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DISCOVERING SCIENCE 7

TEACHER'S RESOURCE

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DISCOVERING SCIENCE 7
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INTRODUCTION AND IMPLEMENTATION HANDBOOK

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Introducing the *Discovering Science 7* Program

Welcome to the *Discovering Science* 7 program! These teacher and student resources are designed to provide 100% alignment with Newfoundland and Labrador's science curriculum. The resources have been created to address the knowledge, skills, and attitudes needed to help your students develop scientific literacy and empower them to critically examine issues and questions from technological, societal, and environmental perspectives.

The *Discovering Science* 7 program is consistent with the vision expressed in the *Common Framework of Science Learning Outcomes, K–12: Pan-Canadian Protocol for Collaboration on Student Curriculum* (Council of Ministers of Education, Canada, 1997).

> 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; become lifelong learners; and maintain a sense of wonder about the world around them. To develop scientific literacy, students require diverse learning experiences that provide opportunities to explore, analyze, evaluate, synthesize, appreciate, and understand the interrelationships among science, technology, society, and the environment that will affect their lives, their careers, and their futures.

Through varied text features, *Discovering Science* 7 enables your students to develop their scientific literacy as they learn basic concepts relating to interactions within ecosystems; heat; characteristics of mixtures and solutions; and Earth's crust. Students will also develop skills in the processes of scientific inquiry. In *Discovering Science* 7, students learn scientific theories and conduct investigations that are related to the concepts and skills explored in each unit.

Meeting Your Goals in the Science Classroom with *Discovering Science 7*

In your science classroom, you must meet many goals as you present science skills and concepts and foster scientific literacy. These goals include:

- creating a safe laboratory environment
- implementing the principles of constructivism in the science classroom
- implementing differentiated instruction and recognizing multiple intelligences
- being aware of, and sensitive to, social considerations

The *Discovering Science* 7 student textbook has been developed with these goals, as well as the curriculum, in mind. To help support the goal of creating a safe laboratory environment, the textbook includes an introductory section on Safety in the Science Classroom (pages 8 to 15). In addition, each investigation and activity in the textbook contains specific, detailed information on the safety issues and safety precautions involved.

Discovering Science 7 Supporting Resources

- In addition to the textbook, the *Discovering Science* 7 program includes valuable resources for you and your students in print and electronic format. Like the textbook, these resources were developed with the curriculum, the principles of scientific literacy, and the goals of you and your students in mind. This *Teacher's Resource* provides science background, planning, and implementation strategies, as well as tips for meeting your classroom goals.
- Our *Blackline Masters* (BLMs) provide you with additional materials you can use for vocabulary building, skill building, concept clarification, alternative activities for differentiated instruction, support for visual learners, assessment, and more. The BLMs are contained on the CD-ROM portion of this package and are modifiable using Microsoft Word™ software.

- Our *Computerized Assessment Bank* will assist you in the implementation of the *Discovering Science* 7 program. The authors and consultants are confident that we have provided you with the best possible program to help ensure your students achieve excellence and a high degree of scientific literacy in their course of study. The variety of question styles will support differentiated instruction in your classroom. The assessment bank is also found on the CD-ROM.
- Our *website*, located at www.discoveringscience.ca, provides links to sites that will help students see the connection between the real world and the new concepts and skills that they are learning.
  In addition, the site has links to materials that will assist you in delivering the course material. The first time you enter this site, use the following username and password:

  Username: discovering7
  Password: teacher07

  Once you log in, you will be prompted to create your own unique username and password.

Meeting the challenge of developing excellent learning resources for today's broad range of needs has been done through a team effort by experienced teaching professionals. We believe our *Discovering Science* 7 program will serve you and your students well.

Components of the *Discovering Science 7* Program

Student Resources

Discovering Science 7 student textbook
Website (www.discoveringscience.ca)
- links to sites that support Internet Connect, Explore More features, and Integrated Resarch Investigations in the textbook
- links to interesting educational, and entertaining sites that support the curriculum

Teacher Support Materials

Teacher's Resource (print)
Teacher's Resource (CD-ROM)
- complete text of print Teacher's Resource in PDF format
- modifiable Blackline Masters in both English and French
- assessment checklists and rubrics

Computerized Assessment Bank (CD-ROM) in both English and French
- 1200 questions
- coded by topic and key word to the Newfoundland and Labrador learning outcomes
- variety of question types
- all answers provided
- user-friendly ExamView™ software

Website (www.discoveringscience.ca)
- additional interactive on-line resources for teachers and parents
- links for teachers

Note: All web links are monitored and maintained by McGraw-Hill Ryerson to help ensure relevance and security.

Using *Discovering Science 7* in Your Classroom

SCIENCE CLASSROOM SAFETY

Safety awareness begins with regulations and guidelines outlined within the Newfoundland and Labrador Provincial Laboratory Safety Manual. Detailed safety practices can be found within this document and teachers are strongly encouraged to read and become familiar with this manual.

As the teacher, however, you have the ultimate responsibility for enforcing safety practices in your classroom. Be sure to set an example in the laboratory by observing all basic rules at all times. Always wear protective clothing and eyewear, and dispose of chemicals and other materials properly. Maintain high standards of cleanliness and organization in the science area.

Planning is essential to laboratory safety and success. That planning must include consideration for accident prevention and review of emergency procedures. The activities in the *Discovering Science* 7 program are designed to minimize dangers in the laboratory. Even so, there are no guarantees against accidents. Careful planning and preparation, as well as being aware of hazards, will help keep accidents to a minimum.

Information on laboratory safety is available from the Newfoundland and Labrador Department of Education safety manual and includes detailed instructions on planning safe procedures and preventing accidents. Much of this information can be summarized in the phrase "Be prepared!" Know the rules and what common violations occur. Know your students and their abilities to follow instructions and evaluate potential hazards. Know where emergency equipment is stored and how to use it. Good laboratory housekeeping and management begin with observing the following guidelines and your local regulations.

In the Classroom/Science Laboratory

Follow your Newfoundland and Labrador Provincial Laboratory Safety Manual recommendations as well as local board regulations. Consider the following as you set up your science supplies:

1. Store chemicals properly.
   - Separate chemicals by reaction type.
   - Label all chemical containers, including purchase date, special precautions, and expiration date.
   - Discard outdated chemicals according to appropriate disposal methods.
   - Do not store chemicals above eye level.
   - Use wood shelving rather than metal. All shelving should be firmly attached to walls. Anti-roll lips should be placed on all shelves.
   - Store only those chemicals that you plan to use. Do not stockpile chemicals.
   - Keep flammable and toxic chemicals in special storage containers. Do not store more than 500 mL of flammable liquids in the laboratory at one time.
   - Ensure that you do not have chemicals that have been banned by your school board or province.
2. Store equipment properly.
   - Clean and dry all equipment before storing it.
   - Protect electronic equipment and microscopes from dust, humidity, and extreme temperatures.
   - Label and organize equipment so that it is easily accessible.
3. Provide adequate workspace for students to do investigations.
4. Provide adequate room ventilation.
5. Review safety and evacuation guidelines at the beginning of each term and from time to time throughout the term. Ensure that students with language difficulties have understood the information. Post the guidelines in a prominent place in the classroom.
6. Ensure that safety equipment is accessible and working properly. Ideally, safety equipment should include at least fire extinguishers, safety blanket, and eyewash stations.
7. Provide containers for the disposal of chemicals, waste products, and biological specimens. Disposal methods must meet local guidelines.
8. Take special care when carrying out any activities that require a heat source.
   - Use hot plates instead of laboratory burners as much as possible for activities requiring a heat source.
   - Ensure that the room has an adequate number of electrical outlets, and use only approved extension cords.
   - Use a central shut-off valve for the gas supply, accessible only to you, if laboratory burners are used.
   - Never using open flames when a flammable solvent is in the same room. Thus, alcohol burners should *not* be used; alcohol in the presence of fire is a potentially dangerous situation.
   - Use hot water from the tap to make a hot-water bath as an alternative to using a hot plate or laboratory burner. Warn students that water from the tap can be hot enough to cause burns.

First Day of Class/Labs

1. With your students, discuss the safety rules on pages xviii–xxi of *Discovering Science* 7. Also discuss the *Discovering Science* 7 symbols and WHMIS symbols shown on page xxi of the student textbook. See Skills Development for teaching strategies.
2. Review the safe use of equipment, chemicals, and biological specimens with your students.
3. Review the use and location of safety equipment and evacuation guidelines with students.
4. Discuss safe disposal of materials and laboratory cleanup policy.
5. Discuss proper attitude for working in the laboratory.
6. Document students' understanding of the above points.
   - Have students sign a safety contract (such as BLM G-1 on the CD-ROM, Activity 1-1B, page 13 of the textbook or that found in the NL Laboratory Safety Manual) and return it to you.
   - Prepare and have students write a safety quiz. (BLM G-2 provides a review and quiz on WHMIS symbols.)
7. Review safety practices with students often during the school year.

Before Each Activity

1. Perform each activity yourself before assigning it to students in order to determine where students may have trouble.
2. Arrange the laboratory in such a way that apparatus and materials are easily accessible and supplies are clearly labelled. Avoid confusion in the area where materials are dispensed.
3. Prepare only the apparatus and materials needed to complete the assigned activity. This practice helps cut down or eliminate the problem of students doing unauthorized experiments.
4. Review the procedure with students. Emphasize cautions within the procedure.
5. Be sure all students know the proper procedures to follow if an accident should occur.

During the Activity

1. Make sure the laboratory is clean and free of clutter.
2. Insist that students wear safety glasses and lab coats when indicated.
3. Never allow students to work alone.
4. Never allow students to use a cutting device with more than one edge.
5. Be sure to shield systems that are under pressure or a vacuum. Use extreme caution if you use a pressure cooker for sterilization purposes. Turn off the heat source and allow pressure to return to normal before opening the cover.
6. Students should not point the open end of a heated test tube toward themselves or other students.
7. Remove broken or chipped glassware from use immediately. Clean up any spills immediately. Dilute spilled solutions with water before cleaning them up.
8. Be sure all glassware that is to be heated is of a heat-treated type that will not shatter.
9. Remind students that heated objects may look the same as objects at room temperature.
10. Prohibit eating and drinking in the laboratory.

After the Activity

1. Be sure that the laboratory is clean, including all work surfaces and equipment.
2. Be certain that students have disposed of any broken glassware and chemicals properly.
3. Be sure any hot plates and burners have been turned off.
4. Insist that each student wash his or her hands when the laboratory work is completed.

OVERVIEW OF THE INSTRUCTIONAL DESIGN

There are a number of definitions of constructivism in science education. The instructional design and strategies suggested in *Discovering Science* 7 support an approach in which constructivism is "a social process of making sense of experience in terms of what is known." That guiding definition has three important points:

- Constructivism is a *social process*, meaning that students articulate their ideas and discuss them with one another.
- Students are *making sense of* experience through "hands-on" and "minds-on" activities in the classroom, and each student is given opportunities to make sense of events and phenomena.
- Finally, *what is known* refers to both what students already know (their pre-existing knowledge) and the accepted scientific concepts they are expected to learn through the curriculum.

The Role of Students in a Constructivist Classroom

In a constructivist classroom, students are active participants in their learning. They constantly modify their knowledge and skills as they are exposed to new concepts and experiences. Students are encouraged to assume responsibility for their own learning by actively making sense of their experiences. They are not simply passive recipients of scientific knowledge.

Students also develop an understanding that their learning requires modification of their pre-existing knowledge on the basis of valid reasoning. Their "meta-cognitive" awareness of this learning process is as important as their grasp of scientific concepts.

The Role of Teachers in a Constructivist Classroom

Just as students in a constructivist classroom are not passive recipients of information, you are not simply a transmitter of information. Neither, however, do you stand back passively and let students take charge. *Discovering Science* 7 supports a balanced approach in which you set up most investigations and conduct discussions that enable your students to construct meaning based on experiences arising from their investigations.

You help your students express their pre-existing understanding of the topic at hand, engage the students in a discussion of the adequacy of their explanations, and introduce accepted scientific concepts and ideas for consideration and assessment. Students can then compare the effectiveness of their ideas to accepted scientific ideas, in a search for deeper understanding and growth. To develop the understanding that science investigations are not made up of closed questions with known answers, stress the idea that both students and scientists are involved in developing explanations.

The following chart details emphases of teaching strategies, based on research about how students best learn.

Constructivism as a Model for Learning

CHANGING EMPHASES[1]	
LESS EMPHASIS ON...	MORE EMPHASIS ON...
treating all students alike and responding to the group as a whole	understanding and responding to individual students' interests, strengths, experiences, and needs
rigidly following curriculum	selecting and adapting curriculum
focussing on student acquisition of information	focussing on student understanding and use of scientific knowledge, ideas, and inquiry processes
presenting scientific knowledge through lecture, text, and demonstration	guiding students in active and extended scientific inquiry
asking for recitation of acquired knowledge	providing opportunities for scientific discussion and debate among students
testing students for factual information at the end of the unit or topic cluster	continuously assessing student understanding
maintaining responsibility and authority	sharing responsibility for learning with students
supporting competition	supporting a classroom community with co-operation, shared responsibility, and respect
working alone as a teacher	working with other teachers to enhance the science program

Reference Cited

1. Texley, Juliana, and Ann Wild, eds. (1996) *Pathways to The Science Standards High School Edition.* National Science Teachers Association, Arlington, VA, p. 24.

In a constructivist classroom, you have an important role in ensuring that students understand reasons why their pre-existing knowledge may sometimes be inadequate to explain the events and phenomena under examination. Educational research has demonstrated that it is ineffective simply to tell students that their ideas are wrong. There needs to be a negotiation in which the new scientific concepts and ideas are shown to be more meaningful, valid, and effective.

An Instructional Model to Support the Constructivist Classroom

A three-phase approach can be used to implement constructivism in the classroom. The three phases are explore, develop, and apply. By using this approach, you can help your students build new knowledge into a comprehensive framework of facts, concepts, skills, and theories.

1. **Explore**
   The explore phase of the instructional model has three purposes: focus the students, activate prior knowledge, and determine preconceptions. To focus, motivate, and determine preconceptions, *Discovering Science* 7 provides the following:
   - *Unit Opener:* The opening spread in each unit provides a colour picture that can be used for a class discussion. Teaching notes in this *Teacher's Resource* provide suggested questions to assist in starting the discussion. On the next two pages, the Getting Started provides two choices for introducing the unit to your class. The first choice is a short reading related to one or more concepts covered in the unit. The second choice is a short, informal Find Out activity. You may choose to do either, both, or neither to introduce the unit and to focus and motivate students.
   - *Chapter Opener:* This spread listing what students will learn, why it is important, and skills they will develop provides a context for the learning in the chapter. The Foldables™ activity at the beginning of each chapter can help students prepare for the lessons or sections in the chapter. Each Foldable™ activity provides an opportunity for students to prepare a unique study tool that can be used during one of the sections. Encourage students to create their own Foldable™ for different sections in the chapter.

- *Section Opener:* Key vocabulary terms (Key Terms) are listed at the start of each section or lesson next to the section summary. Both of these text features can be used to help focus students and prepare them for the section. A Find Out activity is located within the first few pages of each section. These activities can be used to engage students at the start of a lesson.

2. **Develop**
   The develop phase provides the students with a variety of learning opportunities in which they can begin to develop their own understanding of the concepts under study. In *Discovering Science* 7, these opportunities include reading, hands-on activities, and features.
   - *Reading:* Developing literacy skills is key to understanding concepts in science. *Discovering Science* 7 provides highly visual and age-appropriate text to help students learn the concepts in the grade 7 curriculum. A formative assessment tool, called Reading Check, occurs every few pages. Each Reading Check contains questions directly related to the material just covered. Students who have difficulty answering these questions require additional support.
   - *Activities: Discovering Science* 7 provides more activities than can be done in a Science 7 class in a year. The intent is to provide you with choices from which you can select the activities that best meet your students' needs. Engaging students in hands-on activities not only motivates students but also assists them in restructuring their knowledge to explain scientific concepts.
   - *Features:* There are five different types of features: Science Watch, www science, Career Connect, Science Math Connect, and National Geographic. Each feature can be used to extend various concepts covered in the section.

3. **Apply**
   The apply phase provides opportunities for students to demonstrate their understanding of the ideas covered in *Discovering Science* 7. Assessment opportunities are woven through each section, chapter, and unit. It is not intended that students answer every question in the text but rather that you select a series of questions that are appropriate for your students. End-of-unit assessment includes a performance-based assessment task in the Project and a research-based project in the Integrated Research Investigation.

Limits of Constructivism

When using the constructivist approach to teaching, keep in mind that learning science is not a purely individual process for explaining the world. Scientific knowledge, in other words, is more than personal belief reinforced by observation. That is why you need to be prepared to introduce valid scientific concepts to your students as they develop their frameworks of understanding.

For example, it is not generally effective for you to simply provide students with experiences of phenomena and expect them to arrive at accepted conclusions about science and technology. Students invariably "discover" what is apparent to them, not necessarily what would be an acceptable scientific idea. For a student to learn, therefore, experience alone is not enough. Students need access to different lenses—laws, models, and theories—through which to view phenomena, design tests, and interpret data. Teaching is often about getting students to see things in new ways, through new lenses.

Students' existing ideas about phenomena can affect all activities and processes associated with science and technology. How a student classifies objects or phenomena, for instance, depends on what categories for classification the student already has in mind. The emphasis on prompting students to activate and express their prior knowledge is therefore a critical classroom strategy.

DIFFERENTIATED INSTRUCTION

Today's classrooms reflect the diversity of a global world. In a single classroom, children vary in their racial, ethnic, linguistic, socio-economic, familial, and learning profiles. Each student brings his or her own unique set of abilities, perceptions, and needs into the classroom. Research and anecdotal observation confirm that children of the same age "have" differing levels of academic readiness, background knowledge, and experience.

These differences mean that students vary in what they already know, what they are ready to learn, the pace at which they are able to proceed through the curriculum, and the level of adult support they require for success. Students learn best when they are challenged to learn new concepts that are developmentally appropriate for them, that is, that are neither too easy nor too difficult (Flick, 2000). Given the diversity of students in modern inclusive classrooms, therefore, you are challenged to present materials at a variety of complexity levels, provide for flexible pacing, and be open to receive responses from students that reflect their abilities and their potential (Hertzog, 1998).

Definition

Differentiated instruction means offering several different learning experiences simultaneously within a classroom in response to students' varied needs, rather than a single task for all students regardless of appropriateness (Tomlinson, 1995). It is your response to the diverse makeup of your classroom. Learning activities and materials may be varied by difficulty and pace to challenge students at different readiness levels, by topic in response to students' interests, and by students' preferred ways of learning or expressing themselves. When you offer learning stations or centres, use math games of varying levels, or allow students to choose independent projects, you are diversifying instruction.

The key to a differentiated classroom is that all students are regularly offered *choices* and students are matched with tasks compatible with their individual learner profiles.

Curriculum should be differentiated in three areas:

1. Content: Multiple options for taking in information
2. Process: Multiple options for making sense of the ideas
3. Product: Multiple options for expressing what they know

Philosophy Behind Differentiated Instruction

Essentially, the aim of differentiated instruction is to maximize each student's growth by creating developmentally appropriate learning opportunities. This means meeting each student where he or she is, and helping the student to progress. However, it does not mean individualizing each and every student's program. Rather, a continuum of choices within open-ended activities allows small groups of students to work at their level.

Differentiated instruction, therefore, is based on the following beliefs.

- Students differ in their learning profiles.
- Curriculum needs to be varied in content, process, and product.
- Classrooms in which students are active learners, decision makers, and problem solvers are more natural and effective than those in which students are served a "one-size-fits-all" curriculum and treated as passive recipients of information.

Implementing Differentiated Instruction in Your Classroom

- **Differentiating Content:** Content can be described as the knowledge, skills, and attitudes we want children to learn. Differentiating content requires that students are given choices in topics of interest or are pre-tested so you can identify appropriate curriculum for groups of students.
- **Differentiating Process:** Varying learning activities or strategies provides appropriate methods for students to explore concepts. This is the most common way to differentiate process. It is important to give students alternative ways to approach concepts. For example, students may use graphic organizers, a listening centre, maps, diagrams, or charts to augment text. They may work in co-operative or flexible groupings. Teaching through songs, art, drama, and film in addition to text-based research allows for multiple ways of learning. Varying the complexity of a graphic organizer, diagram, film, etc., can very effectively facilitate differing levels of cognitive processing for students of differing ability.
- **Differentiating Product:** Differentiating the product means varying the complexity or type of product/response that students create to demonstrate mastery of the concepts. Allowing students to "show what they know" through multiple modalities allows students who struggle with written work to demonstrate mastery. Role-plays, demonstration experiments, posters, and computerized slide shows are alternatives to written reports that allow students with differing learning profiles to be successful.

The chart below summarizes the more common student needs and gives additional tips that may help you structure the learning environment to meet those individual needs.

	Description	Tips for Instruction
Learning Disabled	All learning disabled students have an academic problem in one or more areas, such as academic learning, language, perception, social-emotional adjustment, memory, or attention.	• Provide support and structure with clearly specified rules, assignments, and duties. • Establish learning situations that lead to success. • Practise skills frequently. • Use games and drills to help maintain student interest. • Allow students to record answers on tape, and allow extra time to complete tests and assignments. • Provide outlines or tape lecture material. • Pair students with peer helpers, and provide class time for pair interaction.
Behaviourally Disordered	Students with behaviour disorders deviate from standards or expectations of behaviour and impair the functioning of others and themselves. These students may also be gifted or learning disabled.	• Provide a clearly structured environment with regard to scheduling, rules, room arrangement, and safety. • Clearly outline objectives and how you will help students obtain objectives. • Seek input from students about their strengths, weaknesses and goals. • Reinforce appropriate behaviour, and model it for students. • Do not expect immediate success. Work for long-term improvement. • Balance individual needs with group requirements.
Physically Challenged	Students who are physically challenged fall into two main categories—those with orthopedic impairments and those with other health impairments. Orthopedically impaired students have the use of one or more limbs severely restricted, so the use of wheelchairs, crutches, or braces may be necessary. Students with other health problems may require the use of respirators or other medical equipment.	• Openly discuss with the student any uncertainties you have about when to offer aid. • Ask parents or therapists and the student what special devices or procedures are needed and if any special safety precautions need to be taken. • Allow physically disabled students to do everything their peers do, including participating in field trips, special events, and projects. • Help non-disabled students and adults understand physically disabled students.
Visually Impaired	Students who are visually impaired have partial or total loss of sight. Individuals with visual impairments are not significantly different from their sighted peers in ability range or personality. However, blindness may affect cognitive, motor, and social development, especially if early intervention is lacking.	• As with all students, help the student become independent. Some assignments may need to be modified. • Teach classmates how to serve as guides. • Limit unnecessary noise in the classroom. • Encourage students to use their sense of touch. Provide tactile models whenever possible. • Describe people and events as they occur in the classroom. • Provide taped lectures and reading assignments. • Team the student with a sighted peer for laboratory work.

	Description	Tips for Instruction
Hearing Impaired	Students who are hearing impaired have partial or total loss of hearing. Individuals with hearing impairments are not significantly different from their hearing peers in ability range or personality. However, the chronic condition of deafness may affect cognitive, motor, and social development if early intervention is lacking. Speech development may also be affected.	• Seat students where they can see your lip movement easily, and avoid visual distractions. • Avoid standing with your back to the window or light source. • Use an overhead projector so you can maintain eye contact while writing. • Seat students where they can see speakers. • Write all assignments on the chalkboard, or hand out written instructions. • If the student has an interpreter, allow both student and interpreter to select the most favourable seating arrangements.
English as a Second Language	Recent immigrants may speak English as a second language or not at all. The customs and behaviour of people in the majority culture may be confusing for some of these students. Cultural values may inhibit some of these students from full participation in class activities.	• Remember that students' ability to speak English does not reflect their academic ability. • Try to incorporate the students' cultural experience into your instruction. • Include information about different cultures in your curriculum to help build students' self-image. Avoid cultural stereotypes. • Encourage students to share their cultures in the classroom.
Gifted	Although no formal definition exists, these students can be described as having above-average ability, task commitment, and creativity. Gifted students rank in the top 5 percent of their class. They usually finish work more quickly than other students and are capable of divergent thinking.	• Make arrangements for students to finish selected subjects early and to work on independent projects. • Encourage students to express themselves in art forms such as drawing, creative writing, or acting. • Ask "what if" questions to develop high-level thinking skills. Establish an environment that is safe for risk taking and creative thinking. • Emphasize concepts, theories, ideas, relationships, and generalizations.

Johnson David, Roger Johnson, and Edythe Holubec, (1995) *Cooperative Learning in the Science Classroom.* Glencoe McGraw-Hill, New York, NY.

The Supporting Diverse Student Needs notes in the sections of this *Teacher's Resource* will give you further suggestions regarding differentiating instruction for specific groups of learners. Even so, the teaching strategies outlined here and throughout this *Teacher's Resource* are consistent with Pathways 1 and 2 as outlined in the brochure *Pathway to Programming and Graduation*, from the provincial Department of Education. Students who need more extensive adjustment of curriculum or teaching methods due to identified exceptionalities would benefit from an Individual Support Services Plan (ISSP) as per Department of Education policy.

MULTIPLE INTELLIGENCES

One educational framework that supports differentiated instruction is Multiple Intelligences (MI) theory (Gardner, 1993). MI recognizes that students have differing learning profiles, and that all are equally valuable and legitimate. For example, if it helps students to put the times tables into a song or rap because they are musical-rhythmic learners, as long as in the end the students master the skill/information, singing is considered to be as equally valid a way to learn as writing the facts with pencil and paper. Thus MI provides a framework for differentiating process and product *in ways that match a student's learning potentials.*

Another reason for considering MI pedagogy is that MI allows for teaching to diversity in an inclusive classroom in ways that traditional teaching methods cannot. "Traditional schools are designed for organized, left-brain learners who are book lovers. This type of learner, however, represents only one quarter of the population" (Rasmussen, 2000). In an MI classroom, students are given opportunities to learn and represent their knowledge in a variety of ways, which allows many more students to be a part of the learning community and be valued equally for their contributions. For instance, if learning takes place only through reading of non-fiction texts and written responses, students who are acquiring English as a second language or who have learning difficulties cannot participate fully in the learning. Instead, they have to be given adult support, or a different task/text, which stigmatizes them as unable. However, if students' intelligences are equally valued, then the student who is visual-spatial can be paired with the student who is verbal-linguistic to complete an activity as equal partners. One partner reads the text aloud, while the other creates a poster demonstrating the concept. MI also develops students' ability to self-direct their learning by encouraging them to develop their sense of self, know their strengths and weaknesses, see value in those strengths and weaknesses, and make choices about career directions more successfully.

All students have varying degrees of each intelligence. Relative strengths and challenges can help guide appropriate differentiation. Students can complete "challenge activities" in their non-preferred intelligences as part of a goal-setting process to develop these areas. Teachers must then be aware that during these activities students will require more support. At other times, students can be allowed to use their strengths to learn new material and "show what they know."

Multiple Intelligences: Definitions and Activities

In the above table, definitions for each of the intelligences and some suggested activities are delineated. *When planning science units, ask yourself whether you have included opportunities for students to process information and demonstrate their learning in a variety of ways.* Consult the Multiple Intelligences chart in the front matter of each unit of this Teacher's Resource for the MI coding of all activities.

For further information or details, see Lazear, 1998.

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INTELLIGENCE	DEFINITION	STUDENT LIKES...	LEARNING ACTIVITIES
Verbal-Linguistic	• the ability to develop verbal skills and sensitivity to the sounds, meanings, and rhythms of words	• reading literature, playing word games, making up poetry and stories, discussions, debating, and telling jokes	• have a debate • write a news article • interview a scientist about… • create a report
Visual-Spatial	• the ability to think in images and pictures, to visualize accurately and abstractly	• to draw, paint, design, and create • tasks that require visualizing, pretending, imagining, and forming mental images	• chart, map, cluster, or graph • illustrate, paint, sketch, sculpt • create a slideshow or photo album of your trip to… (e.g., space, Earth's core) • create a poster or flyer
Logical-Mathematical	• the ability to think conceptually and sequentially and to discern logical or numerical patterns	• to conduct experiments, solve puzzles and other problems, ask cosmic questions, and analyze circumstances and people's behaviour • working with numbers and mathematical formulas and operations, and the challenge of a complex problem to solve	• design and conduct an experiment • describe the patterns or symmetry in… • create a mathematical formula • develop a code for… • measure • classify
Body-Kinesthetic	• the ability to control one's body movements and to handle objects skillfully, to learn through tactile experience	• to perform a task after seeing someone else do it first • to demonstrate to someone else how to do something	• role play • build or construct a… • create movements to explain… • conduct a hands-on experiment
Musical Rhythmic	• the ability to produce and appreciate rhythm, pitch, and timbre	• to study and work with music in the background • to play with sounds, beats, and rhythms	• create a rap or song that explains… • experiment with the effects of vibration on… • indicate the rhythmic patterns in… • use a tune to remember… • give a presentation with musical accompaniment

INTELLIGENCE	DEFINITION	STUDENT LIKES…	LEARNING ACTIVITIES
Intrapersonal	• the ability to be self-aware and in tune with inner feelings, values, beliefs, and thinking processes (reflection, meta-cognition)	• to work alone • time to be self-reflective • to be inwardly motivated rather than seek external rewards • to make connections to his/her own experiences	• describe one of your personal values about… • explain your experience with… • assess your own work/beliefs about… • reflect on…
Interpersonal	• the ability to detect and respond appropriately to the moods, motivations, and desires of others	• to learn through personal interactions • team activities • piggybacking ideas on others' thoughts • discussion	• use lab teams • write team positions on… • conduct a meeting to address… • participate in a service project • teach someone about… • write a sequel to…
Naturalist	• the ability to recognize and categorize plants, animals, and other objects in nature	• to study animals, plants, and almost any natural object • natural field experiments • to collect rocks, bugs, etc. • to be outdoors	• create observation notebooks • care for pets, plants, gardens, parks • use binoculars, telescopes, microscopes, or magnifiers to… • draw or photograph natural objects • classify natural objects
Existential	• the sensitivity and capacity to tackle deep questions about existence	• time to think • thinking about deeper messages in literature, film • community service	• design projects to answer "essential" or "big" questions • write a letter to an environmentalist group, newspaper, etc.

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CO-OPERATIVE LEARNING

Learning science is a social activity. Many students learn best working in co-operative learning groups that encourage communication on a variety of levels. Language and communication are important in developing and consolidating ideas.

This context of learning and doing science reflects the world outside the classroom. The effective use of co-operative skills is becoming increasingly necessary to

Co-operative Learning Groups	Traditional Groups
• Shared leadership	• One leader
• Positive interdependence	• No interdependence
• Heterogeneous membership	• Homogeneous membership
• Instruction in co-operative skills	• Assumption of effective social skills
• Responsibility for all group members' achievement	• Responsibility for individual achievement
• Emphasis on task and co-operative relationships	• Emphasis only on task
• Support by teacher	• Direction by teacher
• One group product	• Individual products
• Group evaluation	• Individual evaluations

cope successfully in the workplace. Because of the increasing importance of co-operative interaction, it is essential that educational strategies include these skills. Students need to learn how to listen, respond, agree, disagree, clarify, encourage, and evaluate. All these skills help teams work together productively.

Basic Elements of Co-operative Learning

The basic elements of a co-operative learning strategy are:

1. Students must perceive that they "sink or swim together."
2. Students are responsible for seeing that everyone in the group (as well as themselves) learns the assigned material.
3. Students must see that they all have the same goals.
4. Students must divide up tasks and share responsibilities equally among group members.
5. Ideally, students should be given one evaluation or reward applicable to all members of the group. This strategy can be modified for specific group or individual problems as described in the Troubleshooting section of this document.
6. Students share leadership while they acquire skills for collaborating during learning.
7. Students are held individually accountable for material worked on in co-operative groups.

Forming Groups

Groups should contain from two to five students. Heterogeneous groups that represent a mixture of abilities, genders, and ethnicity expose students to peers with ideas different from their own and help them learn to work with a variety of people.

At first, co-operative learning groups should work together for only a day or two or for short assignments. Once students gain more experience, assign longer assignments. Assessment Rubric 3, Co-operative Group Work Rubric, can also assist you in promoting co-operative group work.

Co-operative Learning in Your Classroom

Help students see for themselves the benefits of co-operative learning. Ask students to work for 5 or 10 min on something a bit too difficult for them to do alone. It could be identification of animal tracks, a list of health-related myths and facts that they must identify as true or false, or a complex crime that must be solved. Then ask them to work in a group of four to solve the same problem. Ask them to compare individual problem solving with co-operative problem solving.

Beginning Co-operative Learning Strategies

- **Study Buddies:** In groups of two, have each student question the other about the material being studied. Tell pairs they will receive bonus points if they score above a certain percentage.
- **Checkmates:** Have groups compare homework answers or class worksheet answers. Students should discuss answers that differ and come to agreement on the best answers. Collect one paper per group. Do not tell the class in advance which paper you are planning to collect.
- **Turn to Your Neighbour:** After a teacher-led discussion of a topic, an explanation of directions, or assignment, ask students to turn to their neighbour and summarize the key points of what was said.
- **Jigsaw:** On a reading assignment of one or two pages that does not have sequential importance, divide up the reading among the members of a group of three or four. Each person reads his or her part of the assignment and then teaches it to the other group members. Quiz other group members to make sure that they understand the material. Do not divide up whole chapters or units until students have considerable experience in co-operative learning. This strategy can become an advanced co-operative learning task with larger blocks of material.
- **Brainstorming:** Use this strategy to generate a large number of ideas for discussion of a question. Ask students to make a group list. They should not evaluate the ideas until the list is complete. Encourage them to build on each other's ideas, go on sidetracks, and gather the silliest and weirdest ideas they can think up. Stress that all ideas are acceptable on a brainstorming list. Evaluation begins when
students have no more ideas or the time is up.
- **Chalkboard Share:** Ask one member from each group to put the group's best idea or answer on the chalkboard. This strategy allows the groups still at work to consider the ideas on the board as well as their own and perhaps come to an even higher level of thinking.
- **Write a Note:** All members of a team of four write a note that begins, "What I understand about this lesson is… I am still having trouble with…" Ask students to trade notes with someone who is not having the same trouble and reply to the note. They should write the note as if they were writing a real note to friend.

Advanced Co-operative Learning Strategies

- **Group Interdependence:** For each group, prepare a set of four to five "clue cards" for one concept, including a distractor clue. For example, you could make a set of clues for the properties of gases, another for solids, and another for liquids. The sets are traded from one group to another as they figure them out. Instruct students: (a) not to allow anyone to see their clue; (b) to verbally communicate their clues to their group; (c) to decide which of the clues are distractors; and (d) to decide what concept the clues represent.

- **Peer Feedback:** Distribute one of the Assessment Checklists from the *Assessment* section. Students should evaluate another person's or group's performance task using the checklist. Encourage students to comment on what is good before saying anything negative. To avoid arguments, tell students to paraphrase comments so the person knows he or she has been understood.
- **Talking Chips:** Give each group member seven small pieces of paper. Each time someone speaks, he or she must give up a piece of paper. When a group member is out of paper, he or she can no longer speak until everyone has used all their pieces of paper. This strategy ensures that one group member does not dominate discussions.
- **Snowballing:** A pair of students answers worksheet questions or compares lab report conclusions or other written work. Two pairs come together to review and compare answers. Two groups of four come together and compare. One person from a group of eight writes answers or conclusions on the board.
- **Roundtable:** One group member has a pencil and paper. He or she reads a question out loud. Group members consult and refer to the textbook in order to agree on the answer. The group member who has the pencil and paper writes the answer. The answer sheet is passed to the next group member. Repeat the process until all questions are answered. One person in each group should check the answers using a key provided by the teacher. This strategy is especially useful for review questions.
- **Teammate Consulting:** Each student should have a worksheet. All pencils should remain in the middle of the table while group members read and discuss a question. When the group reaches agreement, everyone should pick up a pencil and write the answer to the question. Collect only one worksheet per group. This strategy is an excellent method of reviewing or answering questions for activities and investigations.
- **Group Visits:** Three students from each group take their completed work and visit another group. One student in each group remains and presents his or her group's work to the visitors. The visitors compare their work and note any differences. Students return to their original groups. A different group member then remains while the other three visit different groups. Visits continue until every student has visited three times and explained once. This strategy is useful for checking work.
- **Paraphrase First:** Each time a group member has contributed an idea, another group member must correctly restate the idea before another idea can be contributed.
- **Making Analogies:** Ask students to brainstorm ways a concept is like something in everyday life. For example, students may compare performing an experiment to producing a play. Analogy ideas should be brainstormed by the group. These ideas might be sequential processes such as production of a newspaper, baking a cake, or taking a vacation. If appropriate for the concept, give each group a large sheet of paper on which to make a labelled diagram of its analogy. The diagram should illustrate the everyday process with vocabulary labels from the scientific process. This strategy works well to help students understand a difficult scientific concept.
- **Group Contract:** Ask each group to make a list of specific behaviours that can be changed to improve their group. "We need to work together better" is not specific. Examples of specific behaviours include "Eric should come to class on time" or "Rachel should stop reading magazines." Beside each item, have students write how the change will be accomplished. The teacher then reads the contract and writes on it the number of points or rewards the group will gain by meeting their contract. At the end of the time period, each group should write a justification for the number of points they think they should receive.

Troubleshooting

- **A Student Resists Working in a Group:** In the rare case of determined opposition to working in a group, you may want to allow a student to work individually. The student may eventually reconsider. Alternatively, suggest that the student commit to a group for a limited time, perhaps three weeks. Monitor the group closely during this time. Encourage group members to offer possible solutions to the problem.
- **A Student Behaves Inappropriately:** Whenever possible, allow the group to deal with the problem. By intervening you give up your most powerful tool: peer influence. You also risk sending the message that the students are not capable of solving their own problems. When necessary, offer assistance in the form of specially designed group analysis questions.
- **Students Do Not Effectively Use Co-operative Skills:** Structure lessons so groups can identify their weak skills and practise them. Allow ample time for groups to evaluate their work using Assessment Checklist 21, Project Self-Assessment, and Assessment Checklist 22, Project Group Assessment. Encourage individuals or groups to commit to improving specific skills by forming a group contract as described in the preceding Advanced Co-operative Learning Strategies. Recognize and reward improvement. Keep in mind that giving or receiving praise or encouragement may be very difficult for students who have a reputation for being tough.

- **Group Members Do Not Share Equally in the Work:** Divide up materials so that each group member has information others need. Give the group only one worksheet. Assign each group member an essential role.

  Give each group member five slips of paper. For each contribution to the group task, a student must reliniquish a slip of paper. When a student has no more slips of paper, he or she may no longer contribute.

  If one group member consistently does not participate despite efforts by others to include him or her, take this into consideration when assigning the group mark so other group members are not penalized.
- **A Student's Ability Is Considerably Lower than That of Other Group Members:** Tailor the weaker student's task. Provide appropriate reference materials for him or her to use. You may want to adapt tests and quizzes or the scoring method you use, or automatically add points to the student's individual grade when using it to figure the group mark.
- **A Student Is Absent:** Have the group suggest appropriate make-up work. Approve the assignment. Consider combining groups if two or more students are absent from a group. Another option is to have floaters who are academically successful and skilled in using co-operative strategies fill in empty places.
- **A Student Is Chronically Absent:** Assign the student as an extra member to a group with a core that is usually present, or have the student fill in for absent students when he or she does come to class. Offer a permanent assignment when attendance improves.
- **Students Use "Put-downs," Ridicule, and Demeaning Remarks:** Ask the group to make a list of all the positive qualities they can think of for each group member. Ask them to make a written plan of action for dealing with their negative communication. Ask them what would be a good reward if they were able to improve in one week.
- **A Student Is Extremely Shy:** Use team-building, trust-building, and active listening activities that create an atmosphere of acceptance and respect for each other. Make complimenting, encouraging participation, and appreciating individual differences the co-operative skills that groups must practise. Assign shy students to a smaller group. Ask the group to take on task roles and assign the shy student the role of reader, recorder, or spokesperson.
- **A Student Is a High Achiever:** Reward the student for helping others. Ask him or her to work with a difficult partner and give the group a bonus for the difficult partner's success. Assign challenging roles that the student does not usually take. This student may do observations of the co-operative efforts of the entire class. Group the high achievers together occasionally to work on an especially fast-paced, challenging project. If necessary, reassure the student (and parents if necessary) that research shows that mastery and retention of academic material by high-ability students is found to be higher in co-operative than in competitive or individualistic learning situations.
- **A Student Actively Attempts to Sabotage Group Work or Products:** Reinforce daily any behaviour that is near the co-operative goal. Assign a co-operative skill tied to the disruptive behaviour. Write the skill on an overhead transparency beside the student's name. Tally the number of times the co-operative skill is used by the student, rewarding positive behaviour at the end of class. Choose a reward this student would like. Tell the group that they will receive this reward when they earn a certain number of points for taking positive steps to correct the behaviour. Use a student contract. Role-play the problem with the other students in the class and have a class discussion about how to solve the problem. As a last resort, ask the disruptive student to work alone until he or she is willing to practise co-operative skills.
- **The Noise Level Rises Too High:** Develop a signal that means "quiet." You may simply raise your hand, with students following your example as soon as they see you raise your hand. It may be a quick flick of the light switch or a bell. Have students practise the co-operative skill of working as a group to establish their own technique for keeping noise down early in the year, and if again noise is a problem. Assign the role of "noise monitor" to one member of each group. Educate your colleagues and principal about the difference between "noise" and "beehive of activity" in co-operative learning. Reward groups for keeping the noise level down.
- **Group Consistently Refuses to Work with a Particular Student:** Give the outcast student roles with leadership responsibility. Use careful strategies for grouping. Be sure one student in the group has some positive feelings about the outcast. Each day ask the group to start by saying one positive comment to each person in the group. Use strategies for conflict resolution and structure the activities so the student is needed by the group for them to be successful. Strategies such as jigsaw and limiting materials and information may be included. Ask the group to practise skills such as honouring individual differences and showing appreciation and empathy.

READING INFORMATIONAL TEXT

If students can read narrative fiction with good comprehension, why do they so often need special instruction and support when reading informational text? Does reading a story require different skills than reading informational text? The answer to this question is, most definitely, yes.

The structure of a story is not the same as the structure of informational text. Therefore, the method of reading fiction is not the same as reading nonfiction. To begin, the former tends to be read quickly, with the reader filling in or guessing at unknown or hard-to-pronounce words. Reading nonfiction requires slow, deliberate pacing, as the student must carefully decode all new words and stringently process new ideas.

Why Students Need Assistance in Reading Informational Text

In stories, authors typically use such techniques as allowing different characters to present their responses to the same event. Through this form of repetition, readers gain a clearer understanding of the characters, settings, main ideas, and events.

Informational text, on the other hand, introduces new vocabulary connected to new concepts. The reader is expected to become familiar with all the new words and learn new concepts and new ways of thinking. To do this, most students need the help of a teacher to learn how to:

- slow their pace during the reading of informational text
- make connections between new ideas and previously learned ones
- extract main ideas from the density of ideas introduced and explained
- interpret visuals and graphic organizers
- apply the newly learned concepts to the world around them

Teaching students how to read instructions, scientific explanations, nonfiction narrative, and persuasive material, as well as to identify the text structures, should be a critical part of the curriculum lesson. Once the reader understands that each form has different expectations and objectives, then reader comprehension soars.

Helping Your Students Comprehend Informational Text

Comprehension of informational nonfiction comes from solid grounding in:

- knowing the purpose for reading a passage or chapter
- learning the key vocabulary associated with the new concepts
- activating prior knowledge so the new information can fit into an existing personal framework
- understanding that the text has its own unique organization, and using that particular organization to facilitate learning

These are not separate or distinct factors. They work together and reinforce each other. For example, new vocabulary must reflect the concepts to be learned. These concepts are determined by the teacher when the purpose for reading is set. Once the purpose is set, prior knowledge must be accessed so that the student can make connections between old and new information.

Literacy and the Organization of Informational Text

In this Information Age, more than 70 percent of the material we encounter is expository. "Students who learn to use the organization and structure of informational texts are better able to comprehend and retain the information found in them" (Goldman and Rakestraw, 2000; Pearson and Duke, 2002).

Giving students the reading tools to comprehend informational text is no longer a skill that can be offered only to some students in some classes. All students must be provided with these critical skills and strategies as part of a literacy program that prepares students for active participation in their communities and in their futures.

Understanding how informational text such as student textbooks are organized will give students the strategies needed to make sense of what, at first glance, might appear to be dense and overwhelming material. Students need instruction and practice to help them to:

- use a table of contents and an index
- recognize main ideas
- understand how details elaborate on a concept
- understand cause and effect structures
- explore the relationship of phenomena to other information
- demonstrate broader understanding of new ideas through graphic organizers

Comprehension occurs when students learn new vocabulary, understand the main concepts, and are able to demonstrate in a variety of ways that they have learned and internalized the content of the lesson.

Familiarizing Your Students with Their *Discovering Science 7* Textbook

Here are some features of the *Discovering Science* 7 textbook that your students can use to sharpen their comprehension skills as they encounter informational text passages.

- **Table of Contents:** The table of contents, on pages iv–ix of the student textbook, lists units, chapters, and sections. It also includes activities and chapter reviews.

- **Tour of the Textbook:** Located on pages x–xvi of the student textbook, the tour explains in detail the key structural features of the textbook. Take the tour with your students to familiarize them with the organizational components of their textbook.
- **Section Summary:** The shaded beige box below the section title contains a summary of the science concepts that students will study in the section. This summary is essentially a précis or abstract of the lesson, so new terms may be used here but are not bolded or defined. Have students read the summary before they start the section, even though they may not know all the words. Then, when they finish the section, they can go back and reread the summary to make sure that they understand what they have studied in the section. Students can use the summaries as reviews for studying.
- **Reading Checks:** These features ask recall questions about the material that students have just read. They are designed to help students slow down and think about what they are reading. Encourage students to use Reading Checks to confirm their understanding of new terms and concepts before proceeding.
- **Visuals:** Encourage your students to pay attention to the visuals in their textbook, including tables and other graphic organizers. The visuals in a textbook, along with their captions, offer important clues to the main points that are discussed in the running text.
- **Headings and Subheadings:** Point out the headings and subheadings in a chapter section. These text elements also offer clues to the main points to be discussed in the text that follows.
- **Section and Chapter Reviews:** Each section and each chapter ends with a series of questions that you and your students can use to assess their understanding of the material. Encourage students to draw a concept map to demonstrate their understanding of the new vocabulary they have encountered in the previous text passages. (Refer your students to Science Skill 9 on page 479 of the *Discovering Science* 7 textbook.)
- **Key Terms:** At the beginning of each section and in the unit review are lists of the boldfaced key terms found in that section or unit.
- **Glossary:** The glossary at the back of the student textbook lists and defines key terms that are arranged alphabetically. Pronunciation guides are included where appropriate. The definition includes a reference to the text section in which each key term first appears.
- **Index:** Ensure that your students know how to use the index, located at the back of their textbook.

In addition to the features in the student textbook, each section of this *Teacher's Resource* includes a Using Reading feature that suggests specific Pre-reading, During Reading, and After Reading techniques that students can use to enhance their comprehension of the material in the student textbook.

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CORRELATION TO THE NEWFOUNDLAND AND LABRADOR GRADE 7 SCIENCE CURRICULUM	
UNIT 1 OUTCOMES	**MCGRAW-HILL RYERSON DISCOVERING SCIENCE 7 NOTE: THE CURRICULUM OUTCOMES ARE FUNDAMENTAL TO THE MCGRAW-HILL RYERSON DISCOVERING SCIENCE PROGRAM. FOLLOWING ARE SOME POINTS IN THE TEXTBOOK WHERE THE CURRICULUM OUTCOMES ARE ADDRESSED. THIS IS NOT AN EXHAUSTIVE LIST.**
Components of an Ecosystem	
1.01 Identify questions related to a local ecosystem such as “What types of species live in a particular ecosystem?” (208-2, 208-3)	Getting Started, p. 4 Section 3.3, Monitoring and Managing Ecosystems, p. 86-93
1.02 Describe an ecosystem as a group of interacting living and nonliving things	Section 1.1, Types of Ecosystems, p. 8-15
1.03 Identify examples of ecosystems within Newfoundland and Labrador. Include: (i) ocean (ii) forest (iii) pond (iv) arctic	Section 1.1, Types of Ecosystems, p. 8-15
1.04 List examples of organisms that live in each ecosystem	Section 1.1, Types of Ecosystems, p. 8-15
1.05 Demonstrate the importance of choosing words that are scientifically appropriate	Section 1.1, Types of Ecosystems, p. 8-15 Section 1.3, Biotic Parts of an Ecosystem, p. 24-29
1.06 Define and use terms in context. Include: (109-12, 109-13) (i) ecosystem (ii) abiotic (iii) biotic (iv) species (v) organism (vi) population (vii) community (viii).habitat (ix) niche	Section 1.1, Types of Ecosystems, p. 8-15 Section 1.3, Biotic Parts of an Ecosystem, p. 24-29
1.07 Investigate the biotic and abiotic factors of a local ecosystem (306.3)	Section 1.2, Abiotic Parts of an Ecosystem, p. 16-23 Section 1.3, Biotic Parts of an Ecosystem, p. 24-29
1.08 Define and delimit questions to investigate in a local ecosystem (208-3)	Conduct an Investigation 1-2A, Field Trip to the Schoolyard (Core Lab), p. 20-21
1.09 Organize and record information collected in an investigation of an ecosystemusing instruments effectively and accurately. (209-3, 209-4)	Conduct an Investigation 1-2A, Field Trip to the Schoolyard (Core Lab), p. 20-21
1.10 Communicate questions, ideas, plans, and results, using lists, notes in point form, sentences, oral language, and other means. (211-2)	What Do Living Things Need for Survival 1-1A, p. 10
1.11 Work cooperatively with team members to develop and carry out a plan, and troubleshoot problems as they arise (211-3)	Scrutinizing Soil 1-1B, p. 13
1.12 Evaluate individual and group processes used in planning, decision making, and completing a task (211-4)	What Do Living Things Need for Survival 1-1A, p. 10 Scrutinizing Soil 1-1B, p. 13
1.13 Describe the following abiotic factors of local ecosystems. (i) intensity of sunlight (ii) air, soil and water temperature (iii) wind direction and speed	Section 1.2, Abiotic Parts of an Ecosystem, p. 16-23

CORRELATION TO THE NEWFOUNDLAND AND LABRADOR GRADE 7 SCIENCE CURRICULUM

1.14 Use a key to identify the biotic factors observed in the local ecosystem (210-1)	Think About It 1-3A, Seabirds! p. 26-27
1.15 Identify the biotic factors of a local ecosystem wwwScience, Coldwater Coral Reefs, p. 28	Think About It 3-3A, Modelling an Environmental Impact Assessment, p. 92 Integrated Research Investigation, Saving Endangered Species, p. 99
1.16 Describe interactions between biotic and abiotic factors in an ecosystem. (306-3) Include: (i) biotic-abiotic (ii) abiotic-abiotic (iii) biotic-biotic	Section 2.1, Types of Interactions, p. 35-39
1.17 Describe symbiotic relationships as a form of biotic-biotic interactions	Section 2.1, Types of Interactions, p. 35-39
1.18 Define symbiosis	Section 2.1, Types of Interactions, p. 35-39
1.19 Define and give examples of parasitism, mutualism and commensalism	Section 2.1, Types of Interactions, p. 35-39
1.20 Investigate an interaction between a biotic and an abiotic factor in an ecoystem	Think About It 2-2B, Defending Against Decomposers, p. 45 Conduct an Investigation 2-2C, The Dirt on Decomposers, p. 46-47
1.21 Design and carry out an experiment controlling major variables. (208-6, 209-1)	Section 2.1, Types of Interactions, p. 35-39
1.22 Organize, compile and display data using tables and graphs. (210-2)	Think About It 2-1A, The Ups and Downs of Living Together, p. 39 Think About It 3-3A, Modelling an Environmental Assessment, p. 92 Project, Making a Garbage-Reduction Diary, p. 98
1.23 Defend a given position on an issue or problem based on their findings (211-5)	Think About It 3-3A, Modelling an Environmental Assessment, p. 92 Project, Making a Garbage-Reduction Diary, p. 98 Integrated Research Investigation, Saving Endangered Species, p. 99
Energy Flow in an Ecosystem	
1.24 Identify the niche of producers, consumers, and decomposers in a local ecosystem. (304-2)	Section 2.2, Roles of Organisms in Ecosystems, p. 40-49
1.25 Define and use in context the terms producer, consumer and decomposer	Section 2.2, Roles of Organisms in Ecosystems, p. 40-49
1.26 Given a diverse group of organisms, classify them as producers, consumers, or decomposers (304-1)	Section 2.2, Roles of Organisms in Ecosystems, p. 40-49
1.27 Explain that observations and identification of similar characteristics enables classification in an ecosystem. (109-1)	Section 2.2, Roles of Organisms in Ecosystems, p. 40-49
1.28 Relate the conditions necessary for the growth and reproduction of microorganisms to various aspects of the human food supply (304-3)	Think About It 2-2B, Defending Against Decomposers, p. 45
1.29 Identify the conditions that affect microorganism growth (i) temperature (ii) moisture (iii) light (iv) acidity (v) salinity	Section 2.2, Roles of Organisms in Ecosystems, p. 40-49 Think About It 2-2B, Defending Against Decomposers, p. 45
1.30 Provide examples of how knowledge of microorganisms has resulted in the development of food production and preservation techniques (111-1)	Think About It 2-2B, Defending Against Decomposers, p. 45

CORRELATION TO THE NEWFOUNDLAND AND LABRADOR GRADE 7 SCIENCE CURRICULUM

1.31 Describe how the following food preservation techniques inhibit the growth and reproduction of microorganisms. Include: (i) pickling (ii) salting (iii) drying (iv) smoking (v) refrigeration (vi) freeze-drying (vii) radiation (viii) canning	Think About It 2-2B, Defending Against Decomposers, p. 45
1.32 Describe how energy is supplied to, and how it flows through, a food chain (306-1)	Section 2.3, Food Chains, Food Webs, and the Transfer of Energy, p. 50-59
1.33 Explain how producers use light energy, carbon dioxide, and water (photosynthesis) to produce energy for the ecosystem	Section 2.2, Roles of Organisms in Ecosystems, p. 40-49
1.34 Define food chain	Section 2.3, Food Chains, Food Webs, and the Transfer of Energy, p. 50-59
1.35 Construct simple food chains using local examples	Section 2.3, Food Chains, Food Webs, and the Transfer of Energy, p. 50-59
1.36 Define herbivores, carnivores and omnivores as different types of consumers	Section 2.2, Roles of Organisms in Ecosystems, p. 40-49
1.37 Classify the organisms within food chains as producers, herbivores, carnivores and omnivores	Section 2.3, Food Chains, Food Webs, and the Transfer of Energy, p. 50-59
1.38 Apply the concept of a food web as a tool for interpreting the structure and interactions of an ecosystem. (111-6)	Think About It 2-3B, Riddle of the Pyramids, p. 57 Science Watch, Fisheries and Ecosystems, p. 58
1.39 Define food web	Section 2.3, Food Chains, Food Webs, and the Transfer of Energy, p. 50-59
1.40 Construct food webs using organisms from local ecosys-tems	Section 2.3, Food Chains, Food Webs, and the Transfer of Energy, p. 50-59
Decomposers	
1.41 Describe, using an ecological pyramid, how energy flows through a food web (210-2, 306-1)	Section 2.3, Food Chains, Food Webs, and the Transfer of Energy, p. 50-59
1.42 Draw and interpret a pyramid of energy	Think About It 2-3B, Riddle of the Pyramids, p. 57
1.43 Identify the limitations of a pyramid of energy to accurately portray energy flow in a food web. Include: (210-3) (i) they do not always indicate the exact amount of food energy required, but are simple generalizations. (ii) that energy is transformed into other types of energy (heat) and is not always transferred to the next level in the pyramid. (iii) approximately 10% of the energy is lost at each step in the form of heat energy	Section 2.3, Food Chains, Food Webs, and the Transfer of Energy, p. 50-59
1.44 Explain using examples why energy pyramids and food webs are not always useful.	Section 2.3, Food Chains, Food Webs, and the Transfer of Energy, p. 50-59
1.45 Describe how matter is recycled in an ecosystem through interactions among plants, animals, fungi and microorganisms. (306-2)	Section 2.2, Roles of Organisms in Ecosystems, p. 40-49 Section 2.3, Food Chains, Food Webs, and the Transfer of Energy, p. 50-59
1.46 Illustrate and explain the nutrient cycle	Section 2.4, Cycles of Matter in Ecosystems, p. 60-63

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Ecological Succession	
1.47 Identify changes that have occurred in a local ecosystems over time (306-4):	Section 3.1, Natural Disturbances and Succession, p. 68-73 Section 3.2, The Impact of People on Ecosystems, p. 74-85 Science Watch, Fisheries and Ecosystems, p. 58 Science Watch, Protecting the Limestone Barrens, p. 84
1.48 Define succession	Section 3.1, Natural Disturbances and Succession, p. 68-73
1.49 Predict what an ecosystem will look like in the future based on the characteristics of the area. (208-5)	Section 3.1, Natural Disturbances and Succession, p. 68-73
1.50 Define pioneer species	Section 3.1, Natural Disturbances and Succession, p. 68-73
1.51 Define climax community	Section 3.1, Natural Disturbances and Succession, p. 68-73
1.52 Distinguish between primary and secondary succession	Section 3.1, Natural Disturbances and Succession, p. 68-73
1.53 Construct a flow chart of images to illustrate the changes occurring during primary and secondary succession. Include: (210-2) (i) bare rock to boreal forest (primary) (ii) forest re-growth after fire (secondary)	Think About It 3-1B, Secondary Succession from Beaver Pond to Bog to Forest, p. 72
1.54 Describe the ecosystem changes that occur in the examples above. Include: (i) soil composition (ii) plant types (iii) animal types (iv) amount of light	Section 3.1, Natural Disturbances and Succession, p. 68-73
1.55 Describe how our need for a continuous supply of wood resulted in the development of silvaculture practice. (112-3)	Section 3.2, p. 74-85
1.56 Make informed decisions about forest harvesting techniques taking into account the environmental advantages and disadvantages. (113-9)	Section 3.2, p. 74-85
1.57 Provide examples of how our understanding of boreal forest ecology has influenced our harvesting practices identifying the positive effects of these practices. (111-1, 113-1)	Section 3.2, p. 74-85
1.58 Identify various science and technology-based careers related to forest management and harvesting. (112-9)	Section 3.2, p. 74-85
1.59 Propose and defend a course of action to protect the local habitat of a particular organism. (113-11, 211-5)	Think About It 3-2B, The Pros and Cons of Conservation, p. 83 Integrated Research Investigation, Saving Endangered Species, p. 99
1.60 Describe how humans have influenced the environment. Include: (i) habitat loss (ii) harvesting resources (iii) pollution (iv) introduced species	Section 3.2, The Impact of People on Ecosystems, p. 74-85
1.61 Debate the pros and cons of habitat conservation Pros (i) sustainability of resource (ii) preservation of biodiversity (iii) eco-tourism Cons (i) artificial habitats (ii) economic loss (job loss, etc.) (iii) limited human use	Think About It 3-2B, The Pros and Cons of Conservation, p. 83

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Environmental Action	
1.62 Provide examples of problems that arise in the environment that cannot be solved using only scientific or technological knowledge. (113-10) Include: (i) decline in cod stocks (ii) oil slicks/spills (iii) acid rain	Section 3.2, The Impact of People on Ecosystems, p. 74-85 Section 3.3, Monitoring and Managing Ecosystems, p. 86-93
1.63 Use various sources to research individuals or groups in Canada interested in protecting the environment. (112-4, 112-8, 209-5) Include: (i) local groups and individuals (ii) national groups and individuals (iii) international groups and individuals	Integrated Research Investigation, Saving Endangered Species, p. 99
UNIT 2 OUTCOMES	
Measuring Temperature	
2.01 Relate personal activities in formal and informal settings to temperature. (109-10)	Section 4.1, Describing Temperature, p. 110-119
2.02 Define temperature operationally	Section 4.1, Describing Temperature, p. 110-119
2.03 Relate temperature to everyday experiences. Include: (i) daily temperature changes (ii) cooking temperatures (iii) refrigeration temperatures (iv) average temperatures in different geographic areas	Find Out Activity 4-1A, Boiling Hot, Freezing Cold, p. 110
2.04 Predict and identify the temperature of various familiar objects. Include: (i) human body temperature (ii) temperatures of boiling and freezing water (iii) comfortable room temperature	Find Out Activity 4-1A, Boiling Hot, Freezing Cold, p. 110
2.05 Provide examples of temperature measuring technologies used in the past. (110-7) Include: (i) Galileo's air thermometer (ii) Early liquid thermometers	Section 4.2, Measuring Temperature, p. 120-131
2.06 Identify scales used in temperature measurement. Include: i) Celsius ii) Fahrenheit iii) Kelvin	Section 4.2, Measuring Temperature, p. 120-131
2.07 Select appropriate methods and tools in order to construct and test a thermometer (208-8, 210-13)	Conduct an Investigation 4-2B, Make Your Own Thermometer, p. 128-129
2.08 Compile and display data collected in the test of the design of the constructed thermometer (210-2)	Conduct an Investigation 4-2B, Make Your Own Thermometer, p. 128-129
2.09 Describe various instruments used to measure temperature (308-1). Include: (i) liquid-in-glass thermometer (ii) thermocouple (iii) resistance thermometer (digital thermometers) (iv) bimetallic strip (thermostat) (v) infrared thermometer	Section 4.2, Measuring Temperature, p. 120-131

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Temperature and Matter	
2.10 Define temperature using the Particle Theory of Matter. (308-2)	Section 5.1, Particle Theory of Matter, p. 136-143 Section 6.3, Temperature versus Heat, p. 206-215
2.11 Define matter	Section 5.1, Particle Theory of Matter, p. 136-143
2.12 Describe the Particle Theory of Matter. Include: (i) All matter is made up of tiny particles. (ii) These particles are always moving - they have energy. The more energy the particles have, the faster they move. (iii) There is space between all particles. (iv) There are attractive forces between the particles. (v) The particles of one substance differ from the particles of other substances.	Section 5.1, Particle Theory of Matter, p. 136-143
2.13 Define kinetic energy	Section 5.1, Particle Theory of Matter, p. 136-143
2.14 Define temperature as a measure of the average kinetic energy of the particles of a substance	Section 5.1, Particle Theory of Matter, p. 136-143
2.15 Explain how each state of matter reacts to changes in temperature. (308-3)	Conduct an Investigation 5-3C, The Plateau Problem (Core Lab), p. 166-167
2.16 Compare the characteristics of the three states of matter in terms of: (i) volume (ii) shape	Section 5.3, Changes of State, p. 158-169
2.17 Describe the three states of matter using the particle theory of matter in terms of: (i) arrangement of particles (ii) movement of particles	Section 5.2, States of Matter, p. 144-157
2.18 Define expansion and contraction	Section 5.2, States of Matter, p. 144-157
2.19 Use the particle theory of matter to explain expansion and contraction in the three states of matter	Section 5.2, States of Matter, p. 144-157
2.20 Explain changes of state using the Particle Theory of Matter. (308-4) Include: (i) melting (ii) freezing (iii) evaporation	Section 5.3, Changes of State, p. 158-169
2.21 State a hypothesis, carry out an experiment, identify and control major variables and state a conclusion based on experimental data (208-5, 208-6, 210-11)	Conduct an Investigation 5-3C, The Plateau Problem (Core Lab), p. 166-167
2.22 Use heating and measuring tools accurately and safely (209-6)	Conduct an Investigation 5-3C, The Plateau Problem (Core Lab), p. 166-167
2.23 Organize, compile and display data using tables and graphs (209-4, 210-2)	Conduct an Investigation 5-3C, The Plateau Problem (Core Lab), p. 166-167
Heat Transfer	
2.24 Compare transmission of heat by conduction, convection, and radiation. (308-5)	Section 6.1, Processes of Transferring Heat, p. 191
2.25 Define conduction, convection and radiation in terms of: (i) particle movement (ii) state(s) in which it occurs	Section 6.1, Processes of Transferring Heat, p. 191

CORRELATION TO THE NEWFOUNDLAND AND LABRADOR GRADE 7 SCIENCE CURRICULUM	
2.26 List common examples of the three processes of heat transfer. Include: (i) conduction - cookware, ice pack (ii) convection - air currents, heating a liquid (iii) radiation - fireplace, sunlight	Section 6.1, Processes of Transferring Heat, p. 191
2.27 Provide examples of heat technologies used past and present to heat homes in Newfoundland and Labrador (110-7) Include: (i) wood stove (ii) electric heat (iii) oil furnace (iv) air to air heat pump (v) hot water radiation (vi) geothermal (vii) solar	Section 6.1, Processes of Transferring Heat, p. 191
2.28 Identify different approaches taken to solve the problem of heating homes during cold times of the year (109-7)	Section 6.1, p. 174-191
2.29 Make informed decision about the various technologies used to hear our homes, taking into account potential advantages and disadvantages (110-7, 113-8)	Section 6.1, p. 174-191 Section 6.2, p. 192-205
2.30 Provide examples of how the technologies used to heat homes have improved over time (110-8)	Section 6.1, p. 174-191 Section 6.2, p. 192-205
2.31 Provide examples of how our understanding of evaporation and condensations of liquids resulted in the development of heat pumps (111-1)	Section 5.3, p. 128-169 Section 6.1, p. 174-191
2.32 Describe how various surfaces absorb radiant heat (308-6)	Section 6.1, p. 174-191
2.33 Design and conduct an experiment to test identified questions, state a hypothesis, identify and control major variables. (208-3, 208-5, 209-1)	Keep it Cool 6-2C, p. 200-201
2.34 Use experimental apparatus and tools safely. (209-6)	Currents in a Pie Pan 6-1A, p. 175
2.35 Organize and display data using tables and graphs. (209-4, 210-2)	Keep it Cool 6-2C, p. 200-201
2.36 State a conclusion, based on experimental data, and explain how evidence gathered supports or refutes an initial idea. (210-11)	Keep it Cool 6-2C, p. 200-201
2.37 Distinguish between thermal conductors and insulators.	Section 6.2, Conductors and Insulators, p. 192-205
2.38 Provide examples of insulating technologies used today and in the past. (109-4) Include: (i) animal fur (ii) sod (iii) fiberglass (iv) thermos	Section 6.2, Conductors and Insulators, p. 192-205
Specific Heat Capacity	
2.39 Compare, in qualitative terms, the specific heat capacities of some common materials. (308-7) Include: (i) water (ii) ice (iii) aluminum (iv) concrete (v) steel	Section 6.3, Temperature versus Heat, p. 206-215

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2.40 Distinguish between heat and temperature	Section 6.3, Temperature versus Heat, p. 206-215
2.41 Define specific heat capacity	Section 6.3, Temperature versus Heat, p. 206-215
Temperature, Heat and Technology	
2.42 Describe how our needs related to heat can lead to developments in science and technology (112-1)	Section 6.1, Processes of Transferring Heat, p. 191 Integrated Research Investigation, Building Codes and Insulation, p. 221
2.43 Identify examples of science- and technology-based careers that are associated with heat and temperature. (112-9)	Career Connect, Ask an Expert, p. 203
UNIT 3 OUTCOMES	
Mixtures and Pure Substances – The Particle Theory	
3.01 Define the Particle Theory of Matter	Section 5.1, Particle Theory of Matter, p. 136-143
3.02 Distinguish between pure substances and mixtures using the particle theory of matter. (307-1)	Section 7.1, How Mixtures Are Different from Pure Substances, p. 232-241
3.03 Using observations, categorize substances as pure or mixtures.	Conduct an Investigation 7-1C, Examining Three Common Beverages
3.04 Define the terms pure substance and mixture using the Particle Theory of Matter	Section 7.1, How Mixtures Are Different from Pure Substances, p. 232-241
Homogeneous and Heterogeneous Mixtures	
3.05 Identify various pure substances Include: (i) distilled water (H_2O) (ii) sugar ($C_{12}H_{22}O_{11}$) (iii) copper (CU) (iv) oxygen (O_2) (v) carbon dioxide (CO_2)	Section 7.1, How Mixtures Are Different from Pure Substances, p. 232-241
3.06 Identify various mixtures that are found in or around student homes. Include: (i) salad dressing (ii) chocolate chip cookie (iii) Kool-aid (iv) concrete (v) air	Section 7.1, How Mixtures Are Different from Pure Substances, p. 232-241
3.07 Distinguish between heterogeneous (mechanical) and homogeneous (solution) mixtures using the particle theory of matter. (307-3)	Section 7.2, Classifying Mixtures, p. 242-249
3.08 Identify that homogeneous mixtures appear as one substance and light will pass through unaffected	Conduct an Investigation 7-2A, Shine On, p. 246
3.09 Identify that heterogeneous mixtures may appear as more than one substance and light will reflect perpendicular to the incident beam	Conduct an Investigation 7-2A, Shine On, p. 246
3.10 Identify some mixtures as combinations of heterogeneous and homogeneous mixtures. Include: (i) orange juice (ii) milk (iii) soft drink	Section 7.2, Classifying Mixtures, p. 242-249

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Solutions	
3.11 Describe the characteristics of solutions using the Particle Theory of Matter and precise scientific language. Include the terms (307-3): (i) dissolving (ii) solute (iii) solvent (iv) solubility (soluble/insoluble)	Section 8.1, Making Solutions: Solutes and Solvents, p. 254- 261 Section 8.2, Concentration and Solubility, p. 262-273
3.12 Identify that solutions can form between the three states of matter. Include: (i) solid solute - liquid solvent (ii) gas solute - liquid solvent (iii) gas solute - gas solvent (iv) solid solute - solid solvent (v) liquid solute - liquid solvent	Section 8.1, Making Solutions: Solutes and Solvents, p. 254- 261
3.13 Define solute and solvent	Section 8.1, Making Solutions: Solutes and Solvents, p. 254- 261
3.14 Given an example of a solution and its components, identify the solute and solvent. Include: (i) alloys such as brass, bronze (ii) air (iii) salt water (iv) rubbing alcohol (v) soda water	Section 8.1, Making Solutions: Solutes and Solvents, p. 254- 261
3.15 Describe the concentrations of solutions qualitatively and quantitatively. (307-4)	Section 8.1, Making Solutions: Solutes and Solvents, p. 254- 261 Section 8.2, Concentration and Solubility, p. 262-273
3.16 Distinguish between a quantitative and a qualitative description	Section 8.1, Making Solutions: Solutes and Solvents, p. 254- 261 Section 8.2, Concentration and Solubility, p. 262-273 Science Skill 5, p. 471
3.17 Define the terms quantitative and qualitative.	Section 8.2, Concentration and Solubility, p. 262-273 Science Skill 5, p. 471
Concentration of Solutions	
3.18 Define concentration	Section 8.2, Concentration and Solubility, p. 262-273
3.19 Describe the concentrations of solutions qualitatively using the terms: (i) dilute (ii) concentrated (iii) saturated (iv) unsaturated	Section 8.1, Making Solutions: Solutes and Solvents, p. 254- 261 Section 8.2, Concentration and Solubility, p. 262-273
3.20 Describe the concentrations of solutions quantitatively as the amount of solute per unit volume.	Section 8.2, Concentration and Solubility, p. 262-273
3.21 Express concentration of solutions in g/L. (210-9)	Section 8.2, Concentration and Solubility, p. 262-273
3.22 Convert given concentrations in g/mL to g/L	Section 8.2, Concentration and Solubility, p. 262-273 Science-Math Connect, Working with Concentration Units, p. 272
3.23 Identify different measures of concentration. (109-7) Include: (i) percentage by mass (ii) ppm (parts per million)	Find Out Activity 8-2C, Concentrations of Consumer Products, p. 271

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3.24 State a hypothesis based on background information or an observed pattern of events (208-5)	Conduct an Investigation 8-2A, How Does Temperature Affect Solubility, p. 268-269
Solutions and Solubility	
3.25 Identify and delimit questions and problems to facilitate investigation (208-2, 208-3)	Mixture Match-Up 7-1B, p. 235
3.26 Identify the line of best fit and interpolate or extrapolate based on the line of best fit (210-5)	Conduct an Investigation 8-2A, How Does Temperature Affect Solubility, p. 268-269
3.27 Develop a testable hypothesis on the effect of temperature on solubility (208-1)	Conduct an Investigation 8-2A, How Does Temperature Affect Solubility, p. 268-269
3.28 Carry out procedures controlling the major variables to study the effect of temperature on solubility (209-1)	Conduct an Investigation 8-2A, How Does Temperature Affect Solubility, p. 268-269
3.29 Describe qualitatively the factors that affect the solubility of a solid and a gas. (307-5) Include: (i) temperature (ii) pressure	Section 8.2, Concentration and Solubility, p. 262-273
Separating Solutions	
3.30 Using apparatus safely, identify and separate the components of a variety of mixtures. (209-6, 307-2) Include: (i) mechanical sorting (flotation, magnetism, etc.) (ii) filtration (iii) evaporation (iv) distillation (v) paper chromatography	Conduct an Investigation 7-2B, What Kind of Mixture? p. 247 Think About It Activity 9-1A, Strategies for Separation, p. 279 Conduct an Investigation 9-1B, Making Dirty Water Clear, p. 285 Conduct an Investigation 9-1C, Separating Homogeneous Mixtures (Core Lab), p. 286-289 Project, Purifying Mixtures, p. 304
3.31 Describe how to use different methods to separate a variety of mixtures. Include: (i) mechanical sorting (flotation, magnetism) (ii) filtration (iii) evaporation (iv) distillation (v) paper chromatography	Section 9.1, Separating Mixtures and Solutions, 278-291 Section 9.2, Separating Mixtures from Underground, p. 292-297 Project, Purifying Mixtures, p. 304
3.32 Identify separation techniques used in or around student homes. Include: (i) straining spaghetti in colander (ii) skimming fat off soup (iii) drying clothes (separating water from fabric) (iv) window screens allowing air in while keeping insects out (v) making coffee using ground coffee beans	Section 9.1, Separating Mixtures and Solutions, p. 278-291
3.33 Choose an appropriate separation technique when given a known mixture (students know the identity of the components)	Find Out Activity, Mixed or Pure, p. 229 Think About It 9-1A, Strategies for Separation, p. 279 Project, Purifying Mixtures, p. 304
Distillation	
3.34 Describe the science underlying a distillation apparatus, using the following terms: boiling, evaporation, condensation. (111-5)	Section 9.1, Separating Mixtures and Solutions, p. 278-291
3.35 Define distillation	Section 9.1, Separating Mixtures and Solutions, p. 278-291
3.36 Explain how a distillation apparatus is used to separate a solution	Section 9.1, Separating Mixtures and Solutions, p. 278-291

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3.37 Describe where boiling, evaporation and condensation occurs in a distillation apparatus	Section 9.1, Separating Mixtures and Solutions, p. 278-291
3.38 Carry out procedures controlling the major variables to answer questions arising from practical problems (208-2, 209-1)	Now You See It… 7-1A, p. 233
3.39 Use tools and instruments safely and accurately when carrying out procedures and collecting data (209-3, 209-6)	Examining Three Common Beverages 7-1C, p. 238-239
3.40 Evaluate the potential applications of findings related to distillation and paper chromatography (210-12)	Making Dirty Water Clean 9-1B, p. 285
3.41 Identify, and suggest explanations for, discrepancies in data (210-7)	Separating Homogeneous Mixtures 9-1C, p. 286-289
3.42 Answer new questions that result from the mixture separation activities. (210-16)	Separating Homogeneous Mixtures 9-1C, p. 286-289
3.43 Using distillation as an example show how refining and separation techniques have evolved. (109-4) Include: - simple distillation - fractional distillation	Section 9.1, Separating Mixtures and Solutions, p. 278-291
Applications of Mixture Science	
3.45 Provide examples of how science, related to mixtures and solutions, affect our lives. (112-7)	Section 7.1, How Mixtures Are Different from Pure Substances, p. 232-241 Section 7.2, Classifying Mixtures, p. 242-249 Section 8.1, Making Solutions: Solutes and Solvents, p. 254- 261 Section 8.2, Concentration and Solubility, p. 262- 273 Section 9.1, Separating Mixtures and Solutions, p. 278-291 Section 9.2, Separating Mixtures from Underground, p. 292
3.46 Identify some positive and negative effects and intended and unintended consequences of using salt on highways. (113-1)	Integrated Research Project, Safe, Clean Water for Everyone, p. 305
3.47 Describe how our understanding of the properties of solutions has resulted in better road de-icing technologies (111-1)	Integrated Research Project, Safe, Clean Water for Everyone, p. 305
3.48 Provide examples of how road de-icing technologies have affected our lives, our communities, and our environment (112-	Integrated Research Project, Safe, Clean Water for Everyone, p. 305
3.49 Evaluate the methods used to improve the de-icing ability of sodium chloride including time of application, road weather information, and pre-wetting (113-6)	Integrated Research Project, Safe, Clean Water for Everyone, p. 305
3.50 Make an informed decision about the use of road salt as our main road de-icing chemical taking into account the environmental, social, and economics advantages and disadvantages (113-9)	Integrated Research Project, Safe, Clean Water for Everyone, p. 305
UNIT 4 OUTCOMES	
Rocks and Minerals	
4.01 Classify minerals based on their physical properties. (210-1, 310-2a)	Section 10.1, Investigating Minerals, p. 316-325
4.02 Define mineral	Section 10.1, Investigating Minerals, p. 316-325

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4.03 List and describe properties of minerals. Include: (i) colour (ii) streak (iii) lustre (iv) hardness (v) cleavage (vi) fracture	Section 10.1, Investigating Minerals, p. 316-325
4.04 Use a mineral classification key to investigate questions arising from practical problems (208-2, 210-1)	Conduct an Investigation 10-1C, A Mineralogist's Mystery (Core Lab, p. 322-323)
4.05 Select appropriate methods and tools for collecting and organizing data to identify minerals (208-8, 209-4)	Conduct an Investigation 10-1C, A Mineralogist's Mystery (Core Lab), p. 322-323
4.06 Using a classification key, identify common minerals. Include: (210-1) (i) quartz (ii) calcite (iii) magnetite (iv) mica (v) pyrite (vi) galena (vii) gypsum (viii) talc (ix) feldspar (x) hematite	Conduct an Investigation 10-1C, A Mineralogist's Mystery (Core Lab), p. 322-323
4.07 Classify rocks based on their characteristics and method of formation: (310-2b)	Section 10.2, Investigating Rocks, p. 326-339
4.08 Define rock	Section 10.2, Investigating Rocks, p. 326-339
4.09 Define igneous rock and describe their formation	Section 10.2, Investigating Rocks, p. 326-339
4.10 Differentiate between magma and lava	Section 10.2, Investigating Rocks, p. 326-339
4.11 Differentiate between intrusive and extrusive igneous rocks using examples. Include: -granite(intrusive) - magma -basalt (extrusive) - lava	Section 10.2, Investigating Rocks, p. 326-339
4.12 Relate crystal size in igneous rocks to rate of cooling	Section 10.2, Investigating Rocks, p. 326-339
Classification of Rocks	
4.13 Define sedimentary rock	Section 10.2, Investigating Rocks, p. 326-339
4.14 List and show examples of sedimentary rocks. Include: (i) Shale (small particles) (ii) Sandstone (medium particles) (iii) Conglomerate (large particles) (iv) Limestone (plant and animal particles)	Section 10.2, Investigating Rocks, p. 326-339
4.15 Define metamorphic rock	Section 10.2, Investigating Rocks, p. 326-339
4.16 Describe the formation of metamorphic rocks	Section 10.2, Investigating Rocks, p. 326-339
4.17 List examples of metamorphic rocks and their parent rock. Include: -slate from shale -marble from limestone -quartzite from sandstone -gneiss from granite	Section 10.2, Investigating Rocks, p. 326-339

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Rock Cycle	
4.18 Identify questions to investigate arising from the study of the rock cycle. (208-2)	Section 10.3, The Rock Cycle and Rock and Mineral Resources, p. 340-351
4.19 Sketch and label a diagram of the rock cycle.	Think About It 10-3A, Recycling the Rocks, p. 341
4.20 Recognize the relationship between various types of rocks (igneous, sedimentary, metamorphic)	Section 10.3, The Rock Cycle and Rock and Mineral Resources, p. 340-351
4.21 Explain how society's needs led to developments in technologies designed to use rocks. (112-3)	Section 10.3, The Rock Cycle and Rock and Mineral Resources, p. 340-351
4.22 Identify various minerals and rocks mined past and present, including but not limited to: (i) gold (Nugget Pond) (ii) granite (Lumsden) (iii) iron ore (Labrador City) (iv) slate (Burgoyne's Cove) (v) gypsum (Flat Bay)	Think About It 10-3B, Research the Resource, p. 347
Structure of Earth	
4.23 Describe the characteristics of Earth's crust and some of the technologies which have allowed scientists to study geological features in and on the earth's crust. (109-7, 1112, 310-1)	Section 11.1, A Moving, Changing Crust, p. 356-373
4.24 Sketch and label a model of Earth's layered interior. Include: (i) inner core (ii) outer core (iii) mantle (iv) crust	Think About It 11-1B, A Model Planet, p. 359
4.25 Describe how the composition of the Earth's crust is determined	Section 11.1, A Moving, Changing Crust, p. 356-373
4.26 Recognize that Earth's crust is broken into plates and movement occurs where plate margins meet (plate tectonics)	Section 11.1, A Moving, Changing Crust, p. 356-373
PLATE TECTONICS THEORY	
4.27 Describe how plate tectonic theory has evolved in light of new geological evidence. (110-4)	Section 11.1, A Moving, Changing Crust, p. 356-373
4.28 Identify Alfred Wegener as the person responsible for proposing the Continental Drift Theory	Section 11.1, A Moving, Changing Crust, p. 356-373
4.29 Describe the Continental Drift Theory and the evidence supporting it; Include evidence from: (i) continental fit (paleogeographic) (ii) fossils (biological) (iii) rock layers (geological) (iv) climate (meteorological)	Section 11.1, A Moving, Changing Crust, p. 356-373
4.30 Identify the technological advances that have provided evidence to support the current theory of Plate Tectonics. Include: (i) sonar (ii) magnetometers (iii) deep sea drilling	Section 11.1, A Moving, Changing Crust, p. 356-373
4.31 Identify types of plate boundaries. Include: (i) Divergent (pulling apart) (ii) Convergent (pushing together) (iii) Transform (sliding past)	Section 11.2, How Earthquakes and Volcanoes Shape Earth's Crust, p. 374-389

CORRELATION TO THE NEWFOUNDLAND AND LABRADOR GRADE 7 SCIENCE CURRICULUM	
4.32 Identify convection currents in the Earth as the driving force mechanism behind plate tectonics	Section 11.1, A Moving, Changing Crust, p. 356-373
4.33 Provide examples of Canadian contributions to our understanding of local, regional, and global geology.(112-12)	Career Connect, Geophysicist, p. 372 Science Watch, Exploring the Big Deep, p. 388 Think About It 11-3C, Canada—Past, Present, and Future, p. 399 Think About It 11-3D, Rock Stars, p. 399
4.34 Describe how our explanations of how the Earth has changed over time is based on the collection of evidence and finding relationships between various observations in imaginative ways. (109-2)	Section 11.1, A Moving, Changing Crust, p. 356-373
4.35 Describe how our understanding of the forces that shaped our Earth have changed overtime as new evidence was collected. (110-5)	Section 11.1, A Moving, Changing Crust, p. 356-373
4.36 Identify the Theory of Continental Drift as one early explanation for how our Earth changed over time. (110-1)	Section 11.1, A Moving, Changing Crust, p. 356-373
4.37 Identify the Theory of Plate Tectonics as an example of a major shift in our world view. (110-3)	Section 11.1, A Moving, Changing Crust, p. 356-373
EARTHQUAKES, VOLCANOES, AND MOUNTAINS	
4.38 Compare some of the catastrophic events, such as earthquakes and volcanic eruptions that occur on or near Earth's surface. (311-4)	Section 11.2, How Earthquakes and Volcanoes Shape Earth's Crust, p. 374-389
4.39 Define earthquakes	Section 11.2, How Earthquakes and Volcanoes Shape Earth's Crust, p. 374-389
4.40 Explain why earthquakes occur using the concept of plate tectonics	Section 11.2, How Earthquakes and Volcanoes Shape Earth's Crust, p. 374-389
4.41 Define volcano	Section 11.2, How Earthquakes and Volcanoes Shape Earth's Crust, p. 374-389
4.42 Identify how and where volcanoes form. Include : (i) areas where plates collide (ii) areas where plates separate (iii) areas where plates pass over stationary hot spots	Section 11.2, How Earthquakes and Volcanoes Shape Earth's Crust, p. 374-389
4.43 Organize and analyze data on the geographical distribution of earthquakes and volcanoes to determine patterns and trends. (209-4, 210-6, 311-5)	Think About It 11-2E, Patterns in Earthquake and Volcano Locations, p. 386-387
4.44 Provide examples of theories used in the past to explain volcanic activity, earthquakes, and mountain building. (110-1)	Section 11.2, How Earthquakes and Volcanoes Shape Earth's Crust, p. 374-389 Conduct an Investigation 11-3F, Building a Mountain-Building Theory, p. 401
4.45 Identify explanations of volcanic and earthquake activity from the past. Include: (i) Pele (ii) Glooscap	Think About It 11-2C, Seismic Stories, p. 384
4.46 Explain the processes of mountain formation. (311-1)	Section 11.3, Mountain Building and Geologic Time, p. 390-403
4.47 Define folding and faulting.	Section 11.3, Mountain Building and Geologic Time, p. 390-403

CORRELATION TO THE NEWFOUNDLAND AND LABRADOR GRADE 7 SCIENCE CURRICULUM	
4.48 Explain how mountains are formed using the theory of Plate Tectonics. Include: (i) folding (ii) faulting (iii) volcanic eruption	Section 11.3, Mountain Building and Geologic Time, p. 390-403
GEOLOGICAL TIME SCALE	
4.49 Develop a chronological model or geological time scale of major events in Earth's history. (209-4, 311-6)	Section 11.3, Mountain Building and Geologic Time, p. 390-403
4.50 Describe the geologic time scale in terms of the four main eras and the major events that occurred in each. Include: (i) Precambrian – formation of the Earth and appearance of simple life forms. (ii) Paleozoic – appearance of more complex life forms (iii) Mesozoic – appearance and extinction of dinosaurs (iv) Cenozoic – appearance of human	Section 11.3, Mountain Building and Geologic Time, p. 390-403
WEATHERING AND EROSION	
4.51 Explain various ways in which rocks can be weathered (311-2)	Section 12.1, Weathering, Erosion, and Soil Formation, p. 408-421
4.52 Define weathering	Section 12.1, Weathering, Erosion, and Soil Formation, p. 408-421
4.53 Identify types of weathering. Include: (i) mechanical (ii) chemical	Section 12.1, Weathering, Erosion, and Soil Formation, p. 408-421
4.54 Define Erosion	Section 12.1, Weathering, Erosion, and Soil Formation, p. 408-421
4.55 Identify the various agents of erosion. Include: (i) water in motion (ii) meteorological processes (rain and wind) (iii) geological processes (gravity and glaciers)	Section 12.1, Weathering, Erosion, and Soil Formation, p. 408-421
4.56 Differentiate between weathering and erosion	Section 12.1, Weathering, Erosion, and Soil Formation, p. 408-421
4.57 Relate various meteorological, geological, chemical and biological processes to the formation of soils. (311- 3) Include: (i) rain and wind (ii) glaciers and gravity (iii) plants and acidic action	Section 12.1, Weathering, Erosion, and Soil Formation, p. 408-421
SOIL	
4.58 List the basic types of soil. Include: (i) clay (ii) sand (iii) gravel	Section 12.2, Soil Types and Characteristics, p. 422-431
4.59 Define porosity and permeability	Section 12.2, Soil Types and Characteristics, p. 422-431
4.60 Relate porosity and permeability to soil types	Section 12.2, Soil Types and Characteristics, p. 422-431
4.61 Classify various types of soil according to their characteristics. (310-3) Include: (i) coarse-textured (sandy gravel) soil (ii) medium-textured (loamy) soil (iii) fine-textured (clay) soil	Section 12.2, Soil Types and Characteristics, p. 422-431

CORRELATION TO THE NEWFOUNDLAND AND LABRADOR GRADE 7 SCIENCE CURRICULUM	
4.62 Carry out procedures controlling the major variables to answer questions arising from practical issues. (208-2, 209-1)	Settling Sediments 1-2C, p. 336
4.63 Use instruments effectively and accurately for collecting data (209-3)	Conduct an Investigation 7-1C, Examining Three Common Beverages, p. 238-239
4.64 Compile, organize and display data, using a tabular format. (209-4, 210-2, 211-2)	A Mineralogist's Mystery 1-1C, p. 322-323
4.65 Interpret patterns and trends in data, and infer and explain relationships among the variables. (210-6)	A Mineralogist's Mystery 1-1C, p. 322-323
4.66 State a conclusion, based on experimental data, and explain how the data gathered supports or refutes and initial idea. (210-11)	A Mineralogist's Mystery 1-1C, p. 322-323
4.67 Provide examples of how science and technology, associated with soil enrichment, affect communities. (112-7)	Section 12.3, Sustaining Fertile Soils, p. 432-443
4.68 Define fertilizer	Section 12.3, Sustaining Fertile Soils, p. 432-443
4.69 Define composting	Section 12.3, Sustaining Fertile Soils, p. 432-443
4.70 Identify some positive and negative effects and intended and unintended consequences of enriching soils (113-1)	Section 12.3, Sustaining Fertile Soils, p. 432-443
4.71 Identify positive and negative effects of enriching soil. Include: (i) Positive: -enhanced plant growth -decreased erosion -more food -aesthetic (ii) Negative -runoff -algal bloom -decreased water oxygen levels -increased fish mortality	Section 12.3, Sustaining Fertile Soils, p. 432-443
4.72 Suggest solutions to problems or issues related to soil use and misuse. (113-7) Include: (i) reduced reliance on chemical fertilizers (ii) limiting runoff (iii) planting wind breaks (iv) no-till farming	Section 12.3, Sustaining Fertile Soils, p. 432-443

COURSE MATERIALS

The following chart lists the items you may wish to use for a class of 30 using the *Discovering Science 7* program. The activities can be carried out by pairs of students, unless the instructions clearly specify that students should work on their own. Suppliers of science lab materials and equipment are listed in the suppliers' section of this *Teacher's Resource*.

Item Description	Suggested Quantity	Needed for These Units
NON-CONSUMABLE		
Aquarium with screen top	8	2
Atlas	2	4
Baking pans (glass and metal) or similar pans	8	2, 4
Balance or scale, with masses	2	2, 3
Ball and ring apparatus	8	2
Basin, large	8	2, 3, 4
Beaker (500 mL) or large tin can	16	2, 3
Beaker or jar	32	2, 3, 4
Beaker, 100 mL, pkg of 12	3	2
Beaker, 1000 mL	8	2
Beaker, 250 mL, pkg of 12	2	2, 3, 4
Beaker, 50 mL	8	1, 2, 3, 4
Beaker, 500 mL	8	2
Binoculars	2	1
Block of wood (same height as hot plate)	8	2
Bowl	24	1, 2, 4
Bucket	8	3
Bunsen burner	8	2
Calculator	8	2
Camera	2	1
Clamp	32	2
Coin	8	4
Copper penny	8	4
Cutting board	8	4
Desk lamp with flexible arm	8	1
Electric fan	1 total	2, 4
Electric heater	1 total	2
Electric kettle	1 total	2, 4
Erlenmeyer flask, 500 mL	8	3
Evaporating dish	8	3
Field guides	8	1
Funnel, plastic, large	8	1, 2, 3
Glass jar with metal lid	16	1, 2, 4

Item Description	Suggested Quantity	Needed for These Units
Glass plate	8	3, 4
Glass rods	8	2
Glass tube, 50 cm	32	2
Goose-neck camera (optional)	1 total	4
Graduated cylinder, 100 mL	16	2
Graduated cylinder, 25 mL	8	2
Graduated cylinder, 250 mL	8	2
Graduated cylinder, 50 mL	8	3
Grow light or heat source (optional)	1 total	4
Hair dryer	1 total	2, 3
Hand lens	8	1, 4
Heat conductivity apparatus	8	2
Hot plate	3	2, 3, 4
Knife	8	4
Laboratory burner	8	2
Light (at least 100 W)	3	2
Light meter	8	1
Magnet	8	4
Magnifying glass	8	1, 3, 4
Map of Newfoundland and Labrador mines	Included in Teacher's Resource as a BLM	4
Marbles	8 L	2, 3, 4
Mass with a hook (200 g or 500 g)	8 sets	2
Measuring cup	8	1, 4
Measuring spoon	8	3, 4
Medicine dropper	8	2, 3, 4
Metal rod	8	2
Metre stick	8	2
Microscope	1	1, 4
Mineral samples	8	4
Nail, iron	1 box	4
Oven mitt	8 pairs	2, 4
Petri dish	32	2, 3, 4
Plastic pots (large) with drainage holes	32	1, 4
Pop bottle (2 L)	16	4
Retort stand	8	2, 3
Ring clamp	8	2, 3
Rock samples	8 sets	2, 4
Rock-like materials	8 sets	4

Item Description	Suggested Quantity	Needed for These Units
Rolling pin or heavy weight	8	4
Rubber or plastic tube	8 m	3
Ruler	8	1, 2, 3, 4
Saucers for pots	32	1, 4
Scissors	8	1, 2, 3, 4
Sealable containers	32	4
Small pot	32	4
Spherical flask	8	2
Spoon	8	4
Springs	8	4
Steel file	8	4
Steel shot	8	2
Stirring rod	16	2, 3, 4
Stoppers, assorted	32	2, 3
Streak plate	8	4
Stream table or metal pan	8	4
Test tube rack	8	3
Test tubes, large	32	2, 3
Thermometer	8	1, 2, 3
Thumbtack or pushpin	3 boxes	4
Tongs	8	3, 4
Transparent containers, small	32	3
Tweezers	8	4
Watch glass	8	3, 4
Whistle	8	1
Wide-mouth jar, large	16	1
Wind-speed recorder	8	1
Wool blankets or scarves	8	2
World map with latitude and longitude lines	2	4
CONSUMABLE ITEMS		
Aluminum dish, small	16	4
Aluminum foil	3 boxes	2, 4
Apple	8	4
Aquatic plant, small	16	1
Bag, plastic	16	2
Baking soda	3 boxes	3
Balloons	16	2
Bean seeds	32	1
Bluestone, calcium hydroxide, or other substances	150 mL	3

Item Description	Suggested Quantity	Needed for These Units
Bubble wrap, plastic sheet	32	2
Candle, short and fat	8	2
Cardboard, assorted	32	2, 3, 4
Cheesecloth	16	4
Clay	1 kg	4
Clay powder	1 kg	4
Cloth, assorted sizes and colours	20	1, 2, 3
Coffee can with lid	50	2, 4
Construction paper	60 sheets	4
Copper or iron wire	1 m	2
Cornstarch	1 kg box	3, 4
Different mixtures: salt and water, muddy water, nuts and bolts, iron filings and sand, vegetable oil and sand, vegetable oil and water, salt and pepper, or other	500 mL each	3
Disposable gloves (optional)	32 pairs	4
Drinking straw	2 per group	2, 3
Duct or electrician's tape	1 roll	2
Eggs	2 dozen	3
Emery cloth	8 sheets	4
Epsom salts	1 L	3, 4
Ethanol	500 mL	2
Filter paper	32 pieces	3
Flavoured drink powder	8 packets	3
Flour	1 kg	3
Foam, chips or pellets	8 L	1, 2, 3
Foam, flexible and spongy (3 different colours)	30 sheets	4
Food colouring	1	2
Gelatin dessert	3 boxes	2
Glass bottle with a narrow neck (ie, small pop bottle)	16	2
Glue	3	4
Gravel	1 kg	1, 3, 4
Hydrochloric acid, 1%	150 mL	4
Hydrochloric acid, 10% (optional)	150 mL	4
Ice	3 L	2, 4
Index cards	3 boxes	4
Labels	3 boxes	1, 3, 4
Liquid hand soap or shampoo (that appears pearly)	1 L	2
Marshmallow	1 L	2
Masking tape	1 roll	1, 3 , 4
Matches	2 boxes	2

Item Description	Suggested Quantity	Needed for These Units
Materials to create mixtures	1 kg	4
Materials unlike rocks (sand, cardboard, plastic, charcoal, etc)	1 kg	4
Milk	1 L	2
Milk, homogenized	1 L	3
Mixtures for testing, assorted	1 kg	3
Modelling clay	8 boxes	2, 4
Newspaper	32 pages	2
Notebook	1 per student	1
Oil (paraffin, mineral, or motor)	1 L	2
Orange juice	1 L	3
Paint, dark- and light-colours	2 packs	2
Paper	60 sheets	2, 4
Paper bag, large	16	3
Paper clips	2 boxes	4
Paper cups	32	4
Paper plates	32	1, 2, 4
Paper, blue	60 sheets	4
Paper, drawing	32 sheets	1
Paper, large	32 sheets	1
Paper, poster	32 sheets	4
Paper, waxed	2 boxes	3, 4
Pens, pencils, markers, crayons, assorted colours	2 boxes	1, 2, 3, 4
pH indicator paper	100 strips	1
Pie pan, aluminum	16	2
Pie plate	8	1
Plastic (from a pen)	8	2
Plastic cup, large	32	1, 4
Plastic knife	32	4
Plastic spoon	32	4
Plastic, small pieces	30	4
Pop bottle (2 L)	32	1, 3
Pop cans	32	2
Poured insulation	2 L	2
Puzzle pieces, marbles, building blocks, bingo chips, etc	32	4
Resealable bag, large	32	1, 2
Rubber bands	2 boxes	2, 4
Salt	1 kg	1, 3
Sand	2 kg	2, 3, 4
Sandpaper, medium	16 sheets	4

Item Description	Suggested Quantity	Needed for These Units
Seeds	50	1
Shoebox	16	4
Small plants	32	1
Soda water	1 L	3
Soil moisture meter (optional)	8	4
Soil, garden	15 L	1, 4
Soil, garden (not sterilized)	15 L	1, 4
Soil, potting	15 L	1, 4
Soil, sterilized	15 L	1
Soup can or oatmeal cylinder	8	4
Sponge, fine-mesh plastic pot scrubber	8	1
Stir stick	50	1, 3, 4
Stones	2 kg	1, 4
String or yarn	3 rolls	2, 4
Tape, clear adhesive	1 roll	2, 3, 4
Toothpaste, tube	8	4
Twigs	16	1
Vegetable oil	1 L	2, 3
Vinegar	1 L	3
Washers	32	4
Waste organic material such as peels from carrots, apples, potatoes, or leaves from cabbage or lettuce leaves, grass clippings, wood shavings	2 kg	1, 4
Water, dirty	1 L	3
Water, distilled	1 L	3
Water, pond or river	500 mL	1
Water, rain	500 mL	1, 2
Water, salt	1 L	3
Water, tap	50 L	1, 2, 3, 4
Whipped cream from aerosol can	3 cans	2
White sugar	1 kg	3
Window screen or mesh	32 sheets	1, 4
Wood craft sticks or wood pencil	2 boxes	2
Wood shavings	500 g	2
Wood, 5 cm by 10 cm blocks	16	4

Lesson Planner

Chapter:________ Section/Lesson: ____________________ Date: ______________

Explore	Introduction
____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____	☐ Foldables™ ☐ Reading ☐ Activity # ________ ☐ Did You Know ☐ *Teacher's Resource* ☐ www.discoveringscience.ca ☐ Other ____________
Develop	**Concept Development**
____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____	☐ Reading ☐ Reading Check ☐ Activity # ________ ☐ Activity # ________ ☐ Activity # ________ ☐ Internet Connect ☐ Explore More ☐ Feature ☐ www.discoveringscience.ca ☐ Other _____________

Apply

Assessment

- ☐ Check Your Understanding
- ☐ Chapter Review
- ☐ Unit Review
- ☐ *Teacher's Resource* BLM
- ☐ *Teacher's Resource* Quiz
- ☐ ExamView™ Quiz

Additional Resources

Assessment

- ☐ *Teacher's Resource*
- ☐ ExamView™
- ☐ www.discoveringscience.ca
- ☐ Other

RECOMMENDED RESOURCES

General Resources

Books

Barton, Mary Lee, and Deborah L. Joran. *Teaching Reading in Science (A supplement to Teaching Reading in the Content Areas)*. Aurora, CO, McREL (Mid-continent Research for Education and Learning), 2001. (Available through www.ascd.org)

Bosak, Susan. *Science Is*. Firefly Books Incorporated, Toronto, ON, 1998.

Brown, Janet Harley, and Richard J. Shavelson. *Assessing Hands-On Science*. Corwin Press Inc., Thousand Oaks, CA, 1996.

Campbell, Vincent, et al. *Decisions Based on Science*. National Science Teachers Association, Arlington, VA, 1997.

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Doran, Rodney, et al. *Science Educator's Guide to Assessment*. National Science Teachers Association, Arlington, VA, 1998.

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Jensen, E. *Introduction to Brain-Compatible Learning*. San Diego, CA, The Brain Store, 1998.

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Maiklem, Lara. *Ultimate Visual Dictionary of Science*. Toronto, Stoddard, 1998.

McKeever, Susan. *Random House Science Encyclopedia*. Toronto, ON, Random House, 1993.

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Saul, Wendy. *Crossing Borders in Literacy & Science*. Arlington, VA, National Science Teachers Association, 2004. (Grades K-12, product # PA002X, ISBN: 0872075192) www.nsta.org

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Technology: Science & Math in Action Book I. Technology: Science & Math in Action Book 2. Glencoe McGraw-Hill, New York, NY, 1995.

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Wolfe, P. *Brain Matters: Translating Research into Classroom Practice*. Alexandria, VA, Association for Supervision and Curriculum Development, 2001.

Magazines and Journals

Dugger, W.E., Jr. "The Relationship between Technology, Science, Engineering, and Mathematics." *The Technology Teacher*. Vol. 53, no. 7 (1994).

Pappas, C. "Fostering Full Access to Literacy by Including Informational Books." *Language Arts*. Vol. 68, no. 6, 449–462, 1991.

The Reading Teacher. www.reading.org.

Science. www.sciencemag.org.

The Science Teacher. www.nsta.org.

Scientific American. www.scientificamerican.com.

SkyNews. www.skynewsmagazine.com.

Yes Mag, Canada's Science Magazine for Kids. www.yesmag.bc.ca.

Videos and Videodiscs

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Websites
Please see www.discoveringscience.ca for links to recommended Canadian websites.

Teaching Today can be found at www.glencoe.com/teachingtoday with information on the latest teaching tips and free web-based resources.

National Science Teachers Association (U.S.) can be found at www.nsta.org.

SCIENCE SUPPLIERS

This list of suppliers includes suppliers of science equipment and materials, and also suppliers of technology materials that may be useful to you and your students for Design an Investigation and for end-of-unit Projects, in which students are encouraged to use their own ideas and plans to design and build devices and/or systems that provide a solution to a problem or challenge.
Note: At the end of certain suppliers' names, some words in boldface indicate a specific, recommended product line.

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