Atlantic Canada
Science Curriculum

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Education

CURRICULUM

Science
Grade 2

Atlantic Canada Science Curriculum: Grade 2

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Foreword

The pan-Canadian *Common Framework of Science Learning Outcomes K to 12* (1997) provides the basis for the curriculum described in *Foundation for the Atlantic Canada Science Curriculum* (1998). The Atlantic Provinces Education Foundation (APEF) has developed new science curriculum guidelines for grades primary–10.

Grade 2 science includes the following units: Physical Science: Relative Position and Motion; Physical Science: Liquids and Solids; Earth and Space Science: Air and Water in the Environment; and Life Science: Growth and Changes.

This guide is intended to provide teachers with the outcomes framework for the course. It also includes some suggestions to assist teachers in designing learning experiences and assessment tasks.

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Introduction

Background

The curriculum described in *Foundation for the Atlantic Canada Science Curriculum* and related curriculum guides was planned and developed collaboratively by regional committees. The process for developing the common science curriculum for Atlantic Canada involved regional consultation with the stakeholders in the education system in each Atlantic province. The Atlantic Canada science curriculum is consistent with the framework described in the pan-Canadian *Common Framework of Science Learning Outcomes K to 12*.

Aim

The aim of science education in the Atlantic provinces is to develop scientific literacy.

Scientific literacy is an evolving combination of the science-related attitudes, skills, and knowledge that students need to develop inquiry, problem-solving, and decision-making abilities; to become lifelong learners; and to maintain a sense of wonder about the world around them. To develop scientific literacy, students require diverse learning experiences that provide opportunities to explore, analyse, evaluate, synthesize, appreciate, and understand the interrelationships among science, technology, society, and the environment.

Program Design and Components

Learning and Teaching Science

What students learn is fundamentally connected to how they learn it. The aim of scientific literacy for all has created a need for new forms of classroom organization, communication, and instructional strategies. The teacher is a facilitator of learning whose major tasks include

- creating a classroom environment to support the learning and teaching of science
- designing effective learning experiences that help students achieve designated outcomes
- stimulating and managing classroom discourse in support of student learning
- learning about and then using students' motivations, interests, abilities, and learning styles to improve learning and teaching
- assessing student learning, the scientific tasks and activities involved, and the learning environment to make ongoing instructional decisions
- selecting teaching strategies from a wide repertoire

Effective science learning and teaching take place in a variety of situations. Instructional settings and strategies should create an environment that reflects a constructive, active view of the learning process. Learning occurs through actively constructing one's own meaning and assimilating new information to develop a new understanding.

The development of scientific literacy in students is a function of the kinds of tasks in which they engage, the discourse in which they participate, and the settings in which these activities occur. Students' disposition towards science is also shaped by these factors. Consequently, the aim of developing scientific literacy requires careful attention to all of these facets of curriculum.

Learning experiences in science education should vary and should include opportunities for group and individual work, discussion among students as well as between teacher and students, and hands-on/minds-on activities that allow students to construct and evaluate explanations for the phenomena under investigation. Such investigations and the evaluation of the evidence accumulated provide opportunities for students to develop their understanding of the nature of science and the nature and status of scientific knowledge.

The Science Lesson—Links to the World

It is very important for children to learn through experiences in science. Students can engage in problem solving, decision making, and inquiry only through a hands-on approach to learning. Using their senses, and the power of observation, and recording their findings—in writing, by illustration, or verbally—are key to a meaningful experience and understanding.

Before starting a science activity, the teacher should take the time to engage students in dialogue on their prior knowledge of a topic and to record key vocabulary words and thoughts to be used as a reference as the activity progresses. The teacher should also articulate and discuss expectations for communication and teamwork with the students before they engage in any hands-on learning experiences that require them to be involved in groups.

During the lesson, the teacher should walk among the groups and listen, prompt discovery through questioning, and respond to the students' work. The teacher should act as a guide and support person to help students see themselves as capable and successful. This is an ideal opportunity to assess students' ability to meet the outcomes through the activity being done. Assessment can be in the form of notes, check-off lists, sticky notes, or thoughts to be written down at a later time. Recording assessments during an activity is sometimes a challenge, as the teacher is managing the class, as well as answering individual or group questions. Recording can be done during follow-up time or at a time more manageable for the teacher.

The follow-up to a lesson is crucial as it allows students the opportunity to communicate the ideas, discoveries, and questions that arise from engaging in a hands-on learning experience. This occurs when the results of the activity are pulled together and groups or individuals discuss with the whole class their findings from the activity. Additional vocabulary is often developed and should be recorded for future reference. Without follow-up to a lesson, an opportunity for students to achieve knowledge, skills, and attitude outcomes can be missed. It is important to use this as a time for students to ask questions that might lead to exploration and investigation throughout the unit. Oftentimes the follow-up discussions will lead to further investigations to be done at another time.

Follow-up time can also be an ideal time to *link* other subject areas with science. This could include, for example, reflection on prior activities in math such as in measurement or data management, a shared or read-aloud experience related to the activity during language arts time, or an art activity. The science activity should not be an activity done for the sake of doing an activity. Discussion and links to other areas are key to students' continuing to view learning as an integrated whole.

Writing in Science

Learning experiences should provide opportunities for students to use writing and other forms of representation as ways of learning. Students, at all grade levels, should be encouraged to use writing to speculate, theorize, summarize, discover connections, describe processes, express understandings, raise questions, and make sense of new information using their own language as a step to the language of science. Science logs are useful for such expressive and reflective writing. Purposeful note making is an intrinsic part of learning in science, helping students to better record, organize, and understand information from a variety of sources. The process of creating word webs, maps, charts, tables, graphs, drawings, and diagrams to represent data and results helps students learn and also provides them with useful study tools.

Learning experiences in science should also provide abundant opportunities for students to communicate their findings and understandings to others, both formally and informally, using a variety of forms for a range of purposes and audiences. Such experiences should encourage students to use effective ways of recording and conveying information and ideas and to use the vocabulary of science in expressing their understandings. Through opportunities to talk and write about the concepts they need to learn, students come to better understand both the concepts and related vocabulary.

Learners will need explicit instruction in, and demonstration of, the strategies they need to develop and apply in reading, viewing, interpreting, and using a range of science texts for various purposes. It will be equally important for students to have demonstrations of the strategies they need to develop and apply in selecting, constructing, and using various forms for communicating in science.

The Three Processes of Scientific Literacy

An individual can be considered scientifically literate when he/she is familiar with, and able to engage in, three processes: inquiry, problem solving, and decision making.

Inquiry

Scientific inquiry involves posing questions and developing explanations for phenomena. While there is general agreement that there is no such thing as the scientific method, students require certain skills to participate in the activities of science. Skills such as questioning, observing, inferring, predicting, measuring, hypothesizing, classifying, designing experiments, collecting data, analysing data, and interpreting data are fundamental to engaging in science. These activities provide students with opportunities to understand and practise the process of theory development in science and the nature of science.

Problem Solving

The process of problem solving involves seeking solutions to human problems. It consists of proposing, creating, and testing prototypes, products, and techniques to determine the best solution to a given problem.

Decision Making

The process of decision making involves determining what we, as citizens, should do in a particular context or in response to a given situation. Decision-making situations are important in their own right, and they also provide a relevant context for engaging in scientific inquiry and/or problem solving.

Meeting the Needs of All Learners

Foundation for the Atlantic Canada Science Curriculum stresses the need to design and implement a science curriculum that provides equitable opportunities for all students according to their abilities, needs, and interests. Teachers must be aware of, and make adaptations to accommodate, the diverse range of learners in their classes. To adapt instructional strategies, assessment practices, and learning resources to the needs of all learners, teachers must create opportunities that will permit them to address their various learning styles.

As well, teachers must not only remain aware of and avoid gender and cultural biases in their teaching, they must also actively address cultural and gender stereotyping (e.g., about who is interested in and who can succeed in science and mathematics). Research supports the position that when science curriculum is made personally meaningful and socially and culturally relevant, it is more engaging for groups traditionally under-represented in science and, indeed, for all students.

While this curriculum guide presents specific outcomes for each unit, it must be acknowledged that students will progress at different rates.

Teachers should provide materials and strategies that accommodate student diversity and should validate students when they achieve the outcomes to the best of their abilities.

It is important that teachers articulate high expectations for all students and ensure that all students have equitable opportunities to experience success as they work toward achieving designated outcomes. Teachers should adapt classroom organization, teaching strategies, assessment practices, time, and learning resources to address students' needs and build on their strengths. The variety of learning experiences described in this guide provides access for a wide range of learners. Similarly, the suggestions for a variety of assessment practices provide multiple ways for learners to demonstrate their achievements.

Assessment and Evaluation

The terms **assessment** and **evaluation** are often used interchangeably, but they refer to quite different processes. Science curriculum documents developed in the Atlantic region use these terms for the processes described below.

Assessment is the systematic process of gathering information on student learning.

Evaluation is the process of analysing, reflecting upon, and summarizing assessment information and making judgments or decisions based upon the information gathered.

The assessment process provides the data, and the evaluation process brings meaning to the data. Together, these processes improve teaching and learning. If we are to encourage enjoyment in learning for students now and throughout their lives, we must develop strategies to involve students in assessment and evaluation at all levels. When students are aware of the outcomes for which they are responsible and of the criteria by which their work will be assessed or evaluated, they can make informed decisions about the most effective ways to demonstrate their learning.

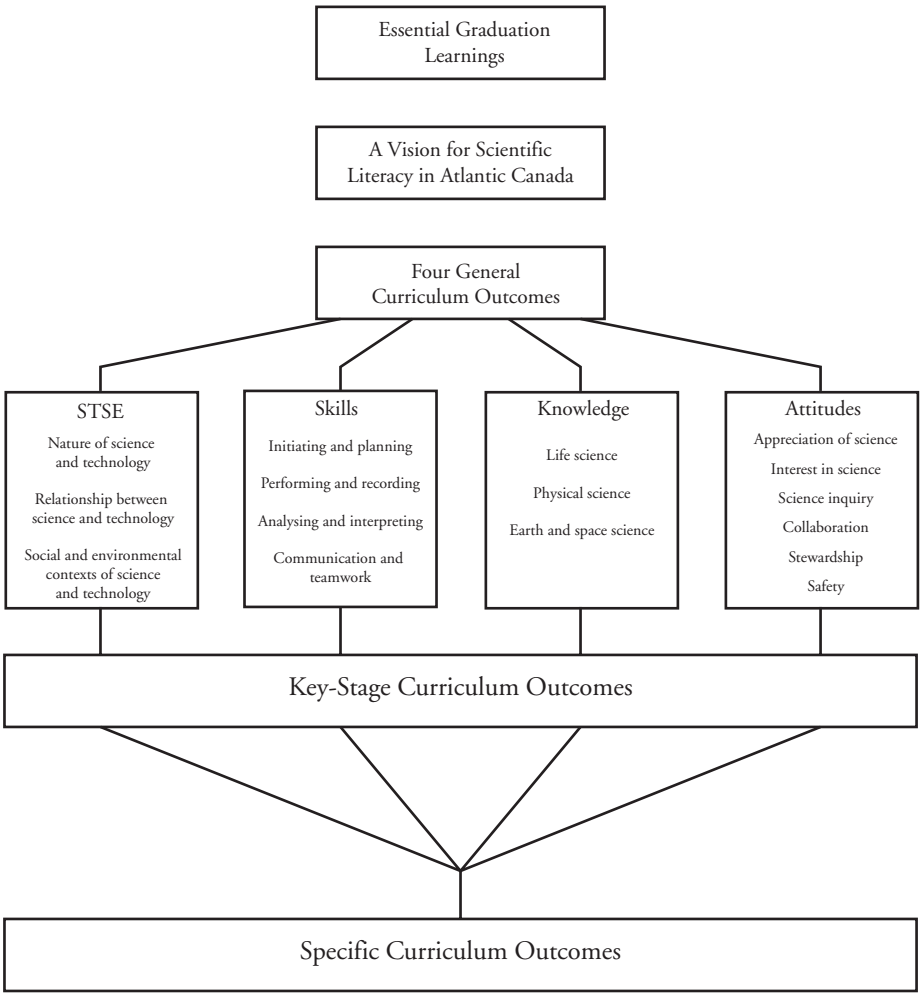
The Atlantic Canada science curriculum reflects the three major processes of science learning: inquiry, problem solving, and decision making. When assessing student progress, it is helpful to know some activities/skills/actions that are associated with each process of science learning. Student learning may be described in terms of ability to perform these tasks.

Curriculum Outcomes Framework

Overview

The science curriculum is based on an outcomes framework that includes statements of essential graduation learnings, general curriculum outcomes, key-stage curriculum outcomes, and specific curriculum outcomes. The general, key-stage, and specific curriculum outcomes reflect the pan-Canadian C*ommon Framework of Science Learning Outcomes K to 12*. The diagram below provides the blueprint of the outcomes framework.

Outcomes Framework



Essential Graduation Learnings

Essential graduation learnings are statements describing the knowledge, skills, and attitudes expected of all students who graduate from high school. Achievement of the essential graduation learnings will prepare students to continue to learn throughout their lives. These learnings describe expectations not in terms of individual school subjects but in terms of knowledge, skills, and attitudes developed throughout the curriculum. They confirm that students need to make connections and develop abilities across subject boundaries and to be ready to meet the shifting and ongoing opportunities, responsibilities, and demands of life after graduation. Provinces may add additional essential graduation learnings as appropriate. The essential graduation learnings are described below.

Aesthetic Expression

Graduates will be able to respond with critical awareness to various forms of the arts and be able to express themselves through the arts.

Citizenship

Graduates will be able to assess social, cultural, economic, and environmental interdependence in a local and global context.

Communication

Graduates will be able to use the listening, viewing, speaking, reading, and writing modes of language(s) as well as mathematical and scientific concepts and symbols to think, learn, and communicate effectively.

Personal Development

Graduates will be able to continue to learn and to pursue an active, healthy lifestyle.

Problem Solving

Graduates will be able to use the strategies and processes needed to solve a wide variety of problems, including those requiring language, mathematical, and scientific concepts.

Technological Competence

Graduates will be able to use a variety of technologies, demonstrate an understanding of technological applications, and apply appropriate technologies for solving problems.

General Curriculum Outcomes

The general curriculum outcomes form the basis of the outcomes framework. They also identify the key components of scientific literacy. Four general curriculum outcomes have been identified to delineate the four critical aspects of students' scientific literacy. They reflect the wholeness and interconnectedness of learning and should be considered interrelated and mutually supportive.

Science, Technology, Society, and the Environment (STSE)

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

Skills

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

Knowledge

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

Attitudes

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

Key-Stage Curriculum Outcomes

Key-stage curriculum outcomes are statements that identify what students are expected to know, be able to do, and value by the end of grades 3, 6, 9, and 12 as a result of their cumulative learning experiences in science. The key-stage curriculum outcomes are from the *Common Framework of Science Learning Outcomes K to12*.

Specific Curriculum Outcomes

This curriculum guide outlines specific curriculum outcomes for grade 2 science and provides suggestions for learning, teaching, assessment, and resources to support students' achievement of these outcomes. Teachers should consult *Foundation for the Atlantic Canada Science Curriculum* for descriptions of the essential graduation learnings, vision for scientific literacy, general curriculum outcomes, and key-stage curriculum outcomes.

Specific curriculum outcome statements describe what students are expected to know and be able to do at each grade level. They are intended to help teachers design learning experiences and assessment tasks. Specific curriculum outcomes represent a framework for assisting students to achieve the key-stage curriculum outcomes, the general curriculum outcomes, and ultimately the essential graduation learnings.

Specific curriculum outcomes are organized in four units. Each unit is organized by topic. Grade 2 science units and topics follow.

Physical Science: Relative Position and Motion

- Position
- Motion

Physical Science: Liquids and Solids

- The Three States of Water
- Properties and Interactions of Familiar Liquids and Solids
- Mixing Liquids and Solids to Make New and Useful Materials

Earth and Space Science: Air and Water in the Environment

- Air
- Forms and Changes in Moisture
- Materials and Moisture
- Protecting Our Water Sources

Life Science: Animal Growth and Changes

- Investigating the Needs and Life Cycle of an Organism
- Comparing Life Cycles of Familiar Animals
- Human Growth and Development

The following pages outline specific curriculum outcomes for Science 2 grouped by units and topics.

Physical Science: Relative Position and Motion

Students will be expected to

Position

- use materials to build objects that move in a specific manner and describe the object's position relative to other objects (201-3, 100-23, 203-2)
- describe the position of objects from different perspectives and answer questions that arise from how different students view the same object (100-24, 202-9)

Motion

- investigate and describe motion in terms of patterns of movement, change in position, and orientation relative to other objects and identify factors that affect movement (100-25, 100-22)
- question, demonstrate, and assess simple conclusions about the various factors that affect the motion of an object (200-3, 200-1, 200-2)
- compare and evaluate the abilities of their constructed objects to move (202-8)

Physical Science: Liquids and Solids

Students will be expected to

The Three States of Water

- predict, investigate, and describe the characteristics of and changes in the three states of water (103-6, 200-3)
- make and record relevant observations during questioning and investigating the interactions of liquids and solids, using written language, pictures, and charts (201-5, 200-1)

Properties and Interactions of Familiar Liquids and Solids

- examine and record the properties and interactions of familiar liquids and solids (100-17, 100-18, 201-5)
- demonstrate and communicate their evaluations of sinking and floating as they relate to various liquids and objects (202-2, 100-21, 202-8, 203-3)

Mixing Liquids and Solids to Make New and Useful Materials

- select and use solids, liquids, and appropriate tools to create new materials that have characteristics different from the original components (100-19, 200-4, 201-3, 100-20)
- identify and use a variety of sources to get ideas for creating new materials (201-7)
- describe and demonstrate ways we use our knowledge of solids and liquids to maintain a clean and healthy environment (102-8)

Earth and Space Science: Air and Water in the Environment

Students will be expected to

Air

- demonstrate that air is a substance and communicate their findings by conducting multiple activities (203-1, 102-10, 201-3)
- observe changes in air conditions in indoor and outdoor environments and describe and interpret these changes (100-26)

Forms and Changes in Moisture

- identify and measure evidence of moisture in the environment, in materials, and in living things (102-9, 201-3)
- describe changes in the location, amount, and form of moisture and investigate and identify conditions that can affect these changes (100-27, 200-4, 201-5)

Materials and Moisture

- predict, investigate, and communicate the properties of materials according to their ability to absorb water (200-3, 200-4, 200-1, 203-3)
- describe the effects of weather and ways to protect things under different weather conditions (103-7)

Protecting Our Water Sources

- identify examples of water in the environment and describe ways that water is obtained, distributed, and used (102-11)
- identify the importance of clean water for humans, and suggest ways they could conserve water (103-8)

Life Science: Animal Growth and Changes

Students will be expected to

Investigating the Needs and Life Cycle of an Organism

- select and use materials to observe an organism's life cycle and ask questions about the organism's needs and changes in growth (200-1, 200-4)
- describe and record observations, in various formats, of changes in the appearance and activity of an organism through its life cycle (101-7, 201-5, 203-3, 102-6)
- propose suggestions for meeting the needs of the organism being investigated and draw conclusions about its growth patterns or stages based on observations (202-7)
- identify new questions about the needs and growth patterns of other organisms (202-9)

Comparing Life Cycles of Familiar Animals

- compare and make predictions about the life cycles of familiar animals (100-15, 200-3)
- describe features of natural and human-made environments that support the health and growth of some familiar animals (102-7)

Human Growth and Development

- describe changes in humans as they grow and contrast human growth with that of other organisms (100-16)
- identify the basic food groups and describe actions and decisions that support a healthy lifestyle (103-5)

Attitudes Outcomes

It is expected that the Atlantic Canada science program will foster certain attitudes in students throughout their school years. The STSE, skills, and knowledge outcomes contribute to the development of attitudes; and opportunities for fostering these attitudes are highlighted in the Elaborations—Strategies for Learning and Teaching section of each unit.

Attitudes refer to generalized aspects of behaviour that teachers model for students by example and by selective approval. Attitudes are not acquired in the same way as skills and knowledge. The development of positive attitudes plays an important role in students' growth by interacting with their intellectual development and by creating readiness for responsible application of what students learn.

Since attitudes are not acquired in the same way as skills and knowledge, outcome statements for attitudes are written as key-stage curriculum outcomes for the end of grades 3, 6, 9, and 12. These outcome statements are meant to guide teachers in creating a learning environment that fosters positive attitudes.

The following pages present the attitude outcomes from the pan-Canadian *Common Framework of Science Learning Outcomes K to 12* for the end of grade 3.

Key-Stage Curriculum Outcomes: Attitudes

By the end of grade 3, students will be expected to

Appreciation of Science	Interest in Science	Scientific Inquiry
400 recognize the role and contribution of science in their understanding of the world *Evident when students, for example,* • give examples of science in their own lives • give examples of how objects studied and investigations done in class relate to the outside world • recognize that scientific ideas help us to explain how or why events occur	**401** show interest in and curiosity about objects and events within the immediate environment **402** willingly observe, question, and explore *Evident when students, for example,* • ask "why" and "how" questions about observable events • ask many questions related to what is being studied • participate in show-and-tell activities, bringing objects from home or sharing a story or an observation • ask questions about what scientists do • express enjoyment from being read to from science books • seek out additional information from library books and digital discs • express enjoyment in sharing science-related information gathered from a variety of sources, including discussions with family members and friends • ask to use additional science equipment to observe objects in more detail • express the desire to find answers by exploring and conducting simple experiments	**403** consider their observations and their own ideas when drawing a conclusion **404** appreciate the importance of accuracy **405** be open-minded in their explorations *Evident when students, for example,* • raise questions about the world around them • willingly record observations in a given format • compare results of an experiment with other classmates • use observations to draw a conclusion or verify a prediction • take the time to measure with care • willingly explore a change and its effects • choose to follow directions when they complete a simple investigation • express the desire to find answers by conducting simple experiments

Key-Stage Curriculum Outcomes: Attitudes

By the end of grade 3, students will be expected to

Collaboration	Stewardship	Safety
406 work with others in exploring and investigating *Evident when students, for example,* • willingly share ideas and materials • respond positively to others' questions and ideas • take on and fulfil a variety of roles within the group • participate in science-related activities with others, regardless of their age or their physical or cultural characteristics • respond positively to other people's views of the world	**407** be sensitive to the needs of other people, other living things, and the local environment *Evident when students, for example,* • ensure that living things are returned to an adequate environment after a study is completed • demonstrate awareness of the need for recycling and willingness to take action in this regard • show concern for other students' feelings or needs • care for living things that are kept in their classroom • clean reusable materials and store them in a safe place • willingly suggest how we can protect the environment	**408** show concern for their safety and that of others in carrying out activities and using materials *Evident when students, for example*, • are attentive to the safe use of materials • insist that classmates use materials safely • act with caution in touching or smelling unfamiliar materials, refrain from tasting them, and encourage others to be cautious • point out to others simple and familiar safety symbols • put materials back where they belong • follow given directions for set-up, use, and clean-up of materials • wash hands before and after using materials, as directed by the teacher • seek assistance immediately for any first-aid concerns like cuts, burns, and unusual reactions • keep the workstation uncluttered, with only appropriate materials present

Curriculum Guide Organization

Specific curriculum outcomes are organized into units for each grade level. Each unit is organized by topic. Suggestions for learning, teaching, assessment, and resources are provided to support student achievement of the outcomes.

The order in which the units of a grade appear in the guide is meant to suggest a sequence. In some cases, the rationale for the recommended sequence is related to the conceptual flow across the year. That is, one unit may introduce a concept that is then extended in a subsequent unit. Likewise, one unit may focus on a skill or context that will be built upon later in the year.

Some units or certain aspects of units may also be combined or integrated. This is one way of assisting students as they attempt to make connections across topics in science or between science and the real world. In some cases, a unit may require an extended time frame to collect data on weather patterns, plant growth, etc. These cases may warrant starting the activity early and overlapping it with the existing unit. In all cases, the intent is to provide opportunities for students to deal with science concepts and scientific issues in personally meaningful and socially and culturally relevant contexts.

Unit Organization

Each unit begins with a two-page synopsis. On the first page, introductory paragraphs provide a unit overview. These are followed by a section that specifies the focus (inquiry, problem solving, and/or decision making) and possible contexts for the unit. Finally, a curriculum links paragraph specifies how this unit relates to science concepts and skills addressed in other grades so teachers will understand how the unit fits with the students' progress through the complete science program.

The second page of the two-page overview provides a table of the outcomes adapted from the *Common Framework of Science Learning Outcomes K to 12* that the unit will address. The numbering system used is the one in the pan-Canadian document as follows:

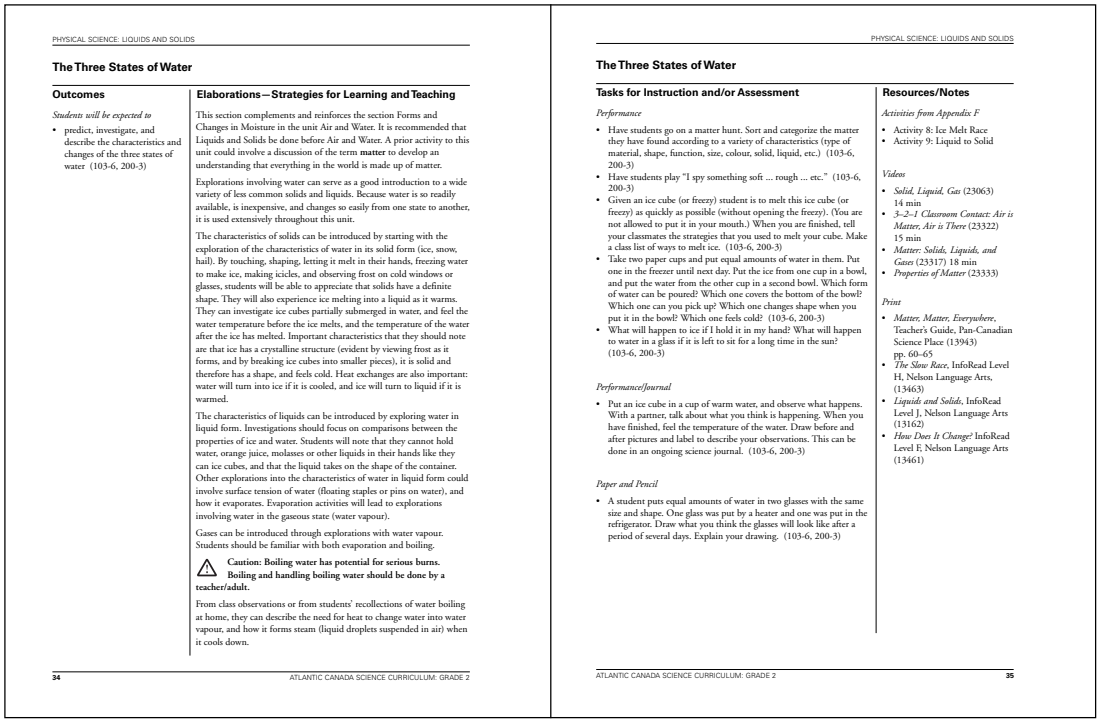
- 100s—Science-Technology-Society-Environment (STSE) outcomes
- 200s—Skills outcomes
- 300s—Knowledge outcomes
- 400s—Attitude outcomes (see pages 15–17)

These code numbers appear in parentheses after each specific curriculum outcome (SCO).

The Four-Column Spread

All units have a two-page layout of four columns as illustrated below. In some cases, the four-column spread continues to the next two-page layout. Outcomes are grouped by a topic indicated at the top of the left-hand page.

Two-Page, Four-Column Spread



PHYSICAL SCIENCE: LIQUIDS AND SOLIDS

The Three States of Water

Outcomes

Students will be expected to

- predict, investigate, and describe the characteristics and changes of the three states of water (103-6, 200-3)

Elaborations—Strategies for Learning and Teaching

This section complements and reinforces the section Forms and Changes in Moisture in the unit Air and Water. It is recommended that Liquids and Solids be done before Air and Water. A prior activity to this unit could involve a discussion of the term **matter** to develop an understanding that everything in the world is made up of matter.

Explorations involving water can serve as a good introduction to a wide variety of less common solids and liquids. Because water is so readily available, is inexpensive, and changes so easily from one state to another, it is used extensively throughout this unit.

The characteristics of solids can be introduced by starting with the exploration of the characteristics of water in its solid form (ice, snow, hail). By touching, shaping, letting it melt in their hands, freezing water to make ice, making icicles, and observing frost on cold windows or glasses, students will be able to appreciate that solids have a definite shape. They will also experience ice melting into a liquid as it warms. They can investigate ice cubes partially submerged in water, and feel the water temperature before the ice melts, and the temperature of the water after the ice has melted. Important characteristics that they should note are that ice has a crystalline structure (evident by viewing frost as it forms, and by breaking ice cubes into smaller pieces), it is solid and therefore has a shape, and feels cold. Heat exchanges are also important: water will turn into ice if it is cooled, and ice will turn to liquid if it is warmed.

The characteristics of liquids can be introduced by exploring water in liquid form. Investigations should focus on comparisons between the properties of ice and water. Students will note that they cannot hold water, orange juice, molasses or other liquids in their hands like they can ice cubes, and that the liquid takes on the shape of the container. Other explorations into the characteristics of water in liquid form could involve surface tension of water (floating staples or pins on water), and how it evaporates. Evaporation activities will lead to explorations involving water in the gaseous state (water vapour).

Gases can be introduced through explorations with water vapour. Students should be familiar with both evaporation and boiling.

⚠ **Caution: Boiling water has potential for serious burns. Boiling and handling boiling water should be done by a teacher/adult.**

From class observations or from students' recollections of water boiling at home, they can describe the need for heat to change water into water vapour, and how it forms steam (liquid droplets suspended in air) when it cools down.

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PHYSICAL SCIENCE: LIQUIDS AND SOLIDS

The Three States of Water

Tasks for Instruction and/or Assessment

Performance

- Have students go on a matter hunt. Sort and categorize the matter they have found according to a variety of characteristics (type of material, shape, function, size, colour, solid, liquid, etc.) (103-6, 200-3)
- Have students play "I spy something soft ... rough ... etc." (103-6, 200-3)
- Given an ice cube (or freezy) student is to melt this ice cube (or freezy) as quickly as possible (without opening the freezy). (You are not allowed to put it in your mouth.) When you are finished, tell your classmates the strategies that you used to melt your cube. Make a class list of ways to melt ice. (103-6, 200-3)
- Take two paper cups and put equal amounts of water in them. Put one in the freezer until next day. Put the ice from one cup in a bowl, and put the water from the other cup in a second bowl. Which form of water can be poured? Which one covers the bottom of the bowl? Which one can you pick up? Which one changes shape when you put it in the bowl? Which one feels cold? (103-6, 200-3)
- What will happen to ice if I hold it in my hand? What will happen to water in a glass if it is left to sit for a long time in the sun? (103-6, 200-3)

Performance/Journal

- Put an ice cube in a cup of warm water, and observe what happens. With a partner, talk about what you think is happening. When you have finished, feel the temperature of the water. Draw before and after pictures and label to describe your observations. This can be done in an ongoing science journal. (103-6, 200-3)

Paper and Pencil

- A student puts equal amounts of water in two glasses with the same size and shape. One glass was put by a heater and one was put in the refrigerator. Draw what you think the glasses will look like after a period of several days. Explain your drawing. (103-6, 200-3)

Resources/Notes

Activities from Appendix F

- Activity 8: Ice Melt Race
- Activity 9: Liquid to Solid

Videos

- *Solid, Liquid, Gas* (23063) 14 min
- *3–2–1 Classroom Contact: Air is Matter, Air is There* (23322) 15 min
- *Matter: Solids, Liquids, and Gases* (23317) 18 min
- *Properties of Matter* (23333)

Print

- *Matter, Matter, Everywhere*, Teacher's Guide, Pan-Canadian Science Place (13943) pp. 60–65
- *The Slow Race*, InfoRead Level H, Nelson Language Arts, (13463)
- *Liquids and Solids*, InfoRead Level J, Nelson Language Arts (13162)
- *How Does It Change?* InfoRead Level F, Nelson Language Arts (13461)

ATLANTIC CANADA SCIENCE CURRICULUM: GRADE 2 35

Column One: Outcomes

The first column provides the specific curriculum outcomes. These are based on the pan-Canadian *Common Framework of Science Learning Outcomes K to 12*. The statements involve the Science-Technology-Society-Environment (STSE), skills, and knowledge outcomes indicated by the outcome number(s) that appears in parentheses after the outcome. Some STSE and skills outcomes have been written in a context that shows how these outcomes should be addressed.

Specific curriculum outcomes have been grouped by topic. Other groupings of outcomes are possible and in some cases may be necessary to take advantage of local situations. The grouping of outcomes provides a suggested teaching sequence. Teachers may prefer to plan their own teaching sequences to meet the learning needs of their students.

In grade 2, the STSE and knowledge outcomes are combined.

Column one and column two define what students are expected to learn and be able to do.

Column Two: Elaborations—Strategies for Learning and Teaching

The second column may include elaborations of outcomes listed in column one and describes learning environments and experiences that will support students' learning.

The strategies in this column are intended to provide a holistic approach to instruction. In some cases, they address a single outcome; in other cases, they address a group of outcomes.

Column Three: Tasks for Instruction and/or Assessment

The third column provides suggestions for ways in which students' achievement of the outcomes could be assessed. These suggestions reflect a variety of assessment techniques and materials that include, but are not limited to, informal/formal observation, performance, journal, interview, paper and pencil, presentation, and portfolio. Some assessment tasks may be used to assess student learning in relation to a single outcome, others to assess student learning in relation to several outcomes. The assessment item identifies the outcome(s) addressed by the outcome number in parentheses after the item.

Column Four: Resources/Notes

This column includes activities to support student achievement in meeting specific curriculum outcomes. These activities are found in Appendices E–H of this guide; National Geographic Windows on Literacy activities and text; *Science Everywhere* teacher's guide; print resources available through the Nova Scotia School Book Bureau (order numbers are listed beside titles); videos available through Education Media Library, Learning Resources and Technology (call numbers listed beside title); as well as links to other curriculum areas, where applicable. This column also provides an opportunity for teachers to make notes about other useful resources.

Specific Curriculum Outcomes

Physical Science: Relative Position and Motion

Introduction

Moving things are a source of fascination for children of many ages. The study of moving things offers children an opportunity to develop a sense of space, orientation, perspective, and relationship. Through observation and the use of specific language, students develop the ability to describe where things are and how they are moving and to share their experience with others.

Focus and Context

This unit should be developed with an inquiry focus, with an emphasis on making observations and developing fair tests. Students will first explore how descriptions of an object's position depend upon their perspective and will learn to make and record accurate observations about the relative position of various objects. They will then investigate various types of motion and the factors that affect them. This will lead to a problem-solving situation, in which students will design their own devices that move in specified ways. The playground or gym would make a good context for this unit. Students could observe and describe their motion in a variety of ways (e.g., swings, merry-go-rounds, pogo sticks).

Science Curriculum Links

Students will investigate the causes of motion in Science 5, Forces and Simple Machines.

Curriculum Outcomes

The following outcomes are from *Common Framework of Science Learning Outcomes K to12*. Column one outcomes have been developed from these pan-Canadian outcomes. See Appendix J for the original outcomes that these were derived from.

STSE/Knowledge	Skills
Students will be expected to	*Students will be expected to*
100-24, 202-9 describe the position of objects from different perspectives and answer questions that arise from how different students view the same object	**201-3, 100-23, 203-2** use materials to build objects that move in a specific manner and describe the object's position relative to other objects
100-25, 100-22 investigate and describe motion in terms of patterns of movement, change in position, and orientation relative to other objects and identify factors that affect movement	**200-3, 200-1, 200-2** question, demonstrate, and assess simple conclusions about the various factors that affect the motion of an object
	202-8 compare and evaluate the abilities of their constructed objects to move

Position

Outcomes

Students will be expected to

- use materials to build objects that move in a specific manner and describe the object's position relative to other objects (201-3, 100-23, 203-2)

Elaborations—Strategies for Learning and Teaching

Students can observe the various types of motion and be challenged to start thinking about the way things move and what they might make to show one or more types of movement. Over the course of the unit, they should be given the opportunity to design and construct their own devices such as matchbox cars, sail boats, or paper airplanes. Various methods of propulsion can be used such as balloons, magnets, sails, or propellers.

Facilitate an active introduction to the unit by assembling a collection of models of machines, each using a specific motion: rolling, swinging, rotating, sliding, etc. The machines can be used to introduce the terminology to be used throughout this unit. K'Nex Educational Kits, Lego Early Simple Machines with activity cards, or Cube-A-Links would also serve this unit well.

As students observe and interact with various moving objects, they can learn descriptive phrases that can be used to describe the position of objects, use language such as "to the left of," "on top," "beside," or "two giant steps behind." Students can become their own balance. Identify different positions for the students to make and have the students describe their position and how they may or may not be balanced. Students can make "Balancing Bob or Betty" from a wine cork with a nail inserted in the middle, a pipe cleaner, and modelling clay. Students can balance this on a water bottle with the cap on. This balancing should be done without students seeing the prototype so that the students can explore their own creation. Students can decorate their cork with googly eyes and so on.

The teacher can construct a model using kit materials such as those found in Lego Early Simple Machines Set or materials on hand. This model is then hidden from view by placing it in a large box turned on its side (labelled "Top Secret"). The teacher might explain that a model is not correct. It only represents what the real object might look like and how it will work. One student from each group is assigned the job of Spy and is the only member of the team allowed to leave his/her seat and view the hidden model. The student must explain to the rest of the team how to duplicate the model (using a similar kit). Pointing at parts is not allowed. This activity forces the development of terminology for the students.

Position

Tasks for Instruction and/or Assessment

Performance

- Create machines that meet certain requirements or invent a new machine and explain its function. (201-3, 100-23, 203-2)
- Design and make an object that balances. (201-3, 100-23, 203-2)
- Create a model, given verbal or written instructions. A simple example utilizing geometric solids follows:
  - Place a cube on your desk.
  - Place one sphere behind the cube.
  - Place a rectangular prism on top of your cube.
  (201-3, 100-23, 203-2)
- In a group of four, create a machine to demonstrate a specific motion. Use materials on hand such as Lego or K'Nex to construct a machine. Classify the movement of each machine. An enrichment activity might involve challenging a team to build a machine that demonstrates a variety of movements. (201-3, 100-23, 203-2)

Paper and Pencil

- Using a hundreds chart, listen to the directions on how to move your marker on the chart to find a given number. Use words like left, right, up and down, three spaces to the left. (201-3, 100-23, 203-2)
- How does "Balancing Bob or Betty" work? Record a picture of your design. (201-3, 100-23, 203-2)

Resources/Notes

Activities from Appendix E

- Activity 1: Position
- Activity 2: Describe the Position of an Object
- Activity 4: Following Printed Instructions for Building a Model

Print

- *Move It*, Teacher's Guide, Pan-Canadian Science Place (13945) pp. 18–26, 37–47, 59–91
- *Luke's Go-Kart*, PM Story Books (12811)

Position *(continued)*

Outcomes

Students will be expected to

- describe the position of objects from different perspectives and identify and answer questions that arise from how different students view the same object (100-24, 202-9)

Elaborations—Strategies for Learning and Teaching

Students can play games like "Simon Says." Commands, such as "Simon says, put the ball on top of the box," or "Simon says, put your eraser to the left of your book," can be given, occasionally leaving off the words "Simon says" to ensure that the students are listening carefully. This activity will help students use the descriptive terms and will lead to questions about perspectives.

Working in groups of two or three, students can place an object such as a paper towel tube in a certain position and then move to different parts of the room to view it. They can then describe how the relative position of the object changes. Using a construction kit, the students can build models and then describe the relative positions of the components from different perspectives. These activities reinforce the development of spatial sense (Mathematics: GCO E).

Alternatively, students can work together to create a map for a "buried treasure," using a variety of reference points and measures. If done orally, students can be challenged to describe more that one way to get from start to treasure. Connections can be made to the social studies curriculum, where they learn to use terms such as **north**, **south**, **east**, and **west**.

Teachers can make a motion list of words that describe various positions and motions that occur in the unit.

Position *(continued)*

Tasks for Instruction and/or Assessment

Performance

- Position yourself so that the airplane on your desk is
  - beside you
  - above you
  - to the right of you (100-24, 202-9)
- Create a model given verbal instructions. Describe the position of various components of the model from different perspectives. (100-24, 202-9)
- Find an object from another student's description. (100-24, 202-9)
- Place your sneaker on your desk. Draw and/or describe it from the following positions: the bottom, one side, the top. (100-24, 202-9)

Paper and Pencil

- Add words to the motion chart as students identify words used. (100-24, 202-9)

Resources/Notes

Print

- *Move It*, Teacher's Guide, Pan-Canadian Science Place (13945) pp. 18–26

Motion

Outcomes

Students will be expected to

- investigate and describe motion in terms of patterns of movement, change in position, and orientation relative to other objects and identify factors that affect movement (100-25, 100-22)

Elaborations—Strategies for Learning and Teaching

Students can explore the motion of a variety of objects that exhibit different types of motion such as spinning, swinging, bouncing, rolling, sliding, vibrating, or moving in a straight line (for example, tops, spring-operated toys, rubber balls, toy helicopters, Venetian blinds, and pendulum clocks or playground motion such as swinging, sliding, or going on the merry-go-round). This may give them ideas for their own devices that they will construct.

Students should use appropriate language such as backward, forward, and sideways to describe the motion of these objects. Their descriptions should focus not only on the types of motion exhibited, such as rolling and vibrating, but also on the object's motion relative to other objects in the room.

Once again, individual students' perspectives play a large role in describing the motion. Activities relating to different perspectives should be kept simple. This will reinforce math outcomes from grade 1 and 2 related to slides and flips.

Prepare a set of cards with each card labelled with a motion word, e.g., rotating, bouncing, swinging. Working in teams, students can draw motion cards and construct an object that illustrates their motion using building materials.

One student can pull another in a wagon, with other students circling the room. The student in the wagon can describe the motion of the other (stationary) students from his/her perspective. For example, "Tommy is moving towards me; Jane is moving away from me; Patrick is moving to the left." This should generate a lot of discussion, since the other students will argue that they are not moving. From the perspective of the student in the wagon, they are. The other students in the classroom can describe the motion of the student in the wagon from their own perspectives.

Students can demonstrate their experiences in a moving car—how trees and houses appear to move past them and how the car appears to be stationary. Alternatively, they can describe the motion of other objects when they are swinging or on other playground equipment.

Teacher Note: *Playground apparatus may or may not be available due to removal as a result of safety concerns*.

Students can play games like "Simon Says," using directions for different types of motion. For example, "Simon says, jump up and down" or "Simon says, roll on the ground."

Motion

Tasks for Instruction and/or Assessment

Performance

- Using geometric shapes such as a cone, cube, or sphere, investigate how these can be moved across the desk (Which will slide? roll? do both?). (100-25, 100-22)
- On the playground, explore something that makes you
  - move up and down
  - move downward and forward
  - move in a circle (100-25, 100-22)
- Create a grid on the classroom floor using masking tape and play a game of human checkers using instructions such as "move two spaces to the right" or "move two spaces forward." Have some students stand in various squares. Give directions for the students, as a group or individually, to follow such as "move one step backwards," "move two steps to your right," "turn north," "move one step south." (Teachers should note that the level of difficulty can vary depending on the student's ability, from forward/backward to left/right to a direction.) (100-25, 100-22)
- Build a machine that exhibits one or more types of motion. (100-25, 100-22)
- Play the game Twister. (100-25, 100-22)

Journal

- Examine the motion of a variety of wind-up toys. Predict and create a map of the pattern of movement each displays. Label and illustrate. (100-25, 100-22)

Paper and Pencil

- Pick some objects in the classroom and describe how they move, e.g., pencil sharpeners, doors, or windows. (100-25, 100-22)
- Create a poster of common objects that move in a specific manner. (100-25, 100-22)

Presentation

- Create a collage of magazine clippings that illustrate objects that spin, swing, roll, or slide, etc. (100-25, 100-22)

Resources/Notes

Activities from Appendix E

- Activity 3: Observing Wind-Up Toys

Print

- *Move It*, Teacher's Guide, Pan-Canadian Science Place (13945) pp. 12–17, 17–36, 44–52, 59–74, 81–91

Motion *(continued)*

Outcomes

Students will be expected to

- question, demonstrate, and assess simple conclusions about the various factors that affect the motion of an object (200-3, 200-1, 200-2)
- compare and evaluate the abilities of their constructed objects to move (202-8)

Elaborations—Strategies for Learning and Teaching

As students explore the motion of various objects, they can be encouraged to find ways to change the motion of an object and identify the factors that affect the motion. The possible factors that they investigate could include the amount of force (introduce this concept here and define it as a push or a pull), the mass of an object (how heavy it is), the height of the ramps they will use to roll things down, and the type of surface that an object is moving over (e.g., carpet, smooth floor). The focus of these activities should be, as much as possible, the development of fair tests.

Students investigate a variety of motions to try to determine factors that affect them (such as height of a ramp, surface of a ramp, and the type of object being rolled down the ramp). For example, students could investigate how to keep an object spinning for longer periods of time or compare/contrast two objects' ability to spin. They could roll various objects down ramps and time the descent to see which ones roll faster or measure the path with a string or measuring tape to see which ones roll furthest. They can try to determine if empty containers roll faster than full ones or if containers filled with liquids roll faster than those filled with solids. They can investigate the effect of rolling cars with different wheel sizes down the ramp. They can investigate how various surfaces or the ramp angle affect an object's ability to slide. They could investigate how the length of a Slinky or spring or the suspension of a weight affects its up-and-down motion. The could make gels of various thickness (not lubricants) to see how these affect its ability to vibrate or jiggle. They can test the viscosity of liquid foods by racing them down a ramp covered with waxed paper.

This list simply illustrates the variety of motions that can be investigated; there are many more investigations that the students could explore beyond these.

At the beginning of the unit, the students were challenged to make an object that moves in a specific way. Students should be given opportunities to construct this device and use what they have learned in this unit. It can then be tested on the basis of the motion that they have designed it for and compared to their classmates' devices.

Using Lego, K'Nex, or found materials, teams of students can compete as they build and test downhill racers.

Motion *(continued)*

Tasks for Instruction and/or Assessment

Performance

- Predict which toy truck (ball, soup can) will reach the end of the ramp first. Design a fair test. (200-3, 200-1, 200-2)
- Test the effects of different ramps on the motion of an object (toy car or truck). (200-3, 200-1, 200-2)

Ramps and My Own Design

Object Tested	Prediction (How Will My Object Roll?)	Results
High, smooth ramp		
Low, smooth ramp		
High, rough ramp		
Low, rough ramp		

Rough surface may be sandpaper, rug, or fabric. (Materials needed are ramps, blocks, suitable construction materials, chart, pencil, measuring tape.)

- Using similar-size soup cans containing different materials, predict and test which one rolls further. (200-3, 200-1, 200-2)

Journal

- Your task is to try to make your ball roll down this ramp as fast as possible. In your journal, write down the things you would like to try, to see if you can make it speed up. (200-3, 200-1, 200-2)

Paper and Pencil

- What things can you do to make balls on a ramp go faster? (200-3, 200-1, 200-2)

Presentation

- Design and make your own toy or gadget that moves. Try to make
  - an object that goes to the left
  - a paper glider that spins in the air
  - the downhill racer that rolls the furthest (202-8)

Resources/Notes

Activities from Appendix E

- Activity 5: Using Ramps
- Activity 6: Building a Downhill Racer
- Activity 7: Collecting Evidence

Print

- *Move It*, Teacher's Guide, Pan-Canadian Science Place (13945) pp. 12–17, 17–36, 44–52, 59–74, 81–91

Physical Science: Liquids and Solids

Introduction

When students examine materials in their environment they become aware of a wide array of similarities and differences in their properties: the way they look, the way they feel, and the way they respond to environmental change. Some properties are common to many materials and are used to group materials into broad categories. Other properties are important for distinguishing individual materials. The categories of liquid and solid provide one way for students to organize their understanding of materials. This understanding is extended as students investigate ways in which solids and liquids interact and learn that materials can have both a solid and a liquid phase.

Focus and Context

Students will get opportunities to practise both their inquiry and problem-solving skills in this unit. Investigations that focus on the properties and interactions of liquids and solids will provide many opportunities for observing and recording. Students will also get opportunities to design solutions to buoyancy challenges and to create and test useful products made by combining solids and liquids.

Science Curriculum Links

Many connections can be made in the first section of this unit, which examines the three states of water, and the Air and Water unit.

Students have already investigated the difference between materials and objects in the Science 1 unit Properties of Objects and Materials. This unit provides the prerequisite skills, knowledge, and experiences needed for a Science 5 unit, Properties and Changes in Materials.

Curriculum Outcomes

The following outcomes are from *Common Framework of Science Learning Outcomes K to12*. Column one outcomes have been developed from these pan-Canadian outcomes. See Appendix J for the original outcomes that these were derived from.

STSE/Knowledge	Skills
Students will be expected to	*Students will be expected to*
103-6, 200-3 predict, investigate, and describe the characteristics of and changes in the three states of water	**201-5, 200-1** make and record relevant observations during questioning and investigating the interactions of liquids and solids, using written language, pictures, and charts
100-17, 100-18, 201-5 examine and record the properties and interactions of familiar liquids and solids	**202-2, 100-21, 202-8, 203-3** demonstrate and communicate their evaluations of sinking and floating as they relate to various liquids and objects
100-19, 200-4, 201-3, 100-20 select and use solids, liquids, and appropriate tools to create new materials that have characteristics different from the original components	**201-7** identify and use a variety of sources to get ideas for creating new materials
102-8 describe and demonstrate ways we use our knowledge of solids and liquids to maintain a clean and healthy environment	

The Three States of Water

Outcomes

Students will be expected to

- predict, investigate, and describe the characteristics of and changes in the three states of water (103-6, 200-3)

Elaborations—Strategies for Learning and Teaching

This section complements and reinforces the section Forms and Changes in Moisture in the unit Air and Water. It is recommended that Liquids and Solids be done before Air and Water. A prior activity to this unit could involve a discussion of the term **matter** to develop an understanding that everything in the world is made up of matter.

Explorations involving water can serve as a good introduction to a wide variety of less common solids and liquids. Because water is so readily available, is inexpensive, and changes so easily from one state to another, it is used extensively throughout this unit.

The characteristics of solids can be introduced by starting with the exploration of the characteristics of water in its solid form (ice, snow, hail). By touching, shaping, letting it melt in their hands, freezing water to make ice, making icicles, and observing frost on cold windows or glasses, students will be able to appreciate that solids have a definite shape. They will also experience ice melting into a liquid as it warms. They can investigate ice cubes partially submerged in water and feel the water temperature before the ice melts and the temperature of the water after the ice has melted. Important characteristics that they should note are that ice has a crystalline structure (evident by viewing frost as it forms and by breaking ice cubes into smaller pieces), it is solid and therefore has a shape, and it feels cold. Heat exchanges are also important: water will turn into ice if it is cooled, and ice will turn to liquid if it is warmed.

The characteristics of liquids can be introduced by exploring water in liquid form. Investigations should focus on comparisons between the properties of ice and water. Students will note that they cannot hold water, orange juice, molasses, or other liquids in their hands like they can ice cubes, and that the liquid takes on the shape of the container. Other explorations into the characteristics of water in liquid form could involve surface tension of water (floating staples or pins on water) and how water evaporates. Evaporation activities will lead to explorations involving water in the gaseous state (water vapour).

Gases can be introduced through explorations with water vapour. Students should be familiar with both evaporation and boiling.

⚠ **Caution: Boiling water has potential for serious burns. Boiling and handling boiling water should be done by a teacher/adult.**

From class observations or from students' recollections of water boiling at home, they can describe the need for heat to change water into water vapour, and how it forms steam (liquid droplets suspended in air) when it cools down.

The Three States of Water

Tasks for Instruction and/or Assessment

Performance

- Have students go on a matter hunt. Sort and categorize the matter they have found according to a variety of characteristics (type of material, shape, function, size, colour, solid, liquid, etc.). (103-6, 200-3)
- Have students play "I spy something soft ... rough ... etc." (103-6, 200-3)
- Given an ice cube (or freezy) a student is to melt this ice cube (or freezy) as quickly as possible (without opening the freezy). (You are not allowed to put it in your mouth.) When you are finished, tell your classmates the strategies that you used to melt your cube. Make a class list of ways to melt ice. (103-6, 200-3)
- Take two paper cups and put equal amounts of water in them. Put one in the freezer until next day. Put the ice from one cup in a bowl, and put the water from the other cup in a second bowl. Which form of water can be poured? Which one covers the bottom of the bowl? Which one can you pick up? Which one changes shape when you put it in the bowl? Which one feels cold? (103-6, 200-3)
- What will happen to ice if I hold it in my hand? What will happen to water in a glass if it is left to sit for a long time in the sun? (103-6, 200-3)

Performance/Journal

- Put an ice cube in a cup of warm water, and observe what happens. With a partner, talk about what you think is happening. When you have finished, feel the temperature of the water. Draw before and after pictures and label them to describe your observations. This can be done in an ongoing science journal. (103-6, 200-3)

Paper and Pencil

- A student puts equal amounts of water in two glasses with the same size and shape. One glass was put by a heater and one was put in the refrigerator. Draw what you think the glasses will look like after a period of several days. Explain your drawing. (103-6, 200-3)

Resources/Notes

Activities from Appendix F

- Activity 8: Ice Melt Race
- Activity 9: Liquid to Solid

Videos

- *Solid, Liquid, Gas* (23063) 14 min
- *3–2–1 Classroom Contact: Air is Matter, Air is There* (23322) 15 min
- *Matter: Solids, Liquids, and Gases* (23317) 18 min
- *Properties of Matter* (23333)

Print

- *Matter, Matter, Everywhere*, Teacher's Guide, Pan-Canadian Science Place (13943) pp. 60–65
- *The Slow Race*, InfoRead Level H, Nelson Language Arts, (13463)
- *Liquids and Solids*, InfoRead Level J, Nelson Language Arts (13162)
- *How Does It Change?* InfoRead Level F, Nelson Language Arts (13461)

The Three States of Water *(continued)*

Outcomes

Students will be expected to

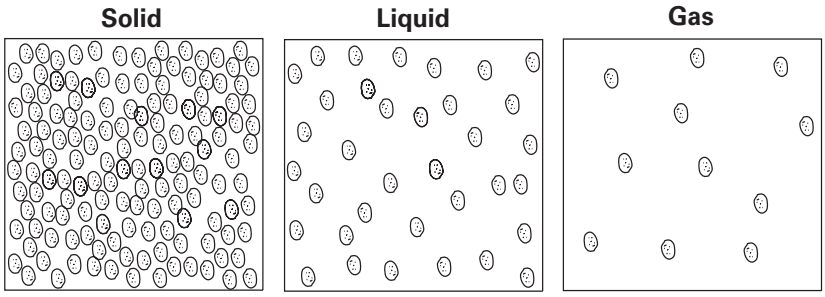
- make and record relevant observations during questioning and investigating the interactions of liquids and solids, using written language, pictures, and charts (201-5, 200-1)

Elaborations—Strategies for Learning and Teaching

Through discussion, students could share times when they have observed water vapour: for example, when they breathe outdoors on a cold day or when they breathe on a mirror. Students could also observe frost designs on windows.

With evaporation, heat exchange is not as obvious. (Background: Evaporation occurs when water molecules break away from others at the water's surface, while boiling occurs when water particles (molecules) throughout the whole water sample have enough energy to break away into a gas.) To illustrate that heat speeds up evaporation, students can compare evaporation rates at different temperatures.

Frozen water particles (molecules) are attracted to one another and stay close together. When water particles freeze, they don't move around much. When water particles are liquid, they move around but stay fairly close together, hence they take on the shape of the container. When water particles get hot, they move faster and farther apart. Some of the particles or molecules escape into the air as gas.



Students should be able to predict what will happen to the various forms of water when they are heated or cooled. Water is the only substance that can be found in all three forms—liquid, solid, and gas—in nature. This will lead into a discussion of the water cycle. Students could be asked to explain how they think rain is formed and to describe the three forms of water in nature. Students should be introduced to the terms **condensation**, **evaporation**, and **precipitation**.

Opportunities to observe condensation of water vapour on cold surfaces will further reinforce the notion that water can change from one form to another. Students should be able to predict what will happen to the various forms of water when they are heated up or cooled down. Students can act out the movement of particles. Teachers can mark off an area, like a square. Students can stand in the area and follow instructions to move like the particles do when they are solid, liquid, or gas.

The Three States of Water *(continued)*

Tasks for Instruction and/or Assessment

Performance

- Put a couple of drops of warm water on your hand. Wave your hands gently. What do you feel? Do you feel the same way when you step out of a warm bath or shower, or a swimming pool or lake? What happens to the water on your hand? (201-5, 200-1)
- Pass out small mirrors to students (or use the classroom window if it is cold). Breathe on the mirror several times. Rub the mirror and describe what you see and feel. (The water vapour condenses on the cooler mirror.) (201-5, 200-1)
- Using two plastic glasses, fill one with ice. Observe what happens. Record your observations. (201-5, 200-1)
- Place ice on a metal tray. Suspend the tray over a bowl using large blocks or books. Ask students to predict what will happen. Observe. Ask, "Where did the water come from?" (The water vapour in the air cooled and changed from gas to liquid. This is called condensation.) Draw a picture and explain what happened. (201-5, 200-1)
- Read Rigby Discovery World (orange series), *Rain, Snow, and Hail* by Katie Sharp. (This book is part of the AYR collection for grade 2. Please note the thermometer readings are in Fahrenheit, not Celsius.) An extension activity could be "Activity 12: Cloud in a Jar (Teacher Demonstration)." (201-5, 200-1)

Paper and Pencil

- As a class, write a song about particles. Use a familiar tune for the song like "Are You Sleeping?" and add actions to the words. Perform the song and actions with students facing a partner. (201-5, 200-1)

Presentation

- Act the part of each type of water
  - **solid**: students stand close together, move very slowly but stay together
  - **liquid**: students stand further apart, then move around each other
  - **gas**: students stand far apart, move, and jump around quickly (201-5, 200-1)
- Draw a picture to show the water cycle. (201-5, 200-1)
- Perform a play about the water cycle. (201-5, 200-1)

Resources/Notes

Activities from Appendix F

- Activity 10: Evaporation—Disappearing Water
- Activity 11: Condensation
- Activity 12: Cloud in a Jar (Teacher Demonstration)
- Activity 13: Rain in the Classroom (Teacher Demonstration)

Videos/Software

- *Where Does the Rain Go after It Falls?* (21057) 11 min
- *Learning about Water* (22259) 11 min
- *Science Court Water Cycle* (51218)

Print

- *Matter, Matter, Everywhere*, Teacher's Guide, Pan-Canadian Science Place (13943) pp. 12–49, 66–71, 83–88
- *Rain, Snow, and Hail*, Katie Sharp, Rigby Literacy (12823)
- *When the Rain Comes*, National Geographic Windows on Literacy, Level C (13150)
- *Water Can Change*, National Geographic Windows on Literacy (13150)

Properties and Interactions of Familiar Liquids and Solids

Outcomes

Students will be expected to

- examine and record the properties and interactions of familiar liquids and solids (100-17, 100-18, 201-5)

Elaborations—Strategies for Learning and Teaching

In classroom discussion, students and teachers can discuss their findings about the water, ice, and water vapour. Teachers can monitor students' discussion to extend their ideas to other solids and liquids. Do they think all liquids and solids have the same properties? In what ways might they be different? How can we find out? Encourage students to make "I wonder ..." statements that could be used as a starting point for exploration, such as "I wonder if all liquids are as runny as water" or "I wonder if there are other solids besides ice that melt in your hand." As they explore the properties of common liquids and solids, they will probably have more "I wonder ..." statements.

Students can explore the properties of various solids such as chalk, salt, sugar, wood, and metals by noting their properties such as appearance, hardness, texture, colour, odour, and ability to be broken into smaller pieces or shapes.

Caution: Some students may have allergies.

Throughout these explorations, students should become used to wearing safety goggles. A number of common, safe liquids (see *Science Safety Guidelines*) such as juice, water, milk, soft drinks, and molasses can be used in these explorations. Students can explore the properties of these liquids by noting colour and odour and by rubbing their hands with each of these liquids. They can explore the thickness (viscosity) of the liquids by stirring the liquids with a spoon or seeing how easily the liquids swirl or pour.

Some properties of materials are determined by how they interact with other substances. Students can observe what happens when drops of liquids are placed on wax paper, tin foil, cardboard, cotton, or other type of surface. They can note things like the shape of the drop on these surfaces and if the liquid wets the surface. Students can have a liquid drop race and select which liquid they want to race and material they want to race it on.

Charts and drawings should be used to record their observations in the following activities. For example, a chart of what floats in water and what does not could be filled in by the students. Drawings could also illustrate the same thing by showing some objects floating, while others have sunk to the bottom.

Properties and Interactions of Familiar Liquids and Solids

Tasks for Instruction and/or Assessment

Performance

- Explore the properties of a variety of solids and record their observations on recording sheets or in their science journals. Does the solid bend? Does it float? Can you scratch it with a nail? Will it roll? (100-17, 100-18, 201-5)

Investigating Solids

Solid	Scratch Test for Hardness	Does It Float?	Can It Bend?
Wood	Nail—yes Finger—no Pencil—yes	Yes	Yes, but then it breaks.
Plastic			
Rock			

- Put equal amounts of water, vegetable oil, milk, juice, and molasses in paper cups. Swirl each cup gently and put them in order of "easiest to swirl" to "hardest to swirl." Record your results. (100-17, 100-18, 201-5)
- Which piece of material will soak up water the most? Put a drop of water on each piece of material (e.g., wax paper, cardboard, white paper, construction paper) and tip the material. Record how far each drop travelled before it soaked into the material. (100-17, 100-18, 201-5)
- Design an activity based on a question you have. Perform it. Record your observations on your activity. (100-17, 100-18, 201-5)

Interview

- What are some things you know about liquids? Do you think all liquids are alike? What are some things that we could test to see if liquids are alike or different? (100-17, 100-18, 201-5)

Resources/Notes

Activities from Appendix F

- Activity 14: Investigating Solids
- Activity 15: Investigating Liquids
- Activity 16: Water Race

Print

- *Matter, Matter, Everywhere*, Teacher's Guide, Pan-Canadian Science Place (13943) pp. 12–49, 60–88

Properties and Interactions of Familiar Liquids and Solids *(continued)*

Outcomes

Students will be expected to

- demonstrate and communicate their evaluations of sinking and floating as they relate to various liquids and objects (202-2, 100-21, 202-8, 203-3)

Elaborations—Strategies for Learning and Teaching

Students can explore in learning centres how some solids float on water (pepper), dissolve in water (salt, sugar, drink crystals), sink in water (sand), or form suspensions in water (cornstarch). An interesting mixture is formed from cornstarch and water. If students scoop the mixture into their hands, it can behave as a solid or a liquid depending on the pressure they exert on it. If they hold it tight in their fist, it will behave as a solid, but if they loosen their grip, it will seep through their fingers like a liquid.

Students can experiment with various objects, such as paper clips, crayons, pieces of wooden stir sticks, jelly beans, to see if they sink or float in water.

Students can use fresh water and salted water to experiment with making sinking objects float and floating objects sink. For example, place an egg in fresh water to observe the sinking. Then add progressively larger amounts of salt and observe the outcome.

Use everyday examples to introduce the idea of whether the type of liquid an object is in will let it float or sink. Do liquids always mix? Students can also investigate what happens when different liquids are mixed, for example, cooking oil and water, or dishwashing liquid and water, to see which ones float and which ones mix. Finally, students can make a mixture of cooking oil and water, and then add the solid objects again. Some objects will float on top, some will float on the bottom layer, and some will sink all the way to the bottom.

Using their knowledge of sinking and floating, students can generate a number of challenges that will involve designing solutions. Some examples are designing a boat or raft from materials such as wax paper, aluminum foil, or modelling clay that will carry the most pennies; making a floating object sink; making a sinking object float, or making a sinking object stay suspended halfway.

Students can work together in co-operative groups to solve problems, share ideas, and test solutions. After they have finished refining their product, be it a raft, boat, attachments for sinking objects or for keeping them afloat, they can share their observations by demonstration or in an oral presentation to class. Connections to technological products can be made by illustrating, for example, how lobster pots (made of wood) are sunk, how heavy metallic boats can float, or how fishers use a variety of floaters and weights to have their nets and lines sink or float to appropriate levels.

Properties and Interactions of Familiar Liquids and Solids *(continued)*

Tasks for Instruction and/or Assessment

Performance

- What floats? Take each of the objects and see if it floats in water. Draw pictures of the objects showing what they do when they are placed in a bowl of water. (202-2, 100-21, 202-8, 203-3)
- Do all liquids mix? Complete the chart by drawing pictures to show how the liquids mix. If layers form, label each layer. (202-2, 100-21, 202-8, 203-3)

Mixing Liquids

Mixture	Drawing
Vegetable oil and water	
Fruit juice and syrup	
Water and vinegar	
Salad dressing (e.g., Italian) and soya sauce	

- In a clear cup, pour equal amounts of water and vegetable oil. Add some food colouring. Which layer does the colouring mix with? Draw a picture to show your observations. (202-2, 100-21, 202-8, 203-3)
- In a tall glass or bowl, add equal amounts of water and vegetable oil. Carefully drop different objects in the bowl. Record your results in the chart. (202-2, 100-21, 202-8, 203-3)

Floating or Sinking

Object	Sinks through Water and Oil	Floats on Water	Floats on Oil
Crayon			
Eraser			

- (Give each student a 10 cm × 10 cm piece of aluminum foil so that each student has the same amount of foil.) With a partner, design a floating device that will hold pennies. Demonstrate your floating device to the rest of the class. (202-2, 100-21, 202-8, 203-3)

Resources/Notes

Activites from Appendix F

- Activity 17: Liquid Race
- Activity 18: Mixing Liquids
- Activity 19: Exploring Solids in Liquids
- Activity 20: Mixing Solids and Liquids
- Activity 21: Can You Design a Boat That Will Float a Cargo?

Software

- Kidspiration (51373)

Print

- *Floating and Sinking*, Honey Anderson, Bookshop Level H
- *Some Things Float*, National Geographic, Level C (13150)
- *Floating and Sinking*, Alphakids Level F, Scholastic Canada Ltd. (13412)
- *Matter, Matter, Everywhere*, Teacher's Guide, Pan-Canadian Science Place (13943) pp. 55–59

Mixing Liquids and Solids to Make New and Useful Materials

Outcomes

Students will be expected to

- select and use solids, liquids, and appropriate tools to create new materials that have characteristics different from the original components (100-19, 200-4, 201-3, 100-20)
- identify and use a variety of sources to get ideas for creating new materials (201-7)

Elaborations—Strategies for Learning and Teaching

Up to this point, the interactions between liquids and solids have, for the most part, left the original liquid or solid intact. In this part of the unit, new products and materials are formed from these interactions.

⚠ Caution: Students should be cautioned not to mix solids and liquids at home without supervision. Some mixtures of household chemicals can be hazardous.

Cooking and making construction materials, such as mud bricks, gelatine, or playdough, are good contexts for this section. There are a wide variety of activities that can illustrate these outcomes; selection of which ones to do depends on availability of materials and tools such as staff room ovens or refrigerators. If these are not available, there are still many products that can be made. The focus in this section should be twofold: the products made should be useful and seen as fitting a human need, and the characteristics of the product made should be different than the components used to make it.

Students can make playdough using flour, salt, and water. They can add different colours of food colouring to the dough to get multicoloured dough. They can experiment with varying the amount of water in order to change the texture of the dough.

Students can prepare a package of gelatin according to directions. Encourage students to observe the characteristics of the ingredients before and after preparation. This will note the change that can happen to substances, which is always a good observation to make.

Plaster of Paris can also be used to make useful objects. Alternatively, students can mix flour and water to make a paste to be used for papier mâché.

Simple chemical reactions can be done to illustrate new materials being formed. Students may wish to help make cookie dough and compare the dough to the baked cookie. Students can drop baking soda into vinegar to yield a burst of bubbles. Yogurt and baking soda will also give a bubbling mixture. The reaction of the yeast on bread dough may be observed in a bread machine.

Students can use some of the many available simple chemistry experiment books to find mixtures that make smelly, bubbling, or colourful products. Other sources of chemical reactions are cookbooks, Internet sites (key words: chemical changes, chemical reactions), and children's science television shows.

Mixing Liquids and Solids to Make New and Useful Materials

Tasks for Instruction and/or Assessment

Informal/Formal Observation

- Observe students as they make their mud bricks (play dough, Jello, muffins). Assess their ability to select and use appropriate tools, communicate their questions and ideas, and evaluate their product. (100-19, 200-4, 201-3, 100-20)

Performance

- Using the materials given (e.g., soil, sand, small gravel, clay, water) make some mud bricks. Let your bricks dry, and then test them the next day to see if they will hold together. (100-19, 200-4, 201-3, 100-20)
- With a partner, add a couple of drops of vinegar to a spoonful of baking soda in a glass. Keep adding drops of vinegar. What new type of substance did you form? (100-19, 200-4, 201-3, 100-20)
- Add a few drops of water to some cornstarch and mix until it looks a bit like glue. Do you think it is a solid or liquid? What evidence do you have to support your answer? Now try to hold the mixture in your hands loosely. What happens? Do you think it is a solid or liquid? Now hold onto the mixture again, and grip it tightly and quickly. What happens? Is it acting more like a solid or a liquid? (100-19, 200-4, 201-3, 100-20)
- Have students use a variety of sources to create a new material. (201-7)

Resources/Notes

Activities from Appendix F

- Activity 22: Magic Mud
- Activity 23: Making New Materials—Creating Clay

Print

- *Matter, Matter, Everywhere*, Teacher's Guide, Pan-Canadian Science Place (13943) pp. 66–75, 83–88

Mixing Liquids and Solids to Make New and Useful Materials *(continued)*

Outcomes

Students will be expected to

- describe and demonstrate ways we use our knowledge of solids and liquids to maintain a clean and healthy environment (102-8)

Elaborations—Strategies for Learning and Teaching

At the end of every investigation, students should clean up any residue material carefully and dispose of it properly. As much as possible, students should use the knowledge they have gained throughout this unit to appropriately dispose of materials, for example, considering which types of materials will absorb liquids and recognizing that some solids will dissolve in water (rain) and may get into the environment more easily. Certain types of materials (e.g., batteries, paint thinner) should not be thrown out with the trash. Environmental posters can be placed in the room to emphasize the care that must be taken with our environment and the types of everyday materials that should be disposed of carefully. Connections to the section Sources of Water in the Science 2 unit Air and Water can be made here.

Students could also investigate the ability of certain materials to soak up oil. This would simulate the real-life situation of cleaning up after an oil spill. Students could note the ability of sawdust, kitty litter, feathers, human hair, moss, and other materials for soaking up oil.

Mixing Liquids and Solids to Make New and Useful Materials *(continued)*

Tasks for Instruction and/or Assessment

Journal

- Recycling can help us keep a clean environment. Things I recycle at home are ... (102-8)

Interview

- Which type of material would you use to clean up a water spill? Give reasons to support your answer. (102-8)
- What would you use to clean up dirty dog prints? sandy prints from the beach? (102-8)

Resources/Notes

Activity from Appendix F

- Activity 24: How Water Can Be Cleaned

Print

- *Matter, Matter, Everywhere*, Teacher's Guide, Pan-Canadian Science Place (13943) pp. 66–75, 83–88

Earth and Space Science: Air and Water in the Environment

Introduction

Air and water are all around us. They form a major part of the physical environment and are essential for life, yet our awareness of them is often incomplete. Where solids are tangible and directly measurable, gases and liquids are sometimes visible only through their effects. The emphasis in this unit is on characteristics of air and water and on how they affect us in daily life. Through investigations, students learn about changes and interactions of air and water when they are heated or cooled and about their movement through the environment. In the process, students discover that water is important to us in many ways. Students can also learn to appreciate that there is more to obtaining clean water than simply turning on a tap.

Focus and Context

The focus in this unit is on inquiry. Students are presented with many opportunities to explore how air and water are connected, and how temperature and moving air can affect the form of water. They also are provided with opportunities to test fabrics to see how suitable they are for various weather conditions. Finally, they gain an appreciation for having a clean water supply and investigate how water pollution can affect living things.

Science Curriculum Links

Some of this unit can be integrated with the first section on The Three States of Water in the Science 2 unit Liquids and Solids. These sections are noted in the following pages.

Students will have already investigated changing weather conditions in the Science 1 unit Daily and Seasonal Changes. In this unit, they account for changes in weather through an understanding of water and air in the environment. This exploration will deepen in the Science 5 unit Weather.

Curriculum Outcomes

The following outcomes are from *Common Framework of Science Learning Outcomes K to12*. Column one outcomes have been developed from these pan-Canadian outcomes. See Appendix J for the original outcomes that these were derived from.

STSE/Knowledge	Skills
Students will be expected to	*Students will be expected to*
203-1, 102-10, 201-3 demonstrate that air is a substance and communicate their findings by conducting multiple activities	**200-3, 200-4, 200-1, 203-3** predict, investigate, and communicate the properties of materials according to their ability to absorb water
100-26 observe changes in air conditions in indoor and outdoor environments and describe and interpret these changes	
102-9, 201-3 identify and measure evidence of moisture in the environment, in materials, and in living things	
100-27, 200-4, 201-5 describe changes in the location, amount, and form of moisture and investigate and identify conditions that can affect these changes	
103-7 describe the effects of weather and ways to protect things under different weather conditions	
102-11 identify examples of water in the environment and describe ways that water is obtained, distributed, and used	
103-8 identify the importance of clean water for humans, and suggest ways they could conserve water	

Air

Outcomes

Students will be expected to

- demonstrate that air is a substance and communicate their findings by conducting multiple activities (102-10, 203-1, 201-3)

Elaborations—Strategies for Learning and Teaching

Students can explore how air takes up space by trying to fill up empty bottles (plastic) with water by holding the bottles under water in a tub or bucket. Structure the activity so that they attempt to fill up the bottles by holding the bottles in different positions under water (opening down, sideways, up). Alternatively, students can be given bottles with paper towels in the bottom, and asked to submerge the bottle without getting the towel wet.

Many familiar technological products (balloons, tires, and air mattresses) can be used to illustrate that air takes up space. Students can inflate some of these products and manipulate them with their hands to feel the air that has been trapped inside.

Air is invisible. As such, students can only see and feel evidence of air in order to gain an understanding that it is an actual substance.

In classroom discussion, students can be given the opportunity to think about the reasons or explanations that the bottles will not fill up with water if they are held upside down. They can also think about what may be in the bubbles they saw as the bottles did start to fill up. Encourage students to respond to other students' ideas. Students can use what they have learned as they race to see who can fill up the bottle fastest, then share their techniques with other students. They can also explore the fastest method to empty the water from a bottle. Students may think holding the bottle upside down is the fastest way to let water out, but it will pour out more quickly if air is allowed to get in by tipping or swirling the bottle.

Have students observe how air feels when there is wind. Involve students in activities where they can feel moving air (for example, letting the air out of balloons or tires; standing in front of a fan; standing in the wind). Teachers can help students make a list of things that wind can do (for example, cause a flag to wave, blow down trees, move sail boats). Probe their conceptions of what it is they are feeling and introduce the idea of "too small to see, but it is there."

Students can construct weather vanes to measure the direction of the wind or make simple wind direction indicators using ribbons hanging from various places around the school and school grounds. They can use phrases like "It is blowing towards the tree," as well using terms like **north**, **south**, **east**, and **west**. They can use pinwheels to show how fast the wind is blowing.

Air

Tasks for Instruction and/or Assessment

Performance

- In a group, construct a wind speed indicator. Use it to measure the wind speed and direction at various locations and at different times. (203-1, 102-10, 201-3)

Observing Wind

Location	Wind Speed	Wind Direction
Beside the school	Really windy. The pinwheel turned so fast it was blurry.	The ribbon pointed straight out towards the back of the school.
In an open field		
On the seashore		

Journal

- Today we did experiments with air. I learned lots of things ... I wonder about ... (203-1, 102-10, 201-3)

Interview

- How can you show me that air is a real substance when you cannot see it? (203-1, 102-10, 201-3)

Paper and Pencil

- Draw pictures to show how you know that (203-1, 102-10, 201-3)
  - air takes up space
  - air can move things

Resources/Notes

Activities from Appendix G

- Activity 25: Where Is the Air?
- Activity 26: Look at the Wind Go!
- Activity 27: Direction of the Wind

Print

- *Air and Water*, Teacher's Guide, Pan-Canadian Science Place (13947) pp. 17–28, 33–39, 50–56

Videos

- *Learning about Air* (22260) 11 min.
- *3-2-1 Classroom Contact: Air Is Matter, Air Is There* (23322) 15 min.

Air *(continued)*

Outcomes

Students will be expected to

- observe changes in air conditions in indoor and outdoor environments and describe and interpret these changes (100-26)

Elaborations—Strategies for Learning and Teaching

Teachers may have demonstrated the use of thermometers in the unit Daily and Seasonal Changes in Science 1, but students did not use them or any standard units of measurement. In grade 2, students are being introduced to standard units of measurement in the math program (such as metres, litres), but they are not introduced to temperature units until later. Students would measure air temperature in various parts of the classroom (by a window, in the sun, by a space heater) with a thermometer to see if they can detect any changes in the height of the liquid in the thermometer.

Indoor air conditions do not change very much. They can describe changes that occur when the thermostat is turned up using terms like "colder" and "warmer." They can identify places in the room or in the school that appear to be warmer than others. For example, they may note that it is noticeably warmer by the heater and noticeably cooler by the open window. They may also observe that it is warmer when they are by a window with the sunlight pouring in. They may note breezes that come through an open window or feel the breeze from a fan or the warm air rising from a heater, but other than that, moving air will not be very detectable indoors.

This investigation can continue outside in the schoolyard and at home. With your help, they could compare outside temperature readings that are taken in the sun to those taken in the shade. Students can describe changes in temperature by describing the type of clothing they would have to wear to be comfortable (such as sweaters, parkas, shorts).

Students can attempt to interpret the various changes in temperature (for example, in the sun, near a furnace, on a cloudy day), and wind (by an open window, out in the open, and not sheltered) using simple explanations.

They can also record the wind direction and wind speed in the same chart using the instruments that they designed. They could compare the wind speed out in an open field to the wind speed in a more sheltered area.

Students could note the amount of cloud cover each day (draw pictures to show shape of clouds and relative amount of cloud cover). Forms of moisture in the environment are addressed next in this unit, so clouds are a natural introduction to this topic.

Air *(continued)*

Tasks for Instruction and/or Assessment

Performance

- With a partner, describe how warm or cold it is at indoor and outdoor locations, and record your observations in the table below. (100-26)

What Do You Feel?

Location in Classroom	How I Feel ...
Near a fan	I can feel the wind from the fan, and it feels cool on my face.
By an open window	
In a sunny spot	
In a shaded spot	

- Find a place outside near your school where you want to collect your weather measurements. Three times a day (for example, before recess, after lunch, and afternoon) for one week, fill out the table with your observations (class activity). (100-26)

Observing the Weather

Location:

Date: Time/Day	Observations (Hot, Cold) Air Temperature	Clouds (Draw Picture)	Rain/ Snow	Wind Speed/ Direction (Draw Ribbons)
Monday 9:30				
Monday 11:00				

Journal

- The things that I learned about the air conditions indoors are ... The things that I learned about outdoor air conditions are ... (100-26)

Resources/Notes

Activities from Appendix G

- Activity 28: Feeling the Air Temperature
- Activity 29: Using a Thermometer

Software

- Kidspiration, "Dressing for the Weather" (51373)

Print

- *Air and Water*, Teacher's Guide, Pan-Canadian Science Place (13947) pp. 50–56

Forms and Changes in Moisture

Outcomes

Students will be expected to

- identify and measure evidence of moisture in the environment, in materials, and in living things (102-9, 201-3)

Elaborations—Strategies for Learning and Teaching

Students should explore evidence of moisture in the environment by observing the various forms of precipitation (fog, rain, snow, drizzle, etc.) in their local area. They can note their breath on a cold day and water steaming up their mirrors after a shower or fogging up the windows in their car. Students who wear glasses may note that they sometimes fog up when they come inside on a cold day.

Moisture in the form of water vapour will be present in the air in varying amounts, even when it is not evident. It can be detected by noting the changes that occur on the surface of a cold object taken from a freezer and placed on a desk. Freeze a container of water and bring it to the classroom for students to observe. Some students may think that the ice and water are actually coming through the container when they see the ice and condensation forming on the surface of the container. Take a chilled solid object from the freezer (empty glass pot, for example). Students will notice the condensation occurring, ruling out the explanation that the water has come from inside the container, and supporting the idea that the water has come from the air. Alternatively, they could add a couple of drops of food colouring to the container of ice water and show that the water that condenses is not coloured.

Students can observe evidence that moisture is present in many materials, such as a wet towel or damp clothes, by feeling them or squeezing some water from them. They can also see evidence of moisture in living things, such as fruits and vegetables. Students could take an apple that has been cut in half, put one piece, sealed in plastic, in the refrigerator, and leave the other piece out. They can then compare appearances and use a pan balance to see which one is heavier. Other activities could involve making juice from oranges or noting that they perspire after exercise.

Students can use a magnifying glass to observe the moisture on leaves or grass at various times of the day. Students should be able to predict the forms of precipitation that will occur during the various seasons.

Students can record the types of precipitation in their journals, use water gauges and measuring sticks for snow to record the amount of precipitation over the course of a week or month. This could be done using non-standard or standard units. Some of these data can be used for symbolic bar graphs, which you can help students construct. This can be used to connect with math outcomes on data processing.

Forms and Changes in Moisture

Tasks for Instruction and/or Assessment

Informal Observation

- Observe student participation in activities.
  - ability to discuss/share their ideas
  - ability to design and conduct a fair test
  - ability to interpret and create charts, drawings, texts

  Tasks may include the following:
  - design an investigation that will control variables as they explore water evaporation/condensation
  - create an instrument for measuring the amount of rain/snowfall
  - create/interpret a chart that describes the changes that they have explored in their investigation (100-29, 201-3)

Performance

- As a class, record your results (for students who may have trouble writing the evidence, these can be relayed orally). (102-9)

Water in Many Places

Places Where I Found Moisture or Water ...	Evidence	Amount
Air		
Apple		
On the playground		

Journal

- Some of the places where I've discovered water are ... (102-9, 201-3)

Interview

- Where do you think the water from the apple went? What evidence do you have to support your answer? (102-9, 201-3)

Resources/Notes

Activity from Appendix G

- Activity 30: Moisture in the Environment

Print

- *Air and Water*, Teacher's Guide, Pan-Canadian Science Place (13947) pp. 23–28, 40–49

Forms and Changes in Moisture *(continued)*

Outcomes

Students will be expected to

- describe changes in the location, amount, and form of moisture and investigate and identify conditions that can affect these changes (100-27, 200-4, 201-5)

Elaborations—Strategies for Learning and Teaching

Students should explore the conditions under which water can change from one form to another. Ask students what they noticed about the location and form of moisture.

Students can investigate conditions affecting evaporation by putting the same amount of water on pieces of the same fabric. Students can hang them from various places, then record the temperature and note air movement. Students can design investigations that attempt to control these variables (temperature and air movement).

Set up co-operative learning groups. Provide opportunities for children to discuss and share their ideas on the conditions under which things dry faster in one location than the other. For example, water vapour in the air can condense on a cool window or water in a glass can evaporate into the air. Dew on a leaf can evaporate, wet clothes might dry on the line, and icicles will melt and drip. Water will freeze into cubes in the freezer.

Forms and Changes in Moisture *(continued)*

Tasks for Instruction and/or Assessment

Performance

- (Class Activity) Make an instrument for measuring the amount of rain (or snow). Measure the amount of rain (snow) each day for two weeks, and record your findings in the chart. (A different student can take the measurement each day.) When you are finished, construct a graph to show your results. (100-27, 200-4, 201-5)

Rainfall

Date	Amount of Rain
October 11	
October 12	

Paper and Pencil

- As you explore how to change moisture from one form to another, fill in the chart (include all changes: such as water to water vapour, water vapour to water). (100-27, 200-4, 201-5)

Ice, Water, and Water Vapour

Form	Location of Moisture	Conditions	Observations
Water	Wet towel	Hung to dry with no wind	Towel dried slowly
Water	Wet towel	Hung to dry in wind	
Ice	Wet towel	Put in freezer	

Resources/Notes

Activities from Appendix G

- Activity 31: What Makes the Water Disappear?
- Activity 32: Where Has All the Water Gone?
- Activity 33: How Much Does It Rain/Snow?

Print

- *Air and Water*, Teacher's Guide, Pan-Canadian Science Place (13947) pp. 29–49, 63–68

Materials and Moisture

Outcomes

Students will be expected to

- predict, investigate, and communicate the properties of materials according to their ability to absorb water (200-3, 200-4, 200-1, 203-3)

Elaborations—Strategies for Learning and Teaching

These outcomes explore the role of choosing materials for a specific purpose. Students could explore different materials and investigate questions such as, Which materials hold the most water? Is one material more waterproof than the other? Which material will dry the fastest? Students can suggest situations in which they would need materials to absorb water (towels, paper towels), repel water (raincoats, tents), and dry quickly (dish towels, clothing). They should also note the clothing for different weather conditions. For example, rain coats, boots, parkas, and umbrellas. Students should then be asked how various materials can affect them in different weather conditions.

Given a variety of materials students can make predictions about the materials and then perform simple tests to test the qualities that make them suitable for different weather conditions or absorbing water.

Absorbing qualities: Students can set up several containers with equal amounts of water and place different materials in the water. They can remove the materials and observe how much water is left in each container after a designated period of time. This also supports outcome 100-18 in the Liquids and Solids unit.

Waterproofing qualities: Students can drop water on materials and note whether the drops "sit" on top of the material, are absorbed by the material, or soak right through. For the materials that allow the water to sit on top, they can see how far they can get the drop to move before it is absorbed.

Drying times: Students can wet a variety of materials and note how long each takes to dry.

Using the results of these tests, students can sequence the materials that they tested from least absorbent to most absorbent, or from least waterproof to most waterproof, or from fastest drying to slowest drying. They can discuss with classmates which materials would be suitable for different purposes, for example, for clothing for various weather conditions, for towels, or for tents.

Students should be able to communicate what they did and their results using words such as **absorb** and **waterproof**. This can be done formally, through the creation of products that show their procedures and results of their tests, or informally, through teacher interviews with students as they are finishing up their work at a learning centre.

Materials and Moisture

Tasks for Instruction and/or Assessment

Interview

- When would you want materials to be absorbent? to be waterproof? to dry quickly? (200-3, 200-4, 200-1, 203-3)

Paper and Pencil

- Predict which materials are more absorbent and give a plan to test your predictions. (200-3, 200-4, 200-1, 203-3)
- List your materials in order from least waterproof to most waterproof. (200-3, 200-4, 200-1, 203-3)

Which Materials Are Waterproof? (absorbent, dry fastest)

Material	Prediction	What I Saw

- Have students create an outfit out of materials tested for a specific weather condition or activity. (200-3, 200-4, 200-1, 203-3)

Resources/Notes

Activities from Appendix G

- Activity 34: Materials Interacting with Moisture
- Activity 35: Rain, Rain, Here to Stay: What Materials Will Keep Us Dry?
- Activity 36: Oops! I'd Better Clean That Up!
- Activity 37: Dry Time
- Activity 38: What to Wear, What to Wear!

Print

- *Air and Water*, Teacher's Guide, Pan-Canadian Science Place (13947) pp. 29–49, 63–68, 77–81

Materials and Moisture *(continued)*

Outcomes

Students will be expected to

- describe the effects of weather and ways to protect things under different weather conditions (103-7)

Elaborations—Strategies for Learning and Teaching

Students can note signs of weather effects around the schoolyard, home, and community. Students can note products that protect structures from the effects of weather.

Both wind and precipitation can affect houses, patios, and other structures. Students can note signs of weather damage around the schoolyard and home. Peeling paint, warped wood, and shingles or siding blown off buildings are examples of evidence that weather has a marked effect. Students could suggest products or processes that have been designed to reduce the impact of weather, such as driveway sealer and storm windows. Students could collect pictorial images that illustrate these products and display them on a weather poster. This connects with health education outcome B3.4 which states that students will be expected to identify and to practice strategies for protecting their skin from the harmful rays of the sun.

Materials and Moisture *(continued)*

Tasks for Instruction and/or Assessment

Performance

- Which season is this material useful for in our climate? Go to the pie plate named according to the season. (Students move to the season; have enough "season" plates for the students. Each plate has one season on it.)
  - I wear mittens in this season.
  - My rubber boots and umbrella keep me dry in this season.
  - My sandals keep my feet cool in this season.
  - My plants and trees are turning yellow and red in this season. (103-7)

Journal

- This is how I would protect ... from weathering. (103-7)

Interview

- What kinds of things do you or your family use to prepare for different weather conditions? (103-7)

Presentation

- Create a poster of products that are used to weatherproof things like clothing, houses, decks, and roads. Flyers and catalogues from hardware stores make a good source of pictures. (103-7)

Resources/Notes

Activities from Appendix G

- Activity 39: Weathering

Print

- *Air and Water*, Teacher's Guide, Pan-Canadian Science Place (13947) pp. 57–62

Curriculum Link

Health Education, Grade 2, Outcome B3.4: identify and practise strategies for protecting their skin from the harmful rays of the sun

Protecting Our Water Sources

Outcomes

Students will be expected to

- identify examples of water in the environment and describe ways that water is obtained, distributed, and used (102-11)
- identify the importance of clean water for humans and suggest ways they could conserve water (103-8)

Elaborations—Strategies for Learning and Teaching

Students can identify sources of water in their local area, such as streams, lakes, and wells. Through field trips and/or guest speakers, they can explore where their water comes from and how it is treated to make it clean and safe to drink. Once they recognize that the water from their taps actually comes from a water supply, be it a well or lake, they should explore how important it is to protect these water supplies from pollution.

Students can brainstorm a list of uses of water and again, through classroom discussion, appreciate the importance of water. Some communities may have a "boil order" in effect, so that all water is boiled before it is used for cooking or drinking. The effects of having a water supply that is not safe can be devastating to a community; and students may become scared if the full extent of the effect of contaminated water is made known to them. Classroom discussions should be limited to the effect of "getting a bad stomach" or having cuts that may get infected or not heal quickly; examples of communities stricken by cholera or other diseases are not appropriate for students of this age.

Humans and animals are not the only ones affected by water that is polluted. Students can perform investigations showing the effect of polluted water on plant growth by growing bean plants and watering them with tap water and with "acid rain" (water with small amounts of vinegar can be used to simulate acid rain).

Students can track and record their personal use of water in daily activities, identify situations where water is wasted, and suggest ways to reduce the waste. For example, they can measure the water from a dripping tap over a period of time, or they can measure the amount of water used to water lawns, take a bath, brush their teeth, or flush the toilet and suggest ways to reduce the consumption of water for each of these activities.

Protecting Our Water Sources

Tasks for Instruction and/or Assessment

Performance

- Visit a local stream, river, seashore, or lake with your class. Look for signs that the water is healthy or signs that it is polluted. Record your observations. (102-11)
- Write down some ways to try to make sure water is kept unpolluted. (Do not ignore the ocean.) (102-11, 103-8)

Journal

- How is water useful in my life? (103-8)
- Some ways I can help keep water safe are ... (103-8)

Interview

- How do people get safe water? Does everyone get it the same way? (102-11)
- How come it is important that our water be clean and not polluted? (103-8)

Presentation

- Class poster or mural: You will be responsible for getting or drawing pictures of one of four aspects of water sources:
  - water sources (lakes, rivers, underground water, ocean)
  - ways of getting this water (wells, pumping stations, hand pumps)
  - how we use water
  - ways to make sure our water is pure and clean (102-11)
- Act out ways in which water and its cleanliness affects you. (103-8)

Resources/Notes

Activities from Appendix G

- Activity 40: Protecting Our Water Sources
- Activity 41: How Do You Use Water?
- Activity 42: Where Does Our Clean Water Come From?
- Activity 43: How Do Air and Water Get Polluted?
- Activity 44: Dora the Duck

Print

- *Air and Water*, Teacher's Guide, Pan-Canadian Science Place (13947) pp. 69–92

Life Science: Animal Growth and Changes

Introduction

All animals grow and change from their earliest beginnings until they reach their full adult condition. The form and pattern of this growth distinguish one kind of animal from another and are sources of interest for children of all ages. Viewing the growth and development of an individual organism can be a powerful learning experience for the young student, especially if the student shares responsibility for its care. For example, students can raise a butterfly from caterpillar to adult. The growth and development of the butterfly can then be compared to that of other animals and of themselves, and the opportunity is provided for children to identify the conditions needed to support healthy growth.

Focus and Context

The focus in this unit is on making observations as part of the inquiry process. As much as possible, these observations should be on live animals, either in their natural habitat or in a environment that models a natural habitat, such as an aquarium or terrarium, in the classroom. As students observe the growth and changes in a variety of animals, they will be able to compare and contrast the various processes and stages that the animals go through in their life cycles.

Science Curriculum Links

Students should already be aware that living things have basic needs and can be grouped based on their common characteristics, from the Science 1 unit Needs and Characteristics of Living Things. This unit extends these concepts by focussing on growth and life cycles of animals. In grade 3, students will explore growth and life cycles again in Plant Growth and Change.

Curriculum Outcomes

The following outcomes are from *Common Framework of Science Learning Outcomes K to12*. Column one outcomes have been developed from these pan-Canadian outcomes. See Appendix J for the original outcomes that these were derived from.

STSE/Knowledge	Skills
Students will be expected to	*Students will be expected to*
101-7, 201-5, 203-3, 102-6 describe and record observations, in various formats, of changes in the appearance and activity of an organism through its life cycle	**200-1, 200-4** select and use materials to observe an organism's life cycle and ask questions about the organism's needs and changes in growth
100-15, 200-3 compare and make predictions about the life cycles of familiar animals	**202-7** propose suggestions for meeting the needs of the organism being investigated and draw conclusions about its growth patterns or stages based on observations
102-7 describe features of natural and human-made environments that support the health and growth of some familiar animals	**202-9** identify new questions about the needs and growth patterns of other organisms
100-16 describe changes in humans as they grow and contrast human growth with that of other organisms	
103-5 identify the basic food groups and describe actions and decisions that support a healthy lifestyle	

Investigating the Needs and Life Cycle of an Organism

Outcomes

Students will be expected to

- select and use materials to observe an organism's life cycle and ask questions about the organism's needs and changes in growth (200-1, 200-4)
- describe and record observations in various formats, of changes in the appearance and activity of an organism through its life cycle (101-7, 201-5, 203-3, 102-6)

Elaborations—Strategies for Learning and Teaching

Consult *Science Safety Guidelines* (2005) for information on the care of animals in the classroom.

Students should investigate the life cycle of at least one type of organism first-hand. The selection of this organism could vary, depending on student and teacher interest, the availability of local organisms, any student or teacher allergies, and the availability of specialized classroom equipment such as incubators or refrigerator. Aquariums, jars, terrariums, or cages must be set up to hold the creatures for extended periods of time, so this unit should be started early in the school year when specimens may be more easily obtained, and students will get the chance to see as much of the life cycle as possible.

Students could describe changes in their pets or siblings. They could notice that their pets or siblings have different needs as they change over time. Students should be encouraged to ask questions like "I wonder how long it takes a chicken to hatch?" "Do butterflies really come from caterpillars?" "Where do moths come from?" "Is a baby frog just like an grown-up frog?" These questions can form the basis for exploration, and students will undoubtedly ask many more as the investigations proceed. Guide the discussion by introducing other organisms like butterflies, fish, chicks, frogs, or meal worms that they will be able to observe and investigate. Do you know how living organisms grow and change? What types of things would you think would be worth investigating about living organisms?

Students should focus on recording their observations carefully, like young scientists, by drawing pictures, writing descriptions of changes as they occur, and recording observations at various time intervals as they observe organisms throughout their life cycle. As they observe an organism throughout its life cycle, students should also include information about the organism's feeding behaviour and activity. Attention should be paid to features of the organism's environment that enable it to meet its needs at different stages of its life cycle. Students can work together to care for these organisms.

Students should investigate constant traits, such as eye colour and number of arms and legs, and changing traits, such as height and weight. Insects, such as butterflies, moths, or meal worms, are relatively easy to study in the classroom. Many of these insects go through metamorphosis. The four stages of this cycle are egg, larva, pupa, and adult. Teachers should encourage students to use this terminology during their observations. Magnifying lenses can be used to get a closer look at the different stages in the life cycle.

Investigating the Needs and Life Cycle of an Organism

Tasks for Instruction and/or Assessment

Performance

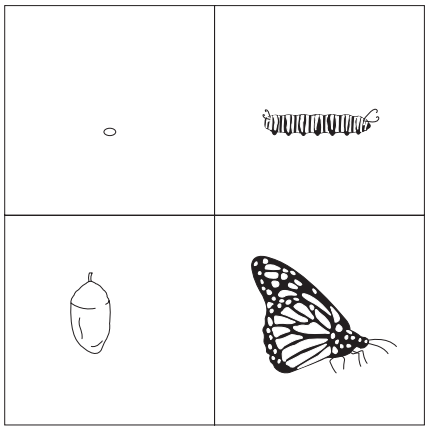
- Dip string or thread in a starch solution, and wrap it around and around an empty film container or other small container. Cut out and colour a butterfly and a caterpillar. Using the chrysalis you have made, show the steps that occur as a caterpillar turns into a butterfly. What is the next stage of this life cycle? How could you show it? (200-1, 200-4)

Journal

- Three times a week, as you watch the life cycle of your butterfly (meal worm, chick, ...), record your observations in your journal. Did you have to use any special equipment? Draw pictures to show how your butterfly is developing. (101-7, 201-5, 203-3, 102-6)
- We are going to be taking care of a ____ so that we can watch it grow. I would like to find out ... (Describe questions that inquire about what the organism will look like as it grows.) (200-1, 200-4)
- Record any changes you observe as the organism develops. (You may choose to keep a drawing or written record.) (101-7, 201-5, 203-3, 102-6)

Paper and Pencil

- Cut and paste the pictures of this organism's life cycle. (Have the students paste it in a circular pattern, with arrows from one picture to the next, to indicate the cycle of life.) (203-3)



- Make a wall growth chart that can be used to record the students' heights and/or weights and may be added to throughout the year. (101-7, 201-5, 203-3, 102-6)
- Keep a class chart of tooth loss that can be added to throughout the year. (101-7, 201-5, 203-3, 102-6)

Resources/Notes

Activities from Appendix H

- Activity 45: Hatching Chicks
- Activity 46: The Life of a Butterfly
- Activity 47: The Meal Worm—An Information Sheet for Teachers
- Activity 48: Growing Meal Worms—Getting Started
- Activity 49: Growing Meal Worms—A Closer Look
- Activity 50: The Life Cycle of a Meal Worm
- Activity 51: Order of Development
- Activities 52: Needs and Growth Patterns of Other Organisms

Print

- *Animals Grow*, Teacher's Guide, Pan-Canadian Science Place (13941) pp. 17–22, 29–45, 64–67

Videos

- *Animal Lifecycles* (23335) 15 min.
- *Butterflies* (22319) 30 min.
- *Insects: Cycle of Life* (21945) 19 min.

Investigating the Needs and Life Cycle of an Organism *(continued)*

Outcomes

Students will be expected to

- propose suggestions for meeting the needs of the organism being investigated and draw conclusions about its growth patterns or stages based on observations (202-7)
- identify new questions about the needs and growth patterns of other organisms (202-9)

Elaborations—Strategies for Learning and Teaching

The total life cycle of a meal worm is about six months. They can be kept in a large jar with holes in the top. Meal worms can be bought from pet stores as pet food.

Students may be able to bring in caterpillars that they have caught in order to study the life cycle of a butterfly or moth. These can be kept in a container with leaves and a twig. Fresh leaves must be supplied each day for caterpillars. Some butterflies will lay their eggs only on certain leaves, for example, monarch butterflies will lay eggs only on milkweed.

Because frogs mature from tadpoles to adult frogs over the summer, a first-hand look at the complete life cycle of frogs would have to be done by students independently. Software, video, or text resources can be used to study the life cycle of frogs in the classroom.

⚠ **Caution: Wear gloves if handling chickens.**

Caution must be exercised if chicken life cycles are studied first-hand. If a resource person, such as a farmer, is willing to bring in the eggs a couple of days before they hatch, show teachers and students the proper care that must be given, and take the chicks away after they have hatched, then the activity may be undertaken. However, the eggs must be in a proper incubator, and proper care must be taken by teachers and students to ensure that the eggs and chicks are cared for appropriately.

Some schools may opt to investigate the life cycles of fish like salmon, cod, or guppies. Raising these organisms requires research and specialized equipment, such as a temperature-controlled aquarium and refrigerator for the eggs. Various agencies, such as the federal Department of Fisheries and Oceans, salmonid interpretation centres, and pet stores may supply eggs and equipment, as well as information and video resources about the life cycles.

Brine shrimp are organisms that are easy to care for in an aquarium. They are tiny and may be difficult for students to observe closely without magnifying lenses.

As students observe the life cycle of the organism they have chosen, they should be encouraged to raise questions about the life cycles of other organisms and how they may be affected by humans. Many of them may have cared for pets and will be willing to share their observations and experiences with their classmates. This will lead to further study of the life cycles of other organisms in the next section.

Investigating the Needs and Life Cycles of an Organism *(continued)*

Tasks for Instruction and/or Assessment

Informal/Formal Observation

- In brainstorming/sharing/generating questions sessions on the life cycles of organisms, assess the degree of participation and respect for others' points of view.
  Observe how: (teacher note)
  – individual students contribute to the group (202-7)
  – the students describe the life cycle of the organism and how it connects to their world using applicable technology (101-7, 201-5, 203-3, 102-6)
  – they recognize that they experience changes in life too (202-7)

Performance

- Build a home for the organism that you are going to investigate. (202-7)
- Match vocabulary with pictures of the organism in various stages. (101-7, 201-5, 203-3, 102-6)

Interview

- Over the time that you have been watching your butterfly (meal worm, chick, ...) grow, what things have stayed the same? What things have changed? (202-9)
- Do you think all animals go through the same stages as the animal(s) we are studying? What other animals would you be interested in finding out about? What are some questions you ask about the growth of living things? (202-9)

Presentation

- Present the results of your investigation of the life cycle of a butterfly (meal worm, chick, ...) to the class. (202-9)
- Write a fiction or non-fiction story about the life cycle of a butterfly (meal worm, chick, ...). Include diagrams. (202-9)

Resources/Notes

Activities from Appendix H

- Activity 46: The Life of a Butterfly
- Activity 48: Growing Meal Worms—Getting Started
- Activity 49: Growing Meal Worms—A Closer Look
- Activity 50: The Life Cycle of a Meal Worm
- Activity 51: Order of Development
- Activities 52: Needs and Growth Patterns of Other Organisms

Print

- *Animals Grow*, Teacher's Guide, Pan-Canadian Science Place (13941) pp. 34–45, 52–57

Video

- *Home Sweet Home, Animal Homes* (23321) 30 min.

Comparing Life Cycles of Familiar Animals

Outcomes

Students will be expected to

- compare and make predictions about the life cycles of familiar animals (100-15, 200-3)

Elaborations—Strategies for Learning and Teaching

Students can now explore the life cycles of other animals. If possible, these explorations should be first-hand (classroom habitats, visits to farms, zoos, aquariums, nature parks, seashore, and aquaculture farms), but in order to make comparisons between similar types of organisms (for example, between the life cycles of cod and salmon), print or electronic sources may be necessary. These resources should be well illustrated and written in simple, age-appropriate language.

Similarities and differences between the life cycles of organisms could be explored. Mammals, birds, insects, fish, reptiles (lizards and alligators), or amphibians (frogs, toads, and salamanders) can be used.

Teacher Note: *This is not terminology that we would expect students to use at this level. It is only mentioned here for teachers to attempt to choose from a variety of organisms that have very different life cycles*.

Students could compare the life cycle of the organism they have investigated to their own life cycle. Teachers could use a dichotomous key to compare animals. Examples include animals that are born alive or hatch, animals that make cocoons or not, or animals that walk on four legs or not.

Comparing Life Cycles of Familiar Animals

Tasks for Instruction and/or Assessment

Performance

- Produce a pictorial time line of an organism's life cycle. (100-15, 200-3)

Presentation

- Select an organism and research its life cycle using a variety of sources. (100-15, 200-3)
- Compare two animals. After the comparison, see if you can find out the animal's name. (100-15, 200-3)

How Animals Compare

Animal A	**Animal B**
2 legs	2 legs
Makes a cocoon	Doesn't make a cocoon
Born alive	Hatched

Resources/Notes

Activities from Appendix H

- Activity 53: Comparing Life Cycles

Print

- *I See What You Mean* and student books, Steve Moline, Visual Literacy (11893)
- *Animals Grow*, Teacher's Guide, Pan-Canadian Science Place (13941) pp. 23–28, 52–57, 85–91

Video

- *See How They Grow* (Series) (22252–22256) 30 min.

Comparing Life Cycles of Familiar Animals *(continued)*

Outcomes

Students will be expected to

- describe features of natural and human-made environments that support the health and growth of some familiar animals (102-7)

Elaborations—Strategies for Learning and Teaching

Students should explore organisms in their natural environments. They should explore how these organisms eat, drink, and move in their natural surroundings. Students could match pictures of organisms to their environments. For example, they could match frogs to ponds, birds to nests, and worms to earth. They can also explore how human-made environments (e.g., farms, zoos, aquaculture farms, aquaria) have supported the health and growth of animals. They could describe the types of environment that they would need to have if they wanted to raise different organisms, such as horses, puppies, or kittens.

Students should be able to make simple predictions about the life cycles of similar organisms and recognize patterns. For example, if they have explored the life cycle of a chicken, they should be able to predict that a robin will also have eggs that will hatch into baby birds.

Comparing Life Cycles of Familiar Animals *(continued)*

Tasks for Instruction and/or Assessment

Performance

- Explore a natural environment that could support or hinder the health and growth of organisms. (102-7)
- Construct a human-made environment that could support or hinder the health and growth of an organism. (102-7)

Interview

- Tell me some ways human-made environments have helped the health and growth of animals. (102-7)
- Now that we have observed the life cycle of a chicken, predict the stages of the life cycle of any bird. (100-15, 200-3)

Paper and Pencil

- Pretend that you have to take care of a bird (or some other type of animal) for a while. How would you take care of it? What kinds of things would you do to make sure that it is comfortable and lives as normally as possible? Draw a picture of the type of home you would make for it. (102-7)

Resources/Notes

Activities from Appendix H

- Activity 54: Growth and the Environment
- Activity 55: Match It Up

Print

- *Animals Grow*, Teacher's Guide, Pan-Canadian Science Place (13941) pp. 46–57, 80–84

Videos

- *Habitats*, Real World Science (23318) 18 min.
- *Habitats: Homes for Living Things* (23324) 15 min.

Human Growth and Development

Outcomes

Students will be expected to

- describe changes in humans as they grow and contrast human growth with that of other organisms (100-16)
- identify the basic food groups and describe actions and decisions that support a healthy lifestyle (103-5)

Elaborations—Strategies for Learning and Teaching

These outcomes will connect with some outcomes of the health education program.

Students love to see evidence that they are growing. These outcomes give students the chance to focus on their own growth over the school year. At the beginning of the school year, various measurements could be taken (hand length, foot size, distance around the head), and these measurements could be continued at intervals throughout the year.

To show that voices change and deepen as they get older, students can listen to a tape of a number of different voices and try to guess who is the oldest and who is the youngest of the people they are listening to.

Students may have some of their baby clothes or baby pictures that they could bring in to illustrate how they have grown. They can also bring in pictures of their brothers, sisters, and parents or guardians to illustrate the progression from baby to child to adult.

To focus on their needs that have changed as they have grown, they could draw pictures of types of foods that they have eaten as they have grown, from milk to mashed food to solid food. Classroom displays could be set up to illustrate this progression.

Health and nutrition issues can be brought in at this point by raising probing questions. Students should be able to recognize that food is a necessary ingredient for growth.

Students can be introduced to the major food groups (dairy, meat, fruit and vegetable, and bread and cereal) by using posters or displays showing the four main food groups. They can then classify various snack and lunch foods into these groups. Guidelines for appropriate amounts of each group can also be displayed and discussed in class.

Students will already have an awareness of some basic hygienic practices that reduce the spreading of germs. They can identify personal behaviours, such as attention to clothing, cleanliness, exercise, and nutritional choices, that help maintain good health. (A community health nurse or dietitian can be invited to talk to the class about nutrition.)

Human Growth and Development

Tasks for Instruction and/or Assessment

Journal

- Write about or illustrate foods that are good for me and foods that are not. (103-5)

Interview

- What is good nutrition? Why is it important to eat nutritious food? (103-5)

Paper and Pencil

- Draw or print the names of the food groups on separate pieces of paper. Cut out pictures of foods and drinks from a magazine and paste them on the correct sheet. (103-5)

Presentation

- Make a picture poster of people at different ages. Select pictures that show how some characteristics change (height, weight), while others remain the same (eye and hair colour). (100-16)

Resources/Notes

Activities from Appendix H

- Activity 56: Changes in Me
- Activity 57: My Family
- Activity 58: Growth
- Activity 59: Healthy Lifestyle

Print

- *Animals Grow*, Teacher's Guide, Pan-Canadian Science Place (13941) pp. 58–63, 69–79

Video

- *That's My Baby* (23320) 30 min.

Curriculum Link

Health Education, Grade 2, Outcome A3.1: demonstrate an awareness of their physical growth

Appendices

Appendix A: Equipment Lists

School Materials

This suggested school list consists of items that each school should have to do the hands-on, minds-on science activities as outlined in this guide. This does not include items in the class or consumables list.

	Position and Moion Appendix E	Liquids and Solids Appendix F	Air and Water Appendix G	Animals Appendix H
Supply List				
ant farm				X
aquarium			X	
attribute hoops				X
bathroom scales				X
binoculars	X	X	X	X
bug boxes with magnifier tops				X
building materials such as Duplo, Lego, or K'nex	X	X		
butterfly cage				X
camera	X	X	X	X
carpet samples for surfacing ramps	X			
collection of rollers (marbles, balls)	X			
collection of wind-up toys	X			
combo balance	X	X	X	X
computers	X	X	X	X
cubic metre set and corner inserts		X	X	
electric kettle		X		
eye droppers		X		
fan, electric			X	
geometric solids	X			
gloves, vinyl				X

	Position and Motion Appendix E	Liquids and Solids Appendix F	Air and Water Appendix G	Animals Appendix H
graduated beakers		X	X	
hot plate or stove		X		
Intel microscope				X
interlocking cubes such as Cube-A-Link or Unifix	X	X		
magnifier, table top tripod				
magnifying lenses			X	X
measuring cups (metric)		X	X	
measuring spoons		X		
measuring tapes	X			X
medicine droppers	X	X	X	X
microscope	X	X	X	X
microscope slides	X	X	X	X
modelling clay		X		
outdoor thermometer			X	
overhead projector	X	X	X	X
ramps and blocks	X			
safety goggles	X	X	X	X
shiny poster board		X		
small mirrors	X			
stethoscopes				
stop watch	X	X	X	
straight pins			X	
strong paper plates			X	
thermometers (regular and soil)		X	X	
water bucket/lids		X		
wooden blocks		X		
wooden stir sticks		X		

Classroom Supplies

This suggested classroom list consists of items that each class should have to do the hands-on, minds-on science activities as outlined in this guide. This does not include items listed in the other lists.

	Position and Motion Appendix E	Liquids and Solids Appendix F	Air and Water Appendix G	Animals Appendix H
Supply List				
bowls		X		
brooder				X
egg incubator				X
metal pan		X		
metal tray (cookie sheet)		X		
pictures/models of food				X
posters of food groups/*Canada's Food Guide to Healthy Eating*				X
rectangular containers		X	X	X
rulers (metric)		X	X	
safety goggles	X	X	X	X
scissors			X	
stop watch	X	X	X	
tape	X	X	X	X
thermometers		X	X	
thumb tacks			X	
Consumables				
alum		X		
aluminum foil		X		
brown sugar			X	
candles		X		
canned soups (variety of densities)		X		
cardboard		X		
cereal (Corn Pops are best)				X
chick food				X
coffee filters			X	

	Position and Motion Appendix E	Liquids and Solids Appendix F	Air and Water Appendix G	Animals Appendix H
cooking oil		X		
corn meal				X
corn syrup		X	X	
cornstarch		X		
cotton balls			X	
cream of tartar		X		
dish detergent		X	X	
drinking straws		X		
elastic bands		X	X	
eggs (chick, ant, fish, frog)				X
fertilized eggs				X
flat, clear pop		X		
flour		X		
food colouring		X	X	
fruits and vegetables				X
garden plants, small			X	
gelatin		X		
glue	X		X	
ice	X	X		
Italian salad dressing		X		
juice		X		
ketchup		X		
kitchen skewers		X		
larvae (butterfly, mealworm, moth)				X
milk		X		
molasses		X		
mustard		X		
oatmeal/bran				X
paper towel		X		
plastic cups		X		

	Position and Motion Appendix E	Liquids and Solids Appendix F	Air and Water Appendix G	Animals Appendix H
plastic sandwich bags (resealable)		X		
plastic sandwich bags (not resealable)		X	X	
plastic wrap		X	X	
powdered drink mix		X		
rice		X		
salt		X	X	
sand		X	X	
soya sauce		X		
sugar		X		
toy cars	X			
vinegar		X	X	
waxed paper		X		
wheels	X			
wood chips		X		

Recyclables and Collectibles

This suggested recyclables and collectibles list consists of items that each class should have to do the hands-on, minds-on science activities as outlined in this guide. This does not include items listed in the other lists.

	Position and Motion Appendix E	Liquids and Solids Appendix F	Air and Water Appendix G	Animals Appendix H
Supply List				
advertising flyers			X	X
bowls		X		
coffee cans				
elastic bands		X	X	
food cartons (empty)		X		
glass jars with lids (mason, baby food, etc.)	X	X		
gravel, small stones		X	X	
ice cream container lids (large)			X	
magazines/old calendar scenes			X	X
milk cartons, 1 L		X		
nails		X		
pictures of butterflies				X
pictures of chick development				X
pictures of other organisms				X
pictures of people				
preventing pollution			X	
pictures of pollutants			X	
plants			X	
plastic containers with lids				X
plastic drinking glasses		X		
plastic lids			X	
plastic meat trays		X		
plastic tubs (margarine)		X		
pop bottles, 1-L and 2-L sizes	X		X	

	Position and Motion Appendix E	Liquids and Solids Appendix F	Air and Water Appendix G	Animals Appendix H
rocks		X		
scrap material (wool, cotton, nylon, fleece, old tent or kite, etc.)		X	X	
soil			X	
spoons, metal or plastic		X		X
strainers			X	
streamers/ribbons			X	
string			X	
twigs		X	X	
water	X	X	X	
wooden boards, new, weathered			X	

Appendix B: Video Resources

Education Media Library

The Education Media Library has over 5000 titles in its video collection. All programs have been evaluated for curriculum fit and are intended to support the Nova Scotia Public School Program. They may be used by teachers and others engaged in public education in Nova Scotia. Public performance rights have been purchased so that all videos can be shown in classroom settings to students and educators.

The Media Library offers video loans and video dubbing services. Loan videos have an assigned number that begins with the number 2, e.g., 23456. These videos may be borrowed and returned. The videos that are available through dubbing begin with a V, e.g., V1123. The Media Library makes a copy of these videos, which is then retained by the client. Dubbing services are provided for the nominal recovery cost of the videocassette on which the programs are taped. Tape prices range from $1.44 for a 20-minute tape to $2.59 for a two-hour tape. Programs can be stacked onto one tape (e.g., four 30-minute programs onto one tape) or be dubbed on separate tapes.

The Learning Resources and Technology website <http://lrt.EDnet.ns.ca> provides a rich variety of curriculum-related resources to help teachers in their classrooms. Teachers can search the video database, find out about educational software, search the database of curriculum-related websites, download curriculum catalogues, access workshops on web safety, and find tips on integrating technology into the classroom.

Title	Description
Physical Science: Relative Position and Motion	
3–2–1 Classroom Contact: Motion and Forces: Play Ball (23323) 15 min., 2000	This program is designed for grade 1–2 students. An object cannot move unless acted upon by some force that sets it in motion. We apply force when we hit a baseball or shoot a basketball through a hoop. Another force is at work—gravity.
Discovering Simple Machines: Compound Machines (V2508) 13 min., 2001	This video shows how the six simple machines can be found in very complicated machines and equipment from giant construction equipment to tools found around the house. The six simple machines are the basis for all other machines. Many examples of compound machines, machines that use two or more simple machines, are presented and analysed by Axle the Robot. Teacher's guide and blackline masters are included.
Force and Friction (20940) 20 min., 1986	This program introduces force as pushes, pulls, and twists and the concept that gravity is a force that pulls things downwards. Students learn that friction is a force that can slow movement or stop it and that falling things are slowed by a resistance force called drag. *Force and Friction* also illustrates how we overcome and maximize friction and drag in everyday life.
How Things Move (23327) 16 min., 2000	Roll, slide, bounce, and spin: students in grades primary–2 will have fun watching objects and predicting movement while developing scientific skills about force and motion.
Simple Machines: A First Look (23372) 17 min., 2001	This program shows students experimenting with a variety of simple machines.
Simple Machines and Motion (22647) 28 min., 1990	This program explains what makes things move. It looks at inclined planes, levers, and pulleys.
The Mechanics of Toys (V2131) 13 min., 1995	Toys move by a variety of means, some internal, some external. This video explains gravity, batteries, friction, momentum, cranks, flywheels, and generators, all of which are employed to propel toys that are used by children of all ages. Brief question sheet is included.

Title	Description
Physical Science: Liquids and Solids	
3–2–1 Classroom Contact: Air Is Matter, Air Is There (23322) 15 min., 2000	This short program intended for grade 2 students explores air. It discusses the properties of air, volume, and mass. It incorporates the senses and features tabletop experiments or demonstrations.
Learning about Liquids, Solids and Gases (22261) 11 min., 1975	The program establishes the similarities and differences among the three forms of matter. It demonstrates how heat is related to changes of state and helps students to understand the molecular nature of matter. A group of children on a winter outing demonstrates, through a series of common experiences, the basic properties of the three states of matter and how these states are directly related to the kinetic-molecular theory of matter. A brief study sheet is included.
Learning about Water (22259) 11 min., 1975	Photographs of Earth suspended in space illustrate that much of the Earth is covered by water. Students conduct a series of experiments that illustrate the water cycle. Topics include liquid, vapour, evaporation, condensation, stored energy, moving energy, and erosion. The video shows that water is essential to all life on Earth. A brief study sheet is included.
Matter: Solids, Liquids, and Gases (23317) 18 min., 2001	Everything on Earth is made of matter. The program intended for grade 2 students presents general information about matter, its properties, and its states.
Properties of Matter (23333) 20 min., 2003	Students will learn that our entire world is made of matter, including things we do not see, like the air we breathe. Using our five senses to identify the properties of an object—size, weight, shape, colour, and temperature—students identify some of the tools that extend our senses and are used to determine that matter has mass and takes up space, and that it can exist in different states—solid, liquids, or gases. Brief liner notes are printed on the video case.
Solid, Liquid, Gas (23063) 14 min., 1986	This National Geographic video introduces students to the three forms of matter and illustrates basic concepts about their properties, as children experiment with everyday materials. It includes observations of bicycles, waterfalls, weather vanes, and balloons.

Title	Description
Water Cycle—Oceanography (23119) 50 min.	This tape includes two 25-minute programs. *Water Cycle*: Did you know that most of the water on the planet is the same water that's been here since the Earth was formed? Using a whimsical model made of a tiny staircase, wind-up penguins, and a bicycle tire, Bill Nye, the science guy, demonstrates the phases of the water cycle: evaporation, condensation, precipitation, and collection. Science kids hit the streets to show us some easy things we all can do to keep the water supply clean and healthy. *Oceanography—Surf's Up!* Get the current information as Bill Nye, the science guy, explains why oceans are salty and explores the ocean currents. Catch a wave with the science guy's parody of the Beach Boys' hit "California Girls." Liner notes are included.
Where Does the Rain Go after It Falls? (21057) 11 min., 1987	Looking through a window during a thunderstorm, Wondercat begins to think about what happens to the rain after it falls. He lets his curiosity and a helpful narrator guide him to a basic understanding of the water cycle. He learns about water running off into rivers and oceans, sinking into the ground, or evaporating into the air to become clouds and to fall as rain again. A study sheet is included.
Earth and Space Science: Air and Water in the Environment	
3–2–1 Classroom Contact: Air Is Matter, Air Is There (23322) 15 min., 2000	This short program intended for grade 2 students explores air. It discusses the properties of air, volume, and mass. It incorporates the senses and features tabletop experiments or demonstrations.
Air: Climate (23340) 20 min., 2000	When it comes to weather and climate, Canada has it all, from the humid rainforests of British Columbia to the badlands of Alberta, from the Arctic to fertile farmland of the Great Lakes and St. Lawrence River region. This program takes students on a tour of the regions and seasons, illustrating extremes of weather and climate. Liner notes are printed on the video jacket.
Clouds, Weather and Life V2410 13 min., 1999	This video is for use for grades primary–4 as an introduction to the hydrologic, or water, cycle and to basic cloud identification. The program explains five scientific concepts of weather: the hydrologic cycle; life is dependent upon this cycle; the sun is the causative agent that powers the formation of clouds and the water cycle; the three states of water (gas, liquid, and solid); and weather is changeable in time and place. A brief teacher's guide is included.

Title	Description
Drying Out (20942) 20 min., 1986	How do things dry out? This program explores both evaporation and condensation, showing how we use scientific principles to quicken or slow each process in different situations. *Drying Out* challenges viewers to use logical thought to explain everyday events.
Gauging the Weather (21669) 10 min., 1995	There's been a long dry spell on Fourways Farm. Then it rains, and Godfrey the Horse is convinced that it's going to get worse. His friends set up a measuring device. The concept is weather.
Learning about Air (22260) 11 min., 1975	A mime, Mr. Air, greets the viewer and highlights the most fundamental characteristics of air throughout the program. Physical and chemical properties of air are demonstrated through a series of simple experiments. Air is established as a mixture of invisible gases that take up space, have weight, and exert pressure to make sounds and move things around. In addition to its basic role as a source of physical energy, air is shown to provide chemical energy for both inanimate objects, such as a candle, and animate objects, all living things. Topics include air, weight, mixture, pressure, force, wind, and energy. A brief study sheet is included.
Life Science: Animal Growth and Changes	
Animal Lifecycles (23335) 15 min., 2002	The stages of life through which animals pass—birth, growth, maturation, reproduction, and death—make up the life cycle. Students will learn about the roles of these stages in the cycle and why they are critical to the survival of each species. Students will look at the life cycle of mammals, amphibians, birds, reptiles, fish, and insects.
Butterflies (22319) 30 min., 1998	This program features series host Celia who is about to set free a monarch butterfly. Students will learn about the life cycle of a butterfly, habitats, how caterpillars fool their enemies, the function of the parts of a butterfly, and how to tag a monarch.
Habitats (23318) 18 min., 2000	This program intended for elementary students (grades primary–3) features the importance of habitats of plants and animals with live-action film and animation. Students will explore the tundra, desert, grassland, forests, and waterways of the world and learn about the plants and animals that live there.

Title	Description
Habitats: Homes for Living Things (23324) 15 min., 2000	This program, aimed at students in grades primary–2, explores ways that plants and animals find to meet their needs in the environment where they live. Students will visit a pond, a desert, a forest, a rainforest, and other habitats to discover how plants and animals adapt to survive in different climates and landscapes.
Home Sweet Home: Animal Homes (23321) 30 min., 1998	Animals build homes suitable to their needs in this video, which describes how animals behave to help them grow and survive.
Insects: Cycle of Life (21945) 19 min., 1987	Insect stages of development, food, homes and life processes are captured through explanation and beautiful photography in this program.
Life and Living Series: Starting Life (V2368) 15 min., 1996	This program features a family who visits a farm and observes three animals having babies—a duck, a lamb, and a calf. This program compares animal births to human. Teacher preview is suggested so young children are prepared for live animal births.
See How They Grow Series (22252–22256) 30 min., 1993, 1996	This series shows animals as they grow from the first hours of life. The six titles in this series include: Desert Animals, Farm Animals, Insects and Spiders, Jungle Animals, Pond Animals, and Tree Animals.
That's My Baby? (23320) 30 min., 1998	This program shows how baby animals from birds to elephants are cared for and the kind of care they require to live and grow. Students will see different ways that animals move and basic changes in humans as they grow.

Appendix C: Classroom Management

Group Organization

Many of the science activities presented involve children working in small groups of three to four students. For some young students, this may be one of their first opportunities to work co-operatively with others, sharing resources and ideas. To make these group experiences more productive, you may find it helpful to assign the following roles/ tasks to the members of each group:

Collector	Recorder	Reporter	Quality Control
• gathers supplies • puts supplies away • cleans up	• asks group for ideas • writes down group's ideas • ensures that all members have completed their work	• shows what the group did • explains what the group did	• listens • participates • shares • helps

Assessment Rubric

A comprehensive evaluation of a student's progress in science should include a performance-based assessment. Areas for consideration may include

- problem comprehension
- co-operative learning
- problem solving
- equipment use
- communication of results

The rubrics on the following page may be used for performance-based assessment. Ideally, a student will be assessed every few weeks, and one or more students may be observed during each activity. The child is observed informally during the activity, and the observed levels of achievement are highlighted on the rubric. The dated rubrics may then be added to the child's assessment portfolio and referred to for evaluation. Levels of performance and progress are easily tracked and any areas of concern identified.

The use of a clipboard and highlighter allows for ease of recording as observations are made.

Performance Assessment Rubric

Name:	**Date:**
Activity:	

Problem Comprehension

4 has complete understanding of the problem
3 understands most of the problem
2 understands some of the problem
1 tries but does not understand the problem
0 makes no attempt to understand the problem

Problem Solving

4 has a plan that could lead to the correct solution
3 follows basic procedure with minor error or omission
2 follows partially correct procedure with major error
1 plans inappropriately
0 makes no attempt to solve the problem

Co-operative Learning

4 consistently encourages work toward the group goals with skill and sensitivity
3 fulfils individual role with skill and sensitivity without prompting
2 fulfils individual role with sensitivity but needs occasional prompting
1 contributes only when prompted and needs reminders regarding sensitivity
0 refuses to work as a group member and/or shows no consideration for others

Equipment Use

4 accurately uses all appropriate tools to gather data
3 effectively uses some of the appropriate tools to gather data with minor errors
2 attempts to use the appropriate tools resulting in inaccurate data
1 does not use the appropriate tools
0 makes no attempt to collect data using the tools

Communication of Results

4 gives concise explanation of method with conclusion based on data collected
3 gives satisfactory explanation of method with conclusion based on data collected
2 gives incomplete explanation of method and/or conclusion partially supported by data
1 gives explanation that cannot be understood/makes no reference to data
0 gives no explanation/gives no conclusion/presents no data

Appendix D: Journals and Logbooks

Logbooks and journals are a part of many occupations and as such are highly reflective of the world of work. Many highly successful people keep a daily journal as a habit that helps them develop insights into their work. A journal can include sketches, diagrams, notes, quotes, questions, excerpts, and drafts. Scientists recording this way are keeping track of all their observations and so on. This is their "private science."

The logbook or journal may be used to develop a final product, such as a report, design, profile, fictional text, or dramatization, or it may be a way of tracking progress and developing ideas and insights. The final product is the young scientists "Public Science."

Students need to see the value of their science log writing, not only through frequent responses from the teacher, including assessments that "count," but also through assignments that provide linkages to previous and subsequent learning or that meet specific learning and/or personal needs for the student.

Since the logbook or journal can contain very personal thoughts and ideas stimulated by thought-provoking questions, the teacher must make provisions to honour the confidentiality of students' work, except where legally required to do otherwise.

Elements of the following journal assessment rubrics can be used in various combinations.

Journal Comment Rubric

Name:	**Comments**:
Ideas • interprets and analyses issues • describes new insight(s)	
Critical Thinking • identifies assumptions underlying an issue, problem, or point of view • probes beneath the surface for layers of significance • explains an issue from multiple perspectives	
Ethical Reasoning • uses rules or standards of right/wrong or good/bad to guide debate/reflection	
Personal Experience • connects insights/thoughts to personal experience	
Development • develops content thoroughly	

Journal Scoring Rubric

	1	2	3	Assessment Student/Teacher	
Ideas	states facts	interprets and/or analyses an issue	interprets, analyses, and describes a new insight(s)		
Critical Thinking	responds to a stated issue, problem, or point of view	identifies assumptions underlying an issue, problem, or point of view	questions assumptions underlying an issue, problem, or point of view		
Critical Thinking	responds to a stated issue, problem, or point of view	identifies more than one layer of significance	probes beneath the surface for multiple layers of significance		
Critical Thinking	describes a single response to a situation or problem	describes several responses to a situation or problem	sees implications of alternative responses to a situation or problem		
Critical Thinking	explains an issue from one perspective	explains an issue from more than one perspective	explains an issue from multiple perspectives		
Ethical Reasoning	does not consider ethical aspects of issues	recognizes and often applies standards/rules	uses rules or standards of right/wrong or good/bad to guide debate/reflection		
Personal Experience	does not personalize journal	makes some connection to personal experience	connects insights and thoughts to personal experience		
Development	develops content minimally	develops content adequately	develops content thoroughly		
Name:			**Score:**		

Appendix E: Activities for Physical Science: Relative Position and Motion

In the following appendices you will find activities you may wish to use or modify to support student achievement in meeting specific curriculum outcomes at the grade 2 level. These activities are referenced under column four, Resources/Notes, in each unit on the two-page spread and are meant to add to other hands-on learning experiences teachers may provide to meet curriculum outcomes.

You can also find well-written, easy-to-follow activities and curriculum links to science in the following resources in, or available to, schools through the Nova Scotia School Book Bureau:

National Geographic: *Windows on Literacy* (13150)

Pan-Canadian Science Place, Complete Grade Two Unit (13929)

Please note that some of the activities in the above resources are referenced under column four in Resources/Notes. Activities from *Science Resource Centre: 240 Learning Centre Activities* are not referenced. Teachers are encouraged to look through this valuable resource to find activities for science and other curriculum areas as links to science, as needed.

Activity 1: Position

Outcome

Students will be expected to

- use materials to build objects that move in a specific manner and describe the object's position relative to other objects (201-3, 100-23, 203-2)

Assessment

- Students are able to describe the position of objects.
- Students are able to answer questions that arise from viewing the position of objects from different perspectives.

Questions

- How did the position of the oject change based on the position you viewed it from?
- What are some of the words you used to describe the position of various objects?

Materials

- geometric solids
- paper
- pencil

Procedure

Here are words you can use to describe the position of an object.

- behind
- in back of
- beside
- below
- in front of
- under
- inside
- over
- on top of
- underneath
- outside
- above
- left
- right
- middle
- centre

1. Build a model using five pieces from a geometric solids kit.
2. Place it in the middle of your desk.
3. Sit behind your desk and draw your model carefully.
4. Do not move your model.
5. Now sit in front of your desk and draw your model again.
6. Write about the ways your drawings are different.

Activity 2: Describe the Position of an Object

Outcome

Students will be expected to

- use materials to build objects that move in a specific manner and describe the object's position relative to other objects (201-3, 100-23, 203-2)

Assessment

- Compare the work to see if everyone ended up with the same picture.
- Check to see if the second picture is opposite to the first one.

Questions

- How can you show the meaning of these terms?
- Compare your pictures. Do the pictures look the same or different? Explain.

Materials

- worksheet
- paper
- pencil
- common/classroom objects for demonstration

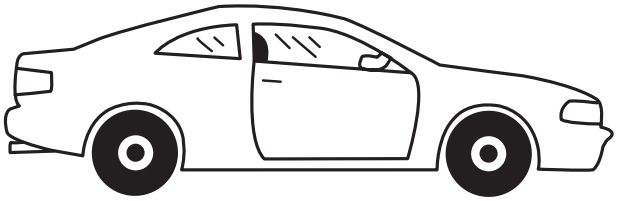
Procedure

1. Discuss the following terms:
   - behind
   - in front of
   - under
   - on top of
   - in back of
   - beside
   - above
   - over
2. Provide the worksheet with directions to complete the pictures.

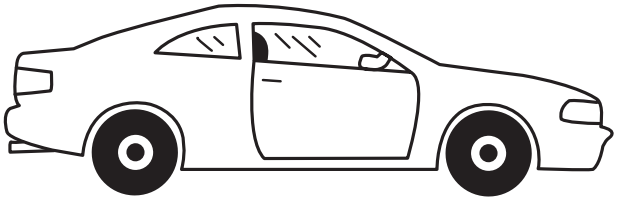
Describe the Position of an Object Activity Sheet

Follow these directions to complete the pictures.

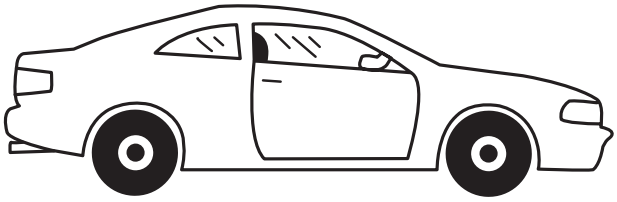
1. Draw the road under the car.



2. Draw a trailer behind the car.



3. Draw a cow in front of the car.



Activity 3: Observing Wind-Up Toys

Outcome

Students will be expected to

- investigate and describe motion in terms of patterns of movement, change in position, and orientation relative to other objects and identify factors that affect movement (100-25, 100-22)

Assessment

- Students present their results to the class and post their maps.
- Students are able to describe the motion of their toy.

Questions

- How does your toy move?
- What path does it follow?

Materials

- wind-up toys
- paper
- pencil

Procedure

1. Prior to this activity, ask students to bring examples of working wind-up toys to class.
2. Depending on number of toys available, divide the class into pairs or small groups.
3. The students observe their toy as it moves and create a map that depicts the path it follows. They add notes to describe any particular motion it exhibits: spinning, jumping, bouncing, etc.
4. Students should illustrate the toy test on the map.

Activity 4: Following Printed Instructions for Building a Model

Outcome

Students will be expected to

- use materials to build objects that move in a specific manner and describe the object's position relative to other objects (201-3, 100-23, 203-2)

Assessment

The students create the models, complete an illustration in their journals, and describe the position of the components.

Questions

- How did you build your model?
- What problems did you encounter?

Materials

- suitable construction kit
- geometric solids

Procedure

1. Prior to this activity, engage the students in a discussion/exploration of these terms:
   - behind
   - between
   - in front of
   - above
   - to the left of
   - below
   - to the right
   - beside
2. Provide students with printed step-by-step directions, which are based on the terms above, for constructing a model, e.g., "Place a sphere behind a pyramid."
3. Give each student pair/team a collection of appropriate building materials (e.g., Lego, Dacta, K'nex, geometric solids).
4. Give the directions you choose.

Activity 5: Using Ramps

Outcomes

Students will be expected to

- question, demonstrate, and assess simple conclusions about the various factors that affect the motion of an object (200-3, 200-1, 200-2)
- investigate and describe motion in terms of patterns of movement, change in position, and orientation relative to other objects and identify factors that affect movement (100-25, 100-22)

Assessment

- Students are able to record their results in their journals.
- Students are able to describe what they observed.

Questions

- Which bottle will travel the greatest distance from the base of the ramp?
- Do some bottles roll better than others? How could you tell?

Materials

- ramps
- blocks
- bottles with caps
- journals

Procedure

1. This activity should be done following students' investigations of ramps. Once they have seen how soup cans will roll, have them bring in a 2-L pop bottle filled with something (not a liquid) of their choice, e.g., crayons, marbles, sand, or rocks.
2. Put the cap on the bottle.
3. Set up two ramps. Have students take turns releasing their bottles. Measure distances/observe results. Do some bottles roll better? Was each bottle filled to the top or partly filled and did this affect the results? For example, marbles may roll around inside if the bottle is not filled to the top and would affect the way it rolled.

Activity 6: Building a Downhill Racer

Outcome

Students will be expected to

- question, demonstrate, and assess simple conclusions about the various factors that affect the motion of an object (200-3, 200-1, 200-2)

Assessment

- Observe students' participation. Each team collaborates to design and build their racer.
- Students are able to build a racer.
- Students are able to design a fair test using their racer.

Questions

- How do I build a downhill racer that works effectively?
- What is a fair test?

Materials

- ramps
- blocks
- suitable building supplies

Procedure

1. Introduce this activity once students have had a chance to explore ramps and rollers.
2. Provide teams of students with building materials (found or kits of building supplies) to build their racers.
3. Hold this event in a hallway or gymnasium where a number of similar ramps (fair testing) can be assembled, facing one direction.
4. Challenge teams to design, test, and modify to create the best racer.

Activity 7: Collecting Evidence

Outcome

Students will be expected to

- question, demonstrate, and assess simple conclusions about the various factors that affect the motion of an object (200-3, 200-1, 200-2)

Assessment

Students should be able to apply the principles of fair testing to other problems.

Questions

- What affects the motion of my object?
- What tools can I use to collect data about my test?
- What evidence do I have to show that my test was fair?

Materials

- ramps
- blocks
- rollers
- measuring tape
- pencil
- paper

Procedure

1. Student teams can identify factors that will affect the motion of their object. They can decide which to test.
2. Make predictions.
3. Record their results.
4. Discuss, as a team, what makes their procedure "fair."
5. Discuss, with the class, each group's procedures, tools, and evidence for their object.
6. Make a class data table.

Appendix F: Activities for Physical Science: Liquids and Solids

Activity 8: Ice Melt Race

Outcome

Students will be expected to

- predict, investigate, and describe the characteristics of and changes in the three states of water (103-6, 200-3)

Assessment

Students should be able to communicate to classmates strategies used to melt ice. A class list of ways to melt ice can be composed. Students can draw pictures of how they melted their ice cubes in their science journals or on activity sheets.

Question

What is the quickest way to melt an ice cube? (You are not to put the ice cube in your mouth.)

Safety

Ice cubes should be put into a tied baggie to avoid discomfort to hands.

Materials

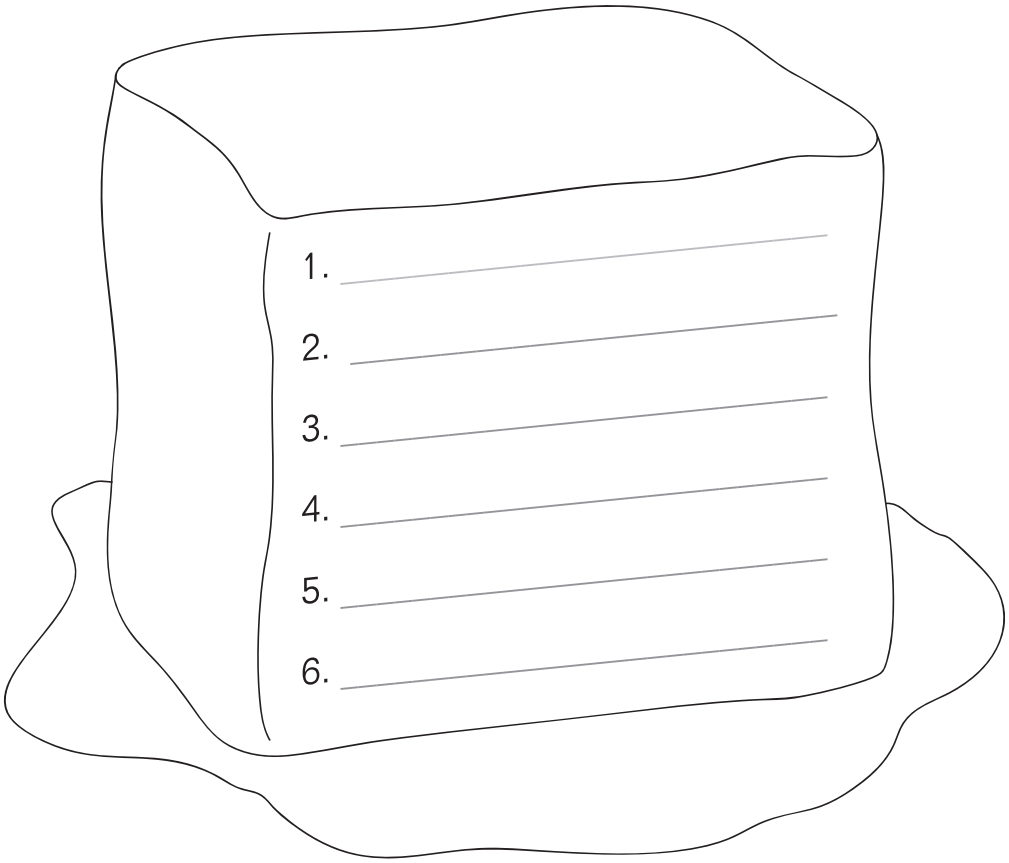
- timer or clock with second hand
- ice cubes in baggie
- chart paper (class list)
- student paper or journal
- activity sheet

Procedure

1. Students can examine the ice cube and discuss words to describe it.
2. Students predict what will happen to the ice if left out of the freezer.
3. Students are then to melt the ice cube as quickly as possible. A time limit could be assigned and a clock with a second hand used to time.
4. Record ways to melt ice.
5. Draw a picture and explain how you melted your ice cube.

Ice Melt Race Activity Sheet

List ways to melt ice.



Draw a picture and explain how you melted your ice cube.

Activity 9: Liquid to Solid

Outcomes

Students will be expected to

- predict, investigate, and describe the characteristics of and changes in the three states of water (103-6, 200-3)

Assessment

Students should be able to predict and describe changes in water when it is frozen and draw and explain changes.

Question

How does water change when it is placed in a freezer?

Materials

- 2 clear plastic glasses
- marker
- 2 bowls
- thermometers
- access to freezer
- activity sheet

Procedure

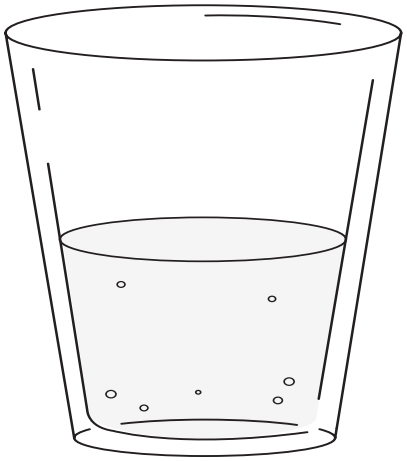
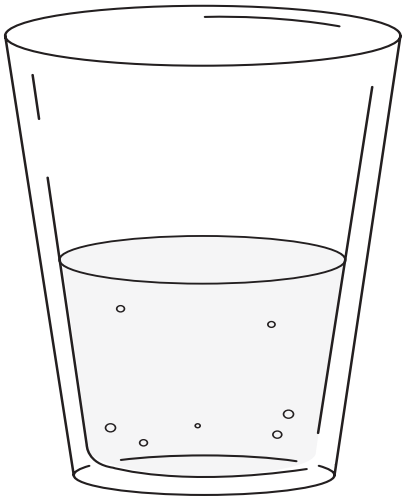
Part 1:

1. This activity spans a two-day period. On the first day, put equal amounts of water in the two plastic glasses. (This can be a teacher demonstration or a group activity, depending on amount of freezer space.) Mark levels on both glasses with a permanent marker.
2. Put one glass, marked "B" in the freezer until the next day. Remove from freezer. Compare level on each glass; mark again. Fill in chart.

Part 2:

1. Now, put ice in one bowl and water in a second bowl. Students should answer the following while exploring: Which form of water can be poured? Which one covers the bottom of the bowl? Which one you can pick up with your hands? Which one changes shape? Have students record their observations on the activity sheet.
2. After the ice has melted, use a thermometer to compare temperatures. Class charts could be started. Properties of solids and properties of liquids could be added to throughout the unit.

Part 1: Liquid to Solid Activity Sheet

Before	After (Draw what you see.)
Glass A  Day 1—tap water	Day 2—room temperature
Glass B  Day 1—tap water	Day 2—freezer

Part 2: Liquid to Solid Activity Sheet

Check ✔

Liquid to Solid

	Ice	**Water**
Which form of water can be poured?		
Which one can you pick up? (not in container)		
Which one changes shape when put in a bowl?		
Which one covers the bottom of a bowl?		
Which one is colder?		
What is the temperature?	(when melted)	(room temperature)

Activity 10: Evaporation—Disappearing Water

Outcome

Students will be expected to

- make and record relevant observations during questioning and investigating the interactions of liquids and solids, using written language, pictures, and charts (201-5, 200-1)

Assessment

- Students are able to predict what will happen to water left in a glass.
- Students are able to record findings on a record sheet.

Question

What happened to the water?

Safety

Keep students a safe distance from the boiling water.

Materials

- plastic glasses, one per group
- markers
- measuring cup
- recording sheet reproduced for each student

Procedure

1. Members of each group pour a measured amount of water into a plastic glass. Water level is marked with a permanent marker. Glasses are placed on a window ledge (preferably with access to sun or heat source).
2. Students check water level after three days. Record on sheet. Pour contents into measuring cup to compare level on first and third day.

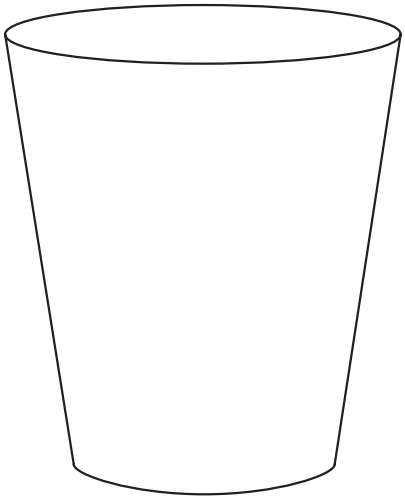
Extension

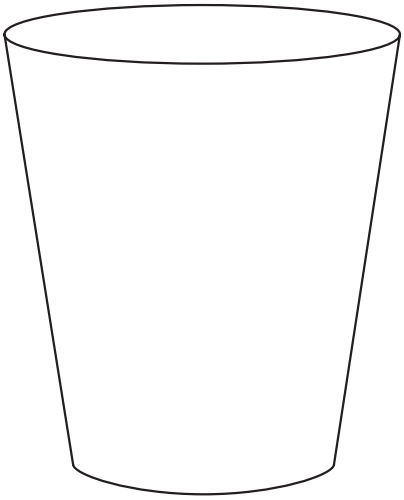
While we see the results of evaporation when we set water in a warm place, we do not actually see it happen. You may wish to boil water so students can see water evaporate before their eyes. Discuss with students how they saw water change from ice to liquid to water vapour or gas.

Evaporation—Disappearing Water Activity Sheet

What happened to the water?

Draw water in each cup.





I filled the container this full.

Later, I saw this amount in my container.

I think this is what happened to the water.

Activity 11: Condensation

Outcome

Students will be expected to

- make and record relevant observations during questioning and investigating the interactions of liquids and solids, using written language, pictures, and charts (201-5, 200-1)

Assessment

- Students are able to understand where the water comes from.
- Students are able to record findings on a record sheet.

Question

Where does the water come from?

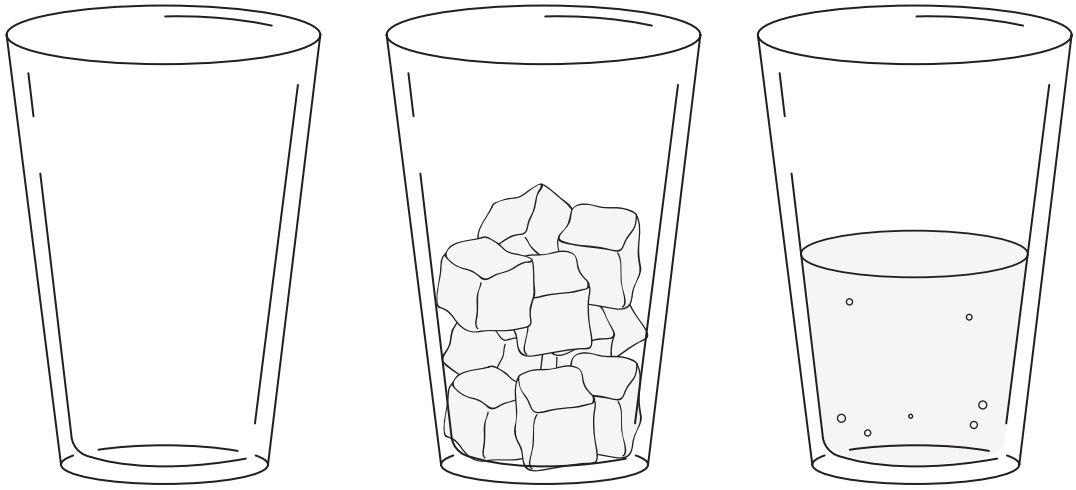
Materials

- two plastic glasses per group
- ice
- access to freezer
- record sheet

Procedure

1. Students place glasses side by side. Fill one glass with ice.
2. Observe and predict what will happen. Share questions and predictions. What happened to the glass with the ice? What happened to the glass with no ice? Where did the water on the outside of the glass come from? Why didn't the empty glass get wet?
3. Record observations on record sheet.

Condensation Activity Sheet



Where do you think the water came from?

Activity 12: Cloud in a Jar (Teacher Demonstration)

Outcomes

Students will be expected to

- make and record relevant observations during questioning and investigating the interactions of liquids and solids, using written language, pictures, and charts (201-5, 200-1)
- predict, investigate, and describe the characteristics of and changes in the three states of water (103-6, 200-3)

Assessment

- Students are able to predict what happened to the ice cubes.
- Students are able to record their observations.

Questions

- Where did the water come from?
- What is water vapour?

Safety

⚠ **Keep students a safe distance from boiling water.**

Materials

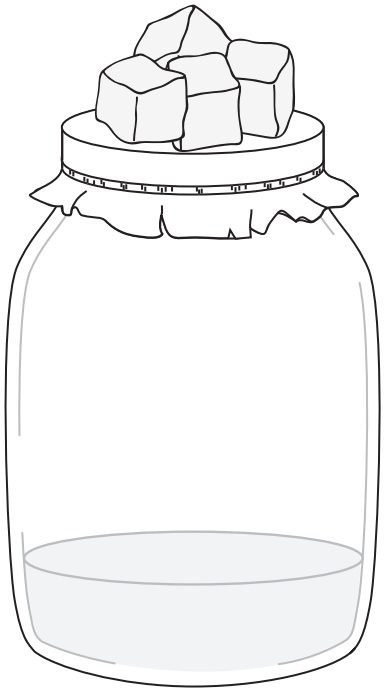
- jar
- plastic wrap
- rubber band
- ice
- water
- electric kettle

Procedure

1. Fill the jar with boiling water. Pour out all but 3 cm of the water. Cover the jar with plastic wrap. Place ice cubes on top of plastic wrap.
2. Students observe for several minutes and respond to the following questions:
   - What happened after the ice was put on top of the jar?
   - Where did the water come from? (It condensed from water vapour in air inside jar.) Compare to the way clouds are formed.
3. Students can complete activity sheet.

Cloud in a Jar Activity Sheet

Draw what happened inside the jar.



What did you see happen after the ice was put on top of the jar?

Where did the water come from?

Explain how clouds are formed.

Activity 13: Rain in the Classroom (Teacher Demonstration)

Outcomes

Students will be expected to

- make and record relevant observations during questioning and investigating the interactions of liquids and solids, using written language, pictures, and charts (201-5, 200-1)
- predict, investigate, and describe the characteristics of and changes in the three states of water (103-6, 200-3)

Assessment

- Students are able to predict and explain where the water comes from.
- Students are able to record findings on sheet provided.

Questions

- Where does the water come from?
- What happened to the outside of the metal pan?

Materials

- metal tray
- two blocks or large books
- metal pan
- ice

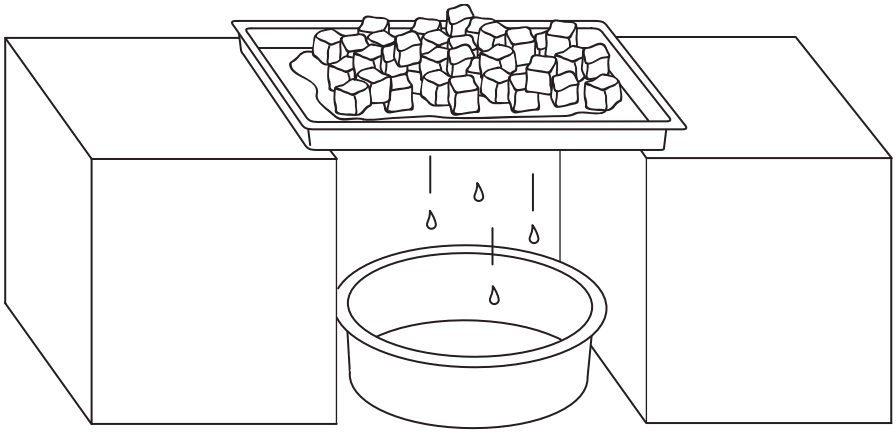
Procedure

1. Set the tray on two blocks so the bottom is exposed to air. Set a pan under the tray. Fill the tray with ice.
2. Ask "What do you think will happen? Where did the water come from?"

Rain in the Classroom Activity Sheet

Where did the water come from?

Make a drawing of the demonstration.



What happened to the tray?

Where did the water come from?

Activity 14: Investigating Solids

Outcome

Students will be expected to

- examine and record the properties and interactions of familiar liquids and solids (100-17, 100-18, 201-5)

Assessment

- Students are able to predict, investigate, and describe properties of solids.
- Students are able to record information on solids.

Questions

- What are some properties of solids?
- How would you describe a solid?

Safety

- Instruct students not to taste or put anything in their mouths.
- Check for allergies.

Materials

- wood
- wax candle
- metal spoon
- nail
- pencil
- sugar
- rice
- modelling clay
- rock
- resealable bag

Procedure

1. Pass out bag of solids (one bag per group of 4–6 students).
2. Ask students to test solids. Generate questions such as, Can your solid bend? What does it feel like? Can it be broken into smaller pieces? What does it smell like? Can you scratch it with your nail or pencil?
3. Have students fill in chart on properties of solids.

Investigating Solids Activity Sheet

Properties of Solids

Solid	What Solid Feels Like ...	What Solid Looks Like ...	Can I Bend It?	Scratch Test With Nail	Smell
candle	smooth	cylinder	yes, but breaks	yes	yes, waxy

Activity 15: Investigating Liquids

Outcome

Students will be expected to

- examine and record the properties and interactions of familiar liquids and solids (100-17, 100-18, 201-5)

Assessment

Students could communicate their observations by completing the table provided. They could also share their discoveries in a whole-class discussion at the end of the lesson.

Questions

- What are some of the properties of a liquid?
- How are liquids different from solids?

Safety

⚠ **You will need to be aware of any allergies your students may have. You will also need to remind your students that it is not safe to touch, taste, or smell any unknown liquids. Explain that the liquids they are about to explore are safe to touch and smell but not taste.**

Materials

- clear plastic cups
- water
- two other liquids to test (e.g., oil, dish detergent, fruit juice, molasses, black tea, liquid tempera paint, honey, etc.)
- meat trays
- eye droppers
- wooden stir sticks
- recording sheets

Procedure

1. Begin the lesson by asking some questions about liquids.
    - What are some things you know about liquids?
    - Do you think all liquids are alike?
    - What are some things we could test to see if liquids are alike or different?
2. Chart the students' responses. Explain to the students that they are going to be doing some experiments today to try to discover the identity of three mystery liquids.
3. Demonstrate how to perform each of the comparison tests on the recording sheet.
4. Show students the proper way to smell a liquid, by waving their hand over the item they want to smell.

5. Show the students how to test the runniness of a liquid by putting a drop of each liquid on a meat tray then tipping the tray and observing which one moves the fastest/furthest.
6. Show the students how to test the thickness of a liquid by stirring the liquid with a stir stick or spoon and seeing how easily/quickly it stirs.
7. Once you have reviewed how to perform each test, organize the students into small groups (three to four students) and hand them the three liquids to be investigated in clear plastic cups marked, A (water), B (test liquid #2—choose from oil, dish detergent, and liquid soap), and C (test liquid #3—choose from fruit juice, black tea, molasses, honey, and paint). Also give each student a recording sheet and any equipment needed to perform the tests (meat tray, stir sticks, eye dropper). Challenge the students to perform the tests indicated on the recording sheet and try to identify each liquid. As a class, discuss their findings.

Investigating Liquids Activity Sheet

Which liquid is it?

Name: _____ Date: _____

Test	A	B	C
What does it smell like?			
Can you see through it?			
How does it feel?			
Which liquid is the runniest?			
Which liquid is the thickest?			
What colour is the liquid?			

Liquid _____ smells the strongest.
Liquid _____ does not smell.
You can see through liquid_____ .
Liquid _____ is hard to see through.
Liquid _____ feels slippery.
Liquid _____ is the thickest.
Liquid _____ is the runniest.

I think liquid A is _____ .
I think liquid B is _____ .
I think liquid C is _____ .

Activity 16: Water Race

Outcome

Students will be expected to

- examine and record the properties and interactions of familiar liquids and solids (100-17, 100-18, 201-5)

Assessment

- Students are able to predict and test which material will absorb liquid best.
- Students are able to record observations.

Questions

- Which material will soak up the most water?
- What are some of the differences between the materials?

Materials

- water
- eye dropper
- wax paper
- cardboard
- white paper
- construction paper
- metric ruler

Procedure

1. Select several materials of equal length. Place a drop of water on each of the materials 2 cm from one end. Watch how the water travels by itself down the materials.
2. Record how far each drop travelled before it was absorbed by the materials.

Water Race Activity Sheet

Properties of Liquids

Name: _____ Date: _____

Water Race

Material	**Least to most absorbent 1 = least, 5 = most**
wax paper	
white paper	
construction paper	
plastic wrap	
cardboard	

Activity 17: Liquid Race

Outcome

Students will be expected to

- demonstrate and communicate their evaluations of sinking and floating as they relate to various liquids and objects (202-2, 100-21, 202-8, 203-3)

Assessment

Students are able to test liquids and fill in record sheet.

Question

Which liquid flows most easily?

Materials

- Petrie dishes or similar containers
- shiny poster board
- mustard
- ketchup
- molasses
- vinegar
- dish detergent
- spoon
- paper towel

Procedure

1. Look at several Petrie dishes (or any other same size containers), one for each of the liquids you are going to use. Each dish contains an equal amount of liquid. For example, dish #1 may be water, dish #2 may be vinegar, and so on. Then place an equal amount of poster board on top of each of the liquids. A 5 cm x 5 cm sample is suggested.
2. Observe if the paper floats on the liquid. Observe if any of the liquid is absorbed into the poster board.

Extension

An extension of this activity would be to see whether temperature affects absorption and viscosity. Cool some ketchup by placing it in the refrigerator. Heat some ketchup by placing it in the sun or a warm area. Test.

Liquid Race Activity Sheet

Name: _____ Date: _____

List liquids in order from slowest to fastest.

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

Which liquid flowed fastest?

_____

Which liquid flowed most slowly?

_____

Activity 18: Mixing Liquids

Outcome

Students will be expected to

- demonstrate and communicate their evaluations of sinking and floating as they relate to various liquids and objects (202-2, 100-21, 202-8, 203-3)

Assessment

- Students are able to record their observations on the chart provided.
- Students are able to observe differences in liquids when they are mixed.

Questions

- Do all liquids mix?
- What changes did you observe when the liquids were mixed?

Safety

- **Remind students not to taste their new mixtures.**

Materials

- jars (baby food type are good)
- water
- milk
- oil
- vinegar
- syrup
- fruit juice
- Italian dressing
- recording sheet

Procedure

1. Organize the students into small groups.
2. Provide each group with five jars with lids, the liquids to be explored, and a recording sheet for each group member.
3. Explain to the students that they are to draw a picture on the recording sheet of what the liquids in the jar look like after they are mixed together. Remind them to show the colour and to label any layers that may form.
4. After all the students have had an opportunity to test all the liquids and record their findings, have them discuss, as a class, what they have observed and discovered.

Extension

The students could choose other liquids they would like to test to see if they will mix.

Mixing Liquids Activity Sheet

Name: _____ Date: _____

Mixture	**Drawing**
Vegetable oil and water	
Fruit juice and syrup	
Water and vinegar	
Salad dressing (e.g., Italian) and milk	

Name two liquids that mixed.

_____

How do you know they mixed? What did you see?

_____

_____

_____

_____

Activity 19: Exploring Solids in Liquids

Outcome

Students will be expected to

- demonstrate and communicate their evaluations of sinking and floating as they relate to various liquids and objects (202-2, 100-21, 202-8, 203-3)

Assessment

Students could communicate their observations by completing the table provided.

Question

Will an object float or sink on oil or on water?

Materials

- clear plastic cups
- collections of everyday objects (paper clip, button, penny, marble, eraser, paper, leaf, fabric, etc.)
- oil
- water
- observation sheets (the teacher may find it easier to fill in all the items to be tested prior to copying the recording sheet)

Procedure

1. Organize the students in groups of three or four. Provide each group with recording sheets (one per student), a tall, clear cup filled with oil and water, and a collection of everyday objects the students have gathered.
2. Have the students carefully place the objects in the glass and record the results on their record sheets.
3. After all the students have had an opportunity to test all the objects, discuss, as a class, what they have observed.

Extension

Complete the same activity using other liquids, e.g., honey, vinegar, dish detergent, shampoo, molasses.

Exploring Solids in Liquids Activity Sheet

Floating or Sinking

Name: _____ Date: _____

Object	Sinks through Water and Oil Yes/No	Floats on Water Yes/No	Floats on Oil Yes/No

What did you discover? (write and draw)

Activity 20: Mixing Solids and Liquids

Outcome

Students will be expected to

- demonstrate and communicate their evaluations of sinking and floating as they relate to various liquids and objects (202-2, 100-21, 202-8, 203-3)

Assessment

Students could communicate their observations by completing the table provided. They could also complete a journal page by drawing and writing about what they saw after they mixed the solid and the liquid.

Question

Do all solids and liquids mix?

Materials

- clear plastic cups
- water
- salt
- sand
- wooden stir sticks
- recording sheets

Procedure

1. Organize the students into groups of three or four. Discuss the term **dissolve**. Provide each group with recording sheets (one per student), three clear cups filled with water, and small containers of sand and salt (film canisters are good for this).
2. Have the students mix the salt in one glass of water and record their findings. Then have them mix the sand in the second glass of water and record their findings. The third glass of water is used to compare. The students may find it helpful to label their cups as they create their mixtures.
3. After all the students have had an opportunity to test all the solids and fill in their recording sheets, the class can discuss their findings.

Extension

Complete the same activity using other solids, e.g., rice, beans, powdered drink mix, flour, pepper, coffee beans. Complete the same activity testing solids in other liquids.

Mixing Solids and Liquids Activity Sheet

Will the solid and the liquid mix?

Name: _____ Date: _____

The cup of water looks like this. Draw a picture.

I mixed the salt and water.
The salt **dissolved/did not dissolve** in the water.
This is what I saw. Draw a picture.

I mixed the sand and water.
The sand **dissolved/did not dissolve** in the water.
This is what I saw. Draw a picture.

Activity 21: Can You Design a Boat That Will Float a Cargo?

Outcome

Students will be expected to

- demonstrate and communicate their evaluations of sinking and floating as it relates to various liquids and objects (202-2, 100-21, 202-8, 203-3)

Assessment

Students are able to communicate their observations by completing journal entries describing their boat design using both illustrations and writing. They are able to complete a journal page by drawing and writing about what happened when they tested their boat design. In groups, students are able to orally present their boat design and findings to the class.

Questions

- What type of boat will hold the most cargo?
- What shape was the boat that held the most cargo?

Materials

- large buckets/containers
- water
- materials to use to build the boats/rafts (clay, linking cubes, aluminum foil, empty milk containers, etc.)
- cargo (pennies, linking cubes, etc.)
- science journal or recording sheets

Procedure

1. This activity may take several classes to complete. First ask your students to predict if the cargo you have chosen will sink or float. Demonstrate that the cargo will sink.
2. Organize the class into small groups then challenge the students to design a boat/raft that will float the cargo using the materials provided. Encourage them to think about what they may know about the materials by thinking about some of the recent liquid and solid explorations we have done. Also encourage them to be creative.
3. Have the students decide on the material(s) they want to use, design the boat, draw, and write about what they have done. What material did they use? Why did they choose that material? Is the bottom flat? How tall are the sides?
4. Then have the students test their boats in containers of water. Have them record whether or not their boat floated and how much cargo it would hold before it sunk.
5. Have the students share their boat designs and findings with the class.

Extension

Have the students draw and write how they could redesign their boat/raft to make it better. Then have them redesign their boats and test the results.

Activity 22: Magic Mud

Outcomes

Students will be expected to

- select and use solids, liquids, and appropriate tools to create new materials that have characteristics different from the original components (100-19, 200-4, 201-3, 100-20)
- identify and use a variety of sources to get ideas for creating new materials (201-7)

Assessment

Students could communicate their observations by orally sharing their observations with the class and by completing a journal page.

Question

Do you think it is a liquid or a solid?

Materials

- wide plastic tubs (large margarine containers or sour cream containers)
- water
- measuring cups
- spoons/stir sticks
- cornstarch
- recipe cards (if you need them, see procedure)
- paper towel
- recording sheets

Procedure

1. Divide the class into partners or small groups and tell them they are going to mix some liquids and solids together to make something new—magic mud.
2. Give each group a plastic container, a measuring cup, water, and cornstarch. Have them follow the magic mud recipe that can be written out on the board or given to each group on a recipe card (you may want to discuss with the class how to read a recipe). As the students are working, circulate and listen to the discussions. You can ask the students the following questions as you are circulating:
   - Do you think the mixture is a liquid or a solid?
   - What makes you think this?
   - What happens when you squeeze it in your hand?
   - What happens when you hold mixture loosely?
3. Have the students complete a journal page about their magic mud discoveries. Invite the students to share and discuss what they have discovered.

Magic Mud Activity Sheet

Ingredients

- 75 ml cornstarch
- 45 ml water

Directions

Place cornstarch in medium-sized container.

Add water and mix.

- Play with the mixture with your hands.
- Squeeze the mixture then let go. What happens?
- How does the mixture feel when you squeeze it?
- How does the mixture feel when you let it go?

Activity 23: Making New Materials—Creating Clay

Outcomes

Students will be expected to

- select and use solids, liquids, and appropriate tools to create new materials that have characteristics different from the original components (100-19, 200-4, 201-3, 100-20)
- identify and use a variety of sources to get ideas for creating new materials (201-7)

Assessment

Students could communicate their observations by orally sharing their observations with the class and by completing a journal page.

Question

What makes the best clay?

Safety

⚠ **Students may need to be reminded not to taste the mixture they create. It is also strongly recommended if the clay recipe used asks students to use boiling water or to cook the mixture that an adult be available to complete this portion of the recipe with the students as observers.**

Materials

- bowls
- water
- metric measuring cups/spoons
- spoons/stir sticks
- recipe cards (one card for each clay recipe used)
- craft books with clay recipes
- ingredients: cornstarch, flour, salt, powdered drink mix, food colouring, cream of tartar, oil, etc.
- hot plate or stove if the clay needs to be cooked
- kettle to boil water
- adult volunteers

Procedure

1. Brainstorm the many ways you can mix solids and liquids together to make a new material, e.g., making cookies, drink mix. Explain to the students that they are going to choose ingredients to make their own clay. Show all the possible ingredients and the places where they can find clay recipes that they can use. (See clay recipes outlined following this activity.) Remind students that they must find an adult to help if their recipe asks them to boil water or cook the dough. Place the students in group of three or four and challenge them to make clay.

2. Once the students have created their clay, they can play with it. When all of the students have finished, display the different kinds of clay and give the students opportunities to explore each type. Discuss how the clay is the same/different. Which clay can be squeezed most easily? Which clay is easiest to roll? Which clay holds its shape? Which clay would you use to make a bead necklace and why?

Making New Materials—Creating Clay Activity Sheet

Salt Clay

Ingredients

- 500 mL flour
- 225 mL salt
- 225 mL cold water
- food colouring

Tools

- bowl
- metric measuring cup

Directions

- Mix together the flour and salt in a bowl.
- Add several drops of food colouring to the water if you want coloured dough.
- Add the cold water to the mixture in the bowl.
- Mix the ingredients.

Play Dough

Ingredients

- 500 mL flour
- 125 mL water (or more if needed)
- food colouring

Tools

- bowl
- metric measuring cup
- metric measuring spoons

Directions

- Mix together the flour and water.
- Add several drops of food colouring if you want coloured dough.

Play Clay

Ingredients

- 500 mL flour
- 250 mL salt
- 60 mL oil
- 5 mL alum

Tools

- bowl
- metric measuring cup
- metric measuring spoons

Directions

Add water, a little at a time, so the mixture is the right consistency, about 250 mL. Knead in food colouring as desired. Pulling sections of the dough apart to make batches of different colours. Store play clay in sealed container.

Activity 24: How Water Can Be Cleaned

Outcome

Students will be expected to

- describe and demonstrate ways we use our knowledge of solids and liquids to maintain a clean and healthy environment (102-8)

Assessment

Students could communicate their observations by completing the table provided. They could also share their discoveries in a whole-class discussion at the end of the lesson.

Question

How were you able to make the water more clean?

Materials

- clear jar/container (two per group)
- water
- pollutants (e.g., leaves, twigs, grass, rocks, plastic foam bits, cooking oil)
- strainers (one per group)
- plastic spoons
- paper towel
- recording sheets

Procedure

1. Discuss water pollution with the students. How does water become polluted and what does it do to our environment? Organize the class into small groups. Give each group a jar/container filled with polluted water, spoons, a strainer, paper towel, and a recording sheet. Discuss ways that the students might use the materials to clean the water. Have the students draw a picture on the recording sheet of their polluted water then have them work together to clean the water.
2. Each time they do something to clean the water, have them fill in the recording sheet and draw a picture of what the water looks like. After the students have finished cleaning the water, have them compare their clean water. Have the class discuss how difficult water would be to clean once it is polluted.

How Water Can Be Cleaned Activity Sheet

Can you clean your water?

Name: _____ Date: _____

This is how my polluted water looked.

Then we _____

This is how my water looks now. (Draw a picture)

Then we _____

This is how my water looks now. (Draw a picture)

Then we _____

This is how my water looks now. (Draw a picture)

Appendix G: Activities for Earth and Space Science: Air and Water in the Environment

Activity 25: Where Is the Air?

Outcomes

Students will be expected to

- demonstrate that air is a substance and communicate their findings by conducting multiple activities (203-1, 102-10, 201-3)

Assessment

Observe student participation in activities, including the ability to follow directions and use appropriate materials to build an instrument. Do students use drawings, writing, and language to perform and record their observations?

Tasks may include the following:

- constructing a wind speed indicator and using it to measure the direction and speed of the wind
- science journal/activity sheet entries (assess written expression and labelling of diagrams)
- paper and pencil tasks, drawing to show how they know air takes up space or that air can move things
- interviews, responses to questions

Questions

- Where is air?
- What is air?
- Is air all around us?
- How do you know it's there?
- How can you show me that the air is a real substance when you can't see it?
- Does air take up space?
- Can air move things?
- How can I know that it's really windy out?
- How can I know which way the wind is blowing?

Materials

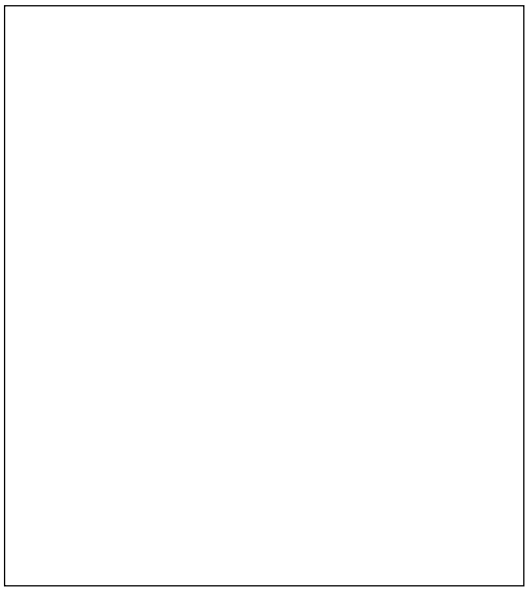
- sandwich bags
- science journals or activity sheet

Procedure

1. Discuss the word **air** with students. Use questions as described above. Solicit predictions, responses.
2. Record the information students give on chart paper. The list may be added to as the exploration continues.
3. After discussions show the children a sandwich bag and ask if it is possible to fill the bag with air? How would that prove that air is a substance and takes up space?
4. Have each student fill a sandwich bag with air. Allow the emptying and refilling of the bags as the students experiment with various methods of filling. Be aware that there will be bags that will pop.
5. Redirect students back to discussion asking, What evidence do you have that air has gone into your bag?
6. Have them record their responses in their science journals using a before-and-after format or on the activity sheet.

Where Is the Air? Activity Sheet

Name: _____ Date: _____



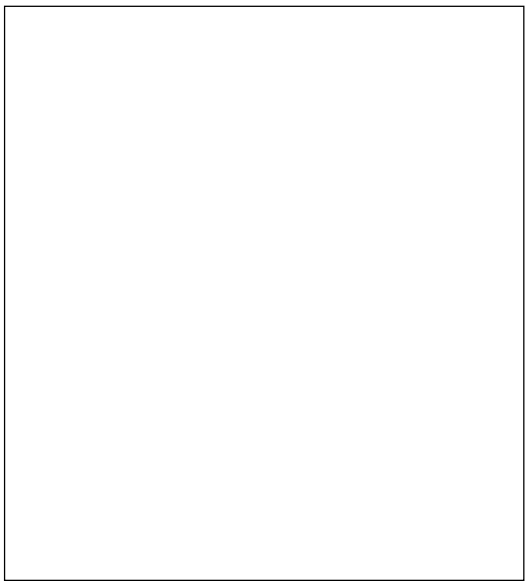
A description of the sandwich bag before I put air in it.

_____

_____

_____

_____



A description of the sandwich bag after I put air in it.

_____

_____

_____

_____

Activity 26: Look at the Wind Go!

Outcome

Students will be expected to

- demonstrate that air is a substance and communicate their findings by conducting multiple activities (203-1, 102-10, 201-3)

Assessment

Observe student participation in activities:

- student's ability to follow directions
- student's ability to build an instrument
- student's ability to record information

Questions

- What does the word **wind** mean?
- How were you able to tell if it was windy or not?

Materials

- pencils with erasers
- master pattern and instructions to make pinwheel
- white glue and straight pins
- bond paper
- crayons
- science journals or activity sheet

Procedure

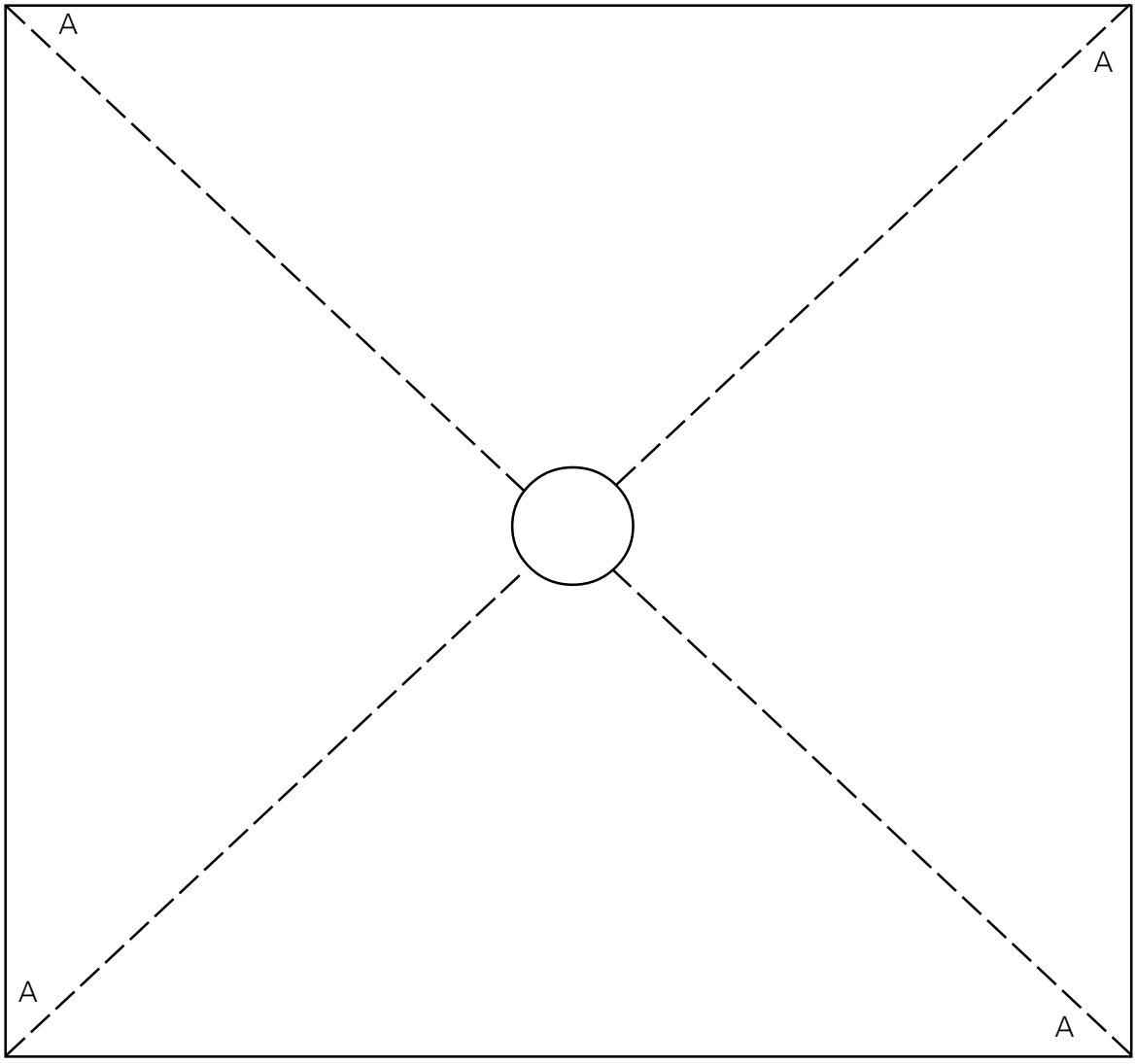
1. Discuss with students what the term **wind** means and how it relates to air.
2. Familiarize the students with a pinwheel. A commercial one can be purchased at a dollar store. Ask their opinion as to whether the pinwheel would be able to show them if there was any wind around.
3. Would the pinwheel be able to show them anything about how fast the wind was blowing? Have students record their predictions and ideas in their science journals or on the activity sheet.
4. Have students build their own pinwheels. Tell them they will be given the opportunity to test their own ideas about what the pinwheel can show them about the wind.
5. Have the students test out their pinwheels and their ideas.
6. Bring the students back to the discussion and their earlier predictions about the abilities of their pinwheels. Ask the questions again, Did the pinwheel help you to determine anything about the wind? Did the pinwheel move slowly or was it moving fast? Could you see the blades of the pinwheel as it moved around or was it moving so fast that they were a blur?

7. Have students refer to their journals and their predictions. Have them record what happened when they tested their pinwheels.
8. Discuss with students if they think the wind speed would be different at various times and places around their school. Together, determine test sites and times. Record your observations in chart form. What inferences could be made between location and wind speed?

Look at the Wind Go! Activity Sheet

Pinwheel Instructions

- Cut out the square.
- Cut along the dotted lines until you reach the circle.
- Put glue on each letter A.
- Fold corners with the letter A so that the edges touch the centre circle. Hold until the glue is dry.
- Put a straight pin into the middle of the circle and attach it to a straw or use a push pin and push it through the top of an eraser.
- The hole may need to be enlarged a bit to allow for the wheel to spin.



Look at the Wind Go! Activity Sheet

Name: _____ Date: _____

- Will my pinwheel spin so fast the blades are a blur?
- Or at a medium speed, so I can see the blades.
- Or so slowly that it's hardly moving.
- Or it did not move at all!

Location	I Predict My Pinwheel Will Spin ...	Here is What My Pinwheel Did ...

Activity 27: Direction of the Wind

Outcome

Students will be expected to

- demonstrate that air is a substance and communicate their findings by conducting multiple activities (203-1, 102-10, 201-3)

Assessment

Observe student participation in activities:

- student's ability to follow directions
- student's ability to build an instrument
- student's ability to record information

Questions

- What differences did you notice with your "wind director" indoors compared to outside?
- How were you able to tell the direction of the wind using your "wind director"?

Materials

- pencils with erasers
- thumbtacks
- assortment of streamers and ribbons
- science journals or student activity

Procedure

1. Discuss with students that, besides the speed of wind, it is sometimes important to know the direction that the wind is blowing. Can they give you examples? Record their responses on chart paper. Sailors, kite flyers ...
2. Show the students a previously made "wind director." Ask their opinion or predictions as to how they think this device will show them which way the wind is blowing. Students can record their responses in their science journals or on the activity sheet.
3. The students will each build a wind director. They will then go outside to determine the direction of the wind.
4. Have students plan certain locations to try out their wind directors. Have them record their locations and results in their science journals or on the activity sheet.
5. Discuss and compare the results of their tests once they have finished recording their observations.
6. Prompt with questions, "Were there places your streamers did not move? Did the direction of the wind change when you stood in different places? How do you know? If you were outside and wanted to be protected from the wind, where would you go?"

Direction of the Wind Activity Sheet

Name: _____ Date: _____

Location	**Wind Direction** Was your wind director blowing toward the school or was it blowing away from the school? Be specific.

If you were outside and wanted to be protected from the wind, where would you go? Give reasons to support your answer.

_____

_____

_____

_____

Activity 28: Feeling the Air Temperature

Outcome

Students will be expected to

- observe changes in air conditions in indoor and outdoor environments and describe and interpret these changes (100-26)

Assessment

Observe student participation.

- Students are able to describe how warm or cold it feels at outdoor and indoor locations.
- Students are able to record their results on a chart.

Questions

- How were you able to determine that sunlight affects temperature?
- What differences did you notice in the air temperature near a fan compared to being away from it?

Materials

- fan
- activity chart

Procedure

1. This activity occurs prior to using thermometers.
2. Have students describe and record changes in how the temperature feels as they move near a window, away from a window, near an opened window, by a fan, outdoors in the shade, in the sun ...
3. After they have completed their observations, discussions should take place on what they observed.

Through discussion of their observations, the students should come to understand that air temperature is affected by sunlight, shade, and wind. This is what happens with our weather on a daily basis.

Extension Activity

- Record sunlight and wind to look for weather patterns.
- See Kidspiration, “Dressing for the Weather.”

Feeling the Air Temperature Activity Sheet

Name: _____ Date: _____

Location	How the Air Temperature Feels ...

Activity 29: Using a Thermometer

Outcome

Students will be expected to

- observe changes in air conditions in indoor and outdoor environments and describe and interpret these changes (100-26)

Assessment

Observe student participation in this activity.

- Students are able to use the liquid in a thermometer to see the change in temperature.
- Students are able to record their results.

Questions

- How did the thermometer help you determine the temperature?
- What importance does the thermometer have in our daily lives?

Materials

- thermometers
- activity sheet

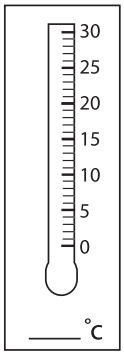
Procedure

1. Teachers may have demonstrated the use of thermometers in the grade 1 science program, but students did not use them or any standard units of measurement. Students are not introduced to temperature units until later in the math program. Students would measure air temperature with the thermometer to see if they can detect any changes in the height of the liquid in the thermometer.
2. Students could use the activity sheet to record the liquid in the thermometer at various places in the school and outdoors.
3. Areas to be checked could be the same as for the activity Feeling the Air Temperature.

   Teacher Note: *The activity sheet thermometers do not go below the freezing mark.*
4. Discussion questions could be, “From your observations, where would you go if you wanted to be warm or cold if you were outside?” These discussions could then be focussed on animals. How do buildings help change the temperature?

Using a Thermometer Activity Sheet

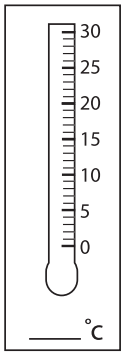
Name the location and colour-in the height of the liquid in your thermometer.



Location: _____

How the air felt: _____

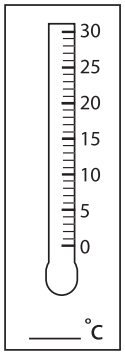
_____



Location: _____

How the air felt: _____

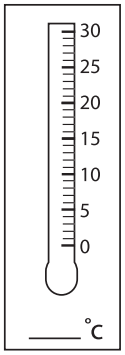
_____



Location: _____

How the air felt: _____

_____



Location: _____

How the air felt: _____

_____

Activity 30: Moisture in the Environment

Outcome

Students will be expected to

- identify and measure evidence of moisture in the environment, in materials, and in living things (102-9, 201-3)

Assessment

Students are able to

- find evidence of moisture in the environment
- record and interpret their observations

Questions

- What is moisture?
- Where can we find it?
- Can water/moisture take another form?
- Where does the dew come from that is on everything during spring and summer mornings?
- Where does the dew go?
- Where do the rain puddles go?
- Is there moisture in apples? oranges?

Materials

- magnifying glasses
- activity sheet or journals

Procedure

Students should identify places where they find moisture or water. Students can use tools such as magnifying glasses, beakers, and rulers to help in their observations. Students should record their observations in a chart.

Moisture in the Environment Activity Sheet

Name: _____ Date: _____

Places Where I Found Moisture or Water	Evidence	Amount of Moisture

Activity 31: What Makes the Water Disappear?

Outcome

Students will be expected to

- describe changes in the location, amount, and form of moisture and investigate and identify conditions that can affect these changes (100-27, 200-4, 201-5)

Assessment

- Students are able to determine what happens to a puddle of water.
- Students are able to record their findings.

Questions

- What happened to your puddle of water?
- How long did it take for you to notice any changes?
- Did the location of the "puddle plate" have an impact on how quickly your puddle disappeared?

Materials

- strong paper plates
- pencils
- water
- measuring cups
- science journal or activity sheet

Procedure

1. Discuss with students where water goes after it rains.
2. Ask students what they have noticed about the conditions outside and the ability of a puddle to dry up.
3. Record their observations on chart paper.
4. Tell students that they are going to make their own puddles on paper plates, and they must decide where in the classroom they are going to put their puddles for the next few days so that they may watch them.
5. Have students record their plan in their journals or on the activity sheet. Don't forget the date. Some options could be in a dark closet, high up on a shelf, in front of a sunny window, in a freezer, under a box, etc.
6. Working in pairs, students will create a puddle of water by pouring 50 mL of water onto their plate. It is best if the plate is already in the intended location. Once the water has settled, the students draw a line around the outskirts of the puddle using a pencil.

7. Have the students check their puddle plate at predetermined times. Each time that they notice a change in the shape of their puddle, they are to draw a new line around it.
8. Keep a class record of which plates dry up and their location. When all of the plates have dried up, examine the class chart. Examine the plates. Did the plates with more lines marked on them take longer to dry? Are there any conclusions the students can make regarding the plate location and the puddle's ability to dry fast? Are there any connections that they can make to real puddles and the conditions and the rate at which they dry up?

What Makes the Water Disappear? Activity Sheet

Our Plan

We are going to put our puddle plate _____

_____

Today is _____ . We have put our puddle plate

_____

Day 1
Here is what it looks like now.

Day 2
Our Observations

Day 3

Day 4

My observations:

Activity 32: Where Has All the Water Gone?

Outcome

Students will be expected to

- describe changes in the location, amount, and form of moisture and investigate and identify conditions that can affect these changes (100-27, 200-4, 201-5)

Assessment

- Students are able to build a mini-greenhouse.
- Students are able to record and discuss changes they observed in their greenhouse.

Questions

- Did you notice any drops on the bottle sides, any misting or clouding inside the bottle?
- Were there any drops dripping down the sides of the bottle?
- What about the plastic wrap on the top, are they any drops on it? How did they get there?

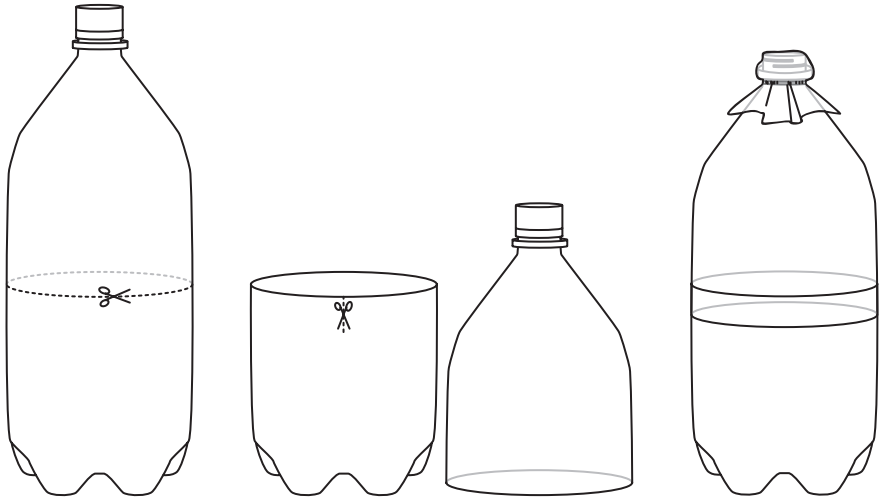
Materials

- empty 2-L pop bottle with cap
- soil
- a small plant
- small stones, pebbles
- small sticks
- water
- plastic wrap
- elastics
- a sunny location in the classroom
- science journal or activity sheet

Procedure

1. Discuss where water goes after it rains or snows. Draw examples from the previous activities. Where did the water go that was on the plates? Record the students' ideas.
2. Students will be constructing a small greenhouse. Tell students that they will be making a small environment that has moisture, but that they are going to seal off any escape paths for the moisture to leave.
3. Have the pop bottles cut in half by an adult.
4. Students fill the lower half with soil, small plants, and a few pebbles and sticks. The bottle cap is filled with water and placed in the environment. This becomes the pond. A good soaking of the soil is needed before the top half of the pop bottle is squeezed over the bottom half.

5. To ensure a snug fit, a vertical cut can be made at the top of the bottom part so it may overlap.
6. Place a piece of plastic wrap over the opening and secure it with an elastic band. Place the finished mini-greenhouse in the sunlight.
7. Students draw their greenhouses from a side perspective and bird's-eye view. Try to get them to be as accurate as possible.
8. Record any changes that the students observe over the next few days.



Where Has All the Water Gone? Activity Sheet

Day 1: My observations

_____

_____

_____

_____

_____

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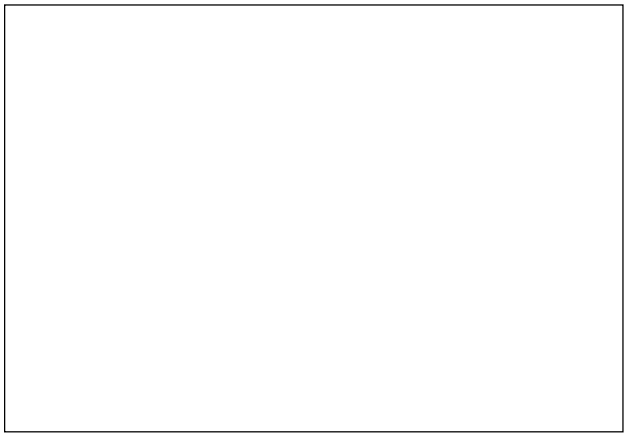

Day 2: My observations

_____

_____

_____

_____

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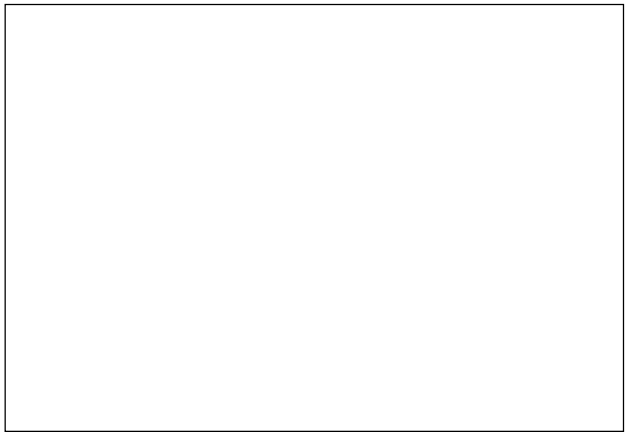


Day 3: My observations

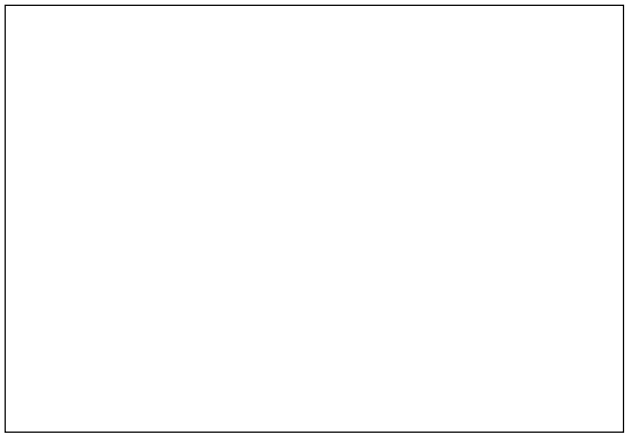
_____

_____

_____

_____

_____

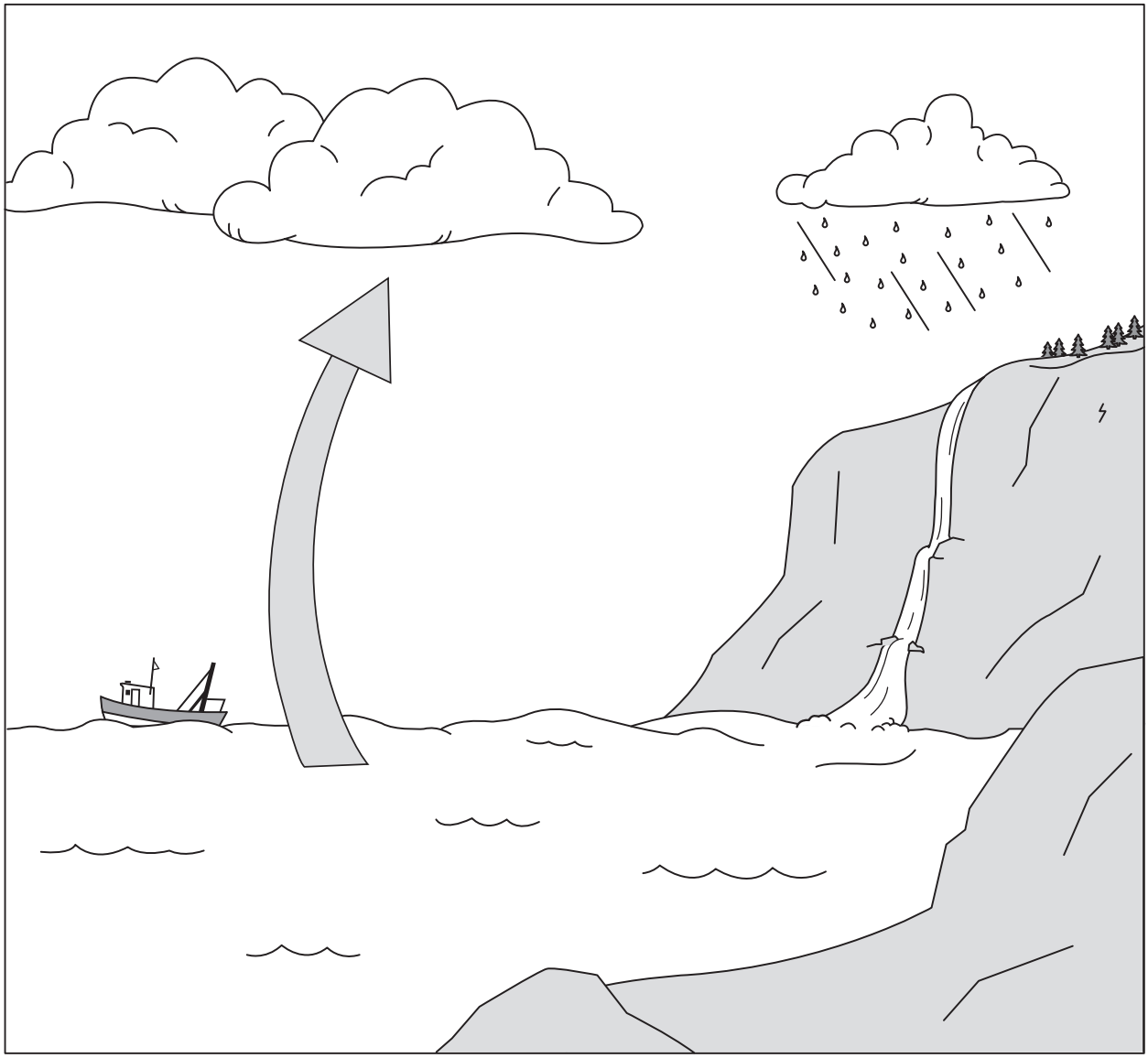


Day 4: My observations

What happened to the water in my greenhouse?

My water cycle diagram.

Water Cycle



Activity 33: How Much Does It Rain/Snow?

Outcome

Students will be expected to

- describe changes in the location, amount, and form of moisture and investigate and identify conditions that can affect these changes (100-27, 200-4, 201-5)

Assessment

- Students are able to make a container to hold precipitation.
- Students are able to observe and record the amounts of precipitation.

Questions

- How much rain or snow did you have over the two-week period?
- How did your measuring instrument help you in your recording of the amount of precipitaiton?
- Which did you have more of, rain or snow?

Materials

- thermometer outside in safe location
- container to hold precipitation
- cm ruler
- chart paper
- graph paper

Procedure

1. Make an instrument for measuring the amount of rain or snow.
2. Measure the amount of rain/snow for two weeks. (The time may need to be extended if there is no rain or snow.)
3. Record your finds on the class chart, noting if it was rain or snow.
4. Measure the outside temperature each day for two weeks.
5. Record your findings on the class chart. Different students may take measurements each day.
6. After two weeks, have half of the class create a pictograph showing the amount of rain or snow. The other half can create a bar graph showing the temperatures for the same two weeks.
7. Match the two halves together so each pair has a graph for the rain/snowfall and the temperature. Ask the students to discuss any observations that they can make as they compare the two graphs.
8. Do they notice anything about the temperature when it rains or when it snows?
9. Record observations on the class chart.

Activity 34: Materials Interacting with Moisture

Outcome

Students will be expected to

- predict, investigate, and communicate the properties of materials according to their ability to absorb water (200-3, 200-4, 200-1, 203-3)

Assessment

Observe students' participation in activities, including their ability to follow directions, using appropriate materials to plan and carry out tests to prove their predictions. Tasks may include the following:

- predicting, planning, and conducting a test to determine the absorbing qualities of materials
- predicting, planning, and conducting a test to determine the waterproofing qualities of materials
- predicting, planning, and conducting a test to determine the drying time of materials
- sequencing their results in logical fashion
- using their information obtained from their tests to communicate which materials would be suitable for different purposes

Questions

- When would you need materials to absorb water?
- Which material will absorb the most water?
- When would you need materials to be waterproof?
- Is one material more waterproof than the other?
- When would you need materials to dry quickly?
- Which material will dry the fastest?
- Can knowing this information help you get dressed for outdoors?
- Is there any way we could test any of your predictions of the above?
- How can various materials affect us at home?

Materials

- chart paper
- samples of materials: nylon, wool, cotton, paper towel, plastic wrap, fleece, rubber
- science journals

Procedure

Lead class discussuions regarding questions as listed above.

- Record responses on chart paper.
- Have students record their thoughts in their science journals.

These entries are great for reflection after students have gone through Activities 35, 36, 37, or 38 (pre-assessment tool).

Activity 35: Rain, Rain, Here to Stay: What Materials Will Keep Us Dry?

Outcome

Students will be expected to

- predict, investigate, and communicate the properties of materials according to their ability to absorb water (200-3, 200-4, 200-1, 203-3)

Assessment

- Students are able to develop a test to see if a particular materials is waterproof.
- Students develop/show an understanding of the term **waterproof**.
- Students are able to determine which materials are waterproof and which ones are not.

Questions

- How were you able to tell if a material was waterproof or not?
- Where would we use waterproof materials in our daily lives?

Materials

- 8-cm squares of the following materials: cotton (an old T-shirt or dish towel), wool (old pair of socks or a sweater), paper towel, plastic wrap, fleece (an old blanket), and nylon (an old jacket, kite, or tent)
- water
- metric measuring cups, 2 per group, or clear plastic cups with measured gradients on side
- elastic bands that will go around the cups
- science journals or activity sheets

Procedure

1. People wear special materials to keep them dry when it rains or snows. Explain to the students that they are going to be testing different materials to find out if they are waterproof or not.
2. Distribute the materials, except the water. Have the students examine the materials that they will be testing. In their science journals or on the activity sheets, have students record their predictions for which material they think is the most waterproof and which one is the least.
3. Students place one of their test materials on top of the measuring cup. Wrap the elastic around the cup to hold the material in place.
4. Fill the second measuring cup with 15 mL of water. Pour it over the material. Students watch, observe, discuss, and record what happens.
5. Did the water sit on top of the material? Did the water soak right through the material and drip into the cup? Or did the material seem to soak up all of the water?

6. Follow the same procedure to test other materials, being careful to record observations.
7. When finished with the testing, have students arrange their materials in sequence from most waterproof to least.
8. Students record or draw in their science journals or on activity sheets which material will keep them the driest when out in the rain.

Rain, Rain, Here to Stay: What Materials Will Keep Us Dry? Activity Sheet

Will the material I test be waterproof?

Yes! No water got through. 

So-so! The material got damp. 

No! Water dripped through. 

Materials I Tested	My Predictions	My Results

List the materials that you tested in order from most waterproof to not waterproof.

Activity 36: Oops! I'd Better Clean That Up!

Outcome

Students will be expected to

- predict, investigate, and communicate the properties of materials according to their ability to absorb water (200-3, 200-4, 200-1, 203-3)

Assessment

- Students are able to explain and demonstrate the term **absorb**.
- Students are able to sequence materials from most absorbent to least.

Questions

- Which materials were the best absorbers?
- Where would you use materials that are good absorbers in your home?

Materials

- 8-cm squares of the following materials: cotton, wool, paper towel, plastic wrap, fleece, and nylon
- a large plastic lid from an ice cream container
- metric measuring cups and water
- stop watch or clock with a second hand
- science journals or activity sheets

Procedure

1. Water spills can happen all the time, especially around the house. Learning to clean up after ourselves is all part of growing up. Explain to the students that they will be testing different materials to find out if they are good absorbers or not. Their tests should help them decide what the best material would be to wipe up a water spill.
2. Distribute the materials except the water. Have the students examine the materials and then record in their science journals their predictions as to which material will absorb or clean up the water the best and which one will be the least absorbent.
3. Pour 15 mL of water onto the plastic lid. Place one of the material samples onto the water and watch for 90 seconds. Do you see any evidence of the water being absorbed? Do you see any evidence of your material becoming wet?
4. After 90 seconds, gently lift the material sample off the lid.
5. Observe and record. Is the material damp? Is it soaked? Can you wring it out? Is it heavier than before? Has the puddle of water gone? Are there visible droplets of water on the underside of the material? Did the material just move the water around on the lid but it did not absorb any water?

6. Have students arrange, in sequence, the materials from most absorbent to least.
7. Students record or draw in their science journals or on the activity sheets which material will do the best job in cleaning up water spills.
8. Students might be starting to see a relation between the materials that are most waterproof and the least absorbent.

Oops! I'd Better Clean That Up! Activity Sheet

Will the material I test absorb water?

Yes! The puddle will be gone. 

So-so! The puddle is almost gone. 

No, the puddle is still there. 

Materials I Tested	My Predictions	My Results

List the materials that you tested in order from the best absorbers to the worst absorbers.

Activity 37: Dry Time

Outcome

Students will be expected to

- predict, investigate, and communicate the properties of materials according to their ability to absorb water (200-3, 200-4, 200-1, 203-3)

Assessment

- Students are able to make predictions based on previous knowledge.
- Students are able to determine which material was the fastest drying.

Questions

- What materials would you want to wear on a hot day?
- How did the drying times of the materials vary?

Materials

- 8-cm squares of the following materials: cotton, wool, paper towel, plastic wrap, fleece, and nylon
- water
- a clothesline (a string strung between desks or windows)
- a clock
- science journals or activity sheets

Procedure

1. Discuss with students the need for quick-drying materials. Have any of them played a game so hard that they were sweating and their shirts became wet or damp from their perspiration? Discuss how they felt. Did they get a chill or did their shirts dry quickly?
2. Pass out the materials and ask the students which material they think will take the longest to dry. Which will take the shortest time to dry? Have students record their predictions in their science journals or on the activity sheets.
3. Students soak their squares of material and place them to dry on the same clothesline, one beside the other.
4. Students record the time and then check their clothesline at a set standard time, e.g., every four minutes.
5. Students record their observations. Are there any signs that one material is drying faster than another?
6. After the results have been recorded, have students sequence the materials from quickest to slowest drying.
7. Have students describe, through writing, in pictures, or orally, the material they would most likely want their sports jersey or their tent to be made of.

Dry Time Activity Sheet

How long will the material I test take to dry?

Very fast. 

A little bit longer. 

Takes the most time. 

Materials I Tested	My Predictions	My Results

List the materials that you tested in order from the fastest to the slowest drying.

Activity 38: What to Wear, What to Wear!

Outcome

Students will be expected to

- predict, investigate, and communicate the properties of materials according to their ability to absorb water (200-3, 200-4, 200-1, 203-3)

Assessment

- Students are able to decide which type of clothing they would wear based on a particular weather condition.
- Students are able to create an outfit for a particular weather condition.

Questions

- What type of materials/clothing would you wear to go outdoors on a rainy day?
- What have you learned about various materials that will help you decide what to wear during various weather conditions?

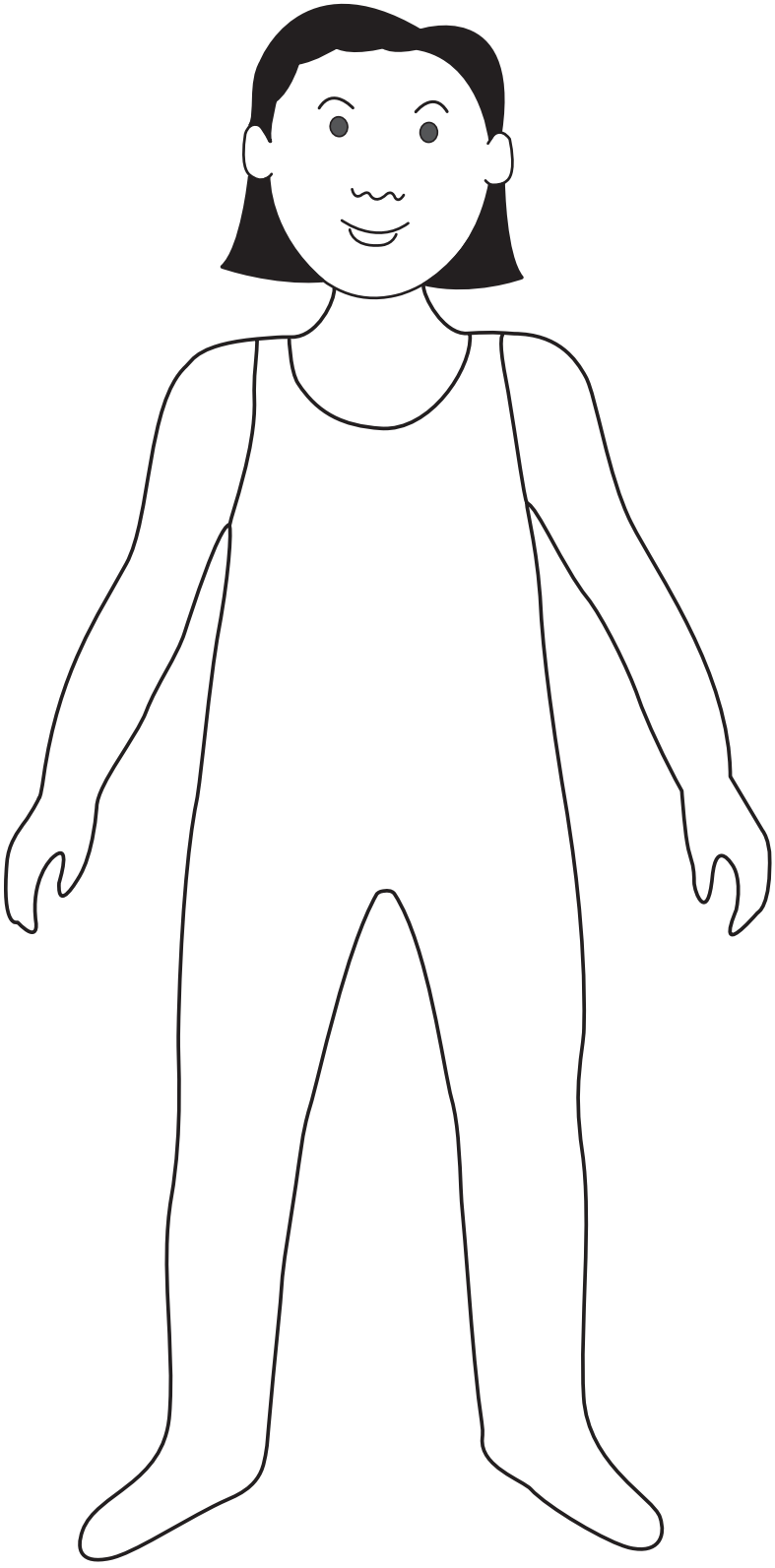
Materials

- drawing paper
- pencils
- crayons
- samples of the materials used in the previous experiments
- scissors
- glue
- paper doll figure patterns

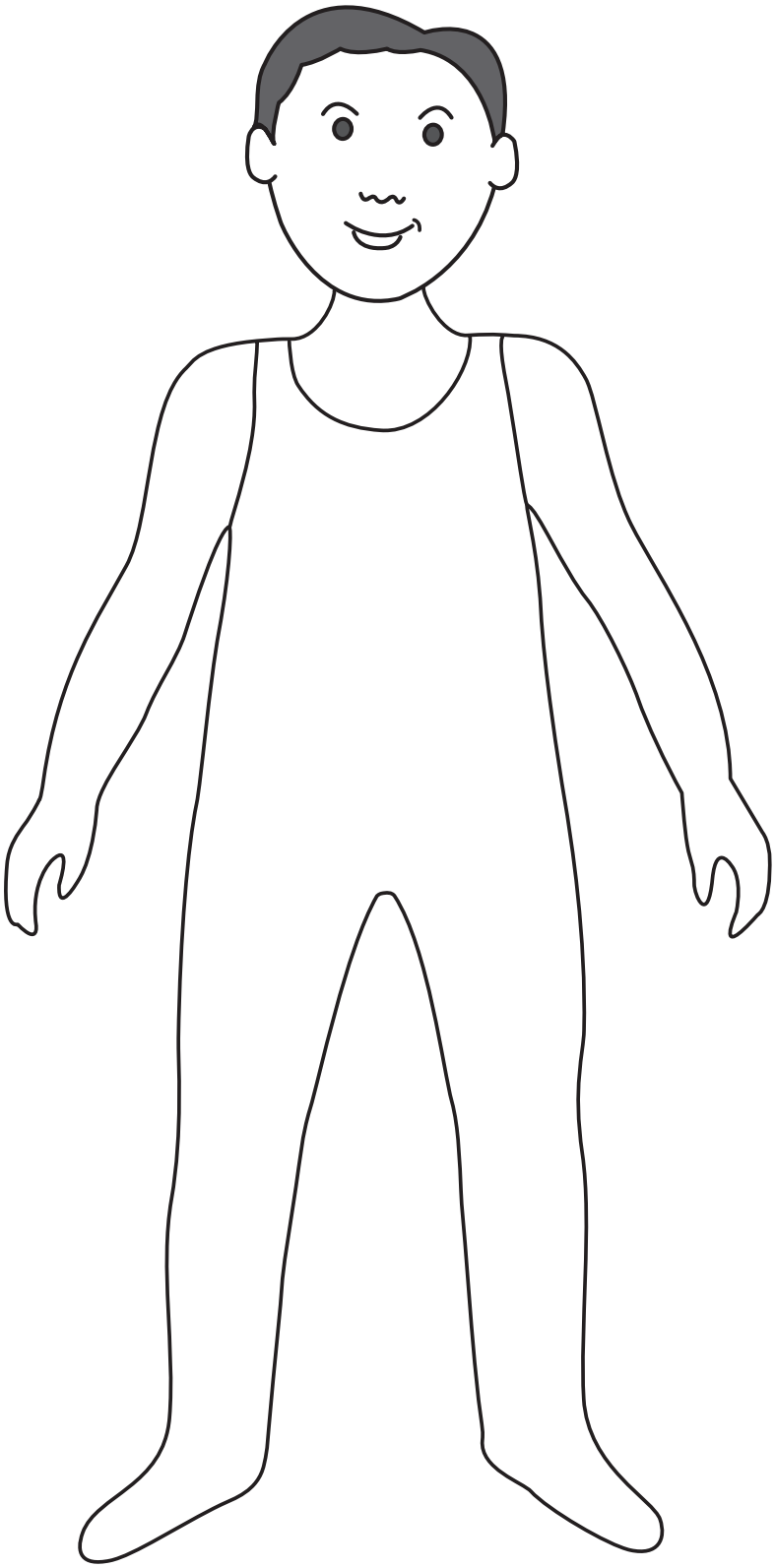
Procedure

1. Using the results of the previous three activities, students are now seeing the relationship between the materials tested and their characteristics to absorb or repel water.
2. Students have had experience sequencing the materials based on a given rule.
3. Have students brainstorm different activities or weather conditions that would make a person need to wear specific clothing in order to protect them from bad weather or help them participate more comfortably.
4. Have students create an outfit out of the material samples for their paper doll figures for a specific weather condition or activity. They have to measure, cut, and glue the outfits onto their figures. Have students draw the background of their pictures to indicate what weather or situation is taking place.
5. Have students write a description of their newly designed outfits describing why they chose the materials that they did.

What to Wear, What to Wear! Activity Sheet



What to Wear, What to Wear! Activity Sheet



Activity 39: Weathering

Outcome

Students will be expected to

- describe the effects of weather and ways to protect things under different weather conditions (103-7)

Assessment

- Students are able to detect the effects of weather on structures.

Questions

- What changes can we see in our structures over time?
- What happens to human-made structures if they are not taken care of properly?

Materials

- a new board
- a weathered board

Procedure

Discuss with students the effects that weather has on structures. If possible, go for a walk around the school and area to look for signs of weathering. When they return to class, make a list of what they observed.

Students have a record of signs of weathering. Thus, an awareness will evolve of the effect of natural weathering on our structures and a knowledge that we have to protect them.

Extension Activity

- Students should collect pictorial images of weathering for a weather picture.
- Students should collect a list of products available from local hardware stores designed to reduce the impact of weathering.

Activity 40: Protecting Our Water Sources

Outcomes

Students will be expected to

- identify examples of water in the environment and describe ways that water is obtained, distributed, and used (102-11)
- identify the importance of clean water for humans and suggest ways that they could conserve water (103-8)

Assessment

Observe student participation in activities and discussions. Does the student use drawings, writing, and language to communicate and record his or her observations and ideas? Tasks may include the following:

- using science journal entries, to describe how we use water; recording data and creating a pictograph
- recording and presenting reasons for our water to be clean

Questions

- Where does water come from?
- Where can we find water?
- How do we use water?
- Is water important to us?
- Do we need water?
- How does water get into our houses, our school?
- How do people get clean water?
- Does everyone get it the same way?
- Is it important that water be clean and not polluted?
- Does everyone in the world have clean water supplies?

Materials

- science journals
- poster board
- old magazines for cutting and pasting
- colouring supplies

Procedure

At the start of this activity, have students record the ways they use water. Perhaps this can be done during a writing time. During math time, have students share their ideas and, as a whole class, construct/create a pictograph. During science time, share ideas and thoughts on ways to keep our water system clean and the importance of having clean water around the world.

In small groups, have students create posters that highlights the importance of clean water. Suggest ways to conserve water and action we need to take to keep our water system healthy.

Activity 41: How Do You Use Water?

Outcomes

Students will be expected to

- identify examples of water in the environment and describe ways that water is obtained, distributed, and used (102-11)
- identify the importance of clean water for humans and suggest ways that they could conserve water (103-8)

Assessment

- Students are able to explain how water is used.
- Students are able to explain how water is wasted.

Questions

- Where is water found?
- How is water transported?
- How is water used?
- What makes water "clean"?
- How can I use less water?

Materials

- paper
- pencil
- crayons
- tally chart activity sheet
- graph paper

Procedure

1. Water is part of our daily lives. We use clean water to drink, cook and wash. How about you? How many ways do you use water?
2. Have students brainstorm with classmates all the different ways to use water in one week and make a list of the uses of water. Have students take the list home and put a tally mark beside the category for every time that water is used that way.
3. Have students return the tally sheet. Have students use the data to make a pictograph showing when and how many times water was used.
4. Can students identify situations where water is wasted? Can they suggest ways to reduce the waste?

How Do You Use Water? Activity Sheet

Take this sheet home and record how many times that you use water. Put your tally mark in the right category.

Ways I Use Water	Tally Marks	Total

Here is what I found out ...

Activity 42: Where Does Our Clean Water Come From?

Outcomes

Students will be expected to

- identify examples of water in the environment and describe ways that water is obtained, distributed, and used (102-11)
- identify the importance of clean water for humans and suggest ways they could conserve water (103-8)

Assessment

- Students are able to make a water filter.
- Students are able to explain the importance of clean water and the use of water filters.

Questions

- Where is water in my life?
- What materials may be in pond water? ocean water? wells? lakes?
- Do the materials/substances in water help it? Give reasons to support your answers.

Materials

- muddy water
- 3 clear plastic 2-L pop bottles, cut in half/per group
- coffee filters, 6 per group
- cotton balls
- sand
- gravel
- soil
- measuring cup and water
- science journal or activity sheet

Procedure

Students can identify sources of water in their local areas, such as streams, lakes, ponds, oceans, or wells. They can explore where their drinking water comes from through field trips and/or guest speakers. They can learn how it is treated to make it clean and safe to drink. Before the water is pumped into people's homes, dirt and germs have to be removed. How is water from lakes and rivers cleaned?

1. Show students the muddy water. Tell them that as city planners, their job is to think of a way to clean the water.
2. Instruct the students as to how to make a basic filter holder. They will need the two parts of their clear pop bottle. Turn the top upside down and put it inside the bottom half of the bottle.
3. Show the students the materials that they may use to test their water filters (cotton balls, sand, gravel, soil, marbles).
4. The students must select three different materials to test in their filters. Have them record the materials they have decided to test.

5. Have the students plan a fair test to find out which of their chosen material cleans the dirty water the best. Guide students toward the importance of proper measurements. Each filter to be fairly tested must have the same amount of muddy water poured into it. Have the students record their predictions before they begin and then their results after their tests are completed.
6. Can the students determine if there is one material that will make the water cleaner than the others?

Where Does Our Clean Water Come From? Activity Sheet

Will the material I tested in my filter help to clean the muddy water?

Yes, very clear. 

So-so, a little muddy. 

No, still muddy. 

Materials I Tested	My Predictions	My Results

List the materials that you tested in order from very good filters to not-so-good filters.

Activity 43: How Do Air and Water Get Polluted?

Outcomes

Students will be expected to

- identify examples of water in the environment and describe ways that water is obtained, distributed, and used (102-11)
- identify the importance of clean water for humans and suggest ways they could conserve water (103-8)

Assessment

- Students are able to identify ways water becomes polluted.
- Students are able to identify ways air becomes polluted.

Questions

- What does pollution mean?
- Is water ever destroyed?
- Is the water you drink today the same water your grandparents used? Give reasons to support your answer.
- What responsibilities do you have toward keeping air clean? water clean?
- Is it important to keep air clean? Give evidence to support your answer.
- What can be done to keep air clean?

Materials

- pictures of water and air pollution
- pictures of people doing things to prevent air and water pollution
- two similar leafy plants per class
- two water bottles
- vinegar
- water
- science journal or activity sheet
- The Adventures of Dora the Duck (see Activity 44, p. 193)

Procedure

1. All living things use the Earth's air and water over and over again. Remind the students about our water cycle. Remind them that all the air and water is never lost or destroyed.
2. Brainstorm with the students, record their responses on chart paper. What kinds of pollution have they seen? Where was it? What did it look like? Did it smell? Do you think that the pollution can affect other animals or plants around it? Did it affect you?
3. Show the students the collection of pictures. Can they identify the causes of water or air pollution? Can they identify the people doing things to prevent air and water pollution?
4. Discuss pollution routes. Just as the raindrop is recycled, so is any pollution that is in the air or water.

5. Read and enact The Adventures of Dora the Duck.
6. For the class, you could show the effect of polluted water on plant health. Water one of the leafy plants with clean water from the tap. Water the other plant with polluted water caused by "acid rain." (Water with small amounts of vinegar in it.) The class can track the plants' growth and appearance. Do they observe any differences? Record on chart paper. Students can record the results in journals.
7. Ask the students, "Is it important for everyone in the world to help keep the Earth's air and water clean?" Ask them for evidence and/or reasons to support their answers. Students record their responses in their science journals or activity sheets.
8. Students could add the following to a class poster or mural: water sources, ways to make sure our water and air stay clean, how we use water.

How Do Air and Water Get Polluted? Activity Sheet

Is it important for everyone in the world to help keep the Earth's air and water clean? Give evidence and/or reasons to support your answer.

Draw a picture of a way to make sure our air and water stay clean.

Activity 44: Dora the Duck

Outcomes

Students will be expected to

- identify examples of water in the environment and describe ways that water is obtained, distributed, and used (102-11)
- identify the importance of clean water for humans and suggest ways they could conserve water (103-8)

Assessment

- Students are able to explain how pollution affects wildlife.
- Students show an understanding of the importance of eliminating pollution.

Question

- What happened in Dora's adventures?

Materials

Per class:

- rubber duck
- aquarium, empty
- 125 mL each of soil, brown sugar, syrup, salt, dish soap, water with green food colouring, and water with red food colouring
- 3–4 pieces of garbage (e.g., chip bag, facial tissue, napkin)

Procedure

- Discuss a "pollution route."
- Follow the story. Read aloud to your class. Have materials on hand. Set up Dora in her clean aquarium.
- As you read of her adventures, add the prescribed ingredient to the aquarium.
- Students write in their science journals what they thought about Dora's habitat and what was happening to it.
- Discuss with children what they can do to help Dora. What can they do to help keep things clean in their own habitat?

The Adventures of Dora the Duck Activity

1. Imagine a clean river as it flows through a protected wilderness area. On this river lives Dora the Duck. How is Dora? Dora has lived in this part of the river for her whole life. But now she is going on an adventure. She begins to swim downstream.
2. Dora swims into farm country. She passes a freshly plowed riverbank. It begins to rain and some soil washes into the river. <Pour in soil.> How is Dora?
3. Dora nears a housing development. Some fertilizer from the lawns washed into the river a while back. The fertilizer made the plants in the river grow very fast and very thick. After a while, the river couldn't give them all the food they needed, and so they died and started to rot. Their rotting is using up some of Dora's oxygen, and making it hard for her to find food. <Pour in "fertilizer" (brown sugar).> How is Dora?
4. Dora swims under a highway bridge. Some cars travelling on it are leaking oil. The rain is washing the oil into the river below. <Pour in "oil" (pancake syrup).> How is Dora?
5. During a recent cold spell, ice formed on the bridge. Trucks spread salt on the road to prevent accidents. The rain is now washing salty slush into the river below. <Pour in salt.> How is Dora?
6. Dora swims past a city park. Some picnickers didn't throw their trash into the garbage can. The wind is blowing it into the river. <Pour in paper.> How is Dora?
7. Several factories are located down river from the city. Although they are not supposed to pollute the water, they still dump some of their waste into the river. <Pour in "waste" (dish soap).> How is Dora?
8. The city's waste water treatment plant is also located along this stretch of the river. The pollution rules are not as strict as they could be. Also, a section of the plant has broken down and chemicals are leaking into the river. <Pour in "chemicals" (water and green food colouring).> How is Dora?
9. Finally, Dora swims past a hazardous waste dump located on the bank next to the river. Rusty barrels of chemicals are leaking. The rain is washing these poisons into the river. <Pour in "poison" (water and red food colouring).> How is Dora?

Appendix H: Activities for Life Science: Animal Growth and Changes

Activity 45: Hatching Chicks

Outcome

Students will be expected to

- describe and record observations, in various formats, of changes in the appearance and activity of an organism through its life cycle (101-7, 201-5, 203-3, 102-6)

Assessment

- Students are able to describe the changes in the development of the embryo of a baby chick.
- Students are able to identify the human-made environment a baby chick needs once it has hatched.

Questions

- What did you observe about the growth of a chicken?
- How did the baby chick get out of its shell?
- What did the baby chick need in order to survive?
- How many days did it take for the chickens to hatch?
- Did the mass of the eggs change over the cycle of development of the chick?

Materials

- commercially purchased incubator
- fertilized chicken eggs
- food for the baby chicks
- brooder or a container to keep the baby chicks warm once they are removed from the incubator
- rubber gloves
- pictures or illustrations of the 21-day growth cycle from embryo to baby chick

Procedure

This is a very exciting learning experience for students. However, prior to considering this learning experience teachers should be able to answer the following questions.

- At what temperature does the incubator need to be maintained?
- How are the eggs rotated?
- What do I do if none of the eggs produce chicks?
- What do I do if a chick starts to hatch (crack open the shell of the egg) and after 24–48 hours has still not hatched and the membrane inside the shell has become hard and dry?

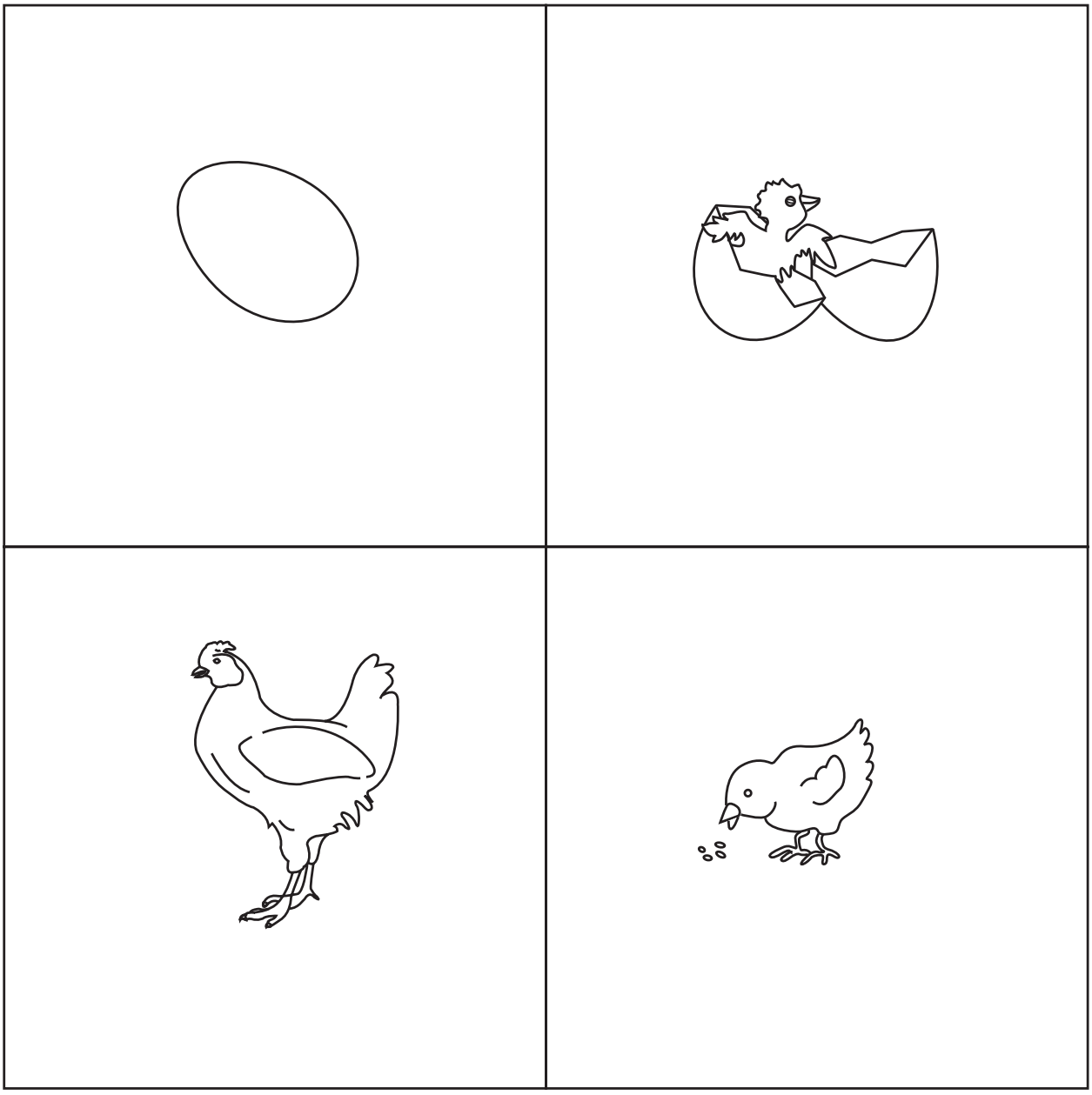
- What do I do if a chick hatches and is either deformed or has a broken leg?
- What do I tell the students if a baby chick dies?
- How do I make a brooder and at what temperature do I keep it?
- What precautions do I need to take with children handling the baby chicks and salmonella germs?
- How do I handle the eggs in order that children can observe the growth of the embryo?
- Is there a local veterinarian or farmer that could help me out?
- Where will I take the chicks after this observation period?

If you feel confident in carrying out this activity, follow the procedures as set out by the company from which you purchase the incubator. "Candle" the eggs for the students prior to putting them in the incubator. Then "candle" them or a few of them every four days. Have students keep a record of what they have observed in their science logs.

Hatching Chicks Activity Sheet

Date	What I Observed	Mass of the Egg

Chick Life Cycle



Activity 46: The Life Cycle of a Butterfly

Outcomes

Students will be expected to

- describe and record observations, in various formats, of changes in the appearance and activity of an organism through its life cycle (101-7, 201-5, 203-3, 102-6)
- select and use materials to observe an organism's life cycle and ask questions about the organism's needs and changes in growth (200-1, 200-4)

Assessment

- Students are able to record through illustration and written expression the life cycle of a butterfly.
- Students are able to identify the stages of the life cycle of a butterfly. Students are able to develop an appreciation for the life of an organism.

Questions

- What are the stages of the life cycle of a butterfly?
- How do their form, shape, and size change during each stage?
- What does each stage need for food in order to survive?

Materials

- pictures of the stages of the life cycle of a butterfly
- butterfly larvae kit (from a scientific company)
- butterfly pavilion (from a scientific company)
- materials as per *Animals Grow*, Pan Canadian Science Place, p. 30, Scholastic

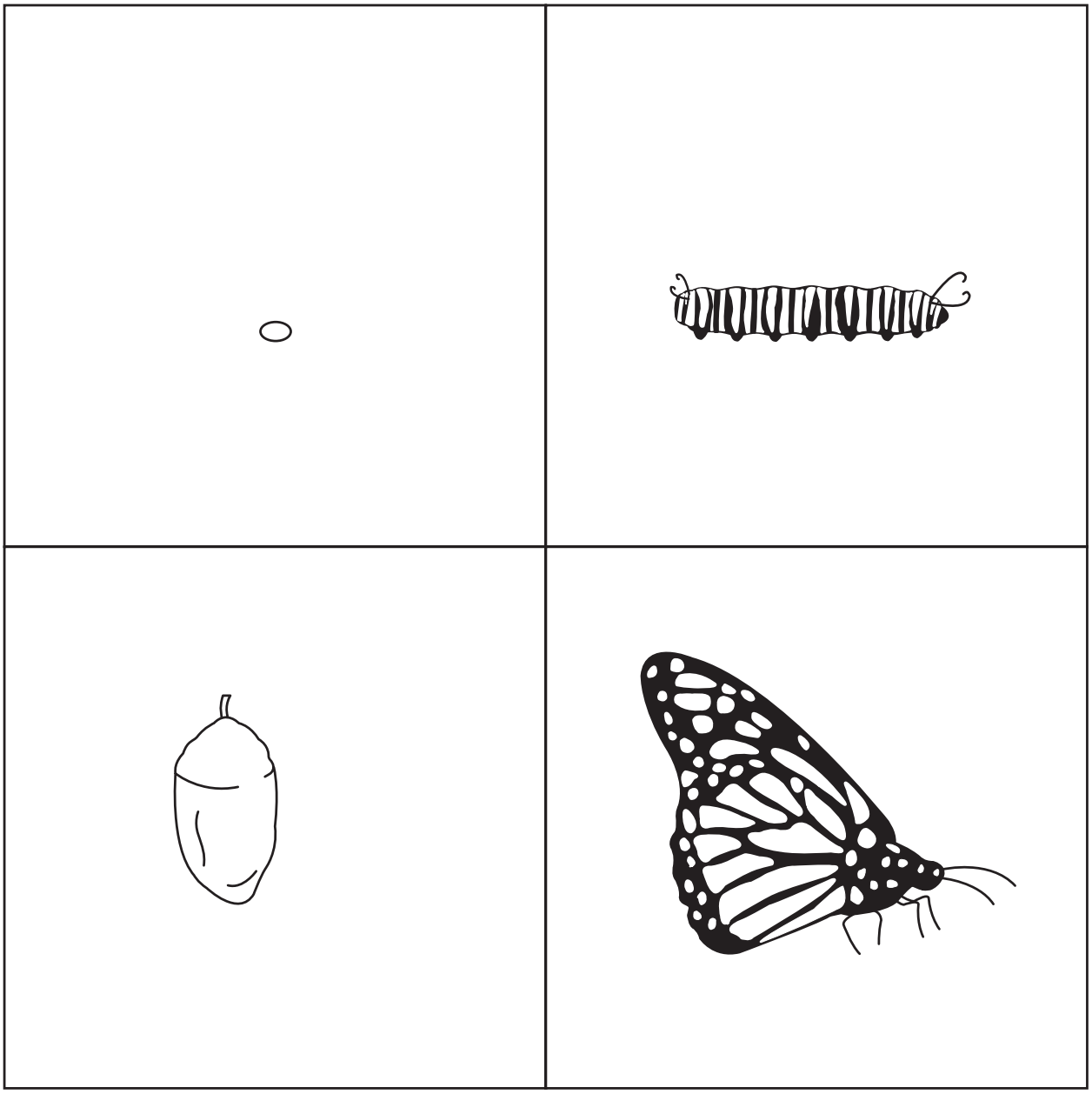
Procedure

If you are purchasing a commercially developed kit, you should plan on doing this activity in the spring. Kits come with complete directions to have this activity meet with success. Discuss the four stages of a butterfly with the students (egg, larva, pupa, and butterfly). Take the students outdoors to see if they are able to observe any stages of the life cycle in the environment around the school. Have the students record their observations. Discuss the importance of respecting the life cycle of organisms. When it is time, go outside with the students to release the butterflies.

The Life Cycle of a Butterfly Activity Sheet

Date	Drawing	Description

Butterfly Life Cycle

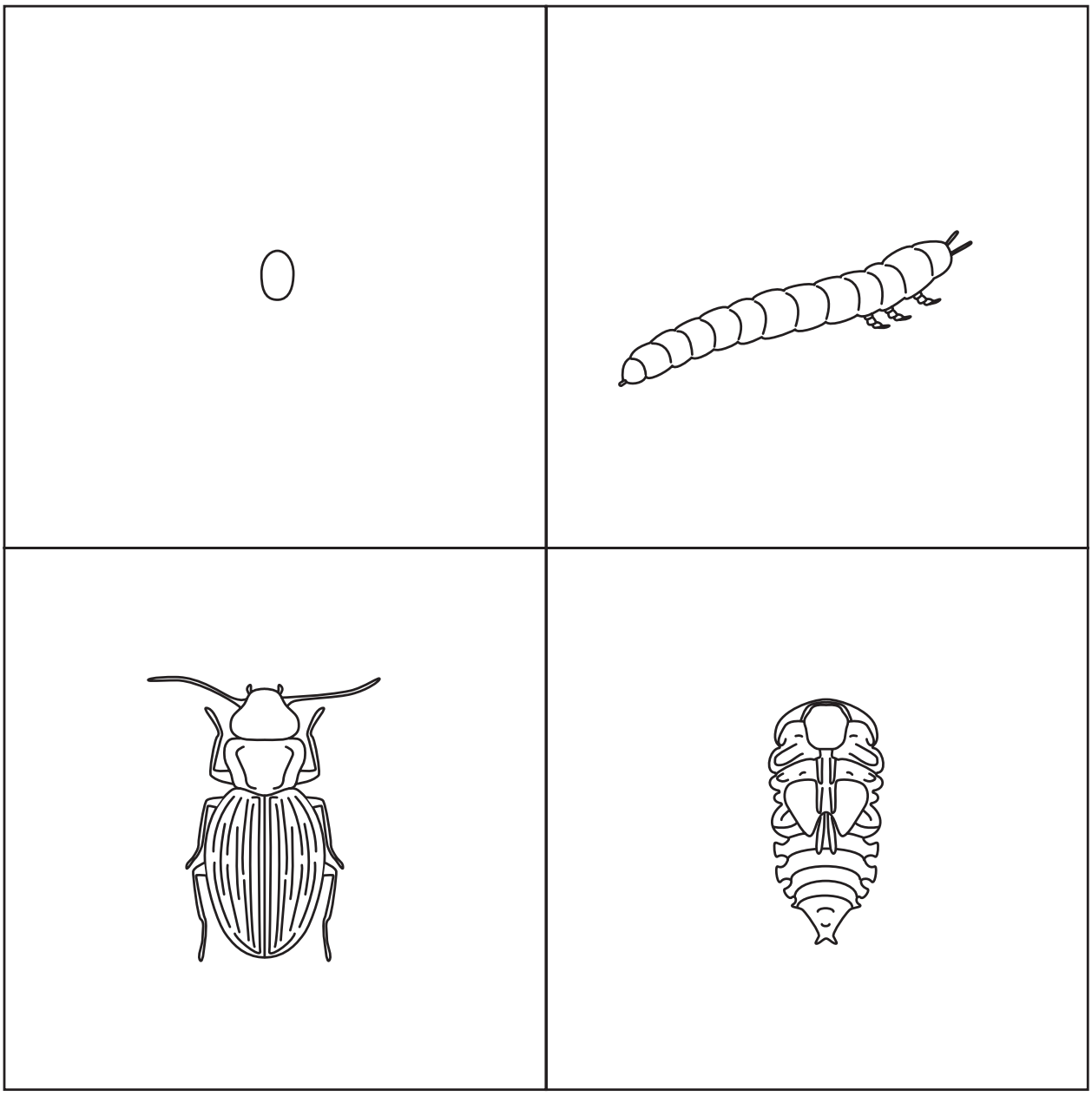


Activity 47: The Mealworm—An Information Sheet for Teachers

- Mealworms are actually the larval stage of the darkling beetle. The mealworm or larva stage is worm-like in appearance, hence the name mealworm.
- Mealworms average in length of about 2.5 cm.
- Their outer shell or exoskeleton is yellowish brown in colour and cylindrical in shape.
- The adult beetle produces eggs, which hatch into mealworms in approximately two weeks.
- The mealworm stays in the larval stage for approximately 10 weeks.
- During this time period it will shed its exoskeleton from 9 to 20 times.
- The mealworm turns into the pupa stage after the 10-week period.
- Within two to three weeks the pupa will split open, and an adult beetle will emerge.
- Adult beetles mate and lay eggs, and the cycle will start again.
- Mealworms should not be kept in direct sunlight, near air vents, or in cold drafts.
- Mealworms prefer dark warm places.

For further information and learning experiences use the Internet. Go to the search engine you use and type in mealworms. You should find several sites with additional information and ideas.

Mealworm Life Cycle



Activity 48: Growing Mealworms—Getting Started

Outcomes

Students will be expected to

- describe and record observations, in various formats, of changes in the appearance and activity of an organism through its life cycle (101-7, 201-5, 203-3, 102-6)
- select and use materials to observe an organism's life cycle and ask questions about the organism's needs and changes in growth (200-1, 200-4)

Assessment

- Students are able to set up an environment in which mealworms can survive.
- Students are able to explain the needs of a mealworm to survive.
- Students are able to illustrate and describe what their mealworm looks like.

Questions

- What type of an environment do mealworms need to survive?
- What are the needs of a mealworm?

Materials

- plastic containers with covers (air holes)
- bran flakes, oatmeal, whole wheat flour, or cornmeal
- slices of apple (for moisture)
- mealworms (purchased from a pet shop)
- plastic spoons
- activity sheet (optional)

Procedure

Teachers should refer to Activity 47: The Mealworm–An Information Sheet for Teachers prior to beginning this learning experience. Have a plastic container for each student. Label the containers with the students' names. Have students put oatmeal and an apple slice in their container (apple slice should be replaced when it dries out or becomes mouldy). Place a few mealworms in each container using a plastic spoon. Have students observe what their mealworms do. Have them record their observations. Explain to students that their mealworm is in the larva stage.

Growing Mealworms—Getting Started Activity Sheet

Container with mealworms, oatmeal, apple slice

Drawing of my mealworm:

Activity 49: Growing Mealworms—A Closer Look

Outcomes

Students will be expected to

- describe and record observations, in various formats, of changes in the appearance and activity of an organism through its life cycle (101-7, 201-5, 203-3, 102-6)
- select and use materials to observe an organism's life cycle and ask questions about the organism's needs and changes in growth (200-1, 200-4)

Assessment

- Students are able to observe and record what their mealworm looks like.
- Students are able to use a magnifier to observe their mealworms.
- Students are able to record and express what effect light has on the movement of a mealworm.

Questions

- How does the magnifier help you have a more detailed look at your mealworm?
- How does the mealworm react in light and dark?

Materials

- mealworms
- plastic spoons
- piece of paper
- black construction paper
- magnifiers
- Intel Microscope

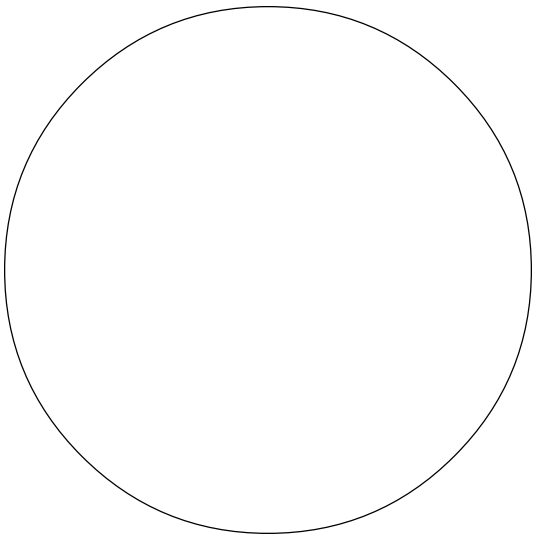
Procedure

Have the students take a mealworm out of its container using a plastic spoon. Have them place it on a piece of paper with some food. Have students observe their mealworms. Have them illustrate and describe them.

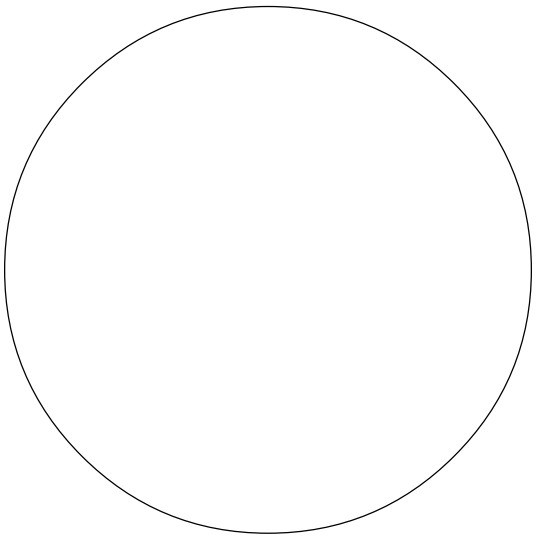
Have the students place a piece of black construction paper in their container to make a darkened area. Have them observe how the mealworms react in the darkened area compared to in the area where light is present. Students could also put food in a black film container and a clear one. Place food in both, add a few mealworms, tape together, and observe what happens.

Growing Mealworms—A Closer Look Activity Sheet

Drawing of a mealworm without using a magnifier.



Drawing of a mealworm using a magnifier.



Description of mealworms:

Activity 50: The Life Cycle of a Worm

Outcomes

Students will be expected to

- describe and record observations, in various formats, of changes in the appearance and activity of an organism through its life cycle (101-7, 201-5, 203-3, 102-6)
- select and use materials to observe an organism's life cycle and ask questions about the organism's needs and changes in growth (200-1, 200-4)

Assessment

- Students are able to observe the lifecycle of a mealworm.
- Students are able to record in illustration and written format the life cycle of a mealworm.
- Students know all of the names of the various stages of the life cycle of a mealworm.

Questions

- How do the mealworms change as they go through the various stages of the life cycle?
- What are two stages of the life cycle of a mealworm?

Materials

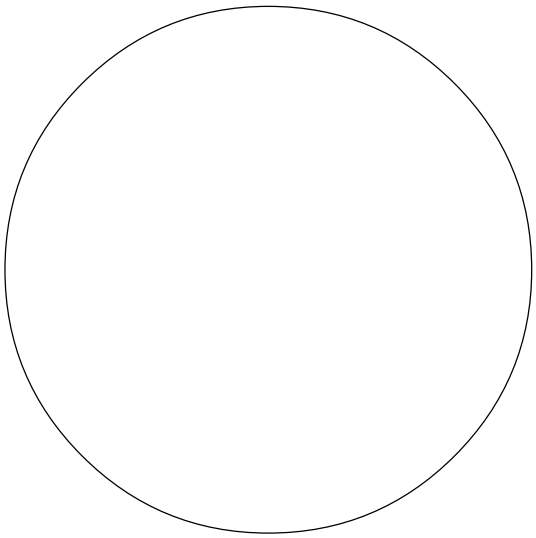
- mealworms
- mealworm containers
- activity sheet (optional)

Procedure

Refer to the information sheet on the life cycle of a mealworm. Have the students observe and record their observations of the mealworm. This will need to be done over a period of time.

The Life Cycle of a Worm Activity Sheet

Date: _____



Description:

_____

_____

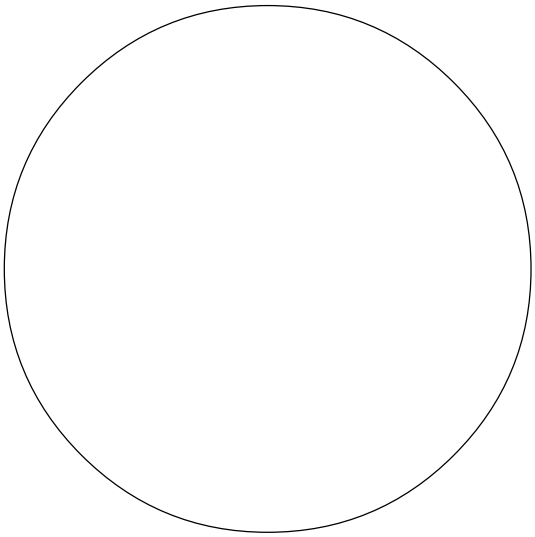
_____

_____

_____

_____

Date: _____



Description:

_____

_____

_____

_____

_____

_____

Activity 51: Order of Development

Outcome

Students will be expected to

- describe and record observations, in various formats, of changes in the appearance and activity of an organism through its life cycle (101-7, 201-5, 203-3, 102-6)

Assessment

- Students are able to place in order the life cycle of various organisms.

Question

- How has what you have learned about the life cycle of an organism helped in understanding their development?

Materials

- pictures of various organisms and their life cycles

Procedure

This learning experience is designed to have students use problem-solving strategies and previous knowledge to identify the life cycles of various organisms. Have a variety of pictures on cards showing the life cycles of a variety of organisms (mealworms, frogs, butterflies, animals). Have students match the organisms to the life cycle in the order in which it would happen.

Activity 52: Needs and Growth Patterns of Other Organisms

Outcome

Students will be expected to

- identify new questions about the needs and growth patterns of other organisms (202-9)

Assessment

- Students are able to take the knowledge they have learned through first-hand experience and relate it to other organisms.
- Students are able to develop new questions to answer regarding the growth patterns of other organisms.

Question

- What type of questions do you need to ask in order to develop an understanding of the growth patterns of other organisms?

Materials

- videos
- websites
- pictures

Procedure

This learning experience will give students the opportunity to look at other organisms, their needs, and growth patterns. Discussions could focus on family pets and visiting a fishery. Students should record their observations, either as a class or individually.

Activity 53: Comparing Life Cycles

Outcome

Students will be expected to

- compare and make predictions about the life cycles of familiar animals (100-15, 200-3)

Assessment

- Students will be able to compare the life cycle of one animal to that of another.
- Students will be able to see the similarities and the differences between the life cycles of various animals.

Questions

- What are some of the similarities between the life cycles of animals you observed?
- What are some of the differences between the life cycles of animals you observed?

Materials

- videos
- pictures of animals and their life cycles
- various animals
- activity sheet (optional)

Procedure

This learning experience can be done in a variety of formats.

Students could view animals and their life cycles by visiting a wildlife park, zoo, or seashore or from their own experience with animals in the classroom or at home.

Students could view a video(s) on the life cycles of various animals and discuss/record their observations. Websites could be used to access the life cycles of various animals.

Comparing Life Cycles Activity Sheet

Animal	Similarities in Growth	Differences in Growth

Activity 54: Growth and the Environment

Outcome

Students will be expected to

- describe features of natural and human-made environments that support the health and growth of some familiar animals (102-7)

Assessment

- Students are able to observe various organisms in their environment. Students are able to explain how an organism's environment supports its health and growth.
- Students are able to explain how human-made environments support an organism's growth.

Questions

- How does the environment that an organism lives in support its health and growth?
- How have human-made environments supported the health and growth of organisms?

Materials

- attribute hoops
- hand-held magnifiers
- activity sheet

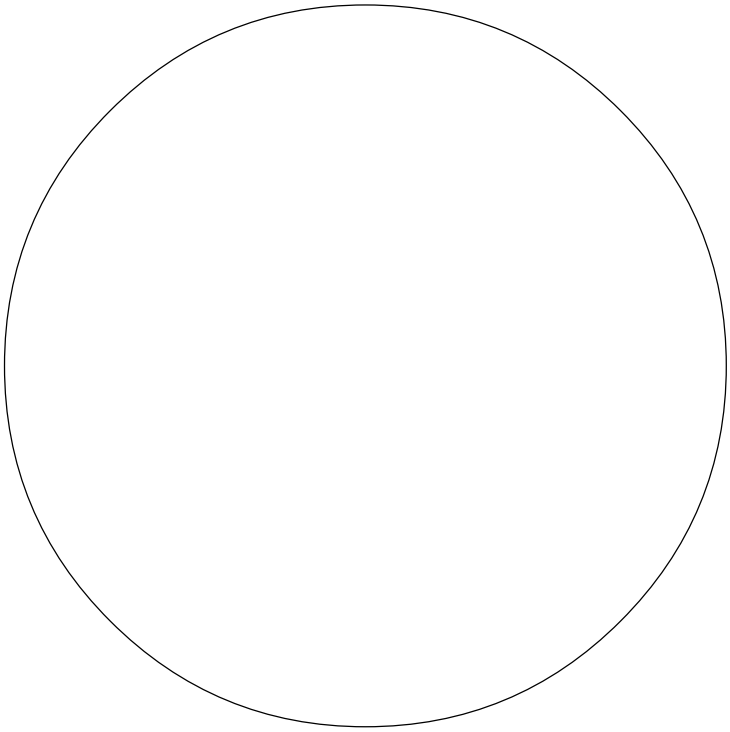
Procedure

Take students outdoors and have them section off an area with their attribute hoops. Have students observe and record the types of organisms they find. Have them record the type of environment that the organisms are found in (e.g., grass, soil). Have students discuss how the environments they found their organisms in support their growth.

Students could be taken to a lake or pond to observe living organisms there. Students could be taken on a nature walk to observe how human-made and natural environments support the growth of organisms (birds' nests in trees and in buildings).

Growth and the Environment Activity Sheet

Drawing of an organism(s) and the environment where it was found.



Types of organisms found:

Type of environment:

Activity 55: Match It Up

Outcome

Students will be expected to

- describe features of natural and human-made environments that support the health and growth of some familiar animals (102-7)

Assessment

- Students are able to match the organism with the environment it lives in.
- Students are able to give explanations for their decisions.

Question

- What strategies did you use to decide which organism suits a particular environment?

Materials

- cards with a variety of organisms and environments that are familiar to students

Procedure

This learning experience will provide students with the opportunity to take the knowledge they have learned through nature walks and classroom experiences and apply it to a problem-solving situation.

Cards are made in two sets: one set that shows organisms and another set with pictures of environments that would provide healthy growth for the organisms. Students are to match up the sets and explain the reason(s) for their decision. This could be done as a whole class, a centre, or as a group experience.

Activity 56: Changes in Me

Outcome

Students will be expected to

- describe changes in humans as they grow and contrast human growth with that of other organisms (100-16)

Assessment

- Students are able to describe their developmental change from infant until grade 2.
- Students are able to provide evidence that they have changed (height, mass, hair).

Questions

- How have I changed from an infant to now?
- What evidence do I have that I have changed?

Materials

- metric measuring tapes
- metric bathroom scales
- pictures of students from infancy until grade 2
- pictures of infants and school-aged children
- recording sheet (optional)

Procedure

Teachers should be sensitive to the fact that some children may not have access to their own baby pictures. Pictures should be provided for students who do not have access to family photos.

Parts of this learning experience could be carried out throughout the year (see recording sheet). Class discussions on changes that children can remember about themselves should be carried out. Students should be asked to bring in pictures from infancy to now. If parents kept a record of their growth (mass, length at birth) this information could be used as well. Children should be given the opportunity to put their pictures in order from earliest years to present. They should write about what they remember or what they can observe from the pictures as to their changes. These could be recorded in their science logs or placed on ticket board for a class display.

Changes in Me Activity Sheet

Body Part	Size (measurement) Then	Size (measurement) Now
Foot		
Hand		
Height		
Body mass		
Length of arm		
Distance around the head		

What I notice about the change in my growth:

Activity 57: My Family

Outcome

Students will be expected to

- describe changes in humans as they grow and contrast human growth with that of other organisms (100-16)

Assessment

- Students are able to see the changes in humans from infancy to adulthood.
- Students are able to provide evidence to show that changes take place.
- Students are able to record through illustrations, graphs, and pictures changes in humans as they grow.

Questions

- How do humans change over the course of their lifetime?
- How do we know these changes take place?
- What methods do we use to record changes in our lives?

Materials

- pictures of various stages of humans
- *Everything Changes*, Rigby (Grade 2 Collection, Active Young Readers)

Procedure

This learning experience is designed to help children see the full life cycle of humans. This could be done through pictures, illustrations, and/or having a generation of a family come into the school.

Students could be given the opportunity to bring in pictures of their families from infant to grandparents/great grandparent. Students should discuss the differences they observe and also write about them. Teachers could provide photographs of humans. Students could order them from youngest to oldest and describe the differences they observed. If a student has a family ranging in age from infancy to grandparent/great grandparent they could be invited in, and students could discuss and write about the differences they observed. Family members could talk about changes in their growth.

Activity 58: Growth

Outcome

Students will be expected to

- describe changes in humans as they grow and contrast human growth with that of other organisms (100-16)

Assessment

- Students are able to describe the differences in human growth compared to that of other organisms.

Questions

- What differences did you notice in the growth of organisms you observed in previous learning experiences to those of humans?
- How does a human have control of its growth compared to that of an organism from previous learning experiences?

Materials

- None required

Procedure

Students have had the opportunity to observe the growth of other organisms and humans. Students should be given the opportunity to discuss the similarities and differences. A class chart could be developed to record the students' observations.

Activity 59: Healthy Life Style

Outcome

Students will be expected to

- identify the basic food groups and describe actions and decisions that support a healthy lifestyle (103-5)

Assessment

- Students are able to describe the importance of eating healthy foods. Students understand the need to wash their hands prior to eating and/or after using the washroom.
- Students will develop plans to promote a healthy lifestyle.

Questions

- What types of food are considered healthy?
- How can I promote a healthy lifestyle?
- What are the major food groups?

Materials

- *Canada's Food Guide to Healthy Eating*
- pictures of various foods and food groups
- various types of fruits and vegetables

Procedure

Discuss with students the types of food they eat. Present to students the major food groups and discuss their importance and the importance of having a balanced diet to support a healthy lifestyle. Students should be provided the opportunity to sample various foods from the different food groups. Prior to sampling food, students should have discussions to lead to the importance of washing hands before eating. Introduce the students to the term **germs** and what it means.

Appendix I: Print Resources

Authorized Learning Resources

The following resources to support teaching and learning in science are currently available through the Nova Scotia School Book Bureau. The NSSBB number is given in parenthesis. For more details, visit the website at <https://w3apps.EDnet.ns.ca/nssbb>.

Animals Grow, Teacher's Guide (13941)

Air and Water, Teacher's Guide (13947)

Cool Tools (13514)

Everything Changes (12823)

Frogs and Toads (13513)

From Rocks to Sand: The Story of a Beach (12699)

How Does It Change? (13461)

I See What You Mean (11893)

Insects Change (13512)

Liquids and Solids (13162)

Living Things Need Water (13150)

Luke's Go-Cart (12811)

Matter, Matter Everywhere, Teacher's Guide (13943)

Move It!, Teacher's Guide (13945)

Oceans, Seas, and Coasts (13160)

Rain, Snow, and Hail (12823)

Rivers, Streams, and Lakes (13160)

Soak It Up (13162)

Some Things Float (13150)

The Flood (12695)

The Slow Race (13463)

The River (12165)

The River's Journey (13150)

Turn on a Faucet (13150)

Watch the Sky (13150)

Water Can Change (13150)

Water, Land, and Air (13150)

Waves: The Changing Surface of the Sea (12705)

When the Rain Comes (13150)

Where Does the Water Go? (13150)

Wind Power (13150)

Wonders of the Ocean (Big Book) (13511)

Materials

Animals and Creatures, Lego Dacta (12378)

Buildings and Structures, Lego Dacta (12424)

Community and Transportation, Lego Dacta (12435)

Early Simple Machines Kit, Lego Dacta (12446)

Software

Eyewitness Encyclopedia of Science (51070)

Kid Pix Studio Deluxe (51398)

Kidspiration (51373)

Sammy's Science House (Mac/Win CD) (50812)

Science Court Water Cycle (51218)

The New Way Things Work (Mac/Win CD) (50836)

Other Print Resources

This section contains resources that are currently *not listed* on the *Authorized Learning Resource* list that teachers may wish to access to support their science curriculum for grade 2. Where possible, an ISBN number is included to aid in locating a title. Many of the titles are trade books available through Canadian publishers and educational distributors and can more than likely be found in publishers' catalogues. They can be found as part of classroom sets of individual titles or in guided reading packs. Many of these titles would be ideal for use during independent reading time in English language arts or as short read-alouds by the teacher. Some titles provide a math link for many science activities in appendices E–H that could be used during math time prior to an upcoming science lesson.

Anderson, Honey. (1986) *Floating and Sinking*. Richmond Hill: Scholastic Tab Publications. ISBN: 0725308125

Berger, Melvin. (2000) *Buzz!: A Book about Insects*. New York: Scholastic. ISBN: 0439087481

Bosak, Susan V. (1991) *Science Is ...* Scholastic. ISBN: 0590740709

Brandt, Keith. (1982) *What Makes It Rain?*. Mahway, NJ: Troll Associates. ISBN: 0893755834

Branley, Franklyn. (1997) *Down Comes the Rain*. Series: Let's-Read-and-Find-Out Science, Stage 2. New York: HarperCollins. ISBN: 0064451666

Carle, Eric. (1987) *The Very Hungry Caterpillar*. New York: Philomel Books. ISBN: 0399208534

Cherry, Lynne. (1992) *A River Ran Wild*. San Diego: Harcourt Brace Javonovich. ISBN: 0152005420

Cole, Joanna. (1996) Scholastic's *The Magic School Bus: Butterfly and the Bog Beast: A Book about Butterfly Camouflage*. New York: Scholastic. ISBN: 0590508342

Cole, Joanna. (1986) *The Magic School Bus at the Waterworks*. New York: Scholastic Inc. ISBN: 0590403605

Damico, Maeve. (2002) *Liquids and Solids*. Toronto: Nelson Thomson Learning. ISBN: 0176252738

Damico, Maeve. (2002) *Soak It Up!* Toronto: Nelson Thomson Learning. ISBN: 0176252770

Dr. Seuss. (1980) *The Lorax* , Canadian Communities Today Kit. Edmonton: Alberta Education.

Finochio, Christine, and Jennette MacKenzie. (2002) *How Does It Change?* Toronto: Nelson Thomson Learning. ISBN: 0176199810

Finochio, Christine, and Jennette MacKenzie. (2002) *The Slow Race*. Toronto: Nelson Thomson Learning. ISBN: 0176199888

Gibbons, Gail. (1993) *Frogs*. New York: Holiday House. ISBN: 0823410528

Gibbons, Gail. (1989) *Monarch Butterfly*. New York: Holiday House. ISBN: 082340773X

Harcourt, Lalie, and Ricki Wortzman. (2000) *Science and Technology 2: In the Kitchen*. Toronto: Addison-Wesley. ISBN: 0130197637

Harcourt, Lalie, and Ricki Wortzman. (2000) *Science and Technology 2: Mechanics at Work*. Toronto: Addison-Wesley. ISBN: 0130197629

Harcourt, Lalie, and Ricki Wortzman. (2000) *Science and Technology 2: On the Move*. Toronto: Addison-Wesley. ISBN: 0130197629

Harcourt, Lalie, and Ricki Wortzman. (2000) *Science and Technology 2: Teacher's Guide*. Toronto: Addison-Wesley. ISBN: 0130279110

Hirschland, Roger B. (1987) *How Animals Care for Their Babies*. Washington, DC: National Geographic Society. ISBN: 087446789

Peters, Lisa Westberg. (1991) *Water's Way*. New York: Arcade. ISBN: 1559700629

Reece, James H. *Lester and Clyde*. (1990) Toronto: Ashton Scholastic. ISBN: 186943028X

Reid, Barbara. *Caterpillar to Butterfly*. (1999) Toronto: HarperCollins. ISBN: 0002240076

Relf, Patricia, and Joanna Cole. (1995) *Scholastic's The Magic School Bus Hops Home: A Book about Animal Habitats*. New York: Scholastic. ISBN: 0590484133

Robinson, Fay. *Creepy Beetles*. (2000) New York: Scholastic. ISBN: 0439067545

Shannon, David. (2000) *The Rain Came Down*. New York: Blue Sky Press. ISBN: 0439050219

Shapiro, Karen. (2001) *Butterflies*. New York: Scholastic. ISBN: 0439206367

Simon, Seymour. (1979) *Pets in a Jar: Collecting and Caring for Small Wild Animals*. New York: Penguin Books. ISBN: 0140491864

Tresselt, Alvin. (1990) *Rain Drop Splash*. New York: Mulberry Books. ISBN: 0688093523

Walker, Malcolm S. (1991) *Air*. Series: Starting Technology. East Sussex: Wayland. ISBN: 0750202688

Wick, Walter. (1997) *A Drop of Water: A Book of Science and Wonder*. New York: Scholastic. ISBN: 0590221973

Appendix J: Pan-Canadian Outcomes Chart

The following outcomes from *Common Framework of Science Learning Outcomes K to 12* were used as guidelines for this science document. Column one outcomes have been developed from these pan-Canadian outcomes.

Physical Science: Relative Position and Motion

STSE/Knowledge	Skills
Students will be expected to	*Students will be expected to*
100-22 describe the motion of an object in terms of a change in position and orientation relative to other objects	**Initiating and Planning**
100-23 describe the position of an object relative to other objects or to an identified space, and place an object in an identified position	**200-1** ask questions that lead to exploration and investigation
100-24 describe the position of objects from different perspectives	**200-2** identify problems to be solved
100-25 investigate and describe different patterns of movement and identify factors that affect movement	**200-3** make predictions, based on an observed pattern
	Performing and Recording
	201-3 use appropriate tools for manipulating and observing materials and in building simple models
	Analysing and Interpreting
	202-8 compare and evaluate personally constructed objects with respect to their form and function
	202-9 identify new questions that arise from what was learned
	Communication and Teamwork
	203-2 identify common objects and events, using terminology and language that others understand

Physical Science: Liquids and Solids

STSE/Knowledge	Skills
Students will be expected to	*Students will be expected to*
100-17 investigate and compare properties of familiar liquids and solids	**Initiating and Planning**
100-18 investigate and describe the interactions of familiar liquids and solids	**200-1** ask questions that lead to exploration and investigation
100-19 identify ways to use a variety of liquids and to combine solids and liquids to make useful materials	**200-3** make predictions, based on an observed pattern
100-20 investigate changes that result from the interaction of materials and describe how their characteristics have changed	**200-4** select and use materials to carry out their own explorations
100-21 demonstrate an understanding of sinking and floating objects by solving a related practical problem	**Performing and Recording**
102-8 describe and demonstrate ways we use our knowledge of solids and liquids to maintain a clean and healthy environment	**201-3** use appropriate tools for manipulating and observing materials and in building simple models
103-6 describe the characteristics of the three states of water and predict changes from one state to another	**201-5** make and record relevant observations and measurements, using written language, pictures, and charts
	201-7 identify and use a variety of sources of science information and ideas
	Analysing and Interpreting
	202-2 place materials and objects in a sequence or in groups according to one or more attributes
	202-8 compare and evaluate personally constructed objects with respect to their form and function
	Communication and Teamwork
	203-3 communicate procedures and results, using drawings, demonstrations, and written and oral descriptions

Earth and Space Science: Air and Water in the Enviroment

STSE/Knowledge	Skills
Students will be expected to **100-26** observe changes in air conditions in indoor and outdoor environments, and describe and interpret these changes **100-27** describe changes in the location, amount, and form of moisture, and identify conditions that can affect these changes **102-9** identify evidence of moisture in the environment, in materials, and in living things **102-10** demonstrate how air, as a substance that surrounds us, takes up space and is felt as wind when it moves **102-11** identify examples of water in the environment and describe ways that water is obtained, distributed, and used **103-7** describe the effects of weather and ways to protect things under different conditions **103-8** identify the importance of clean water for humans, and suggest ways they could conserve water	*Students will be expected to* **Initiating and Planning** **200-1** ask questions that lead to exploration and investigation **200-3** make predictions, based on an observed pattern **200-4** select and use materials to carry out their own explorations **Performing and Recording** **201-3** use appropriate tools for manipulating and observing materials and in building simple models **201-5** make and record relevant observations and measurements, using written language, pictures, and charts **Communication and Teamwork** **203-1** communicate questions, ideas, and intentions while conducting their explorations **203-3** communicate procedures and results, using drawings, demonstrations, and written and oral descriptions

Life Science: Animal Growth and Changes

STSE/Knowledge	Skills
Students will be expected to **100-15** compare the life cycles of familiar animals and classify them according to the similarities and differences of their life cycles **100-16** describe changes in humans as they grow, and contrast human growth to that of other organisms **101-7** observe and describe changes in the appearance and activity of an organism as it goes through its life cycle **102-6** identify constant and changing traits in organisms as they grow and develop **102-7** describe features of natural and human-made environments that support the health and growth of some familiar animals **103-5** identify the basic food groups, and describe actions and decisions that support a healthy lifestyle	*Students will be expected to* **Initiating and Planning** **200-1** ask questions that lead to exploration and investigation **200-3** make predictions, based on an observed pattern **200-4** select and use materials to carry out their own explorations **Performing and Recording** **201-5** make and record relevant observations and measurements, using written language, pictures, and charts **Analysing and Interpreting** **202-7** propose an answer to an initial question or problem and draw simple conclusions based on observations or research **202-9** identify new questions that arise from what was learned **Communication and Teamwork** **203-3** communicate procedures and results, using drawings, demonstrations, and written and oral descriptions