use the latest technology.

Caution: *Web sites require registration. Imperial measurements in EYES. In THE SENSES, a mother is shown nursing her baby.*

Audience: *General*

Category: *Student, Teacher Resource*

Grade Level:

K	1	2	3	4	5	6	7	8	9	10	11	12
					✓							

Supplier: *McIntyre Media Ltd.*

75 First St., Suite 203
Orangeville, ON L9W 5B6

Telephone: (519) 942-9640

Fax: (519) 942-8489

Toll Free: 1-800-565-3036

Web Address: www.mcintyre.ca

Price: Videos: $89.00 or
$329.00 for all three

ISBN/Order No: The Senses: 270152
Eyes: 270153
Bones & Muscles: 270155

Copyright: 2004

Year Recommended in Grade Collection: 2005

Backyard Biodiversity and Beyond, 1999 Edition

Author(s): *Dulc, S. et al.*
General Description:
BC produced teacher resource has been revised and is now coil bound. Contains background information and student activities around the topic of biodiversity. It features native flora and fauna, as well as biodiversity issues and success stories. The booklet contains six modules and 150+ pages of instructional activities.

Audience: *General*

Category: *Teacher Resource*

Grade Level:

K	1	2	3	4	5	6	7	8	9	10	11	12
				✓	✓		✓					

Supplier: *Wild BC*

P.O. Box 9354, St. Prov. Gov.
200A-333 Quebec Street
Victoria, BC V8W 9M1

Telephone: (250) 356-7111

Fax: (250) 952-6684

Toll Free: 1-800-387-9853

Web Address: http://www.hctf.ca/wild.htm

Price: $22.00

ISBN/Order No: 0-7726-3954-X

Copyright: 1999

Year Recommended in Grade Collection: 2005

Below Zero

General Description:
Below Zero is based on the *Project Wild* model. Instructional activities are designed for easy integration into K-7 school subjects. The teacher resource materials concentrate on the understanding and conservation of wildlife in a frozen environment. Goal of the resource is to help learners develop awareness, knowledge, skills, and commitment to make informed decisions, responsible behaviour, with wise actions concerning wildlife in winter and frozen environments.

Audience: *General*

Category: *Teacher Resource*

Grade Level:

K	1	2	3	4	5	6	7	8	9	10	11	12
✓	✓	✓	✓		✓	✓	✓					

Supplier: *Wild BC*

P.O. Box 9354, St. Prov. Gov.
200A-333 Quebec Street
Victoria, BC V8W 9M1

Telephone: (250) 356-7111

Fax: (250) 952-6684

Toll Free: 1-800-387-9853

Web Address: http://www.hctf.ca/wild.htm

Price: $25.00 with workshop

ISBN/Order No: 1-55029-146-7

Copyright: 2003

Year Recommended in Grade Collection: 2005

British Columbia's Mountain Pine Beetle

General Description:
This resource package deals with a current British Columbia epidemic, the infestation of mountain pine beetles which are devastating the BC interior pine forests. This kit contains an engaging and informative video, CD-ROM, overheads, PowerPoint® presentation, poster, activity sheets as well as, a bark sample and a sample of pine beetles (in a vial). Lesson plans are clear and concise and can be adapted to suit grade levels from 4 through to 7. A glossary is included.

Audience: *General*

Category: *Teacher Resource*

Grade Level:

K	1	2	3	4	5	6	7	8	9	10	11	12
				✓	✓	✓	✓					

Supplier: *BC Market Outreach Network*

1130 West Pender Street, Suite 1200
Vancouver, BC V6E 4A4

Telephone: 604-685-7507

Fax: 604-685-5373

Web Address:

Price: Free to schools

ISBN/Order No: Not available

Copyright: 2005

Year Recommended in Grade Collection: 2005

Circulatory and Respiratory Systems

General Description:
Twenty-minute video summarizes the circulatory and respiratory systems. It uses real-world situations to demonstrate heart rate, blood flow, and breathing rates. Accompanying teacher's guide contains suggested activities.

Audience: *General*

Category: *Student, Teacher Resource*

Grade Level:

K	1	2	3	4	5	6	7	8	9	10	11	12
					✓							

Supplier: *National Geographic Society - School Publishing*

2180 Buckingham Road, Suite 204
Oakville, ON L6H 6H1

Telephone: 1-800-368-2728

Fax: 1-800-840-9807

Toll Free: 1-800-368-2728

Price: Check with supplier

ISBN/Order No: Not available

Copyright: 1994

Year Recommended in Grade Collection: 2005

Cycle of Life/Recycle Handbook for Educators

Author(s): *Arntzen, H. et al.*
General Description:
This 276-page teacher resource is divided into five sections: Introduction, Music, Biology, Recycling, and Resources. Through songs and activities, Kindergarten to Grade 7 students learn about at-risk Canadian plants and animals species. Topics include sustainability of resources, life cycles, food chains and webs, ecological footprints, the interrelated nature of living things, and Aboriginal practices. There is a music CD, *Cycle of Life*, with 14 ecology/nature songs. Lyrics are included in print material.

Caution: *See Author's caution re: p. 83, Stan Rodger's song, lyrics refer to "beer" and "hell."*

Audience: *General*

Category: *Teacher Resource*

Grade Level:

K	1	2	3	4	5	6	7	8	9	10	11	12
✓	✓	✓	✓	✓	✓	✓	✓					

Supplier: *Artist Response Team Inc. (ART)*

P.O. Box 91
Brentwood Bay, BC V8M 1R3

Telephone: (250) 544-4006

Fax: (250) 544-4075

Price: $35.00

ISBN/Order No: 0-9736-847

Copyright: 2004

Year Recommended in Grade Collection: 2005

Forests in Focus

General Description:
Forests in Focus is an 85-page activity book on the BC forest environment. It consists of 34 activities, a glossary, stories (for activities), and appendices containing detailed BC information. It is designed for K-12 use but not all activities are appropriate for all grades. Organizers and suggested themes are included in the introduction. All activities are organized 'lab style' with objectives, materials, method, and evaluation. Content is based upon forest process and ecosystem, and does not emphasize harvesting issues.

Audience: *General*

Category: *Teacher Resource*

Grade Level:

K	1	2	3	4	5	6	7	8	9	10	11	12
✓	✓	✓	✓	✓	✓	✓	✓					

Supplier: *Wild BC*

P.O. Box 9354, St. Prov. Gov.
200A-333 Quebec Street
Victoria, BC V8W 9M1

Telephone: (250) 356-7111

Fax: (250) 952-6684

Toll Free: 1-800-387-9853

Web Address: http://www.hctf.ca/wild.htm

Price: $26.00
$22.00 with workshop

ISBN/Order No: 0-7726-3966-3

Copyright: 1999

Year Recommended in Grade Collection: 2005

From Head To Toe (AIMS Activities)

General Description:
Book investigates body systems through numerous hands-on activities that integrate math, science, language arts, and social studies. Detailed support materials accompany each project.

Audience: *General*

Category: *Teacher Resource*

Grade Level:

K	1	2	3	4	5	6	7	8	9	10	11	12
					✓							

Supplier: *Spectrum Educational Supplies Ltd. (Ontario)*

125 Mary St.
Aurora, ON L4G 1G3

Telephone: (905) 841-0600

Fax: (905) 727-6265

Toll Free: 1-800-668-0600

Web Address: http://www.spectrumed.com

Price: $35.95

ISBN/Order No: 1-881431-02-9/20129

Copyright: 1986

Year Recommended in Grade Collection: 2005

Hands-On Science: Simple Machines

Author(s): *Lawson, J. et al.*
General Description:
This 64-page teacher's guide offers activities, background knowledge, diagrams, and clear instructions. It thoroughly covers the study of simple and compound machines and could be easily used for a wide range of teaching styles.

Caution: *The binding, cover, paper and visual quality is poor.*

Audience: *General*

Category: *Teacher Resource*

Grade Level:

K	1	2	3	4	5	6	7	8	9	10	11	12
					✓							

Supplier: *Portage & Main Press*

100 - 318 McDermot Avenue
Winnipeg, MB R3A 0A2

Telephone: (204) 987-3500

Fax: 1-866-734-8477

Toll Free: 1-800-667-9673

Web Address:
www.portageandmainpress.com

Price: $22.00

ISBN/Order No: 1-894110-77-3

Copyright: 2001

Year Recommended in Grade Collection: 2005

Hands-On Science: The Human Body

Author(s): *Lawson, J. et al.*
General Description:
This 109-page teacher guide supports the Grade 5 prescribed learning outcomes through active applications and investigations. It offers the teacher: diagrams, activities, and assessment blackline masters. The knowledge content is age appropriate.

Caution: *Poor quality paper, cover, binding.*

Audience: *General*

Category: *Teacher Resource*

Grade Level:

K	1	2	3	4	5	6	7	8	9	10	11	12
					✓							

Supplier: *Portage & Main Press*

100 - 318 McDermot Avenue
Winnipeg, MB R3A 0A2

Telephone: (204) 987-3500

Fax: 1-866-734-8477

Toll Free: 1-800-667-9673

Web Address:
www.portageandmainpress.com

Price: $22.00

ISBN/Order No: 1-894110-71-4

Copyright: 2001

Year Recommended in Grade Collection: 2005

Kokanee of British Columbia

General Description:
Activities and researched facts for the study and class investigation of landlocked salmonids called Kokanee. This is very appropriate for Interior waterways where Kokanee are mostly found. The teacher resource is organized to present all the same elements of the BC Salmon programs for Coastal BC using the Kokanee instead. Nine activities cover historical evolution life cycle, habitat, and human impacts so students will understand the relationship between Kokanee and the Interior environment. Field studies and observations are detailed in well organized units.

Caution: *This resource covers several learning outcomes at the Primary level, but it is more suitable for the Intermediate level.*

Audience: *General*

Category: *Teacher Resource*

Grade Level:

K	1	2	3	4	5	6	7	8	9	10	11	12
	✓	✓		✓	✓	✓	✓					

Supplier: *Wild BC*

P.O. Box 9354, St. Prov. Gov.
200A-333 Quebec Street
Victoria, BC V8W 9M1

Telephone: (250) 356-7111

Fax: (250) 952-6684

Toll Free: 1-800-387-9853

Web Address: http://www.hctf.ca/wild.htm

Price: $22.00

ISBN/Order No: 0-7726-5130-2

Copyright: 2004

Year Recommended in Grade Collection: 2005

OceanNews

General Description:
OceanNews is a series of learning resource packages developed by the Public Education Program of the Bamfield Marine Station to promote marine education. Each issue of *OceanNews* covers a theme of marine science: Exploring the Fluid Frontier, Marine Mammals, Seabirds, and Marine Pollution. Each theme issue comprises a newsletter, a teacher's guide, and an Ocean Explorer computer disk. Provides background concepts and current research in marine science. Activities in the teacher's guides extend concepts. Software programs enhance and extend activities. Systems Requirement: Installed Acrobat Reader®

Audience: *General*

Category: *Teacher Resource*

Grade Level:

K	1	2	3	4	5	6	7	8	9	10	11	12
					✓	✓	✓					

Supplier: *Bamfield Marine Sciences Centre*

Bamfield, BC V0R 1B0

Telephone: (250) 728-3301

Fax: (250) 728-3452

Web Address: www.bms.bc.ca

Price: 5 copies of each newsletter + 1 CD: $53.00
30 copies + 1 CD: $73.00

ISBN/Order No: Not available

Copyright: 1994

Year Recommended in Grade Collection: 2005

Once Upon a Seashore

Author(s): *Snively, G.*
General Description:
This 304-page adult reference was designed to help teachers in their study of the seashore. It contains clear illustrations, photos, a glossary, transparencies, activity sheets, and offers ideas for drama, creative writing, and art. An excellent resource for field trips to the seashore.

Audience: *General*

Category: *Teacher Resource*

Grade Level:

K	1	2	3	4	5	6	7	8	9	10	11	12
	✓	✓	✓	✓	✓	✓						

Supplier: *BCTF Lesson Aids Service*

100 - 550 West 6th Avenue
Vancouver, BC V5Z 4P2

Telephone: (604) 871-2182

Fax: (604) 871-2295

Toll Free: 1-800-663-9163

Web Address:
http://www.bctf.bc.ca/lessonaids

Price: Not available

ISBN/Order No: 0-9687811-0-1/LA S65

Copyright: 2001

Year Recommended in Grade Collection: 2005

Our Resources (Pan Canadian Science Place)

General Description:
The 48-page student book and 111-page accompanying teacher's guide investigates and presents scientific activities and information that covers the the Grade 5 learning outcomes for Renewable and Non-Renewable Resources. The content is BC oriented.

Audience: *General*

Category: *Student, Teacher Resource*

Grade Level:

K	1	2	3	4	5	6	7	8	9	10	11	12
					✓							

Supplier: *Scholastic Canada/Les éditions Scholastic*

175 Hillmount Road
Markham, ON L6C 1Z7

Telephone: (905) 887-7323

Fax: (905) 887-1131

Toll Free: 1-800-268-3860/1-800-625-858

Web Address: www.scholastic.ca

Price: Student Text: $9.00
Teacher's Guide: $34.00
Program and Assessment Guide: $50.00

ISBN/Order No: Student Text: 0-7791-4674-3
Teacher's Guide: 0-7791-3508-3
Program and Assessment Guide:
0-7791-0093-X

Copyright: 2005

Year Recommended in Grade Collection: 2005

Project WET

General Description:
The 500-page detailed teacher resource includes directions and extensions for 120 activities related to water, wetlands, and water resource management. Each activity includes objectives, method, background, materials, procedures, variations, extensions and evaluation. A wealth of teaching ideas for Grades K to 7. A global perspective, but produced from Montana State University.

Caution: *Not much Canadian or BC highlights. Images are mostly global but some captions are US locations. Dual temperature references, i.e. Fahrenheit/Celsius.*

Audience: *General*

Category: *Teacher Resource*

Grade Level:

K	1	2	3	4	5	6	7	8	9	10	11	12
✓	✓	✓	✓	✓	✓	✓	✓					

Supplier: *Wild BC*

P.O. Box 9354, St. Prov. Gov.
200A-333 Quebec Street
Victoria, BC V8W 9M1

Telephone: (250) 356-7111

Fax: (250) 952-6684

Toll Free: 1-800-387-9853

Web Address: http://www.hctf.ca/wild.htm

Price: $30.00 with workshop

ISBN/Order No: Not available

Copyright: 1995

Year Recommended in Grade Collection: 2005

Project WILD

General Description:
Teacher resource contains directions and extensions for approximately 80 activities that are related to wildlife and resource management. Each activity includes objectives, method, background, materials, procedure, variations, extension, and evaluation.

Audience: *General*

Category: *Teacher Resource*

Grade Level:

K	1	2	3	4	5	6	7	8	9	10	11	12
				✓	✓	✓	✓					

Supplier: *Wild BC*

P.O. Box 9354, St. Prov. Gov.
200A-333 Quebec Street
Victoria, BC V8W 9M1

Telephone: (250) 356-7111

Fax: (250) 952-6684

Toll Free: 1-800-387-9853

Web Address: http://www.hctf.ca/wild.htm

Price: $25.00 with workshop

ISBN/Order No: Not available

Copyright: 1998

Year Recommended in Grade Collection: 2005

Putting It In Motion (Pan Canadian Science Place)

General Description:
The 64-page student booklet and accompanying teacher's guide contain information and activities that support the Grade 5 outcomes for Physical Science. Both components are required to fully cover the processes of science and to make effective use of the student booklet. The student booklet does not stand on its own. The scientific processes are embedded in the teacher's guide.

Audience: *General*

Category: *Student, Teacher Resource*

Grade Level:

K	1	2	3	4	5	6	7	8	9	10	11	12
					✓							

Supplier: *Scholastic Canada/Les éditions Scholastic*

175 Hillmount Road
Markham, ON L6C 1Z7

Telephone: (905) 887-7323

Fax: (905) 887-1131

Toll Free: 1-800-268-3860/1-800-625-858

Web Address: www.scholastic.ca

Price: Student Text: $9.00
Teacher's Guide: $35.00
Program and Assessment Guide: $50.00

ISBN/Order No: Student Text: 0-7791-0088-3
Teacher's Guide: 0-7791-3507-5
Program and Assessment Guide: 0-7791-0093-X

Copyright: 2005

Year Recommended in Grade Collection: 2005

The Real World Science Series

General Description:
These four 15-minute video and support packages present well-paced, accurate, engaging science which describes four body systems. The diagrams, visuals, and vocabulary are clear and age/grade appropriate. Interconnectedness of systems is stressed.

Audience: *General*

Category: *Student, Teacher Resource*

Grade Level:

K	1	2	3	4	5	6	7	8	9	10	11	12
					✓							

Supplier: *Canadian Learning Company Inc.*

95 Vansittart Avenue
Woodstock, ON N4S 6E3

Telephone: (519) 537-2360

Fax: (519) 537-1035

Toll Free: 1-800-267-2977

Web Address: www.canlearn.com

Price: Videos: $39.95 each

ISBN/Order No: The Skeletal and Muscular Systems: 1-2642-F-1#2
The Digestive & Excretory System: 1-2640F-1#12
Respiratory and Circulatory System: 1-2641F-1#3

Copyright: 2002

Year Recommended in Grade Collection: 2005

Salish Sea

Author(s): *Arntzen, H. et al.*

General Description:
This 108-page detailed teacher resource includes background directions, activities, and extensions related to ecosystems, both land and marine, which are specific to the West Coast. This cross-curricular resource contains many Aboriginal references and suggests activities, songs, and projects to amplify student appreciation of historical stewardship and respect for the delicate balance of a coastal ecosystem. There are many references and web links as back-up material. A CD of eco-songs, one in Cowichan language, accompanies this resource which contains a wealth of teaching, learning, and hands-on activities for Grades K to 7.

Audience: *General*

Category: *Teacher Resource*

Grade Level:

K	1	2	3	4	5	6	7	8	9	10	11	12
✓	✓	✓	✓	✓	✓	✓	✓					

Supplier: *Parks Canada*

711 Broughton St., 2nd Floor
Victoria, BC V8W 1E2

Telephone: (250) 363-3511

Fax: (250) 363-8552

Price: $30.00

ISBN/Order No: 0-660-18596-2

Copyright: 2001

Year Recommended in Grade Collection: 2005

Salmonids in the Classroom

General Description:
Salmonids in the Classroom (either Primary or Intermediate versions) is a comprehensive collection of resource materials for the study of Pacific salmonids in British Columbia. The programs are divided into clearly organized and paced 10 units following the life cycle habitats of the salmon. Each unit in the guide includes suggested activities. Content is primarily science-oriented but the development of the units has a language arts approach incorporating unifying themes. The programs would allow the integration of science, social studies and language for extensive periods of time.

Caution: *The material has limited assessment devices explained. It make suggestions for assessment activities but doesn't give any 'how to do' assessment resources.*

Audience: *General*
ESL - late primary to early intermediate; good key visuals; variety of student activities

Category: *Teacher Resource*

Grade Level:

K	1	2	3	4	5	6	7	8	9	10	11	12
✓	✓	✓		✓	✓	✓	✓					

Supplier: *BCTF Lesson Aids Service*

100 - 550 West 6th Avenue
Vancouver, BC V5Z 4P2

Telephone: (604) 871-2182

Fax: (604) 871-2295

Toll Free: 1-800-663-9163

Web Address:
http://www.bctf.bc.ca/lessonaids

Price: Primary: $71.10
Intermediate: $66.60

ISBN/Order No: Primary: S33
Intermediate: S39

Copyright: 2001

Year Recommended in Grade Collection: 2005

Science Answers Series

Author(s): *Cooper, C.*
General Description:
These are 32-page student booklets which focus on light and sound, and forces and motion. They are age/grade appropriate, include current science content, as well as hands-on investigations which emphasize the scientific processes at this grade level.

Caution: *Measurements are given in both Metric and Imperial standards.*

Audience: *General*
Gifted - could easily be used independently, thoughtful and clever activities

Category: *Student, Teacher Resource*

Grade Level:

K	1	2	3	4	5	6	7	8	9	10	11	12
				✓	✓							

Supplier: *J. Appleseed*

PO Box 129
Collingwood, ON L9Y 3Z7

Telephone:

Fax:

Toll Free: 1-866-575-5007

Web Address: www.jappleseed.ca

Price: Not available

ISBN/Order No: Forces and Motion: From Push to Shove: 1-4034-3548-0
Light: From Sun to Bulbs: 1-4034-3550-2
Sound: From Whisper to Rock Band: 1-4034-3553-7

Copyright: 2004

Year Recommended in Grade Collection: 2005

Science Detective™ Beginning: Higher-Order, Thinking, Reading, Writing in Science

Author(s): *Fischer, S. et al.*
General Description:
Teacher resource for ESL or Learning Assistance programs includes simplified pages of science concepts in all strands. Basic teaching strategy of read and complete sheet. Good collection of key visuals and graphic organizers.

Audience: *ESL - key visuals and basic one page text per topic*
LD - key visuals and frames can be used to help learn concepts

Category: *Teacher Resource*

Grade Level:

K	1	2	3	4	5	6	7	8	9	10	11	12
			✓	✓	✓	✓	✓					

Supplier: *The Critical Thinking Co.*

P.O. Box 1610
1069 Broadway Ave.
Seaside, CA 93955-1610

Telephone: (831) 393-3288

Fax: (831) 393-3277

Toll Free: 1-800-458-4849

Web Address: www.criticalthinking.com

Price: $18.99 US

ISBN/Order No: 0-89455-834-X

Copyright: 2004

Year Recommended in Grade Collection: 2005

Science, Please!

General Description:
Fast, factual explanations of scientific phenomena and discoveries, who said science can't be fun? A poster with excellent questions and an extensive interactive web site support these videos (Part 1 and Part 2). Although the DVDs were not available for the reviewers, they felt DVD format would be more easily used as this is a series of science mini-clips.

Caution: *Teacher should preview Part 1, clip 3, for questionable humour.*

Audience: *General*
Gifted - fast-paced, attention-grabber

Category: *Student, Teacher Resource*

Grade Level:

K	1	2	3	4	5	6	7	8	9	10	11	12
				✓	✓	✓	✓					

Supplier: *National Film Board of Canada*

200-1385 West 8th Avenue
Vancouver, BC V6H 3V9

Telephone: (604) 666-3838

Fax: (604) 666-1569

Toll Free: 1-800-267-7710

Web Address: www.nfb.ca

Price: Set of two tapes: $97.95
Each: $49.95

ISBN/Order No: Set of two tapes: C 9101 197
Part 1 or Part 2: C9101 195

Copyright: 2001

Year Recommended in Grade Collection: 2005

Science & Technology 5

Author(s): *Campbell, S. et al.*
General Description:
The student booklet and teacher resource are well organized, with appropriate visuals that promote a good balance between knowledge and applications. Titles include: *Forces on Structures, The Human Body* (for Grade 5), and *Weather* (for Grade 4). This resource is flexible, could be used as a whole or in part, depending on classroom needs. Many hands-on and stimulating activities in a well organized format.

Audience: *General*

Category: *Student, Teacher Resource*

Grade Level:

K	1	2	3	4	5	6	7	8	9	10	11	12
				✓	✓							

Supplier: *Pearson Education Canada*

26 Prince Andrew Place
Don Mills, ON M3C 2T8

Telephone: (416) 447-5101

Fax: 1-800-563-9196

Toll Free: 1-800-387-8028/7851

Web Address: www.pearsoned.ca

Price: Not available

ISBN/Order No: Student Text: Various
Teacher's Guide: Various

Copyright: 2000

Year Recommended in Grade Collection: 2005

Simple Machines

General Description:
This 15-minute video and support package presents a well-paced, age and grade appropriate introduction to the six simple machines, giving real life examples and demonstrating mechanical advantage.

Audience: *General*

Category: *Student, Teacher Resource*

Grade Level:

K	1	2	3	4	5	6	7	8	9	10	11	12
					✓							

Supplier: *Canadian Learning Company Inc.*

95 Vansittart Avenue
Woodstock, ON N4S 6E3

Telephone: (519) 537-2360

Fax: (519) 537-1035

Toll Free: 1-800-267-2977

Web Address: www.canlearn.com

Price: $39.95

ISBN/Order No: 1-2289F-1#36

Copyright: 1999

Year Recommended in Grade Collection: 2005

Thinking Connections: Concept Maps for Life Science

Author(s): *Burggraf, F.*
General Description:
Teacher resource for ESL or Learning Assistance programs with simplified pages of Science concepts in Grades 4 to 7 intermediate strands. Basic teaching strategy of read and complete sheets, and a reinforcement of vocabulary and concepts. Good collection of key visuals and graphic organizers.

Audience: *ESL - key visuals and basic one page text per topic*
LD - key visuals and frames can be used to help learn concepts

Category: *Teacher Resource*

Grade Level:

K	1	2	3	4	5	6	7	8	9	10	11	12
				✓	✓	✓	✓					

Supplier: *The Critical Thinking Co.*

P.O. Box 1610
1069 Broadway Ave.
Seaside, CA 93955-1610

Telephone: (831) 393-3288

Fax: (831) 393-3277

Toll Free: 1-800-458-4849

Web Address: www.criticalthinking.com

Price: $23.99 US

ISBN/Order No: 0-89455-702-5

Copyright: 2001

Year Recommended in Grade Collection: 2005

Urban Stewards

Author(s): *Keetch, T.*
General Description:
Engages students in stimulating hands-on science and environmental education activites in the classroom and outside. Match to the learning outcomes in a cross-curricular fashion.

Audience: *General*

Category: *Student, Teacher Resource*

Grade Level:

K	1	2	3	4	5	6	7	8	9	10	11	12
				✓	✓	✓	✓					

Supplier: *Stanley Park Ecology Society*

PO Box 5167
2nd Floor, Stanley Park Dining Pavilion
Vancouver, BC V6B 4B2

Telephone: 604-257-6908

Fax: 604-257-8378

Web Address: www.stanleyparkecology.ca

Price: Not available

ISBN/Order No: Not available

Copyright: 2004

Year Recommended in Grade Collection: 2005

The Watershed Works

Author(s): *Bermbach, L. et al.*
General Description:
This booklet is an extensive guide for the study of the Fraser River Basin in BC. It includes student activities and teaching strategies that promote awareness and understanding of the social, economic, and environmental issues that are relevant to this area.

Caution: *These are photocopied pages in a binder.*

Audience: *General*

Category: *Teacher Resource*

Grade Level:

K	1	2	3	4	5	6	7	8	9	10	11	12
				✓	✓	✓	✓					

Supplier: *BCTF Lesson Aids Service*

100 - 550 West 6th Avenue
Vancouver, BC V5Z 4P2

Telephone: (604) 871-2182

Fax: (604) 871-2295

Toll Free: 1-800-663-9163

Web Address:
http://www.bctf.bc.ca/lessonaids

Price: Not available

ISBN/Order No: Not available

Copyright: 1998

Year Recommended in Grade Collection: 2005

What's Inside Your Body?

General Description:
These two, 26-minute videos fully cover the Grade 5 curriculum in Life Science. Difficult concepts are covered in an entertaining, clever, and age appropriate way. The bone, muscle, and nervous systems are studied independently, and then how they are interconnected, in one video. The other video covers the heart, blood, digestion, and respiratory systems and their interconnectedness. The visuals diagrams, narration, and overall presentation are stimulating, informative, and engaging.

Caution: *Imperial measure is used but Metric equivalent appears on screen.*

Audience: *General*

Category: *Student, Teacher Resource*

Grade Level:

K	1	2	3	4	5	6	7	8	9	10	11	12
					✓							

Supplier: *B.C. Learning Connection Inc.*

#4 - 8755 Ash Street
Vancouver, BC V6P 6T3

Telephone: (604) 324-7752

Fax: (604) 324-1844

Toll Free: 1-800-884-2366

Web Address: www.bclc.bc.ca

Price: $26.00 each

ISBN/Order No: Heart & Blood/Digestion & Respiration: SC0339
Bones & Muscles/Nervous System: SC0340

Copyright: 2000

Year Recommended in Grade Collection: 2005

A World in Motion: The Design Experience

General Description:
A World in Motion: The Design Experience consists of three different challenges suitable for Grade 5. The series of experiments are sequential, clearly explained, and easily performed by students. A consumable kit is available at no cost.

Audience: *General*

Category: *Student, Teacher Resource*

Grade Level:

K	1	2	3	4	5	6	7	8	9	10	11	12
					✓							

Supplier: *S.A.E. International (The Engineering Society*

400 Commonwealth Drive
Warrendale, PA 15096

Telephone: (724) 776-4841

Fax: (724) 776-0790

Toll Free: 1-877-606-7323

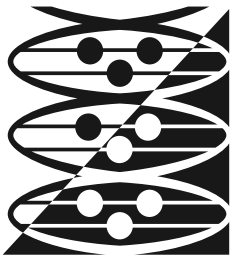
Web Address:
http://www.sae.org/servlets/index

Price: Not available

ISBN/Order No: Not available

Copyright: 2003

Year Recommended in Grade Collection: 2005



GLOSSARY

This glossary includes terms used in this Integrated Resource Package, defined specifically in relation to how they pertain to Science K to 7 topics. It is provided for clarity only, and is not intended to be an exhaustive list of terminology related to Science K to 7 topics. Entries in this glossary have been adapted with permission from the Recommended Resources published by

- McGraw-Hill Ryerson
- Scholastic Canada Ltd.
- Thomson Nelson.

A

acid
A compound that produces hydrogen ions (H+) in water. Strong Acids can cause serious burns on skin. Acidic solutions turn blue litmus paper red and will have a pH value smaller than 7.

acidic
A term used to describe a solution that has a value below 7 on the pH scale; the more acidic a solution, the lower its pH value.

adaptation
The physical characteristic, or behaviour trait that helps an organism survive in its local environment.

amphibian
A class of vertebrates that is born in water and lives both in water and on land. Amphibians begin life in water with gills; later, they develop lungs and legs so they can walk on land as adults. Examples include frogs, toads, and salamanders.

Animalia
One of the Kingdoms of Life (which are part of the scientific system of classification). This Kingdom includes insects, birds, fish, and mammals.

arch
An arch is a curved structure. The separate parts of the curve all push against one another and hold up the arch.

arteries
Thick, muscular vessels that carry blood away from the heart to the rest of the body.

attract
When objects are pulled together by a physical force that combines to unite the surfaces of the objects.

axis
A straight line that runs through the centre of an object.

B

balanced forces
When the total of all forces on an object equals zero and the object's motion does not change.

base
A compound that produces hydroxide (OH-) in water. A solution that is basic turns red litmus paper blue because it has less hydrogen ions.

basic
A term used to describe a solution that has a value above 7 on the pH scale; the more basic a solution, the higher its pH value.

battery
An energy source that uses a chemical reaction to create an electric current.

biodegradable
Material that is able to be broken down or decomposed by natural processes into simpler compounds. Natural processes include exposure to sun, water, and air.

biomass energy
Energy created by burning any type of plant or animal tissue to heat water and create steam, which turns turbines and generates electricity.

biomass
An ecology term for the total mass of living organisms in a certain area.

biomes
Large regions of Earth where temperature and precipitation are distinct and certain types of plants and animals are found.

biosphere
The parts of Earth where life can be found, from mountaintops to the deepest parts of the ocean.

buoyancy
The ability to float in water; the upward force of water on any object placed in water.

C

calculate
To figure out by using mathematics the number for quantities, amounts, sizes, lengths, or mass of items.

camouflage
The colouring of an animal that allows it to blend into its environment to survive better.

Canadarm
A robotic manipulator arm developed by the Canadian Space Agency. The arm is controlled by astronauts inside the space shuttle.

carnivore
A consumer that eats other animals. For example, wolves and orca are carnivores.

cell
A microscopic structure that is the basic unit of all living things. Organisms can be made of as little as one cell (some types of bacteria) or as many as several trillion cells (human beings).

cell cytoplasm
The thick liquid inside the cell; area where the work of the cell is done, as directed by the nucleus.

cell membrane
A thin layer that surrounds the cell cytoplasm and controls which materials enter and leave the cell.

cell nucleus
The cell structure that acts as the control centre by directing all of the cell's activities, such as movement and growth.

cell wall
In plant cells the protective outer layer that surrounds the cell membrane and some protists. It provides protection and support for the cell.

chlorophyll
A green pigment found in chloroplasts that gives plants and some Protista their green colour. It captures sunlight used for photosynthesis.

chloroplast
A plant cell structure containing chlorophyll, found in all green plant cells and some Protista.

classify
Grouping and labelling a collections of items, objects, or living things. The grouping arrangements match a set of classification rules and common characteristics indicating their similarities and differences. [see SORT]

climate
The weather pattern for a geographical region over a long period of time.

cloud
Water vapour in the atmosphere that has cooled and come into contact with tiny particles of dust.

colouration
An adaptation of an organism's colour to help it survive in its environment. Mimicry and camouflage are examples of colouration.

compare
To look and identify two or more objects and see how they are different and how they are the same.

compound machine
Any machine containing two or more simple machines.

compound
A pure substance that is made up of two or more different elements and consists of only one kind of particle.

compression
An engineering term used opposite to tension; any of the forces applied towards the centre of structural objects.

concentration
The quantity of solute that is dissolved in a certain quantity of solvent; the more solute dissolved, the greater the concentration.

condensation
The process of changing from a gas or a vapour to a liquid.

conductor
A material that lets electricity flow through it easily; for example, most metals are good conductors.

conservation
Preserving and carefully managing natural resources so that they can be used by present and future generations. We conserve resources by using them more efficiently, with minimum waste.

construct
To make or build a model or to build a simple structure by joining materials together.

consumer
An organism, such as an animal, that must obtain its food by eating other organisms in its environment; can be a herbivore, carnivore, or omnivore.

consumption
The amount of resources or energy used by a household.

continental crust
The parts of Earth's crust that have continents on them.

continental shelf
A shallow underwater ledge located between a continent and the deep ocean crust.

cover slip
A small, thin piece of glass used to cover a specimen on a microscope slide.

crust
The thin, outer layer of Earth; made of solid rock. The crust "floats" on the inner layers of Earth because it is made of lighter materials than the lower layers.

D

decomposer
An organism that breaks down (decomposes) dead or waste materials, such as rotting wood, dead animals, or animal waste and returns important nutrients to the environment.

design-process
The sequence of steps that take an idea to a completed plan; can be the planning and building processes where prototypes are created and evaluated to solve technological problems.

detrivore
An organism that feeds on large bits of dead and decaying plant and animal matter. For example, earthworms, dung beetles, and wolverines are detrivores.

dilute
A solution that has a low concentration of the dissolved substance (the solute).

dissolve
To completely mix one substance (the solute) in another (the solvent) to form a solution. For example, if you add sugar to water, the sugar dissolves in the water.

E

Earth's inner core
The innermost layer of Earth, which is made up of iron and nickel.

echo
Repetition of sound produced by reflection of sound waves from a surface.

ecosystem
The network of interactions that link together the living and non-living parts of an environment.

effort force
The concept used to describe the force going into moving a simple machine a certain distance; used to describe the degree of effort someone applies to operate a machine.

electric current
A continuous flow of electric charges moving from one place to another along a pathway; required to make all electrical devices work; measured in amperes (A).

electrical energy
The better term for electricity; the form of energy that consists of a flow of electric charges as the energy is transferred through a conductor.

electrical switch
A device that controls the flow of electric current through a circuit. In an open circuit, a light will be off; in a closed circuit, a light will be on.

electricity
See electrical energy.

electromagnet
A magnet that is created by using electricity in a circuit placed around a piece of metal conductor such as steel or lead.

electromagnetism
A magnetic force caused by electric charges in motion; also, the relationship between magnetism and electricity where one can make the other.

electron
A negatively charged particle that is found outside the nucleus of an atom.

element
A pure substance that cannot be broken down into any other pure substance; made up of one type of atom.

emulsion
A special kind of suspension that has been treated to prevent the parts of the mixture from separating. For example, homogenized milk is an emulsion.

energy
Energy cannot be seen or touched. Energy is a property of all matter. Energy comes in many forms and can be transferred from one object to another, but it cannot be created or destroyed; written as the symbol E.

environmental impact
The effect, usually negative, of a human activity on a local area.

equilibrium
A condition where structures or systems are in complete balance. A state of rest or balance, in which all opposing forces are equal. [see BALANCED FORCES]

erosion
The loosening, dissolving, wearing away, or moving of soil and rock from one place to another by wind or water.

estimate
A math and science term for referring to how students use prior knowledge to make a reasonable and sensible decision about amounts. Amounts can be quantity, number, volume, length, weight, or size.

estuary
The region where a river flows into the ocean and fresh river water mixes with saltwater.

evaporate
To change into a gas or vapour.

exploration
Travelling some distance to observe a place or region to learn more about it.

extraction
Removing rock or minerals from the earth.

extreme environment (1)
A place where the conditions are so harsh that human survival is difficult or impossible without technology. For example, deserts, volcanoes, and space are extreme environments for humans to spend long periods of time.

extreme environment (2)
An environment that is difficult to reach, and that has extreme conditions such as high or low temperatures, high or low pressure, or little atmosphere or gravity. Space, deep oceans, the high arctic, the upper stratosphere, polar regions, and deep caves are extreme environments.

F

fair test
A test of a single variable when all the experimental actions around it are applied equally. During a scientific investigation, accurate fair testing involves isolating variables, eliminating bias, repeating the results, and analysing the intended experiment for errors.

fasteners
Special materials used for *joining* structural parts in construction. Fasteners are of differing types (e.g., fixed, rotating, rigid, flexible, and adjustable) and can serve different purposes. Nails, pins, bolts, glue, string, tape, sleeves, and screws are examples of fasteners used to join construction parts together.

food chain
A method for describing how food energy passes from organism to organism. The description establishes a hierarchy of organisms where each feeds on those below and is the source of food for those above.

food web
A network of interconnected food chains in an ecosystem.

force
The physics term used to describe the energy applied in various ways to move objects or change their position. Force usually involve a push or a pulling and is either balanced or unbalanced by other forces.

fossil fuels
Fuel formed over millions of years from compression of the decayed remains of living matter. Coal, oil, and natural gas are fossil fuels.

friction
The resistance a body meets when moving over a surface or through a gas or liquid; the force that resists the motion of two surfaces that are touching each other.

fulcrum
The point on which a lever rests or turns.

Fungi
One of the Kingdoms of Life (which are part of the scientific system of classification). Fungi are a life form consisting of a single or many-celled organisms, which have cell walls, do not have chlorophyll, get food from the environment, and reproduce by spores.

G

geothermal
Energy obtained from the natural heat of the Earth.

gravity
The forces of attraction which the Earth has for objects on its surface; also the force of attraction between any two objects.

H

habitat
The place where an animal or a plant naturally lives or grows and that provides it with everything it needs to grow.

heat
The transfer of thermal energy to other substances that are at a different temperature. Cold things still have heat energy.

herbivores
An animal that eats only plants. (also see CARNIVORE, OMNIVORE)

hydrometer
A device that reads specific gravity and is used to determine density of liquids.

I

inclined plane
A sloping surface; a simple machine that can be used to alter the effort and distance involved in doing work.

insulator
Material that does not transfer heat readily; also, a substance that does not allow any electric current to transfer to other objects.

invertebrate
An animal that does not have a backbone or spinal column. Examples of invertebrates include insects, worms, and crabs.

L

lava
The term used for magma, or molten rock, when it breaks through Earth's crust and reaches the surface, as in a volcanic eruption.

leaching
The process by which soluble materials in the soil, such as nutrients, pesticide chemicals, or contaminants, are washed into a lower layer of soil or are dissolved and carried away by water.

lever
One of the simplest machines; a rigid beam that rotates around a fixed support point called the fulcrum. Levers changes the direction and effort force needed to move a load.

life cycle
All the stages in the life of a plant or animal organism, between life and death.

life-support
Any human-built system that provides air, water, food, and environmental conditions to sustain humans or other living things.

light absorption
To soak up visible and invisible electromagnetic radiation energy ranging in wavelength from about 400 to 700 nanometers. Light is usually absorbed by rough, dark surfaces.

light refraction
The bending of light into a different direction where it follows a new straight-line path.

light
Visible and invisible electromagnetic radiation energy, ranging in wavelength from about 400 to 700 nanometers and travels at a speed of 299, 972 km/s.

load
The mass (weight) of an object to be moved.

local environment
All the influences and conditions in which organisms live, including the actual place, circumstances, soil, water, air, and climate that surround and affect plants and animals in a particular area, and which determine their form and survival.

loudness
Amount of energy that a sound carries.

M

magma
Hot melted rock formed deep below Earth's crust by high temperatures and pressures; cools to form igneous rock.

mantle
The layer of Earth between the crust and the outer core; a hot, thick layer of solid and partly melted rock.

mass
The amount of matter in something, which is measured in grams (g).

materials
The collection of physical and chemical attributes for the objects used to build structures. "Construction materials" refers to the type of substance and its properties.

measure
Using special tools to accurately determine the amount of an object without guessing or estimating. The measured amount must be described relative to a standard unit system.

micro-organism
A living thing that is too small to be seen without the help of a microscope. For example, bacteria and some algae are micro-organisms.

mid-ocean ridge
A raised part of the sea floor, which can become large enough to be considered an underwater mountain range.

migration
The seasonal movement of animals to a less-harsh environment. For example, the elk moves from the mountains to spend the winter in the lowlands.

mimicry
Adaptations that let one animal look or behave like another animal for survival reasons.

mixture
A combination of two or more different types of matter that can be separated by physical changes.

model
A method for showing an idea using objects and/or pictures. When students build a model, they make a physical structure to represent their idea.

Monera
One of the Kingdoms of Life forms; comprises the bacteria, blue-green algae, and various primitive micro-organisms.

N

natural gas
A fossil fuel formed by the decomposition of microscopic plants and animals over millions of years.

net charge
No static charge available as the amount of excess (+) electrons is equal to the amount of deficient (-) electrons.

neutral charge
No static charge and no excess electron or missing electrons.

neutral pH
Neither an acid nor a base. On the pH scale, a neutral substance or solution has a pH value of 7. Pure distilled water has a pH of 7.

niche
The way that an organism fits into an ecosystem, in terms of where it lives, how it obtains its food, and how it interacts with other organisms.

non-renewable
Something that cannot be replaced once it is used or that may take many hundreds of years to be replaced.

nuclear energy
Energy that uses uranium as a fuel to heat water and produce steam, which turns a turbine and produces electricity.

O

observation
Activities where the senses are used to collect and record how objects or events behave. Students record what they see, smell, touch, or read from measuring tools. They do not state opinions about these events.

oceanic crust
The parts of Earth's crust that have only ocean floor on them; thinner and denser than the continental crust.

omnivore
An animal that eats both plants and animals. (see HERBIVORE, CARNIVORE)

opaque
Matter that does not allow any light to pass through.

orbit
A circular path that one object travels around another object.

organ
A body part composed of a collection of differing cells and tissues organized to perform a specific function.

P

parallel circuit
A circuit in which the current travels along two or more separate paths to different devices. The current travels through each part of the circuit devices at the same time.

pH scale
A scale that measures the acidity of substances in solution; has numbers from 0 (strongly acidic) to 7 (neutral) to 14 (strongly basic).

photosynthesis
The process in which the Sun's energy is used by plants to make sugar (food) from carbon dioxide and water. Oxygen is released in this process.

Plantae
One of the Kingdoms of Life (which are part of the scientific system of classification). This Kingdom includes all land plants.

plate tectonics
The theory that the surface of Earth consists of large plates that are continually moving.

predator
An organism that hunts another living thing for food. [see CARNIVORE]

predict
Thinking by using prior knowledge about what a student knows to work out what is going to probably happen next, in a pattern of events.

pressure
A force applied equally to all surfaces of objects or surfaces. Air pressure is the force of all the atmosphere gases pushing down on people at the Earth's surface.

prey
An organism that is hunted by a predator.

producer
An organism that creates its own food rather than eating other organisms to obtain food; for example, a plant. (see also CONSUMER)

Protista
One of the Kingdoms of Life (which are part of the scientific system of classification). This Kingdom includes complex one-celled micro-organisms, such as amoeba, protozoa, slime molds, and algae.

pure substance
A substance that is composed of only one type of atomic particle and therefore always has the same properties. There are two kinds of pure substances: elements and compounds.

R

radar
An acronym for RAdio Detection And Ranging. A device that sends out radio waves and picks up any echoes that are bounced back off objects to tell the distance, speed, direction of motion, and shape of objects.

ramp
Interchangeable with term meaning an incline plane or sloping surface.

recording
To describe (an observation) by using words, numbers, writing, or pictures. To only describe what has been seen, measured, or calculated without any subject judgments.

renewable resources
Natural resources that can be renewed or replaced by nature within 100 years.

rift
An opening in the oceanic crust as plates move away from each other, where molten materials from Earth's mantle can escape.

rotate
To spin around on an axis.

S

saturated
A solution that contains as much of one substance (the solute) as can be dissolved in another substance (the solvent). For example, when you cannot dissolve any more drink crystals in water, the solution is saturated.

scavenger
Any animal that preys on food predators have killed, or food recently discarded.

screw
A simple machine consisting of an incline plane wrapped around a cylinder.

scuba
An acronym for Self-Contained Underwater Breathing Apparatus; allows divers to carry their air supply on their backs.

sediment
Small pieces of material that have broken off of rocks and have been deposited by water, wind, or ice.

sedimentary rock
Layered rock formed when sediment is compressed and forced together naturally over millions of years.

seismic wave
An energy wave that is released by an earthquake and travels outward from its focus.

series circuit
A circuit in which the current travels along a single path to two or more electric devices; the current must travel though each part of the circuit, one device after the other, in turn.

SI system
The most widely used and accepted version of the metric system of measurement employed by all scientists (SI is an abbreviation of *Le Système International d'Unités*); includes the units metre, litre, and gram.

simple machine
One of the basic devices used to redirect forces for a useful function: lever, wedge, ramp, screw, wheel, axle, and pulley.

solubility
The ability of a substance (the solute) to dissolve in another substance (the solvent). Temperature plays an important role in solubility. For example, you can dissolve more orange-drink crystals in warm water than in cold water.

solute
The smaller part that is put into a solution. A solute is mixed with a solvent to form a solution.

solution
A homogeneous mixture of two or more substances that combine so that the mixture is the same throughout and the properties of the substances blend.

sonar
An acronym for SOund NAvigation and Range; a device that ships use to chart the depth of oceans using the echoes of sound waves.

sort
Separating a collection of items, drawings, objects, ideas, or numbers into categories of attributes. [see CLASSIFY]

sound absorption
To soak up audible noise. Sound is usually absorbed by thick, dense materials.

sound waves
A movement of particles that transfers sound from one place to another.

sound
A form of energy that you can hear when something vibrates.

species (1)
A term used to describe a group of organisms that can mate and produce offspring that can in turn produce more offspring.

species (2)
Form *Scientific Names:* species is a specific division in the classification system of organisms. It is the category below genus.

spin-off technology
An everyday use of a technology that was first developed for another purpose. For example, bar codes used in grocery stores were first developed by NASA for space exploration.

static-electric charge
A type of electricity where the electric charges build up on an object by rubbing another object. The movement of the charge off the charged object is called a static discharge. For example, electric charges built up in rubbing a balloon against your pet's fur.

static-electric discharge
A form of electrical energy moving unbalanced charged electrons on an object back to a balanced condition.

subduction zone
A place on Earth's crust where high pressure pushes an oceanic plate under another, converging tectonic plate.

sunlight
Full spectrum electromagnet radiation carrying energy from the nearest star to our planet.

supersaturated
A solution that is more than saturated; using temperature changes, a solution is forced to dissolved more of the substance (the solute) than would normally be found in a saturated solution.

surface runoff
Precipitation that travels over the soil surface to the nearest stream. It does not soak into the soil surface.

suspension
A cloudy mixture in which clumps of a solid or droplets of a liquid are scattered throughout a liquid or gas. For example, muddy water is a suspension.

sustainability
The ability of ecosystems to bear the impact of the human population over a long period of time, through the replacement of resources and the recycling of waste.

T

technology
Any method or tools that are made using scientific principles to solve problems. Science and technology make it possible to survive in challenging environments.

temperature
The measure of how hot or cold something is. In relative terms, it is a measure of the amount of heat present.

tidal energy
Energy created by filling a reservoir with ocean water at high tide, and later releasing the water through hydroelectric turbines as the tide ebbs to produce electricity.

U

unbalanced forces
Forces pulling or pushing each other in which one is greater than all others; when the net force on an object does not equal zero.

unicellular
Made of only one cell; a characteristic of organisms in the Monera Kingdom.

V

veins
Thin tubes that carry blood back to the heart from every part of the body.

verify
To double check by working out the answer or solution again. Usually another way is used to show that the first answer is correct because the second method yields an identical result.

vertebrate
Animal with a backbone, or spinal column; birds, fish, and mammals are examples of vertebrates.

vibration
The back and forth or up and down movement of an object.

voltage
A measure of the energy available to move charges in a circuit between positively-charged and negatively-charged terminals of a battery: measured in volts (V).

W

water pressure
The application of force by water that increases with depth; measured in atmospheres.

weigh
To determine the mass of...

weight
Term often used as a synonym for mass in commercial and everyday use; in scientific and technical work, this term should be replaced by mass or force, depending on the application.

weights
Objects made from steel or metal, manufactured to be used for standard mass sets.

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