Ministry of Education

Ontario
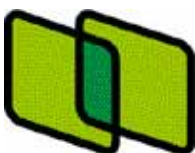
The Ontario Curriculum
Unit Planner

Teaching/Learning Companion

Teacher Companion

The teaching/learning strategies companion

Direct Instruction Strategies..55

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Introduction

This Teaching/Learning Companion is intended to assist teachers designing instructional units using the Ontario *Curriculum Unit Planner*. It is part of the *Planner's* Teacher Companions database that includes the following components:

- Teaching/Learning Strategies
- Assessment Companion
- ESL/ELD Companion
- Special Education Companion
- Explanatory Notes

The Teacher Companions database was compiled by Ontario educators and field-tested for use in Ontario schools. It is intended to help the collaborative and reflective practitioner plan, develop, implement, and evaluate curriculum units that:

- meet the needs of all students in the classroom;
- provide a balance in the range of learning experiences;
- recognize the interrelated phases in the learning process;
- create a consistent understanding to support effective teaching and learning;
- incorporate effective instructional strategies and assessment strategies;
- support the implementation of the Ontario curriculum.

While every effort has been made to provide appropriate information for educators, this database is not intended to be a definitive treatment of the topics it includes. Its contents should be read as suggestions, not prescriptions. To help educators who find themselves in a variety of circumstances, this database includes references to supports and applications that may not be available to all practitioners.

You can use these databases within the *Curriculum Unit Planner* in the following ways:

1. Browse individual records by clicking on the *Companion* icon (i.e., the overlapping pages icon) found on most *Planner* screens.
2. Click on the field and use the right scroll bar to see more text. Individual records are created using field boxes that may be larger than they first appear.
3. Use the "Find" feature to search for key words/phrases according to specific criteria.
4. Copy/Paste specific sections of a *Companion* record into the appropriate text box (e.g., "Teaching/Learning"), making any additional notes.
5. Use the Bookmark feature to attach individual records as a resource for your unit.
6. Attach teaching/learning strategies, assessment strategies, recording devices, and bookmarked resources by clicking on the "+" in relevant fields in the subtasks.
7. Since these databases are fixed records and cannot be altered except by copying and pasting their text into another area (e.g., Scrapbook, Teaching/Learning text box, Subtask Notes), create blackline masters of additional strategies and attach them as resources in specific and subsequent units;
8. Print a whole Companion or individual record using the Print icon;
9. Visit the *Planner* website at *www.ocup.org* to download new versions of these databases.

Checklist for Teaching/Learning Strategies

ACTIVITY-BASED STRATEGIES
- ❑ Activity/Learning Centres
- ❑ Carousel
- ❑ Debate
- ❑ Field Trip
- ❑ Game
- ❑ Oral Presentation
- ❑ Panel Discussion
- ❑ Rehearsal / Repetition / Practice
- ❑ Retelling
- ❑ Simulation
- ❑ Survey

ARTS-BASED STRATEGIES
- ❑ Ceremony
- ❑ Chanting
- ❑ Choral Reading
- ❑ Choreography
- ❑ Collage
- ❑ Docudrama
- ❑ Forum Theatre
- ❑ Improvisation
- ❑ Mask Making
- ❑ Puppetry
- ❑ Reader's Theatre
- ❑ Role Playing
- ❑ Sketching to Learn
- ❑ Story Theatre
- ❑ Storyboard
- ❑ Tableau

COOPERATIVE STRATEGIES
- ❑ Buddy System
- ❑ Collaborative Teaching
- ❑ Community Links
- ❑ Conflict Resolution
- ❑ Discussion
- ❑ Interview
- ❑ Jigsaw
- ❑ Literature Circles
- ❑ Mentoring
- ❑ Numbered Heads
- ❑ Peer Practice
- ❑ Peer Teaching
- ❑ Round Robin
- ❑ Round Table
- ❑ Think/Pair/Share

DIRECT INSTRUCTION STRATEGIES
- ❑ Advance Organizer
- ❑ Book Talks
- ❑ Cloze
- ❑ Conferencing
- ❑ Demonstration
- ❑ Directed Reading-Thinking Activities
- ❑ Expository Text Frames
- ❑ Flash Cards
- ❑ Guest Speaker
- ❑ Guided Exploration
- ❑ Guided Reading
- ❑ Guided Writing
- ❑ Lecture
- ❑ Making Words
- ❑ Mnemonic Devices
- ❑ Practice and Drill
- ❑ Programmed Learning
- ❑ Prompt
- ❑ Read Along
- ❑ Read Aloud
- ❑ Reciprocal Teaching
- ❑ Review
- ❑ Seminar/Tutorial
- ❑ Socratic Dialogue
- ❑ Story Mapping
- ❑ Storytelling
- ❑ Task Cards
- ❑ Textbook
- ❑ Visual Stimuli
- ❑ Visualization
- ❑ Word Cycle
- ❑ Word Sort
- ❑ Word Wall
- ❑ Workbook/Work Sheets

INDEPENDENT LEARNING STRATEGIES
- ❑ Homework
- ❑ Independent Reading
- ❑ Independent Study
- ❑ Learning Contract
- ❑ Learning Log/Journal
- ❑ Memorization
- ❑ Note Making
- ❑ Portfolio
- ❑ Reading Response

- ❑ Reflection
- ❑ Report
- ❑ Response Journal

INQUIRY AND RESEARCH MODELS
- ❑ Cognitive Skills Model
- ❑ Decision-Making Models
- ❑ Historical/Geographic Inquiry
- ❑ Inquiry Process
- ❑ Mathematical Problem Solving
- ❑ Problem-Based Models
- ❑ Questioning Process
- ❑ Research Process
- ❑ Scientific Method
- ❑ Technical Design Process
- ❑ Writing Process

LEARNING STYLES
- ❑ Bodily-Kinesthetic Intelligence
- ❑ Interpersonal Intelligence
- ❑ Intrapersonal Intelligence
- ❑ Logical-Mathematical Intelligence
- ❑ Musical-Rhythmic Intelligence
- ❑ Verbal-Linguistic Intelligence
- ❑ Visual-Spatial Intelligence

TECHNOLOGY / Media-Based APPLICATIONS
- ❑ Communication Applications
- ❑ Computer-Aided Design (CAD)
- ❑ Computer-Assisted Instruction
- ❑ Database Applications
- ❑ Email Applications
- ❑ Graphic Applications

- ❑ Internet Technologies
- ❑ Media Presentation
- ❑ Media Production
- ❑ Multimedia Applications
- ❑ On-line Public Access Catalogues
- ❑ Spreadsheet Applications
- ❑ Time-Management Applications

THINKING SKILLS STRATEGIES
- ❑ Analysing Bias/Stereotype
- ❑ Anticipation Guide
- ❑ Brainstorming
- ❑ Case Study
- ❑ Classifying
- ❑ Concept Clarification
- ❑ Concept Mapping
- ❑ Estimating
- ❑ Experimenting
- ❑ Expressing Another Point of View
- ❑ Fair Test
- ❑ Graphing
- ❑ IDEAL Problem Solving
- ❑ Issue-Based Analysis
- ❑ Lateral Thinking
- ❑ Manipulatives
- ❑ Map Making
- ❑ Media Analysis
- ❑ Mental Calculation
- ❑ Metacognitive Reflection
- ❑ Mind Map
- ❑ Model Making
- ❑ Oral Explanation
- ❑ Problem Posing
- ❑ Problem Solving
- ❑ Process Notes
- ❑ Semantic Feature Analysis
- ❑ Seriation
- ❑ Statistical Analysis
- ❑ Think Aloud
- ❑ Visual/Graphic Organizers
- ❑ Writing to Learn

Activity-Based Strategies

Activity-based strategies encourage students to learn by doing. They provide authentic, real-life opportunities for students to participate in active, self-directed learning experiences where they have opportunities to explore, make choices, solve problems, and interact with others. Activity-based learning is often referred to as project-based learning and shares many of the goals of independent and cooperative learning. Students progress through activities at their own pace, interest, and developmental level. At the same time, students take responsibility for their learning and gain lifelong skills of collaboration and negotiation.

Although active learning experiences are student-centred and promote choice and independence, the teacher must set up routines and expectations for learning and monitor the results through appropriate recording devices – for example, checklists or journal entries. Teachers invite willing participation in activity-based strategies by ensuring that content and activities are relevant and stimulating for students. Activities such as debate, rehearsal, retelling, and simulation engage students in authentic learning and validate their learning by having them present to an appropriate audience. Games and field trips can bring abstract concepts into more concrete and visible understandings for students. Activity-based learning is motivational for many students, as they experience learning situations that are diverse and related to real-life experiences.

Activity-Based Strategies

- ❑ Activity/Learning Centres
- ❑ Carousel
- ❑ Debate
- ❑ Field Trip
- ❑ Game
- ❑ Oral Presentation
- ❑ Panel Discussion
- ❑ Rehearsal/Repetition/Practice
- ❑ Retelling
- ❑ Simulation
- ❑ Survey

Activity/Learning Centres

Description
Learning centres are specifically assigned spaces where activities are provided that promote exploration and interaction with other students. Learning centres foster both independent and collaborative learning and can include permanent organizational structures – such as listening, reading, science, painting, or music centres – or flexible centres related to specific topics or curriculum areas. Centres can be set up in the classroom, the school library information centre, and other areas of the school.

The variety of resources and types of information sources available in such centres can support the achievement of curriculum expectations through different modes of learning. Rotation through the various activities allows students to actively explore areas of interest in greater depth. Learning centres enhance student motivation by providing choices and they help students to develop interpersonal skills and independent work habits.

Method

The teacher:

- establishes a purpose for the learning at the centres;
- arranges the learning environment and organizes for individual differences in interest and ability, including different learning and presentation styles;
- collaborates (e.g., with the teacher-librarian, special education teacher) to provide appropriate and varied resources and materials;
- establishes with students the expectations for learning and for routines at the centres;
- pre-teaches skills and process, if required, for the intended results;
- provides structure in the planning of the learning activities and for the choices available;
- establishes how the learning will be recorded (e.g., graphs, checklists).

Considerations

Learning centres:

- require organization of time, materials, and resources;
- require monitoring of student choices and tracking of completion of activities;
- promote choice, but require structure in determining the choices available;
- require clear communication of the expected results;
- work best if the task is specific.

Illustrations

Elementary

- *transfer their body weight over low equipment in a variety of ways* (2p26)

The teacher organizes six activity centres in the gym, each with a different piece of equipment. Working in small groups, students rotate through each activity centre and explore as many different ways as possible of using the equipment in a set time period.

Secondary

- *express ideas and opinions in short conversations and teacher-guided discussions* (OCV.03B)

Students complete the tasks at each of seven centres that explore multiple intelligences. The teacher then asks the students to share what went well, what they found really difficult, and how the different tasks appealed to different intelligences.

Carousel

Description

Carousel is an information strategy that allows students to share a project, a summary of an article, or a research report with several groups in the classroom. One student in each group is designated to share the information and remains in place, while the rest of the group rotates to listen to the designated speaker from another group. This occurs in a rotational sequence with all the groups in the class. Variations of the carousel strategy can include the designated spokesperson from each group (Student #1) moving one team/group to the right

and presenting to the remaining students in that group. This strategy gives importance and context to a student's work and develops personal accountability as the student presents to an audience beyond the teacher. It enables students to develop self-confidence and to practise presentation skills. It also prevents time-consuming and repetitive reports to the whole class.

Method
The teacher:
- establishes the organizational structure for carousel sharing;
- provides unobtrusive monitoring to ensure students are on task and the process is proceeding according to expectations;
- supports and encourages students as they build their presentation and communication skills;
- determines when it is appropriate to use this type of sharing;
- structures a culminating activity that encompasses the sharing and is a relevant product for this type of learning.

Considerations
Carousels:
- must proceed in ordered fashion to ensure accurate and consistent information is communicated to all students.

Illustrations
Elementary
- *demonstrate an understanding that there are similarities and differences in the ways communities around the world meet their needs* (2z28)

Working in groups, students set up a kiosk or display centre on the country they have researched. One student in each group remains to present, while the other students "tour" the kiosks using a "passport" they have created to record their visits and specific details about the other countries.

Secondary
- *describe, compare, and contrast the general properties and motions of the components of the solar system* (ES1.03)

Each team brainstorms their assigned topic for a period of time, trying to maximize the number of ideas generated. One student from each team moves to another group (rotating clockwise), who add additional ideas to the brainstorming sheet that the student brings. The sheets are posted, and the class develops categories for further exploration of the topics.

Debate

Description
Debates are formal, verbal presentations of opposing sides of an issue by two teams/individuals before an audience or judge. A debate follows a clearly defined format –

for example, parliamentary conventions, who speaks first and last, how long each team speaks. Debates are used to strengthen and extend students' understanding of an issue and to help students develop and demonstrate cognitive thinking, research, and public speaking skills. A level of expertise or comfort in a range of oral skills (logical argument, thinking quickly, clear expression of ideas and arguments) is required. Debates promote risk taking and problem solving, and can also be used to examine unfamiliar contexts or to explore a current or historical social issue in depth. Students are likely to analyse information more carefully if they are required to provide proof to substantiate their arguments.

Method
The teacher:
- pre-teaches debating skills and structures;
- identifies and assigns roles;
- ensures students understand the nature of argumentation and varied argumentation structures such as logical syllogisms and fallacies;
- emphasizes the difference between challenging ideas and challenging people/personalities.

Considerations
Debates:
- should not be used until the classroom comfort level has been established;
- require a clear understanding of the value of positive versus negative argumentation;
- require an awareness of sensitive, shy, or reticent students;
- are usually moderated by the teacher.

Illustrations
Elementary
- *identify and explain economic, environmental, and social factors that should be considered in the management and preservation of habitats* (7s24P)

Students read a series of articles from current newspapers on the redevelopment of a natural habitat area. The teacher then divides the students into two groups, "For" and "Against" the proposed redevelopment. Students develop arguments to support their point of view, either for the proposed new wildlife park or for leaving the area in its natural state. They practise their arguments in small groups.

Secondary
- *provide evidence to support conclusions and opinions* (MI2.09)

Students choose one of the issues related to international trade and prepare arguments to support or oppose it. The teacher organizes a mini-debate where students are asked to present their arguments.

Field Trip

Description
A field trip occurs when students, teachers, and volunteers leave the school building in the pursuit of learning. A field trip is used when active exploration and investigation away from the school will best promote learning by seeing things in authentic contexts. Field trips are relevant when teacher plans require students to apply learning in real settings or when field trips create a real-life experience related to classroom curriculum expectations. Field trips provide concrete, experiential learning opportunities and motivate students to gather data. Field trips can involve the exploration and investigation of a variety of resources by students (natural settings, museums, factories, community settings) and may be facilitated by guides/specialists in partnership with teachers and volunteers.

Method
The teacher:
- identifies settings that will support learning through use of resources not available in the classroom/school;
- determines costs and obtains funding;
- books the location and transportation;
- incorporates health and safety considerations such as providing a list of student names, identifying specific student needs, obtaining administrative and parental/guardian approval, and organizing additional supervision during trip;
- consults with staff at the field trip location if appropriate;
- involves students in planning and organizing the field trip by establishing clear learning expectations;
- pre-teaches and prepares follow-up learning experiences, including debriefing on return from the trip (e.g., journals, artwork, and group discussion);
- incorporates the use of technology into the trip, when appropriate, such as digital or video cameras;
- encourages sharing of the experience and findings with other classes, parents, or community members.

Considerations
Field trips:
- often involve cost;
- can vary in time from part of a day to several days and may require that students miss other in-school learning opportunities;
- should match the length of trip to the age and maturity of students;
- involve extensive teacher preparation;
- require adherence to ministry and board policies and guidelines, including the use of permission forms for students under 18 and the assistance of parents/guardians and other members of the community in providing extra supervision.

Illustrations
Elementary
- *identify products that Canada imports* (6z26)

Students visit local places such as a grocery store, variety store, music store, and bookstore. Students ask questions of the proprietor, read product names, and use pictures, labels, or information on wrappers in order to compile lists of products and the countries of origin.

Secondary
- *gather, organize, and record data through regular observations of the night sky* (ES2.08)

Students observe the night sky with the unaided eye and with binoculars to locate a number of important constellations.

Game

Description
Games are challenging activities, simulations, or contests (competitive and cooperative) played according to a clear set of rules. Games provide students with opportunities for increased factual knowledge, decision making, and interpersonal skills and are designed to achieve clearly defined expectations such as teamwork, skill development, or improved communication. Game rules help students realize that their decisions have consequences for themselves as well as for other participants. Games – whether print, media, or electronic – are meant to be fun and, when run within a protected environment, can motivate students and build enthusiasm for learning. As cooperative activities, games can foster mutual support within a group and increase self-confidence as students become increasingly capable and competent. They can also be an effective way to bring people together by building trust and breaking down barriers between individuals and groups.

Method
The teacher:
- prepares the game structure in order to have organized procedures and rules for maximizing learning;
- involves students in the planning;
- decides whether the game is to be competitive or collaborative;
- finds or develops games that teach or review specific content or skills;
- observes group dynamics and group cooperation.

Considerations
Games:
- should be planned, run, and reviewed in ways that do not foster a winner or loser attitude among students;
- require an atmosphere of trust and risk taking;
- may produce both expected and unexpected behavioural change, with which the teacher and all participants must be prepared to deal.

Illustrations
Elementary

- *demonstrate an understanding of the different connections Canada shares with its trading partners* (6z25)

Students design and create a game that teaches other students about Canada and its trading partners.

Secondary
- *research and report on global concerns that affect Canadians* (GCV.03B)

Students participate in the global challenge, a simulation game that mimics the discrepancies in wealth and resources between developed and newly developing countries.

Oral Presentation

Description
An oral presentation involves the formal or informal presentation of material to an audience. Oral presentations can vary greatly both in content and format. To be effective, students must select a suitable topic, organize the presentation in a clear and logical format, and use appropriate language. It is important to engage the audience by maintaining eye contact, using appropriate body language, and communicating ideas with clear diction and good grammar. An appealing opening, colourful anecdotes, and audience participation are other ways of ensuring the effectiveness of the presentation. An oral presentation is a useful way to deliver reports, new material, facts, questions, and suppositions about a topic.

Method
The teacher:
- provides explicit information about the format and audience;
- sets clear guidelines for the assessment of the presentation (e.g., criteria established through a rubric);
- provides opportunities for rehearsal and practice and accompanying feedback;
- gives feedback in a constructive form, including strengths and areas for improvement.

Considerations
Oral presentations:
- require prior knowledge of audience and appropriate content to maintain interest;
- encompass many variables of voice, movement, thought, and preparation that require a lifetime to practise and master.

Illustrations
Elementary
- *identify ways in which individuals can maintain a healthy environment for themselves and for other living things* (1s23)

The teacher asks students to develop a list of ways that they can help the environment. Students develop and practise a series of brief oral presentations to be incorporated into the school's daily announcements.

Secondary

- *plan and make oral presentations to a small group or the class, selecting and using vocabulary and methods of delivery to suit audience and purpose* (LG2.03D)

The teacher and students brainstorm the many real-life situations where oral communication is important. From the findings, small groups of students compare two examples of that topic in order to present their analysis to the class (e.g., two news commentaries about a sports performance, two oral reviews of a movie).

Panel Discussion

Description
A panel discussion involves a group of participants who present a topic before an audience and a moderator who introduces and facilitates the discussion. A panel discussion provides opportunities for students to examine controversial issues from different perspectives. The moderator introduces the topic, and the panel members then each present a prepared statement of three to five minutes representing various viewpoints. The moderator facilitates audience participation and allows panel members to clarify previous statements or provide new information. After the discussion period, the moderator asks each panel member for some general conclusions or summary statements. Topics chosen for a panel discussion should engage students intellectually and emotionally, allowing them to use higher-order thinking as they make reasoned and logical arguments.

Method
The teacher:
- pre-teaches the components/skills of a good discussion;
- plans and prepares in advance to identify relevant topics;
- provides constructive feedback on the basis of criteria established in advance;
- may have the panel videotaped so that panel members can evaluate their work;
- invites outside panel or audience members with expertise in certain areas.

Considerations
Panel discussions:
- require that moderating/facilitating is judiciously handled to prevent arguments, deviation from the topic, or irrelevant discussion;
- require that panel members have some expertise or preparation in the particular area under discussion;
- require that students in the audience exhibit a basic understanding of the topic.

Illustrations
Elementary
- *present and defend a point of view on how a resource should be used* (7g64)

Each group of students chooses one natural resource to investigate. The group findings are presented to the class as a panel discussion. Each member of the group is responsible for presenting a different viewpoint on how the resource should be used.

Secondary
- *compare the rights and responsibilities of employees and employers* (CC4.04)

The teacher invites a human resources manager, labour relations lawyer, and a union representative to describe the rights and responsibilities of employees and employers. The class enters into discussion with the panel. Pre-planning has involved the students in developing a list of questions to ask each member of the panel.

Rehearsal/Repetition/Practice

Description
Rehearsal/repetition/practice is a strategy whereby students engage in repeated encounters with facts, rules, patterns, skills, or procedures that need to be recalled and applied during current or future demonstrations of learning. This strategy may include self-cueing or self-talk throughout a process, or it may involve doing a task repeatedly.
Rehearsal/repetition/practice can be applied across all curriculum areas and all ages to help students build a repertoire of readily available essential skills and knowledge – for example, multiplication tables. The strategy helps students recall the order or details of a procedure or strategy they frequently use in learning, (for example, what to do when they come to an unknown word in reading), thus building confidence and independence in learning.

Method
The teacher:
- makes decisions about which learning activities are necessary for individual students (e.g., practising cursive writing until it is faster than printing);
- communicates the purpose of the information and the learning activity;
- demonstrates how the smaller pieces fit into the larger picture;
- engages students in meaningful application of the information acquired;
- checks to see that students are learning what is required;
- provides opportunities for students to practise.

Considerations
Rehearsal/repetition/practice:
- requires that understanding precede and accompany practice (e.g., math facts);
- should take place in a context of purposeful activity (e.g., songs, rhymes, computer applications);
- may refine and extend skill development or technique;
- may require the use of specific tactics such as a warm-up, a predictable format with variations to enhance repetition, feedback to inform learning, or selection of specific parts of the whole for rehearsal focus.

Illustrations
Elementary
- *ask and answer simple questions using complete sentences* (6f5)

The teacher asks students, working in pairs, to develop a simple dialogue consisting of a minimum of ten sentences. After practising in pairs, students join another pair and re-create a dialogue for four people.

Secondary
- *present short dialogues*   (OC1.07)

Using accepted models of telephone etiquette, students create a dialogue consisting of a telephone inquiry to a resort to request information on activities. They rehearse their dialogues with their peers and the teacher.

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Retelling

Description
Retelling is a recollection of what has been heard, read, understood, or experienced. Retelling can take many forms (dramatic, written, oral) and may involve sequencing (for example, first … then … after that). Retelling is a comprehension strategy that can examine a student's assumptions and understandings and lead to further reading and responding activities. Planned or spontaneous retelling is a sharing of knowledge or information. Retelling verifies information the learner has gained from experience and organizes thinking. It can be used as a study strategy across all grades and subjects.

Method
The teacher:
- models retelling;
- listens carefully to determine whether students' assumptions and understandings correspond to the material retold;
- encourages students to elaborate or explain certain points in greater depth;
- provides opportunities for students to retell in a variety of forms and situations.

Considerations
Retelling:
- accepts and values all students' ideas within prescribed limits;
- requires respect for the comfort level of all students when they are asked to retell orally in front of peers.

Illustrations
Elementary
- *identify and demonstrate an understanding of major developments that affected the working conditions of Canadians* (8h41)

Students view a video about the working environment in a Canadian automobile manufacturing assembly plant. In small groups, students then write a headline and news story that is a synopsis of events discovered in the video.

Secondary

- *retell stories heard on tape or seen on video* (AOR3.01L)

After listening two or three times to a mystery story told in the third person, students retell the story by writing a version from the point of view of a central character.

Simulation

Description

Simulation is a model or set of circumstances that replicates real or hypothetical conditions through which students respond and act as though the situation were real. Simulation is used when learning about complex processes, events, or ideas (for example, global warming, immigration, the judicial system, the Olympics), when learning about systems, machines, or phenomena that can be replicated, or when trying to understand the emotions and feelings of others. Simulation requires the manipulation of a variety of factors and variables, allowing students to explore alternatives and solve problems and to incorporate values and attitudes into making decisions and experiencing the results. Simulation can take a number of forms, including role playing, case studies, dramatizations, historical events, and replicas of processes or systems. Simulation software applications create computer models of real-life situations and can be particularly effective in developing and sustaining virtual situations while testing a set of variables.

Method

The teacher:

- provides the resources and materials necessary for the simulation;
- establishes, with the students, the purposes and outcomes;
- ensures that the simulation models essential features of the reality being represented;
- sets up the process for students, dividing the class into small groups, assigning work spaces, and allocating time;
- engages students in conferences and group discussions about the simulation;
- ensures that students understand the full range of factors, variables, and the constraints of the real-life situation.

Considerations

Simulation:

- requires considerable preparation and time for student engagement and development of task;
- provides experiential learning as the students involve themselves in the activity;
- stimulates individual student responses;
- requires scheduled discussions and writing sessions as part of the process in order to reflect on new learning.

Illustrations
Elementary
- *describe how the sharing of goods and culture between Canada and other countries can influence the lifestyles of Canadians* (6z43)

Students, in small cooperative groups, are involved in a three-part simulation activity that allows them to use resources to produce and trade items that will meet their needs for food, shelter, and clothing.

Secondary
- *demonstrate an understanding of selected factors that cause change in human and natural systems* (UM1.03D)

Students participate in a simulation activity where small groups represent various groups in Canada (e.g., prairie farmers, city dwellers, business people, small town council members, environmental groups, and students). In the simulation exercise, they respond to the enactment of new laws, the growth of telecommunications, and several natural disasters such as tornadoes and floods. Each group prepares and delivers an oral report on the impact that each of these events has on the particular group they represent.

Survey

Description
A survey is a research method used to extend understanding of an issue or topic by gathering facts, opinions, interests, and attitudes from a representative sample of a population. Conducting an effective survey involves clearly identifying the research question; determining the instrument to be used (for example, questionnaire, test, interview, or attitude scale); determining the population to be surveyed; collecting the data; and tabulating the results. Surveys must be carefully structured and pre-tested and include a high rate of response to be accurate. For validity, surveys must be directed to a representative sample. To ensure a high rate of return, certain strategies must be followed, including identifying the sponsor, inclusion of a cover letter stating the purpose, clear instructions, objective items, attractive format, minimum length, and assurance of anonymity. Questions of confidentiality and ethical considerations must be carefully presented to students prior to administering the survey.

Method
The teacher:
- outlines the basic skills in developing surveys**;**
- assists students in deciding on the appropriate format;
- checks carefully for appropriateness of questions asked;
- screens all surveys and questionnaires before they are distributed;
- may use computer software to facilitate accurate analysis.

Considerations
Surveys:

- can be costly and time consuming to distribute and collect;
- may be intrusive for those asked to complete the survey.

Illustrations
Elementary
- *identify the countries from which Canada imports goods* (6z28)

Students design a survey in class to look for patterns that relate to specific industries and specific countries. Each student conducts the survey at home to determine where different household appliances and products were manufactured. They then map this information and contribute their findings to a class discussion to compare the validity of their conclusions.

Secondary
- *plan and conduct a survey to determine methods used within the local community to reduce waste and conserve energy and water* (HE3.01P)

Working in small groups, students develop a survey that allows them to answer a research question related to recycling in their community. Each group creates a visual display to explain their methodology and findings.

Arts-Based Strategies

The study of the arts helps students to develop the intellectual, creative, social, emotional, and physical aspects of their lives. Arts-based strategies encourage students to understand and appreciate a variety of the forms of music, visual arts, drama, and dance. Such strategies increase students' ability to think creatively and critically, enhance their physical coordination, and develop their ability to work independently or with others. Communication skills developed through the arts promote self-confidence and intellectual and creative growth in all disciplines.

The learning styles of students, particularly those of the visual-spatial and bodily-kinesthetic learners, can be accommodated through arts strategies in all subject areas. In fact, the opportunity to be expressive in understanding concepts and presenting learning often enables students with those particular learning styles to be successful. Applying these strategies will assist students in expressing themselves in verbal and non-verbal ways as well as in discovering and developing abilities that will enhance their lives in the future.

Through the study of the arts and the application of arts-based strategies to all disciplines, students learn to:
- relate their own culture to other cultures (e.g., in history and classical studies);
- communicate using art forms (e.g., in mathematics and science);
- express feelings and ideas through art (e.g., dramatizing scientific concepts);
- connect art to history, geography, language, culture, and human interaction;
- experience art as a source of pleasure and learning (e.g., puppetry strategies for foreign language acquisition and practice);
- understand relationships between disciplines (e.g., mathematics and music, design and visual arts);
- use technology in art (e.g., three-dimensional renderings, web pages).

Teachers can assist students in applying these forms to other curriculum areas to deepen understanding. Strategies developed should provide a balanced opportunity to learn in a structured environment and to explore in unstructured activities. Areas such as inquiry and research, graphing, and scientific investigations provide opportunities to use skills developed in arts-based strategies.

Arts-Based Strategies

- Ceremony
- Chanting
- Choral Reading
- Choreography
- Collage
- Docudrama
- Forum Theatre
- Improvisation

- Mask Making
- Puppetry
- Reader's Theatre
- Role Playing
- Sketching to Learn
- Story Theatre
- Storyboard
- Tableau

Ceremony

Description

Ceremony is the use of ritualistic and stylistic conventions and practices to depict unique and distinguishing features of historical or social traditions of a culture. Ceremony imposes a formal structure, often with prescribed traditional movements, costumes, or artifacts. Innovative use of ceremony can provide opportunities for creative expression in dance and drama.

Method

The teacher:

- plans for research opportunities to ensure that students have appropriate background information;
- provides opportunities for authentic demonstrations by inviting guest speakers with knowledge and experience related to the particular tradition or culture;
- provides opportunities for authentic settings and display and use of artifacts;
- ensures that there is a climate of respect and consideration for activities related to the ceremony;
- encourages students to develop creative presentations using the form of a ceremony;
- arranges visits to settings where ceremonies are practised authentically.

Considerations

Ceremony:

- requires sensitivity and insight with regard to other cultures;
- requires knowledge and adequate background of traditional ceremonies.

Illustrations

Elementary

- *demonstrate an understanding of the distinguishing features of a country in another region* (6z32)

As one part of their presentation on the cultural aspects of Japanese life, students demonstrate a Japanese tea ceremony.

Secondary

- *demonstrate an understanding of how roles may be developed* (DT1.04)

The teacher provides each student with a basic data file on a predetermined list of heroes from different areas in history, mythology, or literature. Students do further research about their assigned/chosen hero and write an acceptance speech for an award they will receive at the annual "Heroes Awards Ceremony." As part of the recognition of the appropriate conventions in dealing with such an event, students should acknowledge their accomplishments as well as thank those who supported their efforts.

Chanting

Description
Chanting is a process of exploring words and text through a rhythmical reading. Chanting helps students to interpret the meaning of a passage through rhythm and actions while engaging them in a new learning experience. The process also increases rhyme and phonemic awareness as students examine the structure and meaning of language. By giving a rhythmic focus for listening, students match text and meaning to sound. This strategy promotes a high level of participation.

Method
The teacher:
- selects appropriate material;
- introduces chant to a small group or to the whole class;
- models possibilities for interpretation;
- encourages students to write their own chants;
- monitors group cooperation.

Considerations
Chanting:
- helps ESL/ELD students and students with special needs to internalize meaning;
- extends interpretations and enhances enjoyment by adding actions and music or sounds.

Illustrations
Elementary
- *use their knowledge and experience to understand what they read* (1e26)

The teacher leads a discussion of certain phrases from a book. The whole group then chants these phrases. The chant can take on different emotional qualities.

Secondary
- *demonstrate knowledge of basic facts about Canada* (ASC1.01)

Students develop their oral English skills while learning the words to some of the better-known regional folk songs of Canada. Before the students chant the refrain, the teacher prefaces the lesson with connections to some of the descriptions of the Canadian landscape that are embedded in the lyrics. Students extend the learning by writing their own chants and sharing them in small groups.

Choral Reading

Description
Choral reading is a rehearsed oral presentation of a text by a group. Choral reading may be used to engage students at the introduction of a learning experience or to aid the

interpretation of text. Through choral reading, students explore sounds and rhythms of language and show appreciation of form. The process also provides practice for reading orally and improving reading skills (students' eyes have to scan the line to keep up with others). Choral reading requires that voices of the group be arranged to interpret meaning effectively (in solos, groups, or whole group, and by volume, tone, and rhythms). In this way, students are encouraged to use their voices with greater expression, vocal range, and skill. As a group activity, choral reading promotes cooperation and enhances self-esteem by allowing individuals to make positive contributions.

Method
The teacher:
- selects the text or provides the opportunity for group selection;
- determines the method for group formation;
- may direct the presentation;
- facilitates group decisions.

Considerations
Choral reading:
- may require adding sound effects and music to extend interpretation;
- requires consideration of reading levels to accommodate students unable to read at the same pace as others;
- may be an informal part of a larger learning experience or a formal presentation as a demonstration of learning.

Illustrations
Elementary
- *enact or create, rehearse, and present drama and dance works based on novels, stories, poems, and plays* (4a61)

Students work in small groups to prepare a choral reading of a poem of their choice. They are then asked to evaluate how well they worked as a group.

Secondary
- *read language-experience stories composed by the class and identify or read aloud specific words or sentences* (ARE1.01)

Students read some of their stories to the class. While one student is reading, the other students identify and jot down rhythmic phrases. The teacher posts the chart paper and leads the class through a series of steps in a choral reading activity based on the chosen phrases.

Choreography

Description
Choreography is the planning and arranging of the basic elements of dance – space, shape, time, and energy – into a finished dance composition. The term is used to describe the

actual steps, groupings, and patterns of a dance composition. Choreography provides for creative expression through rhythmic motor activity. Choreography can involve using traditional steps of a particular dance structure, or it can represent a new composition.

Method
The teacher:
- models choreographic movements to illustrate basic principles involved;
- provides opportunities for students to view videotapes or live performances;
- ensures that students are aware of the safety factors involved in creating dance movements;
- provides a safe environment, both physically and emotionally, for students to rehearse and perform their compositions.

Considerations
Choreography:
- requires background knowledge of the elements required for the composition of a completed work;
- requires opportunities to test ideas and rehearse composition.

Illustrations
Elementary
- *use their creativity in movement, mime, and dance activities* (Ka20)

Students invent dances using familiar rhythms to depict a story they have read.

Secondary
- *create dance compositions using forms and structures* (TC2.02)

Students compose a three-minute dance in one of the forms being studied. The dance consists of original movements that have been organized and manipulated by the group.

Collage

Description
Collage (visual format) is the creation of a new image formed by attaching materials such as paper, fabrics, photos, and other objects to a flat surface. A collage is composed of bits and pieces of originally unrelated images, including used commercial materials, to illustrate a theme or story or to create a new aesthetic work. A collage can have a strong impact by making a social statement, often using found objects or commercial images. The concept of collage can also be transferred to other art forms, such as photomontage, musical collage, dance collage, and multimedia collage. These forms include similar approaches in design and composition to create a new work in the particular medium chosen.

Method
The teacher:
- demonstrates the techniques of creating a collage by modelling the process and having samples available for viewing;

- ensures that students are aware of health and safety issues when using found materials;
- may provide some of the raw materials to be used (e.g., magazines, found objects, mounting boards);
- helps students to understand how techniques of design and composition can be used to create collage in different art forms;
- provides direction by presenting a problem that is to be depicted or resolved using this art form.

Considerations
Collage:
- involves the selection of materials and the art form to be used;
- requires careful arrangement to depict the story, theme, or issue;
- requires knowledge of health and safety issues related to fibres and found materials.

Illustrations
Elementary
- *demonstrate an understanding of the distinguishing features of a country in another region* (6z32)

Students collaboratively create a collage of products made in China to represent the impact of Chinese products on our lives.

Secondary
- *demonstrate a growing awareness of the need to be responsible* (SOV.04)

On a public bulletin board, students create a collage that identifies healthy snacks to assist other students in gaining an understanding of good nutrition. The display could incorporate packaging, advertising images, and nutritional information to increase impact and awareness.

Docudrama

Description
Docudrama is a dramatization based on fact that combines documentary and fictional elements. Docudramas are representations of historical events or lives of historical characters that present a particular point of view from within the event or from the perspective of an outsider looking in. The performers often use historical costumes and authentic dialogue to enhance the dramatization. Docudrama strengthens understanding by transforming knowledge about a person or event in to a new creative form.

Method
The teacher:
- assists students in understanding the background and facts surrounding the person or event that is being dramatized;
- provides opportunities to explore the facts through research in collaboration with the teacher-librarian and community resources;

- encourages students to create and use authentic props and historical costumes;
- considers such factors in the dramatization as appropriateness and authentic voice.

Considerations
Docudramas:
- require basic facts in order to create a plausible and believable dramatization;
- require opportunities for research in order to present an authentic portrayal of the person or event;
- allow for creative latitude in presenting factual information.

Illustrations
Elementary
- *explain Canada's involvement in the "underground railway"* (7h27)

Students re-create a meeting of individuals planning their next move at a "safe house" on the "underground railway."

Secondary
- *create media works for different purposes* (M2D.02D)

Students choose a historical event from the Elizabethan era (e.g., military, social, literary) and cover this event as television reporters in the 1600s.

Forum Theatre

Description
Forum theatre is a theatrical activity where a problem is shown in an unsolved form, and the audience is invited to suggest and enact solutions. Many different solutions are enacted in the course of a single forum – the result is a pooling of knowledge, tactics, and experience. The action may be stopped at key points to allow the audience to speculate about what the characters are thinking, suggest alternative actions for the characters to try in order to solve the problem, or ask characters to assume roles from alternative points of view. Forum theatre is used to work towards desirable attitudes, values, and interpersonal relationships and solve real societal problems when personalized understanding is needed. It provides an approach to complex curriculum material that evokes strong intellectual and emotional response in students. Forum theatre also provides experience in appreciating or giving another point of view.

Method
The teacher:
- identifies a case, problem, topic for inquiry, and roles, possibly collaboratively with students;
- sets parameters of the activity;
- creates the physical environment by seating audience members in a semicircle around the characters playing out the scene;
- initiates warm-up activities and trust building over time;

- models the leading of the forum: pauses the action, poses the questions, invites others to take over roles;
- may use relaxation exercises, tableaux, inner and outer circles, and other strategies to re-energize, refocus, or calm the group;
- leads the debriefing session;
- shares control of the learning process with students.

Considerations

Forum theatre:
- requires trust building among students and teacher;
- requires sensitive facilitation;
- is unpredictable in the possible solution/resolutions;
- requires debriefing to help students make sense of the experiences;
- may facilitate reflection by using response journals.

Illustrations

Elementary
- *identify and explain economic, environmental, and social factors that should be considered in the management and preservation of habitats* (7s24)

Students simulate a community meeting in which a group of industrialists are negotiating a plan to redevelop a parkland area with a neighborhood committee. The audience asks questions and participates in the design of the plan.

Secondary
- *demonstrate behaviours hat are respectful of others' points of view* (LS3.01)

The class divides into two groups: a smaller group of performers and a larger group of spectators. The spectators interact with the performers to explore a range of appropriate ways of showing respect for different points of view. Roles are then reversed to further the exploration.

Improvisation

Description

Improvisation is a process in which, within predictable structures, students are free to experiment and create in order to stimulate new ideas. Improvisation may be used in specific subject disciplines, such as drama, art, music, mathematics, science, language, and social studies, or in cross-curricular activities. In drama, for instance, improvisation is the creation of scenes and characters without the aid of a script. Improvisation may be used to elicit and develop self-expression, generate new questions, foster team building, resolve conflict creatively, and assist students in exploring genre, issues, characters, and ideas freely within a structure. Improvisation may be carefully planned or can take the form of spontaneous response. It can be used to solve problems based on hypothesis building and hypothesis testing.

Method

The teacher:
- structures the learning environment in collaboration with students to generate a forum within which improvisation can develop;
- provides models and demonstrations;
- builds a safe environment for risk taking;
- provides many guided opportunities for improvisation and ways to prompt and encourage feedback.

Considerations

Improvisation:
- requires prior experience or skill development in an area;
- builds upon patterns and previous ideas;
- may generate unpredictable results.

Illustrations

Elementary

- *identify uses of electricity in the home and community and evaluate the impact of these uses on both our quality of life and the environment* (6s53)

Students, working in groups of five or six, are assigned a specific time period (e.g., Iron Age, Victorian Age, post–World War II) and become characters in a family from that time. They improvise a typical morning in the household.

Secondary

- *demonstrate an understanding of focus and concentration in playing a role* (DC1.01)

The teacher directs exploratory improvisations to allow students to deal with conflict resolution from a variety of perspectives. Situations are focused on real-life incidents familiar to the students (e.g., bullying, vandalism, and shoplifting). In improvisation, students have the opportunity to assume many roles and relationships (e.g., teenager and an adult, teenager and a friend, or teenager and a teacher).

Mask Making

Description

Mask making is the creation of a shell-like structure that covers or adapts to the face and is embellished with paint, graphics, feathers, or other materials. The intent is to create a functional work of art that enables a performer, with minimal costuming, to take on a different appearance or role, mimic an animal or bird, or assume a godlike persona. Masks are often deemed to have religious attributes and are believed in some cultures to have powers to fend off evil spirits.

Method

The teacher:

- may plan with the teacher-librarian to provide opportunities for students to research and gain information about the history of masks and mask making;
- develops a purpose and plan for mask making in the classroom;
- demonstrates the creation of masks for a variety of purposes;
- provides materials for students to create masks;
- provides time and opportunities for students to present their masks in an appropriate way to an appropriate audience.

Considerations

Mask making:

- involves understanding and insight into the original purposes of masks;
- requires a variety of materials to create attractive and functional products;
- requires awareness and sensitivity, because masks have ceremonial and spiritual meanings in many cultures.

Illustrations

Elementary

- *explain the function of masks, and use masks in their drama and dance presentations* (6a62)

Students create and use masks to represent characters in their retelling of an original creation story from world cultural sources.

Secondary

- *trace the use of the convention of the mask (e.g., from Greek drama to modern plays)* (TH3.07)

Students research the development of masks in early Greek tragedies and comedies, medieval mystery and morality plays, Commedia dell'Arte, and modern productions. They create a mask from appropriate materials to represent one of the key characters or issues in a play and explain its function (e.g., acoustic, representational, symbolic) in a five minute oral presentation.

Puppetry

Description

Puppetry is a process in which students and/or the teacher manipulate puppets to explore and respond to story, characters, issues, and information. The rich cultural traditions of puppetry (marionettes, shadow puppets, glove-puppets) offer many opportunities in predicting, planning, organizing, entertaining, and problem solving. Puppetry may be used to engage students in storytelling or to explore story and character possibilities in the pre-composition stage of writing. It can use role-play to explore different contexts and points of view for conflict resolution. Through puppetry, students are presented with new information and can use puppets to communicate understanding with less risk than with other approaches. Puppetry engages students readily by encouraging physical involvement,

promoting social interaction, developing communication skills, and supporting role playing, improvisation, and storytelling.

Method
The teacher:
- models the process and its possibilities;
- organizes time, space, and resources;
- builds a climate for risk taking;
- prompts students to extend thinking;
- helps students to reflect on issues and problems that arose in performance.

Considerations
Puppetry:
- may not always need to be presented to an audience;
- requires a supply of puppets or materials on hand to create them;
- requires pre-planning to achieve expected results within the time available;
- requires manipulation of puppets to ensure learning;
- requires supervision, especially in the early stages of use;
- requires monitoring of assigned roles and organization when a small group is involved.

Illustrations
Elementary
- *enact stories from their own and other cultures* (Ka22)

Students, working in pairs, create and a present a story of their own using puppets made from a variety of materials.

Secondary
- *use materials and processes to create art objects that express their intent* (VCV.01)

Students research class and library resources and create a puppet from a variety of materials to represent an aspect of a specific culture.

Reader's Theatre

Description
Reader's theatre is a technique that allows students to dramatize narration selected from novels, short stories, picture books, and poems. Reader's theatre may be used to highlight aspects of text, such as difference in narrator and character, and to enhance literal and interpretative understanding. This strategy promotes a sense of audience and purpose and requires a high level of group collaboration. Individuals and groups use voices, facial expressions, and gestures to bring meaning to the text. Although this technique does not require memorization, it does require rehearsal.

Method
The teacher:

- coaches students in the techniques and form of reader's theatre;
- selects suitable pieces to perform;
- facilitates interpretation and group discussion;
- may determine group composition to build success.

Considerations

Reader's theatre:
- meets the needs of students with varied learning styles by using visual arrangement and sound to support meaning and effect;
- provides opportunities to vary the size of the group;
- requires time for rehearsal;
- requires a "script" of quality and emotion, often with dialogue and suspense;
- may incorporate tableaux.

Illustrations

Elementary
- *retell a story in proper sequence, identify the main idea and the characters, and discuss some aspects of the story* (2e35)

Students demonstrate their ability to read an animal tale previously discussed in class, by presenting the story in dramatic format.

Secondary
- *use a unifying image, mood, or voice to structure descriptive paragraphs or poems* (WR3.01D)

After examining a variety of poems, the teacher asks the question, "How does assuming a role contribute to the point of view?" In pairs or groups, students choose one persona from one of the poems and discuss the characteristics of this persona. Students rehearse and present their reading of this poem in the role of that persona.

Role Playing

Description
Role playing is a process in which one explores the thoughts and feelings of another person by responding and behaving as that person would in a simulated situation. It can involve pairs, groups, or the whole class. Role playing may be used to examine the viewpoints of others and communicate understanding. Role playing gives the distance and safety of role while it provides an opportunity to explore a current, historical, or social issue. It engages students in a text or problem and allows them to apply personal and group skills in assessment of prior knowledge, decision making, and problem solving by examining situations in unfamiliar contexts. Role playing enhances reflection, since feedback and debriefing are integral parts of the process.

Method
The teacher or group leader:

- determines the educational purposes of the role-play;
- may be in role or at the side of the drama;
- may assign roles and manage groups;
- signals when he or she is in or out of role;
- chooses roles for specific outcomes;
- in role, can extend drama, move the action, find a new focus, present alternative viewpoints, elevate the language, and support contributions of the students;
- models how to role-play and affirm belief in the role.

Considerations
Role playing:
- requires time to be modelled and practice for students to write and act in role, especially for young children;
- may be an ongoing strategy to refocus throughout a learning experience;
- requires a level of risk and trust.

Illustrations
Elementary
- *identify ways in which the provincial government is involved in the provision of services* (4z38)

Students role-play telephone conversations between a resident of Ontario and a government representative concerning recreational facilities in the province.

Secondary
- *apply employment acquisition skills (e.g., résumé writing, interviewing, self-marketing) to acquire, or simulate the acquisition of, a part-time job to gain enterprising experience;* (SE4.03)

Students complete individual résumés for a position in an enterprise-oriented workplace. In pairs they simulate the job interview, taking turns to role-play the applicant and the employer. Applicants emphasize their skills and attributes as an "enterprising employee."

Sketching to Learn

Description
Sketching to learn is a strategy whereby students visually represent the ideas they hear, read, or think about in pictorial/graphic form during or immediately following a presentation. Sketching to learn is used as a form of note making during story reading or reading of informational texts. It is often used to help students follow a listening, viewing, or reading experience in order to process new and complex ideas or concepts.

Method
The teacher:
- models and demonstrates sketching during a reading or listening activity;
- invites students to extend the sketches and thereby extend the ideas;

- arranges for students to share/explain their sketches in pairs or small groups;
- helps students relate back to the main ideas/information meaning portrayed.

Considerations

Sketching to learn:
- is unique to the individual student;
- uses a diverse range of forms, formats, and symbols;
- emphasizes meaning, interpretation, and processing rather than artistic technique;
- offers opportunities to students who need to discuss the ideas and share meanings;
- does not come easily to some students who may have difficulty representing ideas visually.

Illustrations

Elementary

- *use appropriate vocabulary (e.g., location, map, symbol) to describe their inquiries and observations*   (1z14)

Students go for a walk in their community to look for various types of symbols. After the walk, they are asked to draw the symbols and connect them visually with the appropriate locations.

Secondary

- *demonstrate an understanding of the use of elements and principles in various artworks*   (LT1.03)

The teacher presents several pieces of art, slides, or reproductions and highlights various elements of design. Each term will be clearly defined. In their sketchbook, students visually present examples of each element under the appropriate heading. Using their own visual method of depicting the elements, students demonstrate understanding and the ability to transfer the learning to their own work.

Story Theatre

Description

Story theatre is a technique for telling stories in dramatic format. A narrator may tell the story, with other students acting it out through the use of dialogue or mime, or the various characters may also provide the narration. Story theatre provides a variety of experiences, such as reading the play, assuming roles, memorizing lines, creating costumes and sets, practising music and choreography, and performing before an audience. Story theatre develops cognitive skills through organization of thoughts and analysis of the parts and whole of the production, including rehearsal and performance. It provides a collaborative experience for students as they work with others towards a common goal.

Method

The teacher:
- models the various aspects of development from story to theatre;

- provides opportunities for rehearsal, with appropriate feedback for constructive improvement;
- provides opportunities for students to work together as a group to make decisions about staging, costumes, and other aspects involved in the production;
- encourages students to explore aspects of story theatre beyond the script.

Considerations

Story theatre:
- develops mental, physical, and technical discipline;
- provides opportunities for students to gain self-confidence in a safe environment;
- develops skills in vocabulary, fluency of expression, and stage presence.

Illustrations

Elementary
- *retell a story by adapting it for presentation in another way* (4e39)

Working in small groups, students re-create a popular fairy tale from a different perspective (e.g., the wolf telling the story of the Three Little Pigs).

Secondary
- *retell stories heard on tape or seen on video* (AOR3.01L)

Students, working in small groups, re-create a simple story as a short play. They integrate all aspects of writing the script, determining the setting, establishing characters, and performing the production.

Storyboard

Description

A storyboard is a series of sketches that frames events (for example, of a story, film, or advertisement) in sequential order. Storyboards are used as a visual planning tool for larger presentations in a variety of formats. Each frame consists of scenes or figures with commentary that helps those involved in the production to visualize the story and sequence. In a television production, for instance, each frame represents a change in camera shot. Instructions for the dialogue, transitions, special effects, and audio have their own unique coding system and are written on the storyboards in ways that are understood by the production crew. Storyboards can be used for a variety of other classroom activities and give students the opportunity to translate ideas or stories into a different mode of expression.

Method

The teacher:
- models the steps for a storyboard framework;
- provides time and materials for students to create the storyboard;
- discusses the sequential ordering of the elements of a story with the students prior to the development of the storyboard;

- encourages students in a group to reach consensus in developing the order that is to be depicted;
- encourages students to use storyboards for planning, organizing, and depicting information in all subject areas;
- assists students in developing coding systems, if required;
- displays storyboards in the classroom.

Considerations
Storyboards:
- may be used in a variety of subjects and for a variety of purposes and are not confined to production of scripts;
- encourage expression of ideas from print into a different mode of expression;
- require careful planning for logical ordering of information, by time or concept.

Illustrations
Elementary
- *recognize the dependence of humans and other living things on soil and recognize its importance as a source of materials for making useful objects* (3s98)

Students use a storyboard organizer, incorporating both visuals and text, to plan a fictional or non-fictional story, on the importance of soil.

Secondary
- *share information using media tools and a variety of technologies* (SPS.O3)

Students create a storyboard and script to plan and describe their short stop-motion animation.

Tableau

Description
Tableau is a purposeful arrangement of a group of people representing a moment frozen in time. Tableau may be used to explore sequence, plot development, and characterization by arranging a number of tableaux in a series. Tableau is also used to access prior learning about a character, genre, text, current event, or historical event. A tableau shows the feeling of characters at a particular time and may reveal relationships between characters by promoting interpretation of text, character, or a situation. Tableau can be used to initiate or summarize discussion and provides a comfortable format for the development of collaborative group skills.

Method
The teacher:
- describes characteristics of the form;
- provides opportunity and purpose for presentation.

Considerations

Tableau:

- may provide opportunities in many subjects to represent material to be explored, such as historical events, chemical interactions, artistic composition.
- may provide opportunities for older students to do a series of tableaux with short narration in between to link "frozen pictures."

Illustrations

Elementary

- *describe how events in the Canadian labour movement have influenced workers today* (8h55)

Students critically examine the data they have collected about the role of factory workers in Canada and explore new perspectives about these workers through role-play. The group uses new knowledge to create a tableau that expresses the emotions and issues discovered.

Secondary

- *communicate a specific message, using appropriate materials, techniques, and technologies* (LC1.05)

After viewing a fantasy video, students work in groups to explore a time and place that they create. The teacher asks students to invent a name and environment for this place. Following a discussion of suggested topics, each group depicts their topic in tableau form using found materials and lighting effects to enhance the presentation.

Cooperative Strategies

Cooperative learning strategies help students to become active, responsible, and caring citizens by promoting positive and collaborative group interactions, respectful listening behaviour, and the weighing of both sides of an argument or issue. The focus of cooperative learning is to teach students to interact successfully with each other and to transfer those skills to effective interactions in society. The key concepts of cooperative learning include:

- group collaboration for positive interdependence (i.e., all must work together to achieve success);
- individual accountability (i.e., each individual must contribute in order to learn);
- interpersonal skills of communication, trust, decision making, and conflict resolution;
- face-to-face interviewing, processing, and sharing skills;
- final reflection and debriefing to assess the effectiveness of the process.

Cooperative learning strategies such as think/pair/share and interview teams provide all students with opportunities to develop thinking, problem-solving, and information-sharing skills along with the cooperative skills required to function in a collaborative manner. Strategies such as numbered heads are efficient, organizational methods to set up sharing groups and idea-generating sessions, while in-depth instructional strategies such as jigsaw are research-based and have long-lasting effects on learning. In order for cooperative learning strategies to be implemented successfully in the classroom, they require a high degree of planning, organization, and skill on the part of the teacher, who must understand and teach the appropriate strategies for the task.

Cooperative Strategies

- Buddy System
- Collaborative Teaching
- Community Links
- Conflict Resolution
- Discussion
- Interview
- Jigsaw
- Literature Circles

- Mentoring
- Numbered Heads
- Peer Practice
- Peer Teaching
- Round Robin
- Round Table
- Think/Pair/Share

Buddy System

Description
The buddy system involves linking students for peer/cross-age support through a number of curriculum or co-curricular activities. It may be established for one student or an entire class/school of students. The buddy system provides student role models and opportunities for mentoring. The buddy system is used for specific purposes, with specific activities linked to these purposes. It provides for authentic audiences for reading, writing, listening, and speaking activities. Elementary and secondary students can connect within a class or across classes, and with students in other schools, colleges, universities, and countries (via telecommunications).

Method

The teacher:
- identifies the purposes and selection of student buddies;
- trains older buddies in ways to facilitate the learning exchange;
- collaborates with students to plan activities;
- establishes clear guidelines and time lines for buddy activities;
- monitors the buddy learning experiences.

Considerations

The buddy system:
- requires team-building or trust-building activities;
- requires that learning take place for all students in a buddy relationship (sometimes older students learn mostly social skills, such as patience and how to build relationships);
- provides opportunities for students to offer support in ways related to adult-child relationships;
- requires that students not be locked in to buddy relationships that are not working well.

Illustrations

Elementary
- *read aloud, showing understanding of the material and awareness of the audience* (7e26)

Senior students choose a picture book and read it aloud to a student in a primary grade as part of their "Reading Buddy" program.

Secondary
- *use interpersonal and teamwork skills effectively and appropriately in school and in learning activities* (IK1.04)

Students work with peers to review and prepare for final semester/year projects, assignments, and tests.

Collaborative Teaching

Description

Collaborative teaching is demonstrated when teachers share skills and expertise to plan, implement, and evaluate programs throughout the school in order to meet the learning needs of students and extend their learning opportunities. This may take the form of team-teaching with other teachers in the same or different grades who have specialized training in areas such as guidance, special education, ESL, ELD, and school-librarianship. Each partner in the process brings relevant curricular experience and expertise, knowledge of diverse resources, and extended teaching and learning strategies. The demonstration by teachers of a collaborative approach to learning provides a model for students when they engage in learning activities, explorations, discoveries, and a variety of other group

projects. Collaborative teachers also make use of community links to support learning inside and outside the classroom.

Method

The teacher and teaching partners (guidance counselors, special education teachers, ESL/ELD teachers, teacher-librarians):

- decide upon clear and concise planning models for collaboration;
- demonstrate a clear understanding of group dynamics;
- practise and model (for students, parents, community members) appropriate structures and frameworks for collaborative planning and working together;
- explore opportunities for flexibility in delivery and modification of programs to suit their individual styles;
- consider the ongoing development of the roles, relationships, and dynamics within a group;
- use a variety of group activities and strategies to build a comfortable, team-building environment.

Considerations

Collaborative teaching:

- requires an understanding of the expertise and skills of the other partner;
- requires respect for the other partner's expertise, learning, and teaching styles;
- requires an atmosphere of trust and empathy.

Illustrations

Elementary

- *create a variety of media works (e.g., a simple multimedia presentation)* (5e66)

The teacher and teacher-librarian set up a framework for students to access and evaluate appropriate resources to provide background information for the student project. They also help students to access and use electronic tools (e.g., video cameras, computers, and software for editing) for their video project. Students work in groups of three or four to create a one-minute video advertisement about an upcoming community event. Each student in the group participates in all aspects of the creation of the ad, from storyboarding to shooting and editing the footage.

Secondary

- *explain how artistic intentions are expressed in specific examples of historical and student artworks (e.g., the Group of Seven's intent to establish a new direction in Canadian art)* (VA1.04) and
- *demonstrate an understanding of how artistic expression reflects the Canadian identity (e.g., works of Ozias Leduc, Group of Seven, Joy Kogawa, Farley Mowat, Michael Ondaatje, Karen Kain, Susan Aglukark, Miyuki Tanobe)* (CG1.03)

The teachers of the Visual Arts and Canadian and World Studies courses collaborate to help students investigate the artistic and historical impact of the Group of Seven. Each teacher takes the other's class for one period to provide a subject-based perspective, and in a joint class held in the school library, the teacher-librarian shows students from both classes how to compare information found in diverse reference materials.

Community Links

Description
Community links foster a wide variety of activities that involve members of the community as part of the learning experiences in a school and students as learners in partnership with the community. Community resources and expertise support learning, for both school and community. Community links can also encourage student volunteer activities in places such as senior citizens' centres or day care facilities. Community links may be initiated by school personnel or community individuals or groups and may involve long-term associations between the school and community. They require knowledge of community organizations and clubs and their resources in order to develop mutually beneficial programs. Community involvement may also focus on project-based initiatives.

Method
The teacher:
- identifies appropriate links between the school and community;
- invites and co-plans with community representatives to participate in the school in meaningful ways;
- prepares students as hosts or partners in the learning experience;
- monitors the learning partnerships and adapts as needed;
- seeks feedback from community partners, and gives feedback to them.

Considerations
Community links:
- require considerable time to establish and monitor;
- require community orientation with respect to student needs and developmental levels, as well as student orientation to community needs and expectations;
- provide opportunity for students to learn social responsibility through community involvement;
- require effort to ensure community members feel welcome and valued and find their experience satisfying;
- require close monitoring by teachers to ensure that problems are solved along the way;
- require that the diversity of the local community is reflected in the projects.

Illustrations
Elementary
- *use a problem-solving process to identify ways of obtaining support for personal safety in the home, school, and community*   (3p11)

Students meet with a group of local crossing guards and police officers and plan strategies to help other students understand the importance of following road-safety guidelines.

Secondary
- *demonstrate data-collecting skills, including the use of questionnaires* (SS1.04)

Students, working in groups of three or four, create a questionnaire designed to gather information from senior citizens about their family celebrations and cultural heritage. Students visit a local senior citizens' centre and ask a number of seniors to answer the questions on the form. Two or three of the seniors from the survey group are then invited to talk to the class about their special memories and family celebrations. The students tabulate and analyse the results of the questionnaires to draw conclusions about cultural background.

Conflict Resolution

Description
Conflict resolution is a set of processes, skills, and interpersonal communication strategies that help manage conflicts and disagreements. Initial strategies include identifying the conflict, brainstorming possible solutions, identifying potential solutions, and selecting the most appropriate solution. Subsequent strategies involve developing a plan to implement, review, and modify the solution. Once students have acquired these skills and strategies, they apply them naturally, spontaneously, and effectively. Training in conflict resolution consistently enhances positive peer relationships because it increases students' awareness about their own and others' feelings and the impact of their behaviour upon others.

Method
The teacher:
- understands that the different styles of handling conflict include competing, collaborating, avoiding, accommodating, or compromising;
- assists students in identifying which style they use most often in conflict situations;
- discusses alternative styles to develop;
- teaches positive and constructive ways to settle differences;
- reinforces strategies to manage frustration and conflict;
- encourages students to identify common causes of conflict and ways of resolving them;
- uses role-play as a strategy to teach and practise the process.

Considerations
Conflict resolution:
- requires training over time for students to acquire the skills;
- requires that trainers have the appropriate skills themselves to teach students.

Illustrations
Elementary
- *use a variety of simple strategies to solve social problems* (Kp31)

The teacher reads a story about an argument that develops between two friends and asks the students to develop a list of possible ways to solve the argument without fighting. The teacher records their ideas on chart paper and discusses with the students which idea they think might work the best.

Secondary

- *demonstrate an understanding of the principles of consumer awareness* (SCV.04)

The teacher prepares several case studies about adolescents who have purchased items of clothing from a local store. In each case, the adolescents are not pleased with their purchase and have already approached the store about their problem, but with unsatisfactory results. Working in pairs, students create a role-play about the attempt to resolve the situation. In each role-play, the adolescent and the storeowner should attempt to reach an agreement that meets both their needs.

Discussion

Description

Discussion is purposeful talk through which students explore thinking, respond to ideas, process information, and articulate their thoughts in verbal exchanges with peers and teachers. Discussion is used to promote and clarify understanding of concepts, ideas, and information in all subject areas. It places the emphasis on students talking and listening to each other. Students use discussion to make connections between ideas and experience and to reflect on a variety of meanings and interpretations of texts, experiences, and phenomena.

Method

The teacher:

- enables talk to go from one student to another (not always back to the teacher);
- helps students develop discussion techniques;
- helps students use discussion to gain new meaning or insight;
- debriefs, summarizes, and shows new possibilities;
- models high-level questions and ideas.

Considerations

Discussion:

- requires a physical set-up in the classroom that promotes interaction;
- demands a sensitivity to shy or reticent students who may need support and encouragement;
- needs time to develop;
- develops into student-to-student interaction from teacher-to-student interaction.

Illustrations

Elementary

- *identify strategies to deal positively with stress and pressures that result from relationships with family and friends* (5p9)

The teacher asks students to watch a video presenting a fight between two students in a playground. After the video, students meet in small groups to discuss strategies for solving the conflict without fighting.

Secondary

- *demonstrate an understanding of the challenges associated with achieving resource sustainability and explain the implications of meeting or not meeting those challenges* (HEV.03B)

Once students have gathered information on their topic regarding resources, a whole-class discussion is undertaken. Students use the discussion to glean ideas for a position paper on the sustainability of a particular resource.

Interview

Description

The interview is a conversation or dialogue in which the interviewer seeks to gain information and insights from the person being interviewed. The interview is used to explore ideas and to gain personal and practical information from an expert or a person in the role of an expert. Interviews help to focus on significant information, ideas, or experiences that yield new learning. The interview can teach students how to probe and follow up questions for further understanding.

Method

The teacher:
- sets the learning goals with the students;
- helps students set up appointments for interviews;
- helps students formulate questions;
- helps students clarify the purpose of the interview;
- provides resources, materials, ideas;
- helps students reflect on learning after the interview.

Considerations

The interview:
- helps students learn when they have observed demonstrations of authentic interviews before engaging in them;
- may require teacher assistance in the preparatory stages;
- may be formal or informal;
- when conducted in role, requires background research for both the interviewer and those to be interviewed.

Illustrations
Elementary
- *formulate questions to facilitate the gathering and clarifying of information on specific topics* (5z42)

Students, working in small groups, develop a list of questions to ask representatives of municipal and/or provincial police forces during a school visit concerning their role and jurisdiction.

- *investigate potential topics by asking questions, identifying information needs, and developing research plans to gather data* (WR1.01P)

Students create a list of fifteen to twenty questions to pose to a person in order to write a brief biography. Their questions are a combination of closed and open-ended questions and are developed and organized to provide sufficient information. The students interview someone they find interesting and/or who has made a difference in their lives.

Jigsaw

Description
The jigsaw is a cooperative learning strategy that provides opportunities for students to gain a variety of perspectives and insights by participating in a specialized group and then by sharing and integrating what they learned in their "home" group. The jigsaw is used to help students acquire an overview of a range of material or opinions. It enables expertise to be developed, recognized, and shared within a group and encourages a high level of student participation. The strategy may provide a review of previously learned material or identify questions or problems within an issue or topic. The jigsaw supports risk taking and the development of interpersonal skills and abilities.

Method
The teacher:
- allows considerable time for students to understand the process;
- organizes the learning materials in advance, sets goals, outlines steps, and sets the time frame;
- may use the jigsaw strategy primarily in two ways:
  - (a) material is divided into sections, and each of the numbered groups is assigned a section to learn, explore, and then report to the home group;
  - (b) the class shares a common learning experience, and the specialized groups take different approaches in analysing or responding to this experience (e.g., by creating a drama presentation, writing a poem, posing a problem and presenting a possible solution for home group discussion);
- assesses student learning through continual observation and adjusts programming accordingly.

Considerations
The jigsaw:
- requires students to have experience in accurate teaching of information to the home group, and also requires the use of active listening skills;
- requires the topic to be kept simple, if used for a short time frame (e.g., 30 to 60 minutes);
- can be applied in a variety of contexts and across all curriculum areas;
- works best when students have experience and skills in working collaboratively;
- is useful for students who are shy or lacking confidence;
- may be useful to help students who are developing English as a second language;

- requires careful teacher monitoring and skilful intervention.

Illustrations
Elementary
- *describe Canada's involvement in various trade organizations* (6z29)

The teacher divides the students into five or six groups. Each member of the group is assigned a different number and joins an expert group. Each specialized group researches a trade organization to which Canada belongs and answers a number of questions. Students return to their home groups to share information on Canada's role in various trade organizations and complete individual organizers on these organizations.

Secondary
- *investigate the ways in which Canada participates in space research and international space programs (e.g., the International Space Station, telecommunications, satellite technology)* (ES3.02)

The teacher divides the class into five home groups. Each member of the group picks a number and joins a different specialized group (i.e., all 1's together, all 2's together, etc.) to find and process information related to one way that Canada participates in space research (e.g., Group 1 researches the International Space Station, Group 2 researches telecommunications, Group 3 researches satellite technology and so on). The students return to their home groups and report their findings in a five-minute oral presentation.

Literature Circles

Description
A literature circle is a process in which students meet to discuss their reading experiences, reveal their perceptions about the book, clarify concepts, and participate in a shared experience of the text. A literature circle comprises three to five students who read the same book and record their thoughts in a journal before meeting with their group. All students in the group have an opportunity to relate their impressions and contribute to the discussion. In a class with four or five circles, only one group should be in discussion at a time. Literature circles encourage students to direct their own learning and to connect the reading to their personal lives and prior knowledge. They also promote good group discussion strategies (appropriate listening and responding skills) and an atmosphere of shared decision making as students help to set conduct and management policies.

Method
The teacher:
- introduces, explains, and demonstrates the concept of a literature circle;
- models good questioning and discussion behaviour;
- provides some structured discussion starters in order to assist students in learning how to extend discussion for greater depth;
- provides some cues to support discussion, such as a chart with topics that students may wish to address;

- schedules appropriate amounts of time for the silent reading, recording of thoughts in journals, and the discussion groups;
- chooses quality literature for students to learn from and enjoy;
- helps students to become independent thinkers as they take control of their own learning;
- assists with the physical structure of the group settings;
- helps students focus on aspects of the text that will extend their experiences;
- observes and supports students in acquiring and demonstrating positive group behaviours.

Considerations
Literature circles:
- are most effective when scheduled regularly;
- free the students to extend their discussions by not having them answer directed questions;
- require understanding about the transition from teacher-centred learning to student-centred learning.

Illustrations
Elementary
- *identify and describe elements of stories (e.g., plot, central idea, characters, setting)* (4e35)

The teacher divides the class into literature circles of four students. Each group/circle chooses a different literary text about a Greek or Roman myth to read. Each member of the group reports on one element of the myth, such as setting, character development, plot, and resolution.

Secondary
- *use elements of the short story, such as plot, characterization, setting, conflict, theme, mood, and point of view, to understand and interpret examples of the genre* (LI2.02)

The teacher divides the class into literature circles of four students each. Each group/circle chooses a Canadian short story to read from a different genre. Each member of the group summarizes and comments on a different element of the story, including plot, setting, conflict, theme, and mood.

Mentoring

Description
Mentoring is a strategy whereby students are provided with one-to-one support to test and explore ideas, take risks, and obtain feedback from outside a current setting. A mentor or adviser provides guidance and formative feedback without the accountability of a summative performance. A mentor provides a role model who supports, nurtures, and guides the student in person or by phone, email, or videoconference. Mentors bring knowledge, experience, and expertise to support a project, daily class work, and other areas

of teaching and learning. The term mentor may refer to teacher-advisors, peer tutors, and community mentors in a variety of instructional settings.

Method
The mentor:
- has a good understanding of the needs of his or her partner;
- should have some expertise in the subject or experience that provides support for another student or teacher;
- may participate in a training program to develop skills required for mentoring.

Considerations
Mentoring:
- requires sensitivity in understanding the needs and feelings of others;
- requires mutual effort and commitment from the school and community;
- requires screening and selection processes and procedures;
- requires a process for matching students and mentors according to board policies;
- requires a process for involving parents to support the program.

Illustrations
Elementary
- *read aloud, showing understanding of the material and awareness of the audience* (6e24)

Each student in a higher grade is matched with a Kindergarten student. They meet once a week and share a library book. The senior student maintains a journal describing the books read and the story response of the Kindergarten student. The senior student discusses the stories and helps the younger student to relate them to everyday experiences and understanding.

Secondary
- *explain the organization of the secondary school program, including types of courses and the destinations for which they are appropriate* (LS3.01)

The secondary school principal invites grade eight students to an orientation tour of the high school. Following the orientation tour, each secondary student is paired with a student from an elementary school to discuss course selection, co-curricular options, and individual questions about school life.

Numbered Heads

Description
Numbered heads is a structure whereby students are organized into collaborative groups and number off (for example, student number 1, student number 2, student number 3, student number 4). The teacher poses a problem and sets a time limit for each group to investigate the problem. The teacher then calls a number, and the student with that number in each group responds. This strategy has a simple structure with a short time frame and can be used at any point in a learning experience. All participants are involved in thinking and

talking as they work collectively to respond to the question and ensure that each member of the group understands the answer. Numbered heads is used as an alternative to whole-class question-and-answer and as a way to support all class members simultaneously in review or consolidation of learning.

Method

The teacher:

- plans composition of small groups (selected carefully to encourage the high comfort level of students);
- sets clear expectations regarding the focus of thinking and sharing;
- gives appropriate time for activity;
- monitors by moving about and listening;
- uses information gained throughout an activity to inform instructional decisions.

Considerations

Numbered heads:

- requires structured instructions that are reinforced until students can use the strategy efficiently;
- requires time to think for individuals prior to collective response;
- can increase the numbers of students responding by asking all "Number 3's" to come to the blackboard to write a response (e.g., do a math problem);
- can be used in conjunction with specific learning materials, such as math manipulatives (e.g., the teacher instructs: "Using base ten blocks, make sure everyone in your group can build ...");
- may encourage competition among groups;
- can be stressful for shy or second language students.

Illustrations

Elementary

- *identify products that Canada imports and exports* (6z26)

Each group prepares ten cards for a class "Jeopardy" game. The front of the card has the answer, and the back of the card has the question. Students are given a number within their research group. The teacher uses the numbered heads strategy to play the game (e.g., "Number 3's, what is the question generating this answer?" Only Number 3's may answer and score points).

Secondary

- *demonstrate an understanding of arts elements that are specific to each of the arts* (LT1.02)

Students form groups of four and number off within the group (1, 2, 3, 4). Each group receives the same piece of visual art and is asked to discuss the elements of design (e.g., line, shape, form, texture, and colour). At the end of the given time, the teacher asks specific students (by number) to respond with the group's findings.

Peer Practice

Description
In peer practice, students help each other to review, drill, and rehearse in pairs or small groups of three or four in order to consolidate their understanding or enhance skill development. Peer practice may be incorporated into direct whole-class instruction periods or may be included on a regular basis in classroom learning experiences (for example, before quizzes, every morning). It is used to reinforce step-by-step skills and to enhance accuracy and effectiveness of performance. It provides a structured process to rehearse or review knowledge within time limits. Students may initiate and establish peer practice themselves, as in study groups.

Method
The teacher:
- models a variety of strategies for review and drill;
- sets aside regular opportunities for students to practise working in small groups for the purpose of review/drill;
- decides appropriate content for peer practice;
- monitors, supports, and intervenes as necessary;
- helps students reflect on advantages of peer practices.

Considerations
Peer practice:
- may require the teacher to pair or match students with similar performance levels or to match a less skilled student with a more skilled one;
- allows students to chart and reinforce progress and set goals.

Illustrations
Elementary
- *relate growing and shrinking patterns in addition and subtraction* (2m92)

Students work in pairs to practise making patterns using solid mathematics cubes. One student initiates the pattern by adding or subtracting a set number of cubes; the second student verbally explains the pattern, repeats it, and then extends it by adding or subtracting a different sequence. Students switch roles and offer peer feedback to increase efficiency.

Secondary
- *demonstrate elements of dance alone and in combination* (TC1.01)

Students work in groups of two or three to practise introductory jazz techniques. Students practise their jazz techniques, applying the feedback given by other students and by the teacher to redo their movements.

Peer Teaching

Description
Peer teaching is a strategy whereby individuals or groups of students who are competent in a skill, or knowledgeable in a particular area, teach what they know to their peers. Peer teaching may be used to individualize a program so that students can learn a skill or have information presented when it is required. Peer teaching also creates a community of learners where all strengths are valued. It can be used to reinforce a concept, such as instructing "home groups" in a jigsaw. Peer teaching requires students to explain and clarify their thinking in order to communicate learning to other students, thereby building confidence and self-esteem. This strategy releases the teacher from being the sole expert, but does require that clear expectations be set.

Method
The teacher:
- circulates, observes, and assesses the understanding and group skills;
- teaches or guides students in learning new information so that they can teach others;
- assists in structuring time lines, resources, and formats for presentation;
- models a wide variety of instructional approaches;
- assesses accuracy and clarity of information during the process;
- recognizes strengths of individuals and groups.

Considerations
Peer teaching:
- requires careful tracking of skills;
- can work well in areas where peers can communicate in different language patterns from the teacher;
- can assist students to improve metacognitive skills as they explore the role and responsibilities of the "teacher."

Illustrations
Elementary
- *participate vigorously in all aspects of the program* (4p28)

Students take turns introducing the warm-up activity at the beginning of each physical education class. They include one stretching exercise and one aerobic activity in the warm-up.

Secondary
- *revise their written work, independently and collaboratively, with a focus on support for ideas and opinions, accuracy, clarity, and unity* (WRV.04D)

Students working on the same type of writing project serve as peer editors to prepare presentations for the Writers Festival.

Round Robin

Description

Round robin is a strategy whereby students, in small groups, engage in a structured discussion that encourages each student, in turn, to contribute ideas and information. Round robin is used to provide information and reflection on books, stories, experiences, and understandings and to share that learning. It may be applied at the beginning of a project (to explore how to build something); during a process (to share responses to a class-read story); or at the end of an activity (to evaluate a group science activity). Round robin can be used to develop and suggest solutions to problems or challenges and to share interpretations or understandings of concepts and phenomena. Round robin requires students to prepare or rehearse a first contribution and to build on the preceding ideas or information in subsequent contributions, while maintaining a clear focus.

Method

The teacher:
- prepares round robin activities in order to provide opportunities and assistance for students;
- provides resources, materials, or shared learning experiences as sources for discussion;
- provides time to help students debrief and summarize the learning;
- suggests next steps or application of the learning.

Considerations

Round robin:
- may intimidate some students by its formality;
- may mean some students need special assistance in preparation;
- requires careful guidance to ensure that purpose and meaning take precedence over rules;
- may proceed from formal to more informal student exchange/interaction.

Illustrations

Elementary
- *demonstrate the ability to move and control their bodies in space and time* (2a60)

Students work together in small groups to simulate the workings of a machine with their bodies. The parts of the machine are added one at a time, until the entire group is working together.

Secondary
- *analyse the food needs of individuals of different ages who have varying time schedules, food preferences, and health concerns and determine how these needs might be met* (SO1.02)

Each group of students receives a profile of an individual outlining lifestyle, food preferences, and health concerns. Taking turns, each individual in the group offers analysis

of the food needs of the individual, building on the ideas of the previous speaker where possible. Groups then create a one-week menu that reflects the analysis.

Round Table

Description

Round table is an information-sharing strategy that is used to generate multiple answers to a question posed by the teacher. Students respond in writing to a question that requires factual answers rather than conceptual or controversial responses. In sequential round table, one piece of paper is circulated and students add information that answers the question as it comes to them. In a simultaneous round table, each student responds on a separate piece of paper. At the end of both writing activities, the students present their answers to the class. This strategy encourages students to take turns, listen actively to peers, and add information to build on the ideas of others. In the next step in the strategy, students can develop categories about the topic and organize their answers into the appropriate categories.

Method

The teacher:
- poses a question that requires a factual response (e.g., "What do you know about ____?");
- constructs questions so that all students have an opportunity to answer on a single sheet;
- monitors responses to assess students' prior knowledge or, as part of a review process, determines what knowledge about the topic may be missing.

Considerations

Round table:
- requires that questions be constructed so that all students feel they can write down an answer;
- takes longer, in its written format, than the round robin (oral) process.

Illustrations

Elementary

- *communicate information using media works, oral presentations, written notes and descriptions, drawings and labels* (5z46)

The teacher asks students to work in small groups. Each group reads a piece of informational text. The teacher then asks each member of the group to create a labelled diagram or illustration to explain one section of the piece of text. Students pass the diagrams around to the group to the right, and the students on the right predict what the informational text was about. They add their comments to a sheet of paper taped to the diagram. Each group then presents a summary of the original text and the predictions submitted by the other group.

Secondary

- *explain how authors and editors use design elements to help convey meaning* (L13.03D)

The teacher selects a number of educational websites. The teacher then assigns students to small groups, each of which thoroughly examines the design elements of one of the websites. Each student in the group writes five points about the site. The students share their findings and delete duplicates. The entire class establishes categories for this evaluation, and the groups develop a handout using the categories established and inserting the information developed in the groups.

Think/Pair/Share

Description
Think/pair/share is a strategy whereby students think alone for a specified amount of time (wait time) in response to a question posed by the teacher. Students form pairs to discuss their ideas, and then share responses with the class. Think/pair/share is used to help students check their understanding during a learning experience and provide opportunities for practice or rehearsal. It provides a simple structure within a short time frame for all students in the class to think and talk (to pose questions, to respond to an issue, to summarize or synthesize ideas).

Method
The teacher:
- plans composition of pairs, carefully selecting them to encourage the comfort level of students;
- sets clear expectations regarding the focus of thinking and sharing;
- gives appropriate time lines;
- monitors student activity and understanding by moving about and listening;
- elicits response from volunteers or by random selection at the end of the think/pair/share;
- uses information gained throughout the activity to make informed teaching decisions.

Considerations
Think/pair/share:
- requires "wait time" to allow students to develop more thoughtful and more complete answers;
- requires the structure of the strategy to be taught and reinforced until students can use it efficiently;
- is the basis for 'think/pair/square' (a pair of pairs) where students think alone, work in pairs, and then in fours before sharing in the whole class.

Illustrations
Elementary
- *use appropriate vocabulary to describe their inquiries and observations* (5z41)

The teacher begins the activity with a few minutes of silence in which students recall occasions when they have felt unfairly or unjustly treated. The occasions can have occurred in school or out of school. The teacher asks student "A" to recount those incidents to his or

her partner. After five minutes, the teacher then asks student "B" to recount his or her incidents.

Secondary

- *describe the basic process of cell division* (BY1.01)

The teacher asks students to think in pairs about the stages of mitosis with a particular emphasis on the number of chromosomes present at each stage. Each pair then consolidates their thinking and creates a visual representation of the stages of mitosis. Each pair shares the visual aid created with another pair.

Direct Instruction Strategies

Direct instruction strategies are used in a structured environment that is directed by the teacher/group leader. Direct instruction encompasses a wide variety of instructional strategies that are effective when:

- background information is required for learning;
- new knowledge and skills are introduced and/or modeled by the teacher;
- it is necessary to communicate information known only to the teacher (for example, safety information);
- prior learning needs to be reinforced.

Direct instruction includes a variety of delivery modes (for example, lecture, modelling, demonstrations, use of overhead projector) that control the focus of attention, especially when time constraints require immediate delivery of information. Material to be learned is often presented through the use of questions and statements, which allows for quick feedback from the class to ensure understanding and enables the teacher to use student reaction to modify a lesson or activity. The teacher can also respond to individual questions that may be of interest to the entire class. Other directed strategies include structures such as text frames, advance organizers, and task cards, as well as guided reading and writing activities to focus on specific learning expectations.

Direct instruction strategies are useful in providing information to students who have difficulty learning through investigative discovery methods and when there are no appropriate resources available for students to use to conduct their own research and investigations. Direct instruction meets the needs of auditory learners, in particular, and sometimes of visual learners. However, the instructor needs to be aware of maintaining the attention of all students throughout the lesson.

For effective use of direct instruction, the teacher understands the content prior to delivery, organizes and plans effective delivery in a logical sequence, and provides opportunities to check for student understanding. Direct instruction strategies are part of the repertoire of every teacher and should be used in those teaching and learning situations for which they are most appropriate.

Direct Instruction Strategies

Advance Organizer	Prompt
Book Talks	Read Along
Cloze	Read Aloud
Conferencing	Reciprocal Teaching
Demonstration	Review
Directed Reading-Thinking Activities	Seminar/Tutorial
Expository Text Frames	Socratic Dialogue
Flash Cards	Story Mapping
Guest Speaker	Storytelling
Guided Exploration	Task Cards
Guided Reading	Textbook
Guided Writing	Visual Stimuli
Lecture	Visualization

Advance Organizer

Description

An advance organizer is an outline or pattern that structures the elements of a lesson or learning task to support student planning and learning. Students use advance organizers to focus their learning and to assist with the selection, organization, and synthesis of information or to provide a breakdown of the steps required for task completion. Advance organizers demonstrate how knowledge is structured and provide a frame of reference for the lesson so that each part can be more easily understood. The steps presented in an advance organizer are dependent on the learning experience or task (for example, in science, the steps might be observations, hypotheses, experimental design, experimental results, and drawing conclusions).

Method

The teacher:

- models the use of the advance organizer;
- refers to the organizer when setting time lines for learning;
- uses the organizer when presenting new ideas and concepts;
- assists students with understanding the reasons for the selection of organizers;
- uses the organizer to help students see relationships and connections in learning;
- teaches students the skills of selection, organization, and synthesis using organizers.

Considerations

Advance organizers:

- require flexibility, in that some students will want to work to a prepared outline and others will want to design their own outline.

Illustrations

Elementary

- *tell the story of a product used every day, identifying the need it meets and describing its production, use, and eventual disposal* (7s95)

Each group views a different video from a how-to series describing the manufacturing of an everyday item. Using an organizer prepared by the teacher, each group records how the product meets a need, how it is produced, how it is used, and how it is disposed. The class as a whole then discusses other categories that might be added to the organizer for further analysis.

Secondary

- *explain the mandate of selected international organizations to which Canada belongs* (GC1.02D)

The teacher presents a chart that students use to investigate an organization in Canada currently trying to solve a global problem. The headings include organization, headquarters, mission and mandate, location of work, recent accomplishments, and Canada's role or membership responsibilities.

Book Talks

Description
Book talks are oral presentations that promote reading materials to students. Book talks stimulate interest in reading, create awareness about the variety of materials available on a particular theme or issue, and expose students to new areas of reading. The texts presented can be informational or fictional and related to the curriculum or personal recreation, but they should act as an invitation for further exploration by students. Book talks can provide opportunities to make connections between real-life problems or issues and those encountered by fictional characters. If a single book is featured, a book talk could focus on a particular element such as plot, character, or theme to stimulate further interest.

Method
The teacher/teacher-librarian:
- models a consistent interest in reading a wide variety of materials;
- promotes access to the school library collection;
- works in collaboration with all school staff to promote reading for students;
- selects, presents, and evaluates appropriate reading materials.

Considerations
Book talks:
- require time for both the teacher and teacher-librarian to plan and present appropriate materials;
- require knowledge about the appropriate reading materials for the age and developmental level of the students;
- require a knowledge of the current materials available;
- require a wide range of knowledge about current and classical literature;
- require an understanding of what books will motivate students to read;
- require management of resources and follow-up activities;
- utilize community members and authors to extend opportunities for access to a wide range of resources.

Illustrations
Elementary
- *demonstrate an understanding of the social, political, and economic issues facing Aboriginal peoples in Canada today* (6z3)

The teacher-librarian introduces students to a variety of illustrated books that address the challenges facing Aboriginal peoples in today's society. Students discuss the issues and volunteer key points, which the teacher summarizes on chart paper.

Secondary

- *select and read texts for a variety of purposes, with an emphasis on recognizing the elements of literary genres and the organization of informational materials, collecting and using information, extending personal knowledge, and responding imaginatively* (LI1.02P)

The teacher and teacher-librarian give a book talk that introduces a number of short stories related by content or theme, highlighting the generic elements of the short story. After selecting and reading the short stories, the students complete a mind map that addresses the question: "What are the characteristics of a good short story?"

Cloze

Description
Cloze involves a systematic omission of letters, words, and phrases from written or oral text. Students must bring to bear their own knowledge of the text, the context, and the language involved in order to fill in unfinished sentences or missing words. Cloze may be used to assess or develop listening skills, reading comprehension skills, and reading strategies such as predicting meaning. The use of cloze strategies can help students to develop specific knowledge of language features such as vocabulary and demonstrate understanding of the information in text.

Method
The teacher:
- needs a clear purpose for each activity (e.g., initial or diagnostic assessment);
- gives enough initial information to provide context;
- assesses the quality of ideas and learning.

Considerations
Cloze:
- differs in purpose from fill-in-the-blank or one-word-answer exercises;
- slows down the reading and interferes with fluency;
- may require teacher assistance throughout the process;
- needs careful selection to match students to text. (If too difficult for some readers, cloze may produce anxiety; students who easily complete cloze activities may have already gained all the possible learning.)

Illustrations
Elementary
- *correctly spell words identified by the teacher* (2e17)

Students record a cloze passage in their writing journals and add the correct word from their spelling list to fill in the blank spaces.

Secondary
- *use some basic patterns of standard Canadian English in some simple forms of writing* (AWRV.01)

The teacher presents students with a cloze passage. Using their knowledge of a recently read text, students complete the cloze exercise. Students then reread the cloze passage and use it as a pattern for writing on a teacher-selected topic.

Conferencing

Description

Conferences are meetings to discuss student work in pairs or small groups in order to facilitate learning (for example, to report on progress, point out strengths, consider problems/solutions, and focus on specific topics). Conferences can be conducted in a variety of formats with the teacher, with other students, and with parents/guardians. They may be chaired by the teacher or the student depending upon the purpose. In all cases, conferencing requires an inviting and supportive forum for open, responsive discussion and demands a high trust level between participants. Conferencing provides teachers with an opportunity to guide and support the learner and a forum for students to demonstrate learning (through written work such as a portfolio or progress log) and express themselves during the ensuing dialogue.

Method

The teacher:
- establishes format, times, and composition of conference groups;
- responds as an interested partner;
- discusses content with the student to promote further reflection and personal response to the material;
- observes and records strengths and needs in order to plan and implement appropriate instruction;
- formulates future student/teacher direction and program decisions;
- monitors and supports students in leading conferences with peers and parents/guardians;
- may allow several conferences to be carried out simultaneously if students are leading conferences with parents/guardians.

Considerations

Conferencing:
- requires time to plan meetings, process findings, and follow up decisions taken;
- requires that the rest of the class is productively engaged in quiet learning experiences when conferencing is done during classroom time;
  - requires the teacher to model supportive constructive analysis, before initiating peer conferences.

Illustrations

Elementary
- *locate relevant information about how early settlers met the challenges of the new land, using a variety of sources* (7h16)

Students work in small groups of four or five to design an independent inquiry project on a topic related to early settlers. The teacher meets with the group at different checkpoints during the process to check student direction and progress.

Secondary
- *identify ways to communicate design and research ideas and solutions through a variety of media* (TFV.02)

Students write a proposal for a travel brochure, clearly outlining the aspects to be highlighted, the intended audience, and a list of skills that will be enhanced during the exercise. Students then decide what type of software would be most appropriately used in the product. The teacher meets with the students to review and assess the proposal before and after the thumbnail sketches are developed.

Demonstration

Description

Demonstration involves modelling a process, showing how something works, or providing an example. Demonstrations give concrete examples of a concept that needs to be learned, a strategy that needs to be practised, or knowledge that needs to be acquired. Materials and context are prepared ahead of time. Demonstrations should be manageable, informative, and applicable to the developmental stage of the student; they should be repeated to strengthen the impact. Demonstrations respond to the needs of visual learners (if the teacher models) or kinetic learners (if the student models) and promote the development of observation skills. There is a link between demonstration and further learning, as students engage in questions and practices that confirm and ensure their understanding.

Method
The teacher:
- engages students through modelling;
- prepares materials ahead of time;
- confirms and ensures student understanding;
- provides a link between demonstration and further learning.

Considerations
Demonstrations:
- require a setting that allows visual access for all students;
- should be supported with hands-on and student participation lessons;
- require teacher awareness of safety issues (e.g., use of chemicals, flame, sports equipment).

Illustrations
Elementary
- *move to external stimuli, using a variety of steps, sequences, directions, and hand actions* (7p23)

The teacher demonstrates the steps of a variety of dances such as the "Alley Cat," "Duck Dance," and line dancing.

Secondary

- *demonstrate the appropriate steps of conflict resolution in situations encountered in class, at school with friends, and at home* (LS2.04R)

The teacher presents a written scenario involving a conflict situation. One group of students role-plays the situation. Another group of students mediate to bring the conflict to an appropriate conclusion.

Directed Reading-Thinking Activities

Description

In a directed reading-thinking activity, students are helped to set purposes for, and make predictions about, their reading. Students gain ideas and information and make connections with literature: stories, poems, narratives, and genre. The process assists students in learning how informational texts work in content areas (science, geography, and technology), in developing fluency and interest, and in focusing their thinking about what they are reading. The process includes an introductory phase that provides background, new concepts, and purpose; individual reading (of the same text); discussion and interpretation; skill development of vocabulary and comprehension; and a follow-up activity. A directed reading-thinking activity provides opportunity to group students according to interest, learning, and needs. The process also allows students of different abilities and backgrounds to successfully find meaning in text.

Method

The teacher:

- models and encourages predictions before and during the process;
- selects texts that are appropriate to the instructional reading levels and interests of students;
- uses questions and discussions to start students thinking about meaning/information (e.g., showing the illustration on the front cover and asking, "What do you think the story is about?");
- teaches the strategies and processes needed to read the text successfully;
- guides students in the task of finding support and evidence in the text;
- models and encourages thinking and problem solving through reading and by asking questions (e.g., "Why do you say that?" and "How do you know that?").

Considerations

Directed reading-thinking activities:

- work well with younger children when using a picture book;
- are particularly useful when used with groups of students (six to eight);
- usually require multiple copies of the same text or a single large picture book, pausing at certain points to ask questions;
- are regularly used with text-supported courses.

Illustrations
Elementary

- *examine and communicate conflicting points of view about a historical issue* (7h52)

The teacher presents an overview of a historical period. The teacher tells students that the purpose of the next activity is to analyse different points of view about a historical issue. Students then read a selected passage on a historical issue, discuss their findings, and answer a series of questions developed to examine conflicting points of view.

Secondary

- *use some basic reading strategies to decipher simple texts* (ARE3.02L)

The teacher instructs students on how to use a glossary to help understand a passage of text. Difficult words are listed in bold. The teacher then discusses the meanings of difficult words with the class and rereads the passage until most students can follow.

Expository Text Frames

Description
Expository text frames are a variety of visual organizers that show the structure or organization of non-fiction text forms to assist students with reading, writing, and thinking in content areas. They are applicable in all subject areas, but are particularly useful for reading and writing applications in science and the social sciences. Expository text frames help to ensure that students have included all key elements in their writing and are used to outline the features (for example, signal words, main idea, supporting detail, headings) of various non-fiction text forms in order to accomplish the specific writing task. Text frames also facilitate the search for information and the development of connections and relationships in non-fiction text.

Method
The teacher:
- selects different forms of non-fiction text for reading and discussing;
- provides instruction in identifying non-fiction text features and text patterns;
- provides modelling and guided practice for students in writing different forms of non-fiction text;
- gives students prepared visual frames as a starting point for organizing their writing or for summarizing their reading;
- engages in conferencing with students during the writing process;
- facilitates opportunities for peer editing.

Considerations
Expository text frames:
- require repeated opportunities for students to practise;
- become more complex and often combine more than one type;
- can be used as an assessment tool to retell or summarize reading.

Illustrations

Elementary

- *use appropriate vocabulary, including correct science and technology terminology, to communicate ideas, procedures, and results* (8s101)

Students develop a series of instructions that outline the operation of a common household tool, using the framework presented by the teacher for procedural writing. The framework includes the goal or aim, the material and equipment required, the steps to be followed, and the method of evaluation and testing.

Secondary

- *explain the purposes of presentation tools* (EC1.02)

The teacher summarizes the features of a presentation software application commonly used in business. Students explain the primary purpose of this software, its common usage, and the advantages and disadvantages.

Flash Cards

Description

Flash cards are double-sided cards used to assist students in mastering key skills and knowledge through drill and practice. One side has the problem, term, or issue; the other side has the answer, definition, or related information. Flash cards are particularly useful for learning, memorizing, or reviewing factual information. After the teacher models the use of flash cards, students can make and use them individually as a study aid or in groups together to practise and review information. Flash cards are often used in second language learning to teach and review vocabulary or in mathematics to reinforce mathematical structures such as the times tables. They provide positive reinforcement as repetition leads to mastery of the material.

Method

The teacher:
- prepares flash cards relevant to the lesson or topic to be learned or reviewed;
- supports students in assessing their learning needs and creating their own flash cards to learn the material (e.g., important facts from book chapters and lectures);
- demonstrates how to construct effective cards and how to use them (e.g., putting cards containing "old" and learned information aside and concentrating on cards with new and difficult information until the entire stack is mastered; reviewing the stack when timely; using labels and subject headings on cards to catagorize them for quizzes and tests);
- assesses the use of flash cards in relation to the material being learned.

Considerations

Flash cards:
- benefit from a consistent format;

- provide a useful portable device for learning and review;
- may become tedious for some students who have mastered the material.

Illustrations
Elementary
- *identify most of the letters in the alphabet and demonstrate understanding that letters represent sounds* (Ke23)

Students use flash cards to practise letter recognition by giving examples of familiar classroom items that begin with the letter displayed on the card.

Secondary
- *recognize and use appropriate language structures* (OC2.09)

The teacher prepares flash cards showing parts of the reflexive structure in French grammar. As a timed event, groups practise sorting flash cards into sentences using the *verbes reflechis*. They then create their own cards for other grammatical conventions.

Guest Speaker

Description
A guest speaker is someone, usually from outside the school, who is invited to present ideas, alternative perspectives, opinions, or descriptions of real-life experiences, and may answer questions generated by students. Speakers may present alone or as part of a panel. Guest speakers can provide alternative resources and experiences for learning and enable students to learn detailed content from a primary source. Guest speakers generate interest and provide real-life connections to curriculum.

Method
The teacher:
- is aware of any school board policies regarding guests or speakers and informs the principal of planned guests or speakers;
- alone, or with students, identifies and invites experts;
- screens guest speakers and provides background and context for the visit;
- teaches students the protocols for having guests in the classroom/school, including follow-up;
- assists students in generating potential questions;
- uses learning opportunities provided by the guest speaker to link with ongoing curriculum experiences;
- arranges alternative methods of securing experts for curriculum support, such as teleconferences and on-line conferences and news groups.

Considerations
Guest speakers:
- may require orientation to age, curriculum focus, and developmental level of students (e.g., attention span);
- provide opportunities for members of the community or agencies to serve as resources to the school;
- should reflect the diversity of the local community.

Illustrations
Elementary
- *identify people and community agencies that can assist with injury prevention, emergency situations, and violence prevention* (4p11)

A guest speaker is invited to talk to the students about local community support services for students in difficulty (e.g., telephone counselling and homework clubs).

Secondary
- *describe the methods used to obtain elements in Canada, and outline local environmental concerns* (CH3.02)

A guest speaker, with first-hand experience working in mining, is invited to talk to students about the benefits, costs, and methods of extracting elements in Canada. A second speaker from an environmental group may also be invited to present the environmentalist point of view. The students design and complete an organizer that outlines the information about the issues and are prepared to debate the pros and cons.

Guided Exploration

Description
In guided exploration, the teacher models or presents a concept or skill that is part of a larger set of skills or knowledge and guides the students as they imitate or practise this first step. The process is repeated until the students master the expected knowledge and skills of the lesson. This strategy is particularly useful for introducing new or unfamiliar skills that build sequentially. By assessing and monitoring the progress of students through every step of the process, the teacher can determine when the students are able to apply the skills independently.

Method
The teacher:
- sets up a framework for the lesson;
- organizes and directs the exploration process (e.g., models, allows for practice and discussion, then repeats the sequence);
- provides opportunities for frequent practice and rehearsal of the skills or concepts;
- provides feedback after each step to reinforce the learning;
- ensures a secure environment so that students feel free to try and retry if necessary;

- assesses the level of performance of the students in the learning task.

Considerations
Guided exploration:
- may be most appropriate for students who may lack confidence in particular areas;
- may be too directive for some students, who may need to be engaged in other ways.

Illustrations
Elementary
- *identify current distinguishing features of the United States* (6z22)

The teacher introduces the concept of reading maps for information by working with students to examine one specific map of the United States. Students learn about each component of the map-reading process (the legend, scale, and so on) before going on to the next component.

Secondary
- *through investigation and application, demonstrate the skills required to plan and conduct an inquiry into reproduction using instruments and tools safely, accurately, and effectively* (BY2.02)

The teacher demonstrates slide preparation techniques by instructing students on how to compress a sample, apply a stain, and remove excess stain. The students then investigate cell division by preparing slides following the sequence of steps demonstrated by the teacher and using various tissues from growing plant material.

Guided Reading

Description
In a guided reading strategy, students are grouped according to similar reading abilities or needs in order to help them read more complex texts and acquire skills to read independently for greater success and enjoyment. The learning groups will regroup as students' individual reading abilities change. Guided reading assists students in learning about and understanding new text through group discussion of the ideas, information, and interpretation of the reading materials. In addition to enhancing the understanding of information, the process supports understanding of other aspects of reading such as: choosing a book; learning reading strategies for different genres; linking prior knowledge; and using meaning, syntax, and phonics to work out unknown words.

Method
The teacher:
- selects reading material for a clear purpose;
- decides on group composition and observes to make appropriate group changes;
- directs questions and student discussion to achieve the chosen outcomes;
- makes the reading strategies used visible to students through discussion of their thinking;

- observes strategies used by students to assess understanding;
- encourages response and reflection.

Considerations
Guided reading:
- requires selection of appropriate materials (class texts, school library resources) to match readers' abilities and interests;
- requires multiple copies of the text;
- requires organization of time and routines for the rest of the class.

Illustrations
Elementary
- *demonstrate an understanding of the distinguishing features of a country in another region (e.g., Pacific Rim)* (6z32)

Each group of students reads and interprets material on different topics, which the teacher has selected to match readers' abilities (for example, "Renting an apartment in a city in China"). Students then demonstrate understanding by comparing the information in the selected texts with similar information from their local region.

Secondary
- *read a range of simple texts to gather information and expand their knowledge of the French language* (REV.07B)

The teacher selects a reading passage about a Canadian hero and his or her contributions to society and prepares comprehension questions relevant to the reading passage. Each group of students looks for different criteria (e.g., the most exciting paragraph, or the paragraph with the most information about the hero's early years).

Guided Writing

Description
Guided writing uses a variety of writing experiences to direct student understanding of the process, purpose, and form of writing. Guided writing demonstrates ways of creating, describing, recording, explaining, and organizing information. It expands the student's repertoire of techniques and modes of writing and introduces writing in unfamiliar contexts (writing a newspaper article, writing in role), thereby complementing personal writing. Guided writing usually involves small-group interaction for analysis and editing purposes. It supports risk taking by providing structure at the beginning of new learning and builds confidence in writing.

Method
The teacher:
- determines the content and purpose of the writing;
- decides group composition;
- establishes an authentic purpose for the writing;

- provides examples of writing in various forms and for various purposes;
- provides a context for writing;
- models the thinking process used in writing.

Considerations

Guided writing:

- may require a reference chart of the process posted in the classroom so that students become familiar with the strategy.

Illustrations

Elementary

- *use writing for various purposes and in a range of contexts* (7e27)

The teacher leads a critical analysis of a variety of articles from a community newspaper. Students then contribute an article to the school newspaper regarding a local community event or issue.

Secondary

- *use a unifying image, emotion, or sensation to structure descriptive paragraphs or poems* (WR3.03)

The teacher distributes models of paragraphs that describe setting. In small groups, students explore the methods that writers have used to evoke atmosphere. After examining model paragraphs and reviewing paragraph structure, students are given a variety of visual stimuli to write their own descriptive paragraphs.

Lecture

Description

A lecture is an oral presentation of information during which the learner is responsible for taking appropriate notes. A lecture provides an opportunity for students to develop and practise listening and note-taking skills. This teacher/presenter-centred format is well suited to transmit information within time constraints and to provide whole groups with structured knowledge or step-by-step skill instruction. Lectures appeal to auditory learners, and to visual learners when visual learning aids accompany the oral presentation

Method

The teacher:

- organizes, plans, and delivers information to be presented;
- provides a classroom environment conducive to listening;
- provides various structures to assist students in developing listening and note-taking skills;
- models a variety of note-taking strategies, such as an anticipation guide or mind map.

Considerations

Lectures:

- tend to limit student participation and active involvement; may be difficult for ESL students or those with limited vocabulary (and may benefit from the use of visuals in such cases).

Illustrations

Elementary

- *compare the motions of particles in a solid, a liquid, and a gas using particle theory* (7s56)

The teacher introduces students to the particle theory through a lecture presentation. The students make notes describing the content of the lecture and review their notes with a partner before proceeding with their investigations. They use the understanding they derived from the lecture to make comparisons of the three states of matter.

Secondary

- *demonstrate an understanding of the historical development of one or more world dance forms* (TT2.02)

The teacher gives a mini-lecture to introduce the roots of jazz dance and a brief overview of its development. Students proceed to work on individual assignments regarding a choreographer, musician, or group who influenced the development of jazz dance.

Making Words

Description

Making words is a strategy that helps students learn how to work with letters to form words, how to change letters to form new words, and how to look for patterns in words. Making words is used when students need to understand how words work and to develop knowledge of common or frequently used words. This directed activity might be done with pencil or paper or with a predetermined set of magnetic alphabet letters, letter tiles, or letter cards. Junior students may be instructed to create two-letter words, then to add a letter to make a three-letter word, and so on, with the aim of reaching a particular target word. Senior students may be instructed to add suffixes and prefixes to roots. Words may be then sorted (see "Word Sorts" in "Direct Instruction Strategies") according to common patterns or characteristics, such as rhyming words, words that end the same, or words that start with similar prefixes.

Method

The teacher:

- pre-selects the letters to be used;
- establishes the patterns to be examined;
- identifies the letters needed by the student;

- observes behaviours that indicate the student's knowledge (e.g. word patterns, initial consonants, or blends).

Considerations
Making words:
- requires classroom management for storage and access to letters.

Illustrations
Elementary
- *identify most of the letters of the alphabet and demonstrate understanding that letters represent sounds and that written words convey meaning* (Ke23)

The teacher prints each student's name on a large card. The students identify their names from the pile and correctly place them inside their Borrow a Book envelope. They identify names that share some letters, or patterns of letters, with their own names.

Secondary
- *describe strategies used to expand vocabulary (e.g., using roots, prefixes, and suffixes to determine the meaning of unfamiliar words) and provide evidence of other vocabulary-building activities (e.g., lists of references consulted for the meaning of unfamiliar or specialized language; lists of new words encountered in works read during the year; personal lists of common prefixes and suffixes and effective words and phrases)* (LG1.01B)

The teacher reads an expository passage and students then use a dictionary to break down the syllabic structure of unfamiliar words. They discuss how such analysis helps their understanding of the passage.

Mnemonic Devices

Description
Mnemonic devices are short and easy-to-remember cues that trigger the recall of particular information from memory. Mnemonic devices may use rhyme, picture association, alliteration, songs, diagrams, and acronyms, alone or in combination. They are helpful in recalling frequently used information and procedures in remembering essential information needed to perform tasks, operations, and processes. By providing additional associations that anchor the learning, mnemonic devices can aid in studying, checking, classifying, and presenting information.

Method
The teacher:
- carefully selects items to be memorized according to importance and frequency of use;
- provides students with the mnemonic devices needed;
- helps students develop their own strategies and devices from personally meaningful information;
- develops a class repertoire of mnemonic devices;
- uses and applies these memory devices during class activities.

Considerations
Mnemonic devices:
- should apply every time (e.g., rules with 100% application);
- may be more successful if the type of device is matched to individual learning styles (for instance, a song for musical-rhythmic, a picture for verbal spatial).

Illustrations
Elementary
- *use phonics and memorized spelling rules (e.g., some verbs ending with a consonant double the consonant before* ed *or* ing*: stop/stopped, signal/signalling) to increase accuracy in spelling* (3e16)

The teacher identifies mnemonic rhymes that help students remember spelling rules (for instance, "When two vowels go walking the first does the talking" for words like "oat" or "eat").

Secondary
- *name the regions, provinces, territories, and capital cities of Canada* (AS1.08)

The teacher shares with students ways of remembering the names and positions of the Great Lakes and introduces the idea of a mnemonic such as HOMES (Huron, Ontario, Michigan, Erie, Superior). Students research or create other mnemonics for Canadian place names.

Practice and Drill

Description
Practice and drill is a strategy to reinforce what has already been learned by repeating an activity (doing mathematics problems), recalling information (scientific formulas), or perfecting a skill (playing a musical instrument or performing a sports routine). It is commonly used when the learner has developed preliminary skills or understanding of specific information related to the subject and the repetition increases ability or understanding. Practice and drill is effective to the extent that the learner is motivated. It is a valuable memorization strategy.

Method
The teacher:
- designs practice and drill activities to reinforce the concepts in a real-world, authentic context;
- provides opportunities for students to demonstrate improvement brought about by using practice and drill (e.g., checklists, charts, learning logs).

Considerations
Practice and drill:
- should be limited to short periods to prevent fatigue or boredom.

Illustrations
Elementary
- *add and subtract money amounts to 100 cents using concrete materials, drawings and symbols* (2m30)

A store activity centre is set up in the classroom for students to practise making change up to one dollar.

Secondary
- *use and combine movement skills in a variety of physical activities* (PA1.01)

Stations are set up in the gym to provide numerous opportunities for students to learn and practise ball handling, body position, footwork, passing/receiving, and shooting skills. The activities should provide challenges for the more highly skilled student and lots of student-teacher interaction for those students who are just beginning to acquire the necessary skills.

Programmed Learning

Description
Programmed learning is a structured and individualized strategy where students are presented with predetermined assignments that are completed independently of other materials or programs. Students work with the instructional material by themselves, at their own level and pace. The information is broken down into small units through which students work and respond. Students are given immediate feedback as to whether their answers are correct and are then encouraged to go on to the next step. Programmed learning often takes the form of computer-assisted instruction.

Method
The teacher:
- monitors to ensure that students are motivated to progress through the sets;
- selects appropriate modules of programmed learning for the specific topics and developmental level of the student.

Considerations
Programmed learning:
- may be most effective if the self-instructional material covers familiar content;
- may be seen as a monotonous activity for some students;
- may present a challenge in finding appropriate programmed learning materials to support the achievement of curriculum expectations.

Illustrations
Elementary
- *recall multiplication and division facts to 81* (4m26)

Students use a math skill-building program (commercially available, computer-based, or teacher-created task cards) to develop multiplication and division facts to 81.

Secondary

- *demonstrate the use of basic functions and features of common business software*
  (SAV.02)

Students complete personalized checklist identifying the functions and features of a software application they can use successfully based upon the completion of readiness exercises. Remedial exercises will be completed where a student does not have a specific competency.

Prompt

Description

Prompts are words, phrases, or sentences used to focus, direct, or prod thinking (for example, "The next step is ..." or "Why would you ..."). This strategy can be used to reinforce the positive aspects of a student's response and can encourage students to complete an incomplete response or revise an incorrect one. Prompts can nudge students towards critical thinking, facilitate discussion, clarify questions for better understanding, or provide direction for the expansion of responses (for example "If this were changed, then …" or "I wonder about …"). Prompts are open-ended and may be used to assess student comprehension.

Method

The teacher:
- expects certain results, and prompts to obtain them;
- decides when to use or remove prompts;
- prompts in a positive, encouraging manner;
- determines the type and level of prompt to use for further understanding.

Considerations

Prompts:
- promote a climate of accountability;
- may be posted for reference;
- provide a support strategy for students;
- may be used in peer practice/teaching situations to encourage understanding.

Illustrations

Elementary

- *locate the distinguishing physical features of their community (e.g., school playground)*
  (1z26)

The teacher asks students to describe the physical characteristics of the playground from the classroom window by using prompts (e.g., "From the window I see …" and "I like to play on …").

Secondary

- *demonstrate effective communication skills* (DCV.02)

The teacher helps students learn to comment in a positive fashion on a performance they have watched and to offer suggestions for improvement by using prompts (e.g., "What I liked best was …").

Read Along

Description

Read along is a practice that engages students in reading a text along with an expert reader (a teacher, a parent volunteer, another student, a taped reading, or an electronic reading). This strategy can be used with individuals, small groups, or large groups. It allows opportunities to observe the learning of individual students and provides additional reading experience for students who could not read the material independently. The process is used with text that would be challenging for students to read without assistance, thereby increasing the students' repertoire of stories, literary experiences, and other texts.

Method

The teacher:
- selects texts to meet the learning needs of a student or students;
- paces the reading so that students can actually read along;
- explains the purposes/goals of the read along activity;
- assesses learning related to the purpose of the read along;
- demonstrates strategies used in reading.

Considerations

Read along:
- requires the teacher to be aware of the various reading needs of students;
- requires a collection of taped stories, text sets, or multiple copies for purposes of read along.

Illustrations

Elementary

- *read aloud familiar material, using correct pronunciation and intonation* (4f13)

The teacher reads aloud a simple poem. The students join in and read along for a second reading.

Secondary

- *read and respond to short passages from fiction and non-fiction texts* (AREV.01)

The teacher reads aloud a passage from the current geography textbook while students follow along. After discussion on some key vocabulary, the students read along further in the text. Following the same procedure, the teacher then reads a passage from a novel on a

similar topic. The teacher asks the students how the passages were the same and how they were different.

Read Aloud

Description
Read aloud is the practice of the teacher or students reading aloud texts, stories, or poems for a variety of learning purposes. This strategy provides ideas and information through listening, and it builds the student's repertoire of stories, language patterns, ideas, and genres. Read aloud demonstrates how texts work and how they signal particular kinds of ideas and information that enrich the language experience of students. Read aloud promotes appreciation, reflection and love of reading, introduces new forms (a poetry anthology on a theme, for example), and provides a shared context for discussions and further learning. It can be used to generate interest and enrich content areas such as history (anecdotes about well-known historical figures) or science (stories about well-known scientific discoveries). The reader may pre-read and prepare or rehearse to ensure effective reading.

Method
The teacher:
- involves students through prediction;
- models reading techniques and fluency;
- provides opportunities for students to prepare and rehearse selections;
- selects texts that enrich student thinking.

Considerations
Read aloud:
- requires a skilful presentation to ensure student engagement throughout the reading;
- provides opportunities for students to read aloud texts that are within their level of fluency;
- should include topics, issues, and language supportive of all students, taking care to avoid discomfort for any individual.

Illustrations
Elementary
- *construct and read a variety of graphs, charts, diagrams, maps, and models for specific purposes*   (2z34)

The teacher reads aloud a picture book about a journey in a fantasy setting. The students visualize the land and create a map showing the main character's journey.

Secondary
- *understand and respond to a short, simple story, either told or read aloud* (AOR1.02)

The teacher reads aloud a short mystery story. The students listen for any clues that might help them solve the mystery and record their responses at strategic points in the story.

Reciprocal Teaching

Description
Reciprocal teaching is a form of dialogue where the teacher models the steps of the dialogue and encourages students to assume the role of the teacher in a group or in pairs. It is used to justify reasons, resolve differences, and listen actively to another person's point of view. Reciprocal teaching involves four strategies for improving comprehension: question generation, summarization, clarification, and prediction. Reciprocal teaching promotes flexibility to use the strategies as the situation requires. It engages students as teachers after the strategies are mastered.

Method
The teacher:
- models the steps of the process;
- encourages students to reach consensus on issues in the clarification stage;
- encourages students to assume the role of the teacher.

Considerations
Reciprocal teaching:
- requires extensive training and modelling before students become proficient in all strategies;
- recognizes that generating questions may be the most difficult step for students to master;
- benefits from the addition of question-response cues.

Illustrations
Elementary
- *evaluate the human use of water and the economic and environmental effects of that use* (8s139)

Students read two articles that present different points of view on the human use or abuse of water as a natural resource. Working in two groups, they develop questions that lead to a greater understanding of the articles and predict the issues that may be raised. Representatives of each group ask each other the questions and following a discussion, students return to their groups to summarize the position and clarify the point of view of the articles read.

Secondary
- *analyse the ethical implications of posting, accessing, and transmitting information in various digital formats* (EE3.03)

The teacher models several questions that could be applied to an article discussing the ethical use of electronic information. Small groups of four students each are given individual articles (different from that used for whole-class question formation). Each student in the group records the results of one of four separate tasks: to generate their own

questions, summarize the information in the article, clarify the position of the author, and predict why the article was written.

Review

Description
Review is a process used to clarify, consolidate, and reinforce previously learned knowledge or skills. The review process can assist in diagnosing learning difficulties and confirming understanding or skill development. Review summarizes previous work and provides reinforcement prior to assessment procedures. It can occur at any point in the learning, but is usually done at the beginning or end of a lesson to form a link between previous learning and further instruction. Review can take many forms, including questioning, reflection, and oral, written, or physical demonstration.

Method
The teacher:
- identifies areas of weakness and plans teaching accordingly;
- identifies and reinforces key points;
- reviews prerequisite knowledge for the day's lesson;
- provides opportunities for review in class;
- models effective review strategies in preparation for tests and examinations.

Considerations
Reviews:
- should be focused and short in duration;
- may be used as a self-assessment strategy.

Illustrations
Elementary
- *follow safety procedures related to physical activity, equipment, and facilities* (5p33)

The teacher reviews safety procedures in the gym. The students create posters highlighting one aspect of the established safety procedures and identifying why safety is important for subsequent physical activities.

Secondary
- *communicate scientific ideas, procedures, results, and conclusions using appropriate language and formats* (CH2.07)

At the end of the chemistry unit "Exploring Matter," students review previously learned laboratory skills and techniques and use them to investigate and classify an unknown substance. They communicate their ideas, procedures, and findings through a written laboratory report.

Seminar/Tutorial

Description

A seminar or tutorial is an instructional approach that brings together a small group of students to discuss topics of interest or examine areas in greater depth under the direction of a teacher or discussion leader. Seminars may provide opportunities for students to assume leadership roles in leading the discussion in a small group. Tutorials are directed opportunities for discussion of independent projects, for remediation, and for advanced learners to explore more complex topics. Responsibility for the discussion and analysis is vested in the students, allowing them to learn from each other and thereby ensuring meaningful discussion and group interaction. These strategies are useful in all subject areas.

Method

The teacher:
- identifies topics suitable for this method of learning;
- models good questioning techniques;
- fosters participation while playing less of a leadership role;
- acts as a resource person.

Considerations

Seminars/tutorials:
- provide opportunities for students acting as seminar leaders to develop leadership skills by learning to move the discussion along, accept the input of others, and encourage all members to contribute;
- are often used interchangeably with other terms such as workshop or study group.

Illustrations

Elementary
- *formulate questions to facilitate the gathering and clarifying of information on study topics* (6z34)

Each student group independently researches one of six regions of Canada. Seminar groups meet on a weekly basis to share questions, issues, and information, and to plan for the next steps in the process.

Secondary
- *effectively communicate the results of their inquiries* (SSV.02)

Students independently investigate a career opportunity related to food and nutrition. At the conclusion of the inquiry, students meet in small seminar groups to share their findings using a poster as a visual aid.

Socratic Dialogue

Description

Socratic dialogue is a method of questioning that leads students to logical conclusions and often to deeper meanings through a series of questions and answers. It is a collaborative approach that emphasizes helping students discover answers themselves. Students are stimulated to think about, analyse, explore, and defend their beliefs. Socratic dialogue often uses analogies to test the logic of the positions put forth by the student. The teacher's function is to question and probe the students' opinions, premises, and positions in order for them to demonstrate relevance, clarity, and consistency in their thinking.

Method

The teacher:
- serves as a questioner of students' points of view;
- poses questions that lead students to think, reason, and evaluate their ideas;
- develops questions that require thoughtful and in-depth responses;
- gives students enough time to formulate a thoughtful response;
- challenges students' assumptions in order to test their position and arguments.

Considerations

Socratic dialogue:
- emphasizes the responsibility of the learner for his or her own learning;
- requires planning and skill by the teacher to lead the dialogue to meaningful conclusions and further questions.

Illustrations

Elementary
- *investigate some of the ways in which humans have altered the landscape to meet their needs, and assess the environmental and economic consequences* (7s124)

Students read a recent newspaper article about the proposed development of a natural preserve. The teacher asks them to indicate their position on this issue. In a series of questions, the teacher asks the students to explain their position, using information from the newspaper article and other sources as required. For example, the teacher may ask why this development is essential, what impact it will have on wildlife, or what will happen if it does not proceed as planned.

Secondary
- *evaluate Canada's participation in organizations that deal with global issues* (GC2.02D)

After a discussion of Canada's trade patterns, the teacher divides the students into four or five groups, and each group examines a scenario depicting a trade issue. Issues could include human rights violations, nuclear technology sales, environmental pollution, tobacco sales, and child labour practices. As a group, students examine the arguments for and

against the issue. The teacher poses questions to help the students probe their own feelings and opinions on the issue.

Story Mapping

Description
Story mapping is a process whereby graphic representations trace narrative progression (plot), trait development (character), or changes in location (setting). Story mapping may take many forms and can be used by individuals, small groups, or whole classes to visually plan a story before writing the first draft or as an aid in retelling previously read stories. Story maps can be used to examine student comprehension of the key elements of a story. Students can also use this strategy as a self-assessment tool to ensure they have included all of the key story elements in their personal writing. The maps can become more sophisticated in features and analysis as the student gains experience.

Method
The teacher:
- carefully constructs story maps that match the ability level of the student;
- adds elements to the story map as they are introduced in the reading process;
- models the use of a story map;
- uses a student's story map in student-teacher conferences to direct questions and discussion that will lead to improvement in student writing;
- assesses the story map to ascertain the students' summary of key elements of a read story.

Considerations
Story mapping:
- may be used independently or cooperatively in groups;
- require clarity related to methodology as there are different versions of story maps and alternative ways of organizing narrative elements;
- should not be used exclusively for planning stories, as this may restrict students who require other methods of planning such as talking aloud or webs.

Illustrations
Elementary
- *make and read simple models and maps of familiar areas in their local community;*(1z43)

The teacher reads aloud a story set in a local community that includes illustrative maps of buildings, roads, and other locations (for instance, *Katie Morag and the Wedding* by Mollie Hedderwick). The teacher discusses the sequence of events in the story using the map. Students then create their own map of their local community and tell a story of a day's journey from place to place (for instance, from home to school, from school to the library).

Secondary
- *use knowledge of elements of the short story* (LI2.02P)

Students review the structure of a narrative plot graph and apply this structure to a variety of narrative texts by Canadian short story writers.

Storytelling

Description
Storytelling is the art of telling a story rather than reading it aloud. Storytellers use gesture, voice techniques, rhythm, pitch, and other nuances of language to create dramatic effects and clarify meaning. Storytelling builds a repertoire of story language and literary experiences, enhances and extends the meaning of literary selections for students, and helps them to connect ideas and themes across cultures. Storytelling often makes information easier to remember. Telling stories is an entertaining and powerful form of communication that provides insight into history and cultures and reveals the hopes, fears, values, and accomplishments of individuals and society.

Method
The teacher:
- selects stories that are more appropriately told than read;
- develops and practises the techniques to be used to create effect;
- animates the key points of the story with sound and hand or body movements;
- invites students into the story through their participation in refrains, repeated phrases, story actions, or sound effects;
- helps students develop storytelling techniques;
- uses storytelling to develop ideas and experiences, and to enrich language;
- provides opportunities for students to tell stories;
- invites storytellers to perform before the class or uses media and technology to provide storytelling performances.

Considerations
Storytelling:
- requires preparation and practice to develop critical elements;
- may exclude some students who may feel uncomfortable performing;
- requires careful story selection so that the richness of language, plot, and concept sustain the purpose and interest of the students.

Illustrations
Elementary
- *describe the relationships between Aboriginal peoples and their environment* (6z5)

The teacher invites a Native storyteller to class to share stories and discuss the importance of storytelling to his or her culture.

Secondary
- *perform in the classroom a variety of dramatic presentations* (DC2.01)

Each student is given a slip of paper with a word on it. The teacher begins the story by giving the first sentence. Students take turns to continue the story orally by contributing up to three sentences. Each contribution must further the narrative and include the word on each student's slip of paper.

Task Cards

Description
Task cards are instructional aids that outline specific tasks or experiments in a series of structured activities. Usually created by the teacher, task cards promote independent study and exploration of materials and information connected to a specific unit of study. Task cards also provide opportunities for peer teaching and interaction. Task cards can augment the teaching of any subject and may introduce or reinforce learning. Task cards can also be created and shared by students to review learning. They are an appropriate use of limited resources around a theme in the classroom or library and can be used to direct student activities at learning stations or on a field trip.

Method
The teacher:
- pre-plans and creates appropriate tasks cards that organize topic, theme, and content;
- compiles extensive resources and materials;
- requires creative input to maintain student interest in working through all the learning stations and tasks;
- considers the learning needs and developmental levels of all students in the class;
- modifies tasks to address the individual abilities of the learners.

Considerations
Task cards:
- require storage and maintenance for the cards and the learning station components;
- require frequent renewal to keep up with new resources and appropriate tasks for all learners;
- may include assessment criteria (e.g., rubric) as part of the description.

Illustrations
Elementary
- *classify, using their observations, materials that are magnetic and not magnetic, and identify materials that can be magnetized* (3s30)

Students work in small groups at different learning stations. At each of the stations, they follow the simple experiment related to magnetism outlined on the task card.

Secondary
- *identify and describe, orally and in writing, how the elements of music work together in a particular historical style and cultural context* (MA1.02)

Students visit a series of learning stations. At each station, they are directed to follow specific tasks designed to allow students to experience a different aspect of Canadian music. They then proceed in groups to create additional task cards for proposed learning stations.

Textbook

Description

Textbooks are books used in classroom instruction and for personal study that are a standard account of a subject or discipline written for a specific audience (for example, grade, jurisdiction). They are basic tools for teaching many courses. Textbooks present a great variety of information for all students in one resource that is consistent, controlled, and often sequential. They are effective in transmitting the content that is considered necessary to provide a foundation of knowledge and skills in a particular subject. Textbooks can also provide some guidance in structuring learning activities. Textbooks may be in print or electronic form and often contain useful sections such as chapter-by-chapter questions, glossaries, indexes, and bibliographies.

Method
The teacher:
- ensures the textbook's currency and relevance to the subject and curriculum;
- develops strategies for using textbooks effectively (e.g., teachers' guide, workbooks, quizzes and tests);
- augments the textbook with extra resources to expand on the topics (e.g., library resources, Internet sites);
- considers other learning styles when presenting material using textbooks.

Considerations
Textbooks:
- contain many reading and comprehension aids (e.g., tables of content, headings, illustrations, captions), which can be used for greater understanding of the subject;
- may not be current, so must be augmented with recent materials;
- may be a one-sided, edited presentation of material;
- do not always consider individual differences;
- may present difficulties in accommodating different reading levels;
- should be considered part of a larger reading and learning strategy.

Illustrations
Elementary
- *solve problems using fractions and decimals using the appropriate strategies and calculation methods* (7m26)

Students work independently through a textbook chapter on fractions and decimals. They do the review exercise and practise solving problems using what they have learned in the chapter. Students then complete the chapter's test and check the answers with the solutions in the back of the textbook.

- *analyse statistical data on population density to identify trends and variations* (SS2.02D)

Students analyze population density information from the most current Canadian geography textbook and identify trends. The students compare these trends with those identified using computer databases and almanacs containing more current population density information.

Visual Stimuli

Description
Visual stimuli, as part of a learning strategy, are visual cues or objects used to enhance learning. They promote creative associations and connections that aid in memorizing and recalling information. Interest and excitement in learning can be generated by the visual alteration of colour, shape, and imagery in the learning materials used as well as in the classroom environment. Visual stimuli can take the form of illustrations, photographs, films, real objects, or graphics. Students can create their own visual stimuli to assist them in memorizing and recalling information.

Method
The teacher:
- uses visual stimuli to enhance the learning needs of the visual learner;
- presents a visual medium to stimulate creative thinking and make connections;
- uses concrete objects, movies, television, posters, charts, diagrams, and computers to stimulate the visual learner;
- provides tools so that students can create their own visual stimuli or vision;
- effectively enhances the visual dimension of the classroom through the use of colour, lighting, and furniture arrangement.

Considerations
Visual stimuli:
- should be used judiciously to prevent visual overload, which is distracting for some learners;
- should be changed frequently to remain interesting and inviting.

Illustrations
Elementary
- *describe the relationship between Aboriginal peoples and their environment* (6z5)

Each class begins with a quiet circle. The teacher begins with a poem, song, or story. Students pass an object, such as a stone, shell, or leaf that provides a tactile and visual connection to the listening activity.

Secondary
- *describe, using their observations, the evidence for chemical changes* (CH1.08)

The teacher introduces the vocabulary of chemistry through demonstrations that result in dramatic changes of colour, shape, or texture of various properties. The visual changes that occur act as associative cues for recalling the terms.

Visualization

Description
Visualization is a process of internally making an object, event, or situation visible to one's mind by mentally constructing or recalling a visual image. Teachers can use visualization as an exercise prior to writing to help students simulate the feeling of being in a particular situation. Visualization allows for individual response, extends thinking, and enhances creativity through the use of prompts and drawing on prior experience. It can aid reading comprehension when students are asked to create mental images of what they have read.

Method
The teacher:
- may lead and prompt students through the process;
- creates a secure, non-threatening atmosphere, often through a relaxation activity;
- models thinking aloud to the students;
- reserves evaluative judgment in response;
- may add sketching to the process.

Considerations
Visualization:
- is usually quite detailed in description or narrative in order to make an impression;
- requires repeated experiences to extend thinking and raise comfort level;
- requires prior planning by the teacher to paint a word picture for the students;
- works well to help students understand something they may not experience first-hand;
- may require the opting out of some students for whom sustained visualization is intense or objectionable.

Illustrations
Elementary
- *utilize special purpose maps* (4z54)

The teacher asks students to close their eyes and visualize a map of the world. The teacher poses such questions as "Where on the map is Canada located?" and "How much space does Canada take up compared to other countries they know?" Following this brief visualization, students give their responses, try to establish a class consensus, and then examine Peters projection maps to compare their findings.

Secondary
- *demonstrate an understanding of the use of elements and principles in various artworks* (LT1.03)

The teacher leads students in a discussion of how the soundtracks they hear while watching a movie help to create a mood and underscore important events. The students close their eyes and try to determine what is happening on the screen by just hearing the music. Following the visualization, the students compare their findings with actual plot summarizes or scripts.

Word Cycle

Description
A word cycle is a vocabulary-building strategy that helps students identify the relationships between and among words. A word cycle is an open-ended activity that encourages students to think in creative ways in order to find relationships between words or phrases and to diagram these relationships in a meaningful way. It is applicable in any situation and in all subject areas where an understanding of relationships among words or concepts is required. A word cycle is used to introduce a new topic or unit, to review newly learned material or concepts, and to assess knowledge of vocabulary and concepts.

Method
The teacher:
- explains and models the strategy: for instance, placing terms from a prepared list in adjacent positions and indicating their relationship on an adjacent band;
- encourages students to see that there is more than one way to look at relationships between words and concepts;
- selects the words to be used to build the word cycle;
- decides if the strategy is used individually or in small groups;
- decides where in the learning process to use the strategy (e.g., as an introduction, as review, or for assessment);
- provides prompts when students are having difficulty building relationships or seeing connections.

Considerations
Word cycles:
- work best with six to eight words or concepts;
- require a visual frame, preferably a teacher-prepared frame at first;
- require an environment where unique or creative thinking is encouraged;
- usually enable the first few connections to be made easily; as fewer words are left, the connections become more difficult.

Illustrations
Elementary
- *describe the behaviour of light, using their observations, and identify some of its basic characteristics* (4s49)

Students begin their investigations on the properties of light by brainstorming words and phrases related to light (e.g., lightning, light bulb). Students then group words and phrases and draw a diagram to visually represent the connections between them.

Secondary

- *identify the elements and principles common to all the arts* (LT1.01)

Students brainstorm words related to rhythm and movement. They then decide which words apply only to music, to visual arts, or to dance and which words are common to all three. They indicate the results of their decision by placing the words in the appropriate part of the Venn diagram.

Word Sort

Description

Word sort is a strategy whereby students sort words and concepts into different categories. Word sort can be used to introduce a new topic or to ascertain prior knowledge necessary for student understanding of new material. It is also used to examine ways in which words or concepts might be related or connected and to support student discussion around these connections. It may then be used to identify patterns in words (see "Making Words" in "Direct Instruction Strategies"). Word sort is an open-ended activity that requires students to use higher-level thinking skills to find unique or unusual ways to categorize words.

Method

The teacher:
- decides which words and concepts will be used in the word sort;
- provides modelling when the strategy is first introduced;
- supports students to think about and organize words and concepts in unique or creative ways;
- provides opportunities for groups to generate and share their categories;
- provides opportunities in follow-up work for students to examine definitions of concepts and words used in the sort.

Considerations

Word sort:
- is a good way to introduce or review new vocabulary and concepts in a motivating way;
- focuses students on the key ideas of the object of study (e.g., topic, lesson, story);
- requires an environment where risk taking is encouraged;
- in early grades, should start with five to ten words or concepts at a time; for older grades, with ten to twenty words or concepts;
- may include pictures for early emergent readers;
- provides opportunities to practise thinking in new or unique ways.

Illustrations

Elementary

- *use appropriate vocabulary (e.g., direction) to describe their inquiries and observations* (1z14)

The teacher pre-selects action words from a dramatic poem and students use the word sort strategy to identify and sort them. The teacher then reads the poem and colour-codes the action words. The students then do the actions while the poem is read again.

Secondary
- *use vocabulary correctly and appropriately in the classical language in a variety of writing activities (e.g., completing unfinished sentences, matching words to their definitions, composing short phrases)* (WR1.01)

Students are given a set of words from passages they have recently studied. They work in groups to categorize the words (e.g., by theme, by grammatical form, by derivative connection). At the completion of the categorization, groups share and justify their work.

Word Wall

Description
A word wall is a visual strategy in which new vocabulary or words encountered with high frequency are posted on the wall in the classroom. Words are posted beneath the letter of the alphabet with which each word begins. Students refer to and use these words in activities such as reading, writing, spelling, presenting, and storytelling. The word wall can be used to reinforce learning by providing cues to curriculum content. A word wall promotes the use of language in the classroom to enrich literacy and motivate student interest in reading. It may be used in all subjects and may include words meeting varied criteria (for example, most misspelled words, word-for-today, technical terms, words with etymological interest).

Method
The teacher:
- initially identifies the words to be added to the word wall;
- conducts activities to make students familiar with high-frequency words and focuses on word patterns, rhyming words, and initial consonants;
- connects the word wall to curriculum content;
- refers to the word wall on a regular basis.

Considerations
Word walls:
- should contain words that, at least at the start, are very different to avoid confusing similar words;
- might take the form of a wall of quotations or questions.

Illustrations
Elementary
- *use appropriate vocabulary (e.g., directions) to describe their inquiries and observations* (1z14)

A class word wall is created to list directional instructions that students receive (e.g. in swimming lessons, at soccer games). Students add additional directional words to the word wall.

Secondary
- *demonstrate effective use of strategies to improve literacy* (LS1.01)

Students contribute five words to a word wall. In groups, students compose short pieces that contain words used for humorous or dramatic effect. (The word wall can change regularly with class topics.)

Workbook/Worksheets

Description
Workbooks or worksheets are guided instructional aids with prompts and questions for completion that help students focus on specific content, either in classroom activities or in assignments for a course. They can be used to review the knowledge that is expected as a prerequisite for a particular course, provide practice with new concepts, and ensure the consistent assessment of student learning. Students can use worksheets to analyse the concepts and information presented and as frames of reference to organize thinking. Students can demonstrate comprehension of newly learned concepts by successfully completing worksheets. Workbooks or worksheets can be teacher-generated or purchased commercially. They are most effective, however, when adapted to individual student learning needs.

Method
The teacher:
- clarifies expectations related to student completion of worksheets;
- prepares worksheets and exercises based on classroom curriculum and experiences;
- adapts the worksheets for individual students considering learning styles and levels of understanding;
- returns marked worksheets promptly in order to provide relevant feedback;
- involves students in the peer evaluation of the worksheets.

Considerations
Workbook/worksheets:
- may provide a consistent medium for knowledge and skills at specific grades and stages of learning;
- are often used by parents for home study;
- may stifle creativity and learning if not relevant to the material taught;
- should be screened carefully if purchased commercially to ensure relevancy;
- should not be used too often, or the process becomes mechanical.

Illustrations

Elementary

- *identify root words and use them to determine the pronunciation and meaning of unfamiliar words* (4e46)

Students read a passage. The teacher then asks them to complete a worksheet that demonstrates their ability to determine the meaning of unfamiliar words through the examination of root words.

Secondary

- *describe the benefits of each health-related fitness component and its relationship to active living* (AL2.05)

Students complete a health-related circuit and a follow-up Health-Related Fitness Worksheet. The worksheet requires students to match each exercise in the circuit with the appropriate health-related fitness component. The worksheet activity also requires students to develop answers that include the definition and benefits of each health-related fitness component.

Independent Learning Strategies

Independent learning strategies help students build knowledge and skills to become self-directed, motivated, and independent learners. They provide opportunities for students to make decisions about their learning, investigate topics of interest in more depth, make discoveries about a new topic, and generate new thinking. In order to be effective independent learners, students must also master time-management and self-monitoring strategies.

The process of independent learning enhances students' motivation because they are active participants in controlling their learning. Independent learning strategies allow students to select the materials they wish to present and to develop appropriate presentation formats to demonstrate their learning – for example, portfolios and response journals. Independent learning provides students with opportunities for self-reflection – thinking about their own learning and evaluating and revising the material before submitting or presenting their work.

Independent learning strategies work well with the processes of inquiry and research, as students learn to use a variety of research methods and learning resources, structure their research questions, and pursue areas of investigation. The development of logical frameworks and information-seeking strategies involves skills that are transferable to all subjects as well as areas of personal interest.

Students who develop independent, creative, and critical problem-solving skills can apply those skills to meet current curriculum expectations and will use them in real-life situations throughout their lives.

Independent Learning Strategies

Homework	Note Making
Independent Reading	Portfolio
Independent Study	Reading Response
Learning Contract	Reflection
Learning Log/Journal	Report
Memorization	Response Journal

Homework

Description
Homework is work that is completed by the student outside of class. Homework can involve review and practice of classroom learning or may be remedial in nature. It may be assigned to encourage students' responsibility for their own learning and their acquisition of specific skills or knowledge. Homework can also encourage students to pursue an in-depth interest in a topic and generate new thoughts on the topic. Homework may be assigned to individual students or to the class as a whole. It can be informal (for instance, personal reading) or formal (for instance, a specific task or set of questions) in nature.

Method

The teacher:

- assigns and monitors the homework on a continuous and regular basis;
- provides the structure for students to acquire independence in the management of their homework;
- communicates expectations regarding homework to both students and parents.

Considerations

Homework:

- requires differentiated supervision of students as they mature and accept responsibility for out-of-class work;
- requires consistent monitoring and review of the assigned work;
- requires coordination of teacher planning and parent/guardian support.

Illustrations

Elementary

- *analyse personal eating habits in a variety of situations* (6p6)

Students track their eating patterns for a one-week period in and out of school and prepare a summary sheet showing their findings and patterns.

Secondary

- *demonstrate an ability to negotiate and perform tasks related to meeting the needs of families* (SO3.03)

After classroom practice, students, at home, produce a healthy meal for their families to enjoy. Each student produces a written analysis of the meal's nutritional value.

Independent Reading

Description

In independent reading, students are given time to read material of their own choice on a regular basis. Students are encouraged to access a wide range of reading materials, forms, and genres in and outside the classroom, including at home and school and public libraries, on an informal basis. Independent reading may be used to provide students with the opportunity to practise reading, apply strategies, and pursue a favourite author or genre (for example, mystery or science fiction). It is an opportunity for teachers to observe students as readers, for students to view themselves and others as readers, for reading to be placed in an authentic context, and to demonstrate that reading is a valued experience.

Method

The teacher:

- shares what he or she is reading, and enthusiasm about particular authors;
- establishes a positive attitude towards reading;
- provides time for selection from a wide range of suitable reading materials;
- establishes routines for accessing and sharing materials;

- encourages parents to value time for independent reading;
- encourages reading as a lifelong habit;
- values personal reading choices by students.

Considerations
Independent reading:
- requires access to a wide range of materials;
- requires program coordination with the school and public library staff for material selection, visits, book talks, assessment, and promotions;
- encourages students to record the types and number of books they read individually or by class;
- requires opportunities for choosing books regularly;
- encourages students to make time in their own lives for reading on a regular basis;
- requires students to be responsible for returning books when due.

Illustrations
Elementary
- *read a variety of fiction and non-fiction materials for different purposes* (3e29)

Students maintain a reading log, listing a minimum of three books a month they have read outside of school.

Secondary
- *select and read text for different purpose* (LI1.02P)

Students independently read from the literature of a particular region or country, selecting materials that help them transfer curricular knowledge to personal recreational reading.

Independent Study

Description
Independent study is a strategy that develops, with teacher guidance, the student's ability to plan, explore, organize, and communicate a topic of interest independently and in more detail. It is also used to generate thoughts, review or research a topic, and extend personal learning within the framework of curriculum expectations. Independent study may provide opportunities to pursue individual variations to a topic/issue under classroom study or to provide an alternative assignment based on the student's needs and individual learning style. It makes students active participants in the learning process, thereby enhancing motivation and retention. Through independent study, students learn to make responsible choices and accept responsibility for their own learning. Students may also take school courses independently through distance learning, such as those offered in Ontario by the Independent Learning Centre.

Method
The teacher:

- assists the student as a guide and a facilitator, making sure the requisite skills (e.g., research, Internet use, time management) are in place for success;
- poses questions to further and deepen the study;
- schedules regular progress conferences with the learner to maintain focus;
- monitors student progress and decision making during the study;
- models the skills associated with self-directed learning;
- provides support with organizational strategies, time lines, and sources for information;
- helps the student narrow the area of study (e.g., a study of "the Great White Shark," or "Sharks," instead of "Undersea Life");
- establishes access to equipment and resources;
- intervenes as required to maintain student confidence in the self-directed learning;
- monitors the student's ability to assume greater responsibility;
- assists with structures for self-assessment and peer evaluation of the study;
- provides a forum and feedback for the presentation of the study.

Considerations

Independent study:
- requires careful assessment of the student's degree of independence in order to assist the student with goal-setting and choices for independent study;
- requires coordination among teachers to monitor student work load;
- requires coordination among teachers to prevent overlap of assigned skills and/or knowledge;
- builds in a sliding scale of student supervision as students demonstrate growing independence;
- requires coordination with information sources in the school (e.g., school library, guidance services) and community (e.g., public library, government archives) to facilitate access to information.

Illustrations

Elementary
- *compare works (of art) on a similar theme from various periods and cultures and discuss the impact of time period and location on style* (5a42)

Students choose three works of visual art by different artists on a similar theme (e.g., animals, family life, and religion) and make some comparisons. Independently, students research the artist's background, geographic location, and historical time period. They relate this information to the works of art and communicate their findings to the class through an oral presentation.

Secondary
- *analyse how a changing society affects individuals and families* (DIV.01)

Students design and complete an independent research project studying the change in a family (e.g., customs and cultural aspects), or the change in one particular member of the family, when they move to Canada.

Learning Contract

Description
A learning contract is a negotiated plan of intent between teacher and students to meet the learning needs and interests of an individual or small group. A learning contract gives students a role and responsibility in shaping the learning experience because the student(s) and teacher develop it collaboratively. Learning contracts outline clear goals and processes for the learning experience. For example, a learning contract may abridge or extend specific learning activities, or modify time frames and learning conditions according to student needs, interests, and the expectations of the curriculum.

Method
The teacher:
- selects an appropriate range of options and frameworks for learning contracts;
- may need to elicit parental agreement and support;
- assists students at frequent predetermined checkpoints;
- monitors student progress regularly in following the contract.

Considerations
Learning contracts:
- work particularly well with individual students because they have made a commitment;
- require considerable supervision by the teacher;
- require a high level of structure, focus, and organization;
- may require outside resources/personnel (e.g., for supervision or assistance);
- require consideration of the student's maturity and sense of independence.

Illustrations
Elementary
- *incorporate time-management and organizational skills in the goal-setting process* (5p39)

Students design an individual plan related to physical activity or personal fitness in order to address individual physical fitness needs. Each student develops the plan in collaboration with the teacher to encompass both curriculum expectations and the student's personal fitness goals. The negotiated contract includes a time line and self-assessment of achieved goals.

Secondary
- *produce and evaluate learning plans* (LS3.08)

Students use their portfolios and evaluation reports, with the assistance of their teacher, to develop, review, and revise any goals and plans in meeting their performance expectations in a particular subject area. Each student's plan includes a scheduled conference to present evidence of achievement.

Learning Log/Journal

Description

The learning log/journal is a sustained, written reflection on the process and content of learning. Learning logs/journals require regular entries, but may be used at different points in a unit or topic (at the beginning of a lesson to focus learning and make connections to previous lessons, or during the lesson to consolidate learning and ensure understanding). They can be used to record observations (for instance, monitoring plant growth, recalling classroom discussions), to track learning through independent study, and to assess progress and attitude to learning. Learning logs require the reflective participation of the student. The teacher may respond to student reflections orally or in writing, in both formal and informal ways.

Method

The teacher:

- describes the expectations, purpose, and structure of a learning log;
- provides continuous and sustained time for the process;
- leads discussions about what the students are learning;
- provides prompts, if necessary, to encourage recording and reflection;
- may conference with students about their individual learning;
- provides support when students are in the process of writing.

Considerations

Learning logs/journals:

- require a teacher to respect the confidentiality of a student's entries/responses while carefully considering thoughts and emotions to which he/she may be compelled to react;
- take time to develop self-reflection;
- are suited to all program areas, but can be less effective when a log/journal is required in every subject.

Illustrations

Elementary

- *demonstrate an understanding of factors contributing to change in a society* (8h38)

In small groups, students record major social events on a time line created to look like a river. Groups discuss the causes and effects of each change/event. Individuals reflect on the experience in learning logs.

Secondary

- *record personal thoughts and observations in diaries, journals, and logs* (WR1.28)

The teacher discusses the importance of journal writing, shows examples of effective journal entries, and develops the journal evaluation rubric with the students. Students keep a journal, adding an entry after every drama class, using the vocabulary and structures they have learned in relation to successful journal writing and specific to drama activities.

Memorization

Description

Memorization is a mental, oral, or written rehearsal of content or skill that enables the material to be recalled quickly for further development or transfer to other contexts. It is a means of mentally organizing words or concepts in order to connect them to the objects, events, actions, or qualities that they represent. Memorization is an individual activity and is highly dependent upon the learner's capacity to recollect information. It is particularly relevant when a foundation or base of knowledge needs to be recalled quickly or as a base for further knowledge and transfer (for example, the alphabet for dictionary skills). By memorizing basic facts, poems, or lines, the mind can be free to concentrate on other skills (for instance, making an oral presentation). Memorization includes both short-term and long-term recall and can be improved through practice.

Method

The teacher:
- provides visual and auditory supports to assist with the recall of information;
- communicates a purpose and application for memorizing;
- supports and encourages students;
- sets time lines and guidelines for the amount of information to be memorized.

Considerations

Memorizing:
- should accommodate the way the method of memorizing (e.g., mnemonics or visual organizers) impacts on individual learning styles;
- may involve games, chants, and songs;
- requires a variable amount of time for individual students;
- requires that material to be memorized is relevant, transferable, and applicable to other life situations.

Illustrations

Elementary

- *recall multiplication and division facts to 81* (4m26)

The teacher asks students to orally rehearse and then write out the multiplication tables, from 1×1 through to 9×9, to demonstrate their ability to memorize and recall these number facts for subsequent application in solving mathematical problems.

Secondary

- *describe the basic process of cell division, including what happens to the cell membrane and the contents of the nucleus (e.g., stages of mitosis – prophase, metaphase, anaphase, and telophase)* (BY1.01)

Students orally rehearse what is occurring at each stage of mitosis using a series of photographs depicting the stages as a visual cue. Then they repeat the exercise without the cues.

Note Making

Description
Note making is a method of recording and organizing information in one's own words from a variety of sources for comprehension and transfer. This skill may be used for a number of purposes, such as recording information acquired in the inquiry process, recording information obtained when listening to a speaker or a teacher-directed lesson, or organizing ideas in the early stages of the writing process. Making effective notes actively engages students in the listening or research process. Students can use a variety of forms or structures (maps, webs, and outlines) to make the information clear and personally meaningful. Note making ensures better recall of information, encourages inferences and interpretations, and helps identify and synthesize what is important. It is appropriate at all grade levels and subject areas.

Method
The teacher:
- models a variety of strategies and forms for note taking;
- introduces students to methods used by speakers and authors to give cues about the main idea (e.g., headings, signal words, repeating an idea);
- demonstrates to students how to use and create their own short forms when listening and recording;
- introduces techniques for summarizing in one's own words;
- illustrates a variety of note-making forms, such as two-column notes, herringbone/fishbone notes, maps and webs, charts, outlines (see visual/graphic organizers in the Thinking Skill Strategies section of this guide for further information).

Considerations
Note making:
- requires explicit teaching from early grades;
- cannot be assumed as a skill that students have in content areas;
- is a thinking skill, not just a language skill, and is useful in all subject areas;
- may be supported by providing frequent opportunities for students to summarize orally.

Illustrations
Elementary
- *communicate information, using media works, oral presentations, and written notes and descriptions* (2z35)

The students watch a video on trees in Canada. Before the second viewing, the teacher models using point-form notes and quick sketches for recording data. Students are then asked to take their own notes on the video.

Secondary

- *compare electrical energy production technologies, including risks and benefits*
  (PH3.03)

The teacher presents information on the generation of electricity from various sources – tides, hydro, wind, nuclear, heat, solar, geothermal, fuel cells, biomes, and fossil fuels. Students make notes on the topics as a starting point for research on the conversion of energy to electricity.

Portfolio

Description
Portfolios are authentic collections of student work that demonstrate a student's efforts, progress, and achievement over a period of time. Portfolios can have a specific subject or curriculum focus or can be used more generally to collect examples of best performance either in print, media, or electronic format (booklet, photographs, video, computer disk). Portfolios encourage collaborative assessment with the teacher and develop students' abilities to critically assess their own growth and development. They are a valuable resource for the preparation of anecdotal reports, for parent-teacher interviews, and for assessing program delivery and needs. They also provide consistent opportunities for one-on-one conferencing between the student and teacher. Parents can also become part of the conferencing and goal-setting process with the student and teacher. Portfolios contribute to self-esteem by allowing students to "show" a collection of what they have achieved. (Also see "Portfolios" in the *Assessment Companion: Assessment Strategies*)

Method
The teacher:
- models the components and format of a sample portfolio;
- provides time and encouragement for students to organize their inclusions;
- uses the portfolio for performance review, assessment, and evaluation;
- sets up a regular time to conference with the student to review the contents and set goals;
- assists students in establishing and applying criteria for assessing and evaluating their work.

Considerations
Portfolios:
- require time to be allotted and scheduled for maintenance of the portfolios and for peer and teacher conferencing;
- require solutions for storage (e.g., year by year and over several grades).

Illustrations
Elementary
- *use appropriate vocabulary to describe their inquiries and observations* (6z33)

At the beginning of the unit on Japan, students construct a folder/portfolio in which they keep their completed work, with annotations and reflections for each major component. From the completed work, they choose three pieces to describe to the class.

Secondary
- *outline key aspects of physical, social, emotional, and moral development in adolescence* (SO1.01)

Students prepare an autobiographical project of their life, by using a portfolio to collect photographs, record discussions with family members, and write reflectively about themselves.

Reading Response

Description
Reading response is a strategy whereby students make thoughtful, personal connections with the ideas, language, emotions, and experience in a literary text. Reading response enables students to articulate links to personal experience and to form generalizations from the text for deeper meaning and understanding. It allows students to participate emotionally, intellectually, and reflectively in the reading experience. Although student talk is an important component of the processes of reflecting, connecting, comparing, and challenging assumptions, other forms of response are also encouraged (for example, illustrations, sketches, student questions, letters to the author).

Method
The teacher:
- makes diverse literary experiences available to every student;
- encourages dialogue and discussion after reading;
- allows students to share responses;
- models his or her thoughts and feelings in demonstrations of the various forms of response (e.g., a word collage, significant questions for the author);
- helps students make connections with other ideas, experiences, and texts;
- suggests timely opportunities to respond (e.g., three times throughout the first section of a novel, rather than at the end of each chapter).

Considerations
Reading response:
- requires planning to arrange for discussion and reflection by all students;
- requires additional support for some students;
- encourages students who share similar background knowledge to learn from one another when grouped appropriately;
- can link students personally to literature in ways not possible with other strategies;
- require a teacher to respect the confidentiality of a student's entries/responses while carefully considering thoughts and emotions to which he/she may be compelled to react.

Illustrations

Elementary

- *demonstrate an understanding of the social, political, and economic issues facing Aboriginal peoples in Canada today* (6z3)

Students reflect, relate, and retell George Littlechild's story "This Land Is My Land" by recording their feelings through writing and drawing.

Secondary

- *explain the factors that contribute to effective business leadership (e.g., vision, goal setting, power, personality traits)* (HR1.01)

Students read three articles that explore the lives and contributions of effective business leaders. Students then discuss their responses to the articles and record their thoughts and questions in their journals for further analysis.

Reflection

Description

Reflection is a thinking process that involves taking time to consider information and making sense of it in light of previous experience. Reflection also involves looking back to evaluate previous experience and learning and to identify possible problems and likely opportunities ahead. It is part of the metacognitive process and, as such, is a complex process that enables deeper thinking. Keeping a journal or response log is a reflective practice that provides opportunities for students to synthesize their thoughts, document their thinking, and become aware of their decision-making and learning process.

Method

The teacher:

- provides time for students to reflect on their learning;
- establishes criteria for students to think through a process or project;
- models thoughtful and reflective teaching practices;
- incorporates wait time (e.g., three to ten seconds) before students respond to a question;
- encourages student to think of the how and why of what they are learning;
- provides structures for students to share their progress, thoughts, perceptions, and behaviours;
- encourages reflective evaluation of strategies, group interactions, and processes used in the classroom.

Considerations

Reflection:

- may foster creative application of learning into students' everyday lives;
- requires time and opportunity to practise;
- may be the last subtask in a unit after an assessed culminating task.

Illustrations

Elementary

- *describe the significance of drama and dance in their lives* (7a74)

At the beginning and at the end of a unit, students write reflections on their aesthetic experiences in a journal, and compare how their views on the significance of drama and dance in their lives have changed.

Secondary

- *reflect on learning by maintaining a journal and/or practice log to record progress* (MA2.03)

Students reflect on comments written in their art journal, and answer two essential questions: "What does my art say about me?" and "Why is art important to me?" They use vocabulary specific to the art form in their reflective writing.

Report

Description

A report is a text of varied length that is written to document and communicate information on a topic. It is often based on findings as a result of an investigation, inquiry, or research. Reports are used to organize, present, and classify factual information. The content must be expressed in a clear, concise, and objective style using formal and precise language. When reports are about a technical or scientific topic, they contain vocabulary specific to that topic. Reports may be presented orally, but should retain the logical organization and clear language characteristic of a formal written text.

Method

The teacher:

- explains the purposes and forms of reports and how they differ from other kinds of writing;
- models the appropriate format required for the specific type of report;
- provides a context or subject for the report;
- assists the students in determining the audience for the report;
- provides opportunities for writing and editing initial drafts.

Considerations

Reports:

- are effective when they have a clear focus on a specific topic;
- require that students have access to relevant and appropriate information about the topic.

Illustrations

Elementary

- *describe the history, construction, and use of an instrument* (7a33)

Students research a musical instrument of their choice and prepare a brief oral report to present to the class that will address the specific expectation. In the report, students include a sample of music featuring the use of this instrument and a description of their findings.

Secondary
- *identify the human and financial resources necessary to create a venture* (EP2.04)

Students research and produce a written report answering specific questions on the human and financial resources required to create their chosen entrepreneurial venture.

Response Journal

Description
A response journal is a form of writing in which students make thoughtful connections to texts, activities, and experiences. A response journal provides sustained opportunity to explore, analyse, question, interpret, or reflect in order to gain new insights and enriched appreciation or understanding. Response journals may be used in any subject area where students encounter interesting or powerful content, experiences, and ideas. A response journal is the personal processing of the student rather than a restatement or recounting of text. Reading, viewing, or listening to material that has interest to the student, stimulates the use of response journals.

Method
The teacher:
- models and demonstrates by showing and reading published responses;
- instigates discussion after reading or viewing that leads to student thinking and reflection;
- responds to student journal entries;
- arranges for use of student responses in group discussions.

Considerations
Response journals:
- have a designated audience who give validity to the undertaking;
- may defeat their purpose and reduce student interest if overused or too highly structured;
- may be presented in alternative forms (e.g., tapes, pictures, newscasts, films);
- may follow oral discussions and explorations;
- require teacher assistance in connecting and expanding ideas;
- may include illustrations, collage, and sketches;
- require a teacher to respect the confidentiality of a student's entries/responses while carefully considering thoughts and emotions to which he/she may be compelled to react.

Illustrations

Elementary

- *demonstrate an understanding of voice and audience by speaking and writing in role as characters in a story* (4a54)

In their response journals, students write in role as one of the characters from the story. The teacher also responds in role.

Secondary

- *describe information, ideas, opinions, and themes in print and electronic texts they have read during the year* (LI1.01D)

Students prepare a personal response journal on literature, focusing on a particular region or country, specific culture, time in history, theme or motif. They later review their journals and choose one author to profile as an example of a writer whose work has been influenced by his or her background.

Inquiry and Research Models

Inquiry and research models encompass a wide range of common strategies as well as diverse approaches characteristic of specific disciplines. However, the overall purpose of inquiry and research for students is not just to answer a specific question but more "to encourage high levels of critical thinking so that processes and resources are appropriate, conclusions are based on supporting evidence, problems are posed and solved, and decisions are made that will extend learning for a lifetime" (Ontario School Library Association, *Information Studies, 2000,* p. 16).

The process of inquiry is accessible to all students at all ages and abilities because it builds on natural curiosity. Many teachers and students find that the success of the inquiry depends on using a structured process that is clear and consistent across all grades. Conceptually, most research and inquiry models share similar stages:

- *Stage 1: Preparing for Research and Inquiry*
- *Stage 2: Accessing Resources*
- *Stage 3: Processing Information*
- *Stage 4: Transferring Learning.*

Once the problem to be solved or the information need is defined, opportunities to explore must be provided to link new learning to prior knowledge. This linking is a key factor in retention of information and a motivator for further learning. Exploratory activities include interaction with others and with a wide variety of resources – print, electronic, or human.

Understanding how the information is organized and applying organizational structures and mathematical or scientific concepts to data is an important aspect of transferring the learning to other problems and inquiries. Synthesizing and testing information prepare the presentation of findings and build new knowledge based on the inquiry. Throughout the process, an ongoing climate of evaluation and reflection should be encouraged. The teacher's role in modelling and teaching strategies such as questioning, interviewing, searching, critical thinking, and presenting information is important in all stages.

Continual implementation of research and inquiry models in each subject or discipline, will help students to develop the necessary skills, knowledge, and habits of mind that enable them to transfer their learning to solve other problems in expected and unexpected situations. Collaboration and coordination among teachers, teacher-librarians, parents, and the community can provide extensive opportunities for students to practise the research process, model appropriate learning strategies, and connect with a variety of school, community, and global resources.

Independent Learning Strategies

Cognitive Skills Model
Decision-Making Models
Historical/Geographic Inquiry
Inquiry Process
Mathematical Problem Solving
Problem-Based Models

Questioning Process
Research Process
Scientific Method
Technical Design Process
Writing Process

Cognitive Skills Model

Description

A cognitive skills model of inquiry and learning involves using concepts, skills, and habits of mind that enable students to examine not only what they think (content) but also how they think (process). Cognitive skills development focuses on processing incoming information and on transferring that learning to other learning situations. Teachers can use strategies such as note taking and mind maps to help students relate new information to prior knowledge, generate and answer questions, and structure the information in order to reformulate it in personally meaningful ways. Specific cognitive skills models can also be used such as that of Gagne and Briggs (1979), which is based upon a hierarchical structure of learning strategies (e.g., gaining the learners' attention, informing them of the objective, assessing the performance, and enhancing retention and transfer).

Method

The teacher:

- sets authentic learning goals and tasks that make recall and transfer more effective;
- demonstrates the ability to think about and evaluate how learning strategies work;
- models how to monitor effective learning (e.g., questioning techniques and logical sequencing);
- recognizes that it is important not only to teach the skills, but also to evaluate which skills are appropriate for specific tasks.

Considerations

Cognitive skills models:

- may benefit from using a simple-to-complex sequence (also known as an elaborative sequence) which allows instruction to be presented at the level of complexity that is most appropriate to a particular stage in the learner's development;
- require students to analyse concepts and organize the information in ways that are meaningful to them.

Illustrations

Elementary

- *recognize that there are three classes of rocks: igneous, sedimentary, and metamorphic* (4s106)

The teacher divides students into three groups, and each group investigates a different class of rock. The teacher models the process of using an organizer to structure the investigation. The organizer outlines what we know, what we want to find out, and what we have learned. Each group lists a minimum of six questions under what we want to find out prior to beginning their research. The teacher conferences with each group to help them generate appropriate questions.

Secondary
- *identify how the ways of learning with which they are less successful are (still) required in a variety of learning situations, and describe how they adapt to these situations* (PK1.04)

The teacher asks students to think about a subject area, class, or recreational activity in which they feel most confident and one in which they feel less confident as learners. Students describe the subject/activity, what they like/dislike about it, and what their strengths/weaknesses are in the area. Students make a personal list of ways they think they learn best, the conditions under which they learn best, and tasks and/or subjects in which they feel most/least confident. Students then determine whether there is a relationship between the learning factors and preferences and their most/least preferred subject/tasks. Students can express this relationship using a graphic organizer that assists in illustrating cause and effect.

Decision-Making Models

Description
Decision-making models are ongoing instructional processes (both planned and incidental) that encourage the selection of solutions from alternatives in order to reach a desired goal and make prudent choices. Decision-making models are of great importance in inquiry and research where they usually include ordered activities such as:
- gathering information about a problem;
- analysing and evaluating alternatives;
- selecting a solution;
- implementing the solution;
- reviewing the process for possible modification.

Decision-making models can be connected to both curricular and/or real-life situations, and a variety of models should be used to reflect the needs of the class or situation (e.g., simulations, decision trees, probability models). Models are applicable in all subjects and for both individual learning and when group consensus is necessary.

Method
The teacher:
- provides students with a model of the steps of effective decision making;
- provides safe contexts in which students may make decisions;
- allows students to make frequent decisions at increasing levels of complexity;
- models the various types of decisions so students can differentiate between simple decisions and those requiring a detailed process;
- encourages decision making as a means of arriving at consensus;
- engages all students in the decision-making process.

Considerations
Decision-making models:
- take into account the personal characteristics and cognitive styles of students;
- should be a planned instructional component of a cooperative learning program;

- may require that teachers provide extra support for special needs students in identifying alternatives in decision making.

Illustrations
Elementary
- *apply the steps of a decision-making model to address age-specific situations related to personal health and well-being in which substance use or abuse is one of the factors* (8p19)

Students examine a number of case studies that involve substance use and abuse. They are then asked to determine what steps the individual should take to deal with the issue as a younger student, as a teen, and as a parent.

Secondary
- *select and use a decision-making model effectively to study a geographic issue in a local bioregion* (MI3.03)

Students complete a decision-making matrix that compares five different ecozones in order to decide which ecozone is in most need of protection.

Historical/Geographic Inquiry

Description
Historical/geographic inquiry is a structured framework or process in which students apply critical thinking to recognize basic issues and provide strategies for developing subject content through questioning and focused research. This model takes into consideration the nature of problems and investigations in the two subject areas. Historical/geographic inquiry encompasses eight general skills (compare "Methods of Geographic Inquiry," p. 15, and "Methods of Historical Inquiry," p. 35, in *Canadian and World Studies, Grades 7 to 8*):
- focus (limit, direct, or define a problem or issue);
- organize (select or develop visual representation, charts, or organizers for the focus);
- locate (identify, find, and use reliable, relevant sources of information);
- record (summarize and translate the information);
- evaluate/assess (determine the validity, appropriateness, significance, and accuracy of the information);
- synthesize/conclude (observe relationships in and draw conclusions from the information);
- apply (predict, generalize, compare, and decide on a conclusion using these formulations);
- communicate (express the information and ideas and describe the processes involved in the inquiry).

Method
The teacher:
- models the use of a framework to structure an introductory research/inquiry project;

- may collaborate with the teacher-librarian to assist students in developing appropriate research strategies and supporting resources;
- assists students in developing appropriate questions to focus the inquiry;
- assists students in developing appropriate organizers for the focus (e.g., time sequence, cause and effect, comparison, issues analysis, decision making);
- provides opportunities for students to carry out field studies and action research to gather data and information to solve problems;
- develops a series of activities that will encourage students to take increasing responsibility for independent problem solving.

Considerations

Historical/geographic inquiry:
- provides opportunities to examine a wide variety of viewpoints, understanding that there are different but valid ways of looking at situations and issues;
- promotes the development of organizers at increasing levels of complexity depending on the nature of the inquiry and the developmental level of the students.

Illustrations

Elementary
- *demonstrate an understanding of the roles of key individuals and main events leading to Confederation* (8h6)

Students choose one historical figure that made a significant contribution to Confederation. They formulate questions about the problems faced by the historical figure, investigate the contribution he/she made and present their findings as an oral presentation.

Secondary
- *research different perspectives on a geographic issue and present arguments supporting a point of view* (UM2.01B)

Students investigate a number of geographic issues (e.g., development of wetlands by private corporations, lumbering operations in national parks, or waste disposal issues). Students then engage in a formal debate on a geographic issue, substantiating their arguments with information collected through their research.

Inquiry Process

Description

The inquiry process is a set of strategies whereby students answer questions – either their own, those set by the teacher, or those developed collaboratively – to solve problems and make decisions. In ways similar to the research process, the inquiry process includes discernible stages, although these may or may not be followed in a fixed order depending on the task and learning style. During this process, students:
- focus questions for the task to be defined, often using categorization and classification of questions;
- develop a plan of how to conduct the inquiry for answering their questions;

- access information from a variety of sources;
- record and process the information;
- share the information;
- evaluate the response and the process.

An inquiry (and research) methodology provides opportunities for students to acquire an attitude of inquiry and build habits of mind to be independent learners. Inquiry helps students develop higher-level thinking skills such as synthesizing findings, formulating conclusions, and transferring skills and knowledge to new situations.

Method

The teacher:
- models both the attitudes of inquiry and the process of inquiry;
- creates a learning environment that fosters inquiry;
- works with the teacher-librarian to introduce a variety of models for inquiry;
- identifies which models are most appropriate for the type of inquiry;
- collaborates with all staff (e.g., the teacher-librarian, guidance teachers) to access appropriate sources of information;
- encourages students to develop their own inquiry questions and to seek responses;
- meets and conferences with students throughout the process.

Considerations

The inquiry process:
- requires time and planning;
- requires access to information sources and ways to select appropriate resources;
- may be challenging in finding or creating meaningful ways in which students can share the results of their inquiry;
- supports students' present and future learning when consistent, cross-curricular models are used.

Illustrations

Elementary
- *describe how artists representing a variety of historical periods, styles, and cultures have used the elements and principles of design to create a specific effect* (7a49)

Students choose one principle of design and examine its use in four works by different artists. They present their findings organized in terms of the questions they used to guide their inquiry.

Secondary
- *analyse the responsibilities involved in maintaining nutritional health and well-being* (PRV.01)

Students investigate health issues and lifestyle choices that require dietary modifications and present information as to why a person must, or chooses to, follow these modifications. Information is presented in poster format.

Mathematical Problem Solving

Description
Mathematical problem solving is a structured process of inquiry that uses mathematical ideas, principles, and concepts to solve a variety of problems. Reasoning and making connections from one area of mathematics to another and to real-life problems are important aspects of this process. Mathematical problem solving may use an inquiry model, such as described in *Mathematics, Grades 1 to 8*, and p. 74:

- **understand the problem (exploratory stage)**
  - rereading and restating the problem;
  - identifying information given and required;
  - communicate (talking about the problem to understand it better).
- **make the plan**
  - comparing the problem to previous experience;
  - considering possible strategies;
  - selecting a strategy or blend of strategies;
  - communicate (talking to clarify the method and listening to ideas of others).
- **carry out the plan**
  - executing the chosen strategy;
  - doing the calculations;
  - monitoring success;
  - revising as necessary;
  - communicating (drawing pictures, using manipulatives to illustrate projections or interim results, writing words and symbols to represent steps of "doing," sharing output from computer or calculator operations).
- **look back**
  - checking the reasonableness of the answer;
  - reviewing the method (Does it make sense? Is there a better way?);
  - communicating (choosing the best format for describing and explaining how the solution was reached).

Method
The teacher:
- poses relevant problems that allow for the use of mathematical principles and conventions;
- provides support by teaching mathematical concepts necessary for problem solving;
- models problem-solving strategies;
- monitors progress and intervenes as required to maintain student confidence in the process;
- assists students in expanding their critical thinking and using prior knowledge to solve problems in unique ways.

Considerations
Mathematical problem solving:
- should be open to creative and unconventional solutions;

- provides opportunities for applying learned mathematical concepts to everyday, real-life problems.

Illustrations

Elementary

- *demonstrate a verbal and written understanding of and ability to apply accurate measurement strategies that relate to their environment* (7m28)

Students plan for the relocation of their classroom and its contents to a smaller imaginary location. The teacher requires them to accurately measure and draw a new floor plan using a grid and indicate furniture placement.

Secondary

- *determine the point of intersection of two linear relations graphically, with and without the use of graphing calculators or graphing software, and interpret the intersection point in the context of a realistic situation* (AG1.01D)

In this activity, students use given data and information to create linear mathematical models with points of intersection in order to make decisions about the cost-effectiveness of various family vacation options (e.g., modes of travel, lodging, and activities).

Problem-Based Models

Description

Problem-based models are structures whereby students use knowledge and skills from several disciplines to solve problems developed through an interdisciplinary approach to inquiry. Curriculum units are designed based on problems that are relevant to students and that have significant social, cultural, or environmental characteristics. Students set up the problem, clarify the issues, and develop ways to gather the information or data to help resolve the problem, then test or evaluate the conclusions. The more "real" the problem or the more connected the students are to the problem, the more real and transferable will be the learning result, especially when students choose their own problems to solve.

Method

The teacher:
- teaches problem-solving skills through a systematic process;
- structures problem-solving strategies for students to follow (i.e., IDEAL model, technical design process);
- provides relevant, real-life issues for students to investigate and develop solutions;
- continually conferences with students to monitor their progress and assist in next steps if required;
- plans access to resources to provide an authentic context for the problem-solving activity (e.g., access to daily newspapers if monitoring a current issue).

Considerations

Problem-based models:

- involve systematic investigation of a problem and the development of a concrete solution;
- make a connection between real-life issues and the curriculum;
- help students develop skills for lifelong problem solving.

Illustrations
Elementary
- *identify Canada's connections to the United States* (6z30)

Students consider an environmental problem shared by Canada and the United States. Using a problem-solving organizer, they suggest possible solutions.

Secondary
- *describe and critically analyse contemporary examples of interdisciplinary products and activities that apply innovative approaches and solutions to a variety of real-life situations around the world* (IE3.01)

Students examine the range of e-learning opportunities available to learners in remote locations in Ontario, geographically distant locations across Canada, and locations in developing countries. They determine the problems such learners face in meeting new educational challenges and analyse ways that e-learning has provided educational solutions through provincial, national, and international links.

Questioning Process

Description
Questioning is a process whereby a wide range of strategies are used to stimulate discussion, explore ideas, and encourage students to think about their learning. Questions help students to probe for deeper understanding, extended meaning, and new applications for learning. Questioning initiates the process of inquiry, engages students in divergent thinking and provides opportunities for them to articulate their understanding by exchanging ideas and viewpoints. The use of open-ended questions, which have no single word response or "right" answers, challenges students to further their learning and open up the multidimensional aspects of issues, ideas, phenomena, and experiences. Good questioning strategies assist in directing research projects by providing focus for topics and engaging students' personal interests. The quality and success of student thinking and learning are closely linked to the quality of the questions that students and teachers raise and the nature of the supporting classroom interaction, environment, and resources.

Method
The teacher:
- creates a climate in which questioning regularly takes place;
- is familiar with the scope of questioning techniques;
- models different forms of questioning, such as beginning with a whole-class activity to generate questions, then encouraging students individually to generate questions;
- reserves judgment and guides lower-level responses towards extended thinking;
- helps students generate their own open-ended questions;

- provides rich resources and activities so that students are able to pursue answers;
- uses questions to engage students in the active quest for understanding, knowledge and ideas;
- uses questions to promote understanding, encourage student inquiry, probe for further understanding, and invite comparisons and analogies;
- finds and challenges assumptions;
- uses questions to apply generalizations and exceptions;
- uses questions to develop and apply criteria;
- makes connections with experience, knowledge, and ideas through questioning techniques.

Considerations

The questioning process:
- requires teachers and peers to accept a wide range of responses;
- requires assistance for ESL students or those with limited vocabulary;
- may be particularly effective with gifted students;
- requires time for reflection, discussion, and follow-up;
- helps students to develop many cross-curricular skills, such as:
  - making connections with other subjects, previous experience, and information from a variety of sources;
  - making predictions before, during, and after reading;
  - identifying assumptions and detecting bias in stories, historical accounts, and laws;
  - gaining new information from texts, interviews, and demonstrations;
  - probing the ideas and understanding of others in group situations such as literature circles, debates, sharing of math and science journals, role playing, and dramatizations;
  - applying rules and generalizations to natural phenomena, language features, and science experiments;
  - applying criteria to their own work, to the work of other students, and to published works;
  - making comparisons between ideas, features, points of view, language, careers;
  - developing hypotheses, speculations, and probabilities in science, mathematics, literature, and history;
  - using and creating categories in science, mathematics, language and other subjects/disciplines.

Illustrations

Elementary
- *formulate comparative and speculative questions to identify issues* (7g11)

Students develop a list of questions to identify issues and define problems for research purposes on a current environmental issue. The questions should assist in identifying the differences between bias, fact, and opinion.

Secondary
- *explain the impact that business activity has on the changes occurring in the community* (RB2.10)

Using the "what if" technique, student groups brainstorm a business activity that could have a positive or negative impact on their community (e.g., "what if" a new cinema opens in the neighbourhood; "what if" the corner store sells cigarettes to minors).

Research Process

Description

Research is the process whereby students investigate a topic by asking questions, locating and selecting resources, analysing and evaluating information, reporting findings, and transferring learning for purposes of extending and creating knowledge, solving problems, and making decisions. Research is used by students to acquire further learning about topics of personal interest, or for school projects and assignments. Research supports students in fostering information management skills such as retrieval, selection, organization, and communication. Particularly through the analysis and evaluation of information, research also encourages students' critical, creative, and independent thinking. Effective school library programs can also help to promote the development of information literacy skills among all students by supporting and coordinating the collaborative planning and implementation of reading programs, inquiry and research tasks, and independent study (*The Ontario Curriculum, Grades 9 to 12: Program Planning and Assessment, 2000,* p.10). In ways similar to the inquiry process, the research process includes discernible stages, although these may or may not be followed in a fixed order depending on the task and learning style. A generic model of research (*Information Studies, 2000: Kindergarten to Grade 12* – reprinted with permission of the Ontario School Library Association) includes the following stages:

Stage 1: Preparing for Research
- define information needs;
- explore information needs;
- identify ways information is organized;
- relate prior knowledge.

Stage 2: Accessing Resources
- locate a variety of appropriate resources;
- select information appropriate to need using a variety of strategies;
- gather information using organizers, and conventions of text;
- collaborate with others to share findings and ideas.

Stage 3: Processing Information
- analyse and evaluate the information;
- test ideas to adjust research and problem-solving strategies;
- sort information using a variety of formats and organizers;
- synthesize findings to create meaning and formulate conclusions.

Stage 4: Transferring Learning
- revise product appropriate to purpose, audience, and format;

- present findings in a variety of forms;
- reflect on and evaluate research process and product;
- transfer skills and knowledge to solve problems and make decisions.

Method
The teacher:
- partners with the teacher-librarian to:
  - design research based on the age and maturity of the student;
  - structure the process according to a clear, well-defined model that addresses the continuum of skills necessary for lifelong learning:
  - schedule regular progress conferences with the learner;
  - model the skills associated with acquiring, organizing, and communicating information;
  - provide support with organization, time lines, and sources for information;
  - arrange with appropriate staff for access to equipment and resources (e.g., books, VCR, multimedia computers, web-based resources);
  - intervene as required to maintain student confidence in the self-directed learning;
  - transfer control as the student demonstrates the ability to assume greater responsibility for the research;
  - assist with creating a structure for self-assessment, particularly with older students;
  - provide a forum and feedback for the communication of the research.

Considerations
The research process:
- improves learning when research activities and tasks are designed around important and enduring knowledge at the heart of a discipline (Wiggins, *Understanding by Design*, p. 23);
- promotes the development of information literacy skills among all students;
- supports student present and future learning when consistent, cross-curricular models are used;
- enhances student motivation and retention through independence and choice;
- allows students to explore areas of interest in greater depth;
- is best supported by coordination among teachers and the teacher-librarian who provides a coordinated, cross-curricular program of research instruction and application and access to appropriate resources and programs;
- requires differentiated supervision of students as they mature and accept responsibility for research goals and choices for the research;
- requires coordination among teachers to monitor student overload;
- requires coordination with information sources (e.g. print, media, human and electronic) in the school and community to facilitate access to information.

Illustrations
Elementary
- *ask simple questions and use a variety of means for obtaining information about communities around the world* (2z31)

Students conduct research, in groups, to find out, "How is life in the country of ___ the same or different than life in our community?" The students identify the stages of the research process model and apply the model in a whole-class investigation that compares two Canadian regions.

Secondary
- *research a dramatic form prevalent before the twentieth century* (DT3.05)

Students conduct research into the elements of a particular pre-twentieth-century dramatic form. They then perform a short dramatic piece that illustrates the form and produce a one-page information sheet documenting the elements of the form.

Scientific Method

Description
The scientific method/inquiry model is a logical reasoning process used to solve a problem through observation and measurement, experimentation and research, and analysis and dissemination. It attempts to explain phenomena by examining cause and effect. Usually experimentation involves manipulating one variable while other variables remain constant, thus providing a controlled situation that allows conclusions to be drawn with reliability. The scientific method may be used in all subject areas that allow for empirical testing of data, hypotheses, or prior knowledge. The scientific method includes many skills, such as the following summarized from *The Ontario Curriculum, Grades 9 and 10 – Science*:
- formulating the scientific question;
- planning and conducting an inquiry;
- planning ways to model or simulate an answer to the question posed;
- selecting and integrating information from various sources – electronic, print, community;
- performing personal data collection, observation, and experimentation;
- analysing qualitative and quantitative data and explaining how the gathered evidence supports or refutes the initial hypothesis;
- communicating scientific ideas, procedures, results, and conclusions using appropriate language, formulas, and conventions;
- predicting, verifying, and explaining the effect;
- defending a given position on an issue or problem based on the findings;
- evaluating the processes used in planning, problem solving, decision making, and completing the task.

Method
The teacher:
- ensures that all students have been taught to use instruments and tools safely, accurately, and effectively;
- monitors the progress of the inquiry to ensure a sound procedure is being followed;
- provides time for a thorough investigation of the problem;
- models and provides an environment that fosters experimentation and curiosity in generating new learning and knowledge;

- ensures that students are taught and have an understanding of the skills and habits of mind required to develop scientific knowledge.

Considerations

The scientific method:
- requires that students and teachers use materials and instruments safely, accurately, and effectively;
- provides opportunities for students to explore problems;
- requires that students have learned the appropriate structure for conducting an experiment and collecting data through approved scientific methodology.

Illustrations

Elementary
- *communicate the procedures and results of investigations for specific purposes and to specific audiences, using oral presentations, written notes and descriptions, drawings, and charts (e.g., create a shade chart of a selected colour; make a spinning colour wheel to demonstrate how "white" light is composed of all the colours)* (4s34)

Students design experiments to test pulley systems. They outline the method and the results of their investigation (using words, diagrams, and physical apparatus) in a display to share with parents on a parent-interview evening.

Secondary
- *demonstrate the skills required to plan and conduct an inquiry into electricity* (PH2.03)

Students identify the health and safety concerns related to conducting an inquiry into electricity. They plan and build an electric circuit and then measure current using the appropriate tools and techniques.

Technical Design Process

Description

The technical design process is a problem-solving model that deals with concrete manipulation of images, materials, and technology for the purpose of solving a design problem. It promotes creativity, extends thinking, and develops competence in the use of technologies, as students are required to develop original solutions. It reinforces the reflection process in that students need to create, evaluate, and revise the product on a continuous basis. The technical design process can be open-ended when the student designs all the steps or it can be teacher-directed to varying degrees. The stages of development include:
- developing a focus: using a design process, researching, problem solving, and documenting the process;
- developing a framework: using appropriate materials and tools for the project;
- choosing the best solution: identifying production techniques and materials to meet the specifications;
- implementing a plan;

- reflecting on the process;
- reflecting and evaluating the product.

Method
The teacher:
- encourages students to constantly question the process and understand and respond to the problems, thereby aiding in the ongoing development of the product;
- provides the materials and tools necessary to implement the project;
- encourages students to reflect and track progress through consistent conferencing;
- ensures a non-competitive environment where students are comfortable making comparisons with others in terms of process and product;
- expands students' experience of technological possibilities by providing resources and challenges;
- monitors the process so that difficulties can be resolved during the development stage.

Considerations
The technical design process:
- can involve the use of organizers and time-management strategies and applications in order to ensure completion of the project in a timely manner;
- requires acceptance of novel and unusual solutions;
- provides practical contexts and applications throughout many areas of the curriculum;
- may involve the use of computer software.

Illustrations
Elementary
- *design and make pulley systems and gear systems* (4s78)

Students design, make, and use a pulley system that performs a specific task related to a fairy tale (e.g., a pulley to rescue Rapunzel from the tower).

Secondary
- *establish test criteria and use them to test projects* (SP1.03D)

After designing and building solar-powered cars, students develop a list of test criteria to determine the best design. Students test their vehicles against the criteria.

Writing Process

Description
In the writing process, students work through key steps from discussion or brainstorming, selecting a topic, planning, writing a first draft, revising, redrafting, and editing to publishing a finished/polished written product. The writing process is used in all grades and subjects for writing that will be published or have an audience (for example, in sharing written stories). Initially students must be given instructions for each step and directed activities to develop their skills stage by stage. The writing process requires that students actively participate in assessing and revising their own work and that they make appropriate

decisions regarding form, purpose, and audience. With daily practice and purposeful application, students gain confidence in sharing edited stories with an audience.

Method

The teacher:
- explains the writing process and its stages when appropriate;
- identifies possible purposes and audiences;
- teaches various forms of writing;
- provides feedback through conferences and observation;
- models forms of writing and the writing process;
- provides examples of effective writing;
- provides opportunities for students to read their work to a variety of audiences.

Considerations

The writing process:
- requires access to authoritative resources such as dictionaries, thesauruses, and word books to check work;
- does not require that all parts of the process be implemented each time (e.g., not all work will be published; individual journals may not be edited);
- requires time and space for effective writing and peer/teacher feedback;
- requires access to word-processing applications and the development of student skill level with such applications.

Illustrations

Elementary

- *communicate ideas and information for specific purposes and to specific audiences* (3e1)

Students prepare a notice for a community newspaper about an upcoming event in their school. They revise and edit their work following prepared checklists and proofread and correct their final drafts before submission.

Secondary

- *explain the impact that business activity has on the changes occurring in the community* (RB2.10)

After a discussion on ethical business practices, the teacher reviews the correct format for writing a letter to the editor of a newspaper. Students write a letter to the editor regarding business practices that are currently in the news. Students peer-edit the letters before submitting them to the local newspaper.

Learning Styles

Learning styles have been "…at the centre of controversy for several decades now, and there is still little agreement about what learning styles really are" (Greg Gay, http://snow.utoronto.ca/Learn2/mod3/targets3.html) The term "learning styles" suggests that individuals may have modalities of learning that are distinguishable, though as Gay points out "whether they represent learning styles or learning differences remains to be seen." Theories regarding learning styles and differences are derived from complex and evolving research into how the brain works.

It is a common assumption that accommodating these differences will provide for more successful learning experiences as individual styles and preferences are supported and allowed to develop. While learning styles encompass a wide variety of theories and models, Gay identifies two major issues that remain constant: whether to teach to students' strengths or attempt to expand their styles, and whether or not teachers can observe the differences among students' styles or whether valid and reliable tests and inventories should be used.

Learning Model
The theory of multiple intelligences developed by Howard Gardner is at the forefront of current research into learning characteristics. Gardner maintains that all learners possess varying amounts of identifiable intelligences, but they combine and use them in personal ways. The seven intelligences that Gardner has identified are:
- Bodily-kinesthetic;
- Interpersonal;
- Intrapersonal;
- Logical-mathematical;
- Musical-rhythmic;
- Verbal-linguistic;
- Verbal-spatial.

These intelligences are broadly categorized in three areas:
- *object-related*: (controlled or shaped by objects): visual-spatial, logical-mathematical, and bodily-kinesthetic;
- *object-free*: (dependent on language and musical systems)**:** verbal-linguistic and musical-rhythmic;
- *person-related*: interpersonal and intrapersonal.

Other learning models include
- Visual-spatial (e.g., 4 MAT Systems of Bernice McCarthy);
- Energic Model (Anthony Gregoric);
- Learning Styles Inventory (Rita and Kenneth Dunn);
- Sensory Modalities approach (e.g., visual*,* auditory, kinesthetic);
- Personality Types (e.g., Myers-Briggs Type Indicator);
- Emotional Intelligence (Daniel Goldman).

Teachers can develop approaches such as differentiated instruction and a multidimensional classroom environment to meet individual needs and provide independent opportunities for students to focus on their preferred styles. Equally important to using a variety of teaching strategies is consideration of appropriate and varied evaluation and assessment strategies that address different learning styles. Extending access to resources, learning environments, and varied strategies can be accomplished through collaboration with all teachers. For instance, classrooms and school libraries can provide a wide range of appropriate and diverse learning materials – print, electronic, and audio-visual – to extend the opportunities for student learning.

In addressing the potential of all learners, it may be important to identify which intelligences dominate and to assist students in utilizing their areas of strength for learning and in developing areas that require improvement. Teachers can do this by presenting lessons that include multi-modal presentation – singing, performing, building, interacting with an audience, displaying charts and diagrams – and providing opportunities for reflection and cooperative and leadership skill development. Gardner also stresses that each of us has our own developmental sequence of learning, and these sequences emerge at different times in our lives. Learning environments can be designed to support the learning potential and creative expression of each student.

Learning Styles

Bodily-Kinesthetic Intelligence

Musical-Rhythmic Intelligence

Interpersonal Intelligence

Verbal-Linguistic Intelligence

Intrapersonal Intelligence

Visual-Spatial Intelligence

Logical-Mathematical Intelligence

Bodily-Kinesthetic Intelligence

Description

Bodily-kinesthetic intelligence is characterized by the use of the whole body or parts of the body to solve problems. Students with strength in this form of intelligence learn best by direct involvement and participation. They explore objects and the environment through touch or movement, thereby constructing the information they are learning. A person with highly developed bodily-kinesthetic intelligence demonstrates skill in and creates new approaches to acting, athletics, and dancing and has the ability to fine-tune and perfect these physical performances through mind and body integration.

Method

The teacher:

- provides opportunities for students to actively participate in making things, building, drawing, carrying out projects, and acting things out;
- provides concrete learning experiences such as activity-based field trips, tactile modelling projects, role playing, games, or other physical exercise.

Considerations

Bodily-kinesthetic intelligence:

- requires planning to avoid disruption in allowing non-traditional expressions of learning;
- must be guided by clear structures and well-defined expectations.

Illustrations

Elementary

- *identify each of the senses and demonstrate understanding of how they help us recognize and use a variety of materials* (1s27)

The teacher instructs the students to act out how each of our senses helps us to recognize and use a variety of materials. In mime, one student pretends to be using the senses in everyday situations (for instance, peeling and eating a banana or hearing a danceable tune) and the other students guess the situation and which sense is being used.

Secondary

- *explain how authors and editors use design elements to help communicate ideas* (LI3.03)

In groups of four to six, students use bodily forms and simple props to demonstrate the relationship between design elements and communication of ideas in print and electronic texts. For instance, one group dramatizes the nature of hyperlinks on an Internet home page. First they arrange themselves in linear order of the hyperlinks on the home page. As one student reads the text from a home page, students physically regroup to tag each other in order to demonstrate the linked ideas as they emerge. The reader can assert his/her right to return to the home page when necessary, at which point the initial group order is re-established.

Interpersonal Intelligence

Description

Interpersonal intelligence is characterized by the ability to understand and communicate with others noting the difference in mood, temperament, motivation, and skill. It also includes the ability to form and maintain relationships and assume various roles within a group, whether as an effective group member or as a group leader. Students exhibit interpersonal intelligence when they show sensitivity to the feelings of others and demonstrate a commitment to helping others around them. Interpersonal intelligence involves an interest in the social relevance of classroom studies.

Method

The teacher:

- provides a secure and caring classroom environment;
- provides opportunities for collaborative group work;

- uses collaborative groups to demonstrate individual accountability and positive interdependence within the group;
- demonstrates various roles and appropriate behaviour in groups;
- uses forums such as class meetings to establish mutually respected rules and procedures;
- uses strategies such as role playing to teach various social skills.

Considerations
Interpersonal intelligence:
- requires recognition that effective interpersonal behaviour is an important aspect of student learning.

Illustrations
Elementary
- *transfer appropriate interpersonal skills to new physical activities* (7p34)

Students design a cooperative game that involves at least four students and at least two fundamental movement skills already practised in class.

Secondary
- *demonstrate collaborative problem solving, conflict resolution, and planning skills* (SS3.03)

In groups, students plan a lab to show fair division of labour, equal participation of all members, and a list of tools required in completing a recipe. Students prepare the meal as planned and participate in the serving and clean-up, accepting equal responsibility for all aspects.

Intrapersonal Intelligence

Description
Intrapersonal intelligence is characterized by the ability to perceive and understand oneself and thus to make thoughtful connections with learning and transfer that learning to ways of understanding other situations. Intrapersonal intelligence reveals itself as a curiosity about the meaning, relevance, and purpose of life and as an inner strength that can be relied on for planning, monitoring, and evaluating goals and values in life. The intrapersonal learner manages ongoing learning and personal growth effectively and has a keen awareness of inner thoughts and emotions that affect this growth. This learner finds appropriate outlets to express feelings and thoughts.

Method
The teacher:
- provides quiet time and private places to work and reflect;
- teaches ways to understand and process feelings and emotions;
- assists with strategies to set and achieve goals;

- encourages students in gaining self-knowledge and self-esteem;
- enables students to explore ways to better understand themselves;
- discusses how to handle mistakes in a non-threatening way.

Considerations

Intrapersonal intelligence:
- requires a lifetime of living and learning to develop;
- can be evident in learners' involvement or withdrawal based on their distinguishing pleasurable from painful experiences.

Illustrations

Elementary

- *communicate their thoughts and feelings about the music they hear* (7a31)

Students keep a music journal in which they respond in writing to a new piece of music each week. The subject of their writing might be a description of the emotions and feelings evoked by the music.

Secondary

- *identify personal strengths and areas for growth* (LSI.01)

Students individually select three factors that influence personal physical activity choices. Using a goal-setting process, students develop a personal action plan for one goal related to healthy active living.

Logical-Mathematical Intelligence

Description

Logical-mathematical intelligence is characterized by mathematical calculation, logical thinking, problem solving, deductive and inductive reasoning, and discernment and representation of patterns and relationships. It includes a high level of competence in calculating, qualifying, and developing propositions and hypotheses and in carrying out complex mathematical operations. Central to logical-mathematical intelligence is the ability to recognize and solve problems. Learners who exhibit logical-mathematical intelligence are familiar with concepts of quantity, time, and cause-effect relationships and demonstrate understanding through the use of concrete objects and predicting and testing logical outcomes.

Method

The teacher:
- provides concrete objects to actively engage students in problem solving (e.g., pattern blocks, games, puzzles, rulers, graph paper);
- integrates mathematical concepts and logical thinking into other subject areas (e.g., using a variety of graphs to present information in history);
- provides opportunities to apply mathematical concepts to real-life situations;

- encourages the construction of models to demonstrate key concepts;
- provides opportunities for discerning patterns and connections in a variety of situations;
- communicates information precisely.

Considerations
Logical-mathematical intelligence:
- should not be perceived as a subject that develops specific mathematical skills, but rather as a problem-solving process.

Illustrations
Elementary
- *identify some of the major scientific and technological achievements of early civilizations* (5z10)

Students create a time line that identifes the major scientific and technological achievements of a specific early civilization.

Secondary
- *identify various types of investment alternatives* (PF2.36)

Students decide how to invest an imaginary $100,000 per group using information from the Toronto Stock Exchange, and then track their choices for a ten-week period.

Musical-Rhythmic Intelligence

Description
Musical-rhythmic intelligence involves the human voice and body as instruments and means of self-expression. Students gifted in music exhibit the tendencies early and demonstrate facility in making music and using it in a variety of ways (for example, to express humour, heighten suspense, sadness, tragedy, or joy). Those who exhibit musical-rhythmic intelligence respond to experience by conducting, performing, composing, creating, or dancing – emotionally through response to the tempo and moods of music and dance, and intellectually and aesthetically by analysing, exploring, and evaluating the content and form of music and dance. They exhibit sensitivity to pitch, melody, rhythm, and tone and may use the vocabulary and notation of music proficiently.

Method
The teacher:
- fosters a positive attitude towards music and dance and recognizes the relationship it has to other types of learning;
- incorporates music and dance on a regular basis into lessons;
- understands the qualities music and dance has in focusing students' attention and enhancing physical energy;
- understands that music and dance may also be distracting for some verbal-linguistic learners and exhibits judgment in its use;

- provides regular opportunities for students to dance and make their own music in the classroom.

Considerations
Musical-rhythmic intelligence:
- requires judgment in determining when it is appropriate to play and interact with music and dance;
- requires that appropriate resources are available to support learning (e.g., quality sound equipment, dance space).

Illustrations
Elementary
- *use specialized terms in different subject areas, as appropriate* (5e42)

Students form groups of eight and sit in a circle to play a word association game based on specialized vocabulary found in different subject areas. The leader claps a short rhythm that the students imitate. All students keep the rhythm throughout the game. Each student in turn says a word (for instance, one associated with sports) on beat three of the clapping.

Secondary
- *describe how their art forms demonstrate the relationships of Aboriginal peoples to themselves, their families, their communities (including gender roles), their nations, Canada, and the natural environment* (RE1.02)

Students contribute to a Sharing Circle, which is an authentic mode of expression and communication among Aboriginal peoples. Their contributions could include communicating through sound and rhythm, writing a song, or creating a soundscape.

Verbal-Linguistic Intelligence

Description
Verbal-linguistic intelligence is characterized by the ability to use language to express and explain complex meanings and concepts. It involves the use of language to explore and expand human intelligence through thoughtful reading, effective speaking, careful listening, and skilful writing and consists of the ability to think in words to remember, analyse, plan, and create. The ability to use words to communicate and document information and to express emotions is unique to human beings. Students with a dominance in verbal-linguistic intelligence demonstrate a strong sensitivity to the sound, rhythm, and meaning of words, as well as the ability to move quickly from concrete to abstract thinking.

Method
The teacher:
- creates an appropriate, stimulating, language-rich classroom;
- provides opportunities for verbal interaction (e.g., playing with words, telling jokes and riddles, storytelling, and reading aloud);

- encourages student-centred discussions and activities such as debates;
- provides opportunities for students to state opinions and explain feelings and concepts in order to make meaningful choices and decisions.

Considerations
Verbal-linguistic intelligence:
- requires a secure environment where students are free to ask questions, make comments, discuss issues, debate viewpoints, and defend their positions.

Illustrations
Elementary
- *identify references made to Canada's historical development in Canadian art and music* (8h34)

In small groups, students locate and orally present a poem that is relevant to Canadian history. In the presentation they dramatize the parts or voices in the poem and explain the importance of the event or person presented in the poem.

Secondary
- *describe the characteristics and skills often associated with successful entrepreneurs* (EP1.01)

Students rewrite a nursery rhyme or fable that illustrates entrepreneurial characteristics and skills. They may use the analogy of a modern-day entrepreneur and a character from the fable in creating their project.

Visual-Spatial Intelligence

Description
Visual-spatial intelligence is characterized by the ability to perceive mental images and think in pictures, visuals, and details. Students with highly developed visual-spatial intelligence learn by seeing and observing, using visual images as aids to recall. Visual-spatial learners see things in different ways or from new perspectives and demonstrate the ability to arrive at unique solutions to artistic problems. They enjoy doodling, drawing, painting, sculpting, or other forms of representation. Visual-spatial learners have the capacity to navigate themselves and objects through space and to re-create, transform, or modify images and think about and create objects in three dimensions. These learners demonstrate ability in decoding charts, graphs, maps, and diagrams and exhibit skills such as visual discrimination, visual recognition, and image manipulation.

Method
The teacher:
- creates a positive, aesthetically pleasing environment that is visually vital and attractive;
- supports written or spoken language with charts, diagrams, or photographs for visual learners;
- provides opportunities for students to present work in visual as well as written format;

- provides visual tools such as computers, telescopes, video cameras, art supplies, and building and drafting supplies.

Considerations

Visual-spatial intelligence:
- is often perceived to belong only to the arts domain, but in reality underlies all human activity.

Illustrations

Elementary
- *communicate information about regions, using media works, etc.* (4z50)

Students design their own coat of arms or flag, using the identified themes and patterns as a guide and incorporating personal (family) symbols.

Secondary
- *describe, compare, and contrast the general properties and motions of the components of the solar system* (ES1.03)

Students create and use a three-dimensional model of the sun and earth to demonstrate the reasons for the variations that occur during the earth's annual rotation around the sun.

Technology/Media-Based Applications

Technology and media-based applications are vital aspects of the learning environment in an information-based society. It is therefore important that students learn the strategies and tools to use technology effectively and wisely in their learning – for productivity (databases, spreadsheets, graphic applications), research (the Internet and on-line public access catalogues), and communication (email, the Internet, and multimedia). *The Ontario Curriculum: Program Planning and Assessment, 2000* (pp. 9–10) identifies the role of technology in the curriculum as:

- assisting students to become computer literate;
- developing information literacy skills;
- assisting students to become familiar with a wide range of software applications;
- developing the ability to critically evaluate information;
- ensuring students use technology safely, effectively, confidently, and ethically.

Technology facilitates the transfer of learning through presentation of learning, the synthesis of information, and the production of new knowledge. Students require the skills to choose appropriate formats for presenting their culminating products and to use the appropriate technological tools to do so.

The Ontario Curriculum: Program Planning and Assessment, 2000 (p.10) also states that teachers should work collaboratively within and across disciplines to effectively plan for the integration of computers and information technologies into the teaching/learning process. As the technology capable of enhancing student learning becomes available, teachers should, within a reasonable period of time, incorporate that technology into their planning of instruction and learning activities in individual disciplines and, collaboratively, across disciplines. Effective school library programs can also help to promote the development of information literacy skills among all students by supporting and coordinating the collaborative planning and implementation of reading programs, inquiry and research tasks, and independent study.

Principles of evaluation and discernment apply equally to the use of information accessed electronically as they do to media images and text. Students must be encouraged to develop the habits of mind that are essential for dealing with technology: commitment to accuracy, precision, and integrity in observation, experimentation, and reporting; respect for evidence; concern for safety procedures; and respect for the environment and living things (*The Ontario Curriculum: Science and Technology, 1998,* p. 9).

Independent Learning Strategies

Communication Applications	Media Presentation
Computer-Aided Design (CAD)	Media Production
Computer-Assisted Learning	Multimedia Applications
Database Applications	On-line Public Access Catalogues
Email Applications	Spreadsheet Applications
Graphic Applications	Time-Management Applications
Internet Technologies	

Communication Applications

Description
Communication software falls into several categories. Productivity software consists of word-processing, database, and spreadsheet software for communication and data management. Telecommunications software includes email programs and web browsers for electronic access. Desktop publishing and graphics programs heighten visual display. Multimedia and hypermedia software help create multimedia presentations, slide shows and web-based publications. Students develop skills in using the appropriate application to communicate new learning, either through interactive communication or the creation of a product. Use of communication software provides opportunities for students to consolidate knowledge and clarify thinking in preparation for delivery to a specific audience. The process of preparing a final product for presentation develops skills in editing, critical thinking, and synthesizing information to transform it into an effective format.

Method
The teacher:
- provides access to appropriate equipment and software;
- teaches the basic skills involved in each software application and allows for peer teaching in areas where students have particular expertise;
- provides models of exemplary products;
- arranges for students to share their products with an appropriate audience.

Considerations
Communication applications:
- require that students and teachers have appropriate access to communications hardware and software;
- require time to research, prepare, and present the product;
- can be used for group projects to practise decision-making and team-work skills;
- should enhance learning and meaning;
- should be assessed for appropriateness and currency in curriculum implementation.

Illustrations
Elementary
- *communicate information using media works, oral presentations, and written notes and descriptions* (2z35)

Using a presentation software program, each student designs and presents a slide show consisting of five slides to show what they have learned about a specific Canadian topic. The structure of the presentation can follow a pre-designed or student-created template.

Secondary
- *demonstrate a knowledge of the characteristics of natural systems* (SS1.02B)

Working in groups of two or three, students use a desktop publishing program to produce an informative, attractive, and detailed two-sided, three-panel brochure to illustrate and promote a protected wildlife conservation area. The brochure should outline the aspects of

the natural habitat that require protected status (i.e., the types of birds and animals that must be protected as well as the natural vegetation that supports the wildlife).

Computer-Aided Design (CAD)

Description
Computer-aided design (CAD) is a software application used to design, create, simulate, and test products for a variety of professions and industries. The ease of use in changing design variables allows student to visually see the results before undertaking a modelling or building project. CAD programs allow students to engage in creative experimentation without risk. At the same time, students develop reasoning and decision-making skills. Related to CAD applications are CAM applications (computer-aided machining/manufacturing applications) which may be used in secondary manufacturing technology course, and 3-D modelling software that allows users to create three-dimensional objects, which can then be rotated, stretched, and combined with other model objects in complex 3-D representations.

Method
The teacher:
- arranges for access to equipment and resources;
- teaches the basic skills connected with using these specific software applications;
- provides the specifications of form and purpose for the design or modelling project;
- encourages students to experiment and consider "what if" questions in their experimentation;
- provides time for students to examine and discuss their own and other students' findings.

Considerations
Computer-aided design (CAD) applications:
- require equity of access to hardware and software – based on availability of school resources and level of computer expertise;
- require time for students to test and then accept or reject various designs or models.

Illustrations
Elementary
- *draw and build three-dimensional objects and models* (3m56)

Students work with a computer-aided design program to draw and build three-dimensional objects and models according to specific measurements of angles and sides. The flexibility of the draw and design program permits experimentation and trial and error to arrive at the final products.

Secondary
- *identify, through investigation, the relationship between the volume and surface area of a given rectangular prism or cylinder* (MG1.02)

Students use a geometry-based computer-aided design program to construct models of a rectangular prism or cylindrical design package that minimizes the surface area and therefore the use of expensive packaging material.

Computer-Assisted Learning

Description
Computer-assisted learning/instruction describes the use of a computer to learn new material, practise skills, or reinforce material already learned through individualized instruction and immediate feedback. Such applications allow students to pace their own learning, retrace the steps if necessary, and track their progress. Students can develop problem-solving skills through the use of open-ended software, or they can focus on specific skill development, learn new software applications through tutorials, or participate in simulations. Computer-assisted learning is a motivating tool that can engage students when doing repetitive tasks and assist in building their self-esteem through successful experiences. Computer-assisted learning is a strategy used in distance learning, where students work independently on-line to meet specific curriculum expectations in courses.

Method
The teacher:
- provides access to the appropriate software programs and hardware to meet student needs;
- is familiar with using the software and provides basic instruction on its use to the student;
- conferences with the student to reinforce instruction, monitor progress, and provide feedback;
- provides opportunities for the student to use newly acquired skills and knowledge through follow-up activities.

Considerations
Computer-assisted learning:
- requires a certain level of independence;
- requires consideration of prerequisite skills required for software use and understanding and some awareness of keyboarding;
- requires consistent access to hardware and software;
- may require students to understand and sign with parents an "Acceptable Use Policy" before proceeding independently.

Illustrations
Elementary
- *identify and name major parts of the sentence (e.g., subject, object, predicate)* (7e11)

Students use a grammar program on the computer to reinforce their ability to identify and name the parts of a sentence. To demonstrate learning, each student completes three sequential activities, focusing on the subject, object, and predicate.

Secondary
- *describe how effective accounting and financial statements contribute to the success of a business* (CC5.02)

Students work through the balance sheet and income statement activities in the template provided in a simple accounting software program. Any errors they enter will automatically be highlighted in the summary analysis.

Database Applications

Description
A database is an organized collection of information that can be categorized, sorted, analysed, and stored in a computer. The information can be manipulated, controlled, and retrieved as required. A complete set of related information is called a record. A field is a category of information (for example, "name" and "address") in a database record. Each field can be searched and sorted as required to analyse and use the information gathered. Students can use a database to organize information in a useful and retrievable format, applying decision-making and reasoning skills in the process. Students must decide which information they have gathered is important; determine under what headings (fields) it is to be entered; develop a search strategy; and transform the data into tables, lists, or diagrams that form the basis of the analysis and investigation. Databases are also available in commercial formats – CD-ROM and online – which provide access to full-text records of journals or encyclopedias, bibliographic databases with citations or abstracts, directories of lists, numeric census or stock market figures, and on-line library catalogues.

Method
The teacher:
- demonstrates database creation and relevant use;
- teaches the concepts of record, field, field name, and database layout;
- provides opportunities for students to examine and work with a number of types of databases available, including commercial products;
- encourages the use of student-created databases;
- provides access to information or poses a question for investigation that will require the use of a database to organize and manipulate the data;
- engages in discussions with students to examine their reasoning for determining which fields are created and which data are entered in the appropriate fields;
- works with other staff (e.g., the teacher-librarian, the guidance teacher) to develop a strategy for teaching essential searching skills to students.

Considerations
Database applications:
- require hardware and software accessibility;
- provide opportunity to consolidate and manipulate the results of whole-class investigations;
- are available in a variety of formats, each with its own set of features.

Illustrations

Elementary

- *identify human uses of mixtures and solutions in everyday life, and evaluate the environmental impact of some of these uses* (7s27)

Students create a database of mixtures and solutions, including warning symbols or cautionary notes, information about the properties of the solution or mixture, and an imported picture of the container. Students also generate a rating-scale diagram and rank each solution and mixture on its environmental friendliness, adding explanatory comments to support the rankings.

Secondary

- *demonstrate an understanding of the information terms used in business* (IMV.01)

Students create a database of information-technology terminology using appropriate categories, such as Definition, Origin, and Use. They use this file in an interactive manner, allowing for searching and retrieving of important terms. Use of the extended capabilities of a database program enables the sorting to occur easily.

Email Applications

Description

Electronic mail (email) is a form of electronic communication from one computer to another that allows users to communicate with each other locally and globally. Email is available through a commercial Internet service provider (ISP) or a school board provider and gives users an electronic address. Email enables the user to send and receive messages and add file attachments of documents, images, or sound. Messages and files sent through email can be copied/imported into a word-processing program, which allows the document to be manipulated and edited. This makes it an ideal format for curriculum sharing among students and teachers. Email serves a variety of other purposes, enabling students and teachers to:

- contact global experts in any field to satisfy information needs;
- participate in bulletin boards, listservs, news-groups, and on-line conferences;
- collaborate in local and international projects;
- gather data in activities such as research of primary and secondary sources;
- experience virtual field trips;
- communicate with parents and others in the school community.

Method

The teacher:

- models and encourages appropriate use of email;
- works with staff and parents to promote a school-wide "Acceptable Use Policy" to ensure the safe, legal, and ethical use of personal information at all times;
- provides opportunities for students to compose, send, and receive email and for access to appropriate email partners in other schools/countries;

- uses email for curriculum projects by encouraging students to submit work and participate in on-line conferences and collaborative work groups;
- explains the purpose, conventions, and necessary safeguards when using listservs, news groups, and bulletin boards;
- participates in the use of email for conducting school business (e.g., attendance, planning, and student and parent communication).

Considerations

Email applications:
- vary in accessibility depending on speed and cost of access – long-distance charges may apply;
- raise issues of student safety and security regarding contact with unknown email users;
- raise problems of inappropriate use under the guise of anonymity.

Illustrations

Elementary

- *demonstrate an understanding of the characteristics of rural communities* (3z35)

With the assistance of the teacher, students in an urban classroom use email to partner with students in a rural school. They develop a survey collaboratively to collect information about their neighborhoods and share this information electronically.

Secondary

- *exchange information by writing an email message* (WR1.27)

Using a template consistent with the school/board "Acceptable Use Policy" (for instance, with regard to "netiquette," safety, and privacy), students compose an email message that introduces and describes themselves to another student. Upon receiving a reply, students then describe current class projects in a variety of subjects and elicit responses and suggestions from their correspondent.

Graphic Applications

Description

Graphic applications are computer software programs, such as paint and draw programs that are used to create and edit images, pictures, and other visuals. They are also used to capture and alter images through digital means such as scanners and digital or video cameras. Clip art files, charts, and graphs are graphics included in many word-processing and presentation software programs or as stand-alone products, and they can also be edited, grouped or ungrouped, and located or aligned on a page or document. Graphic organizer software is a specific application that visually creates and dynamically manipulates images such as flow charts and conceptual maps. The use of graphic applications and desktop publishing software can enhance work by clarifying and illustrating the text to improve communication, provide additional information, illustrate ideas, appeal to the visual learner, and act as memory aids.

Method
The teacher:
- identifies specific purposes for the use of graphic applications;
- teaches the basic skills involved in using graphics;
- uses graphics to create professional worksheets, banners, newsletters, and other vehicles to enhance communication;
- uses graphic images to highlight important ideas on worksheets and handouts;
- models the use of slide presentations and other self-created visuals for teaching and learning;
- encourages creative thinking by using graphics such as webs and organizers;
- provides time to explore and investigate the many features of the software, while maintaining focus on the task at hand.

Considerations
Graphic applications:
- are often quite costly, especially if network or site licenses are involved;
- are time consuming in skill development and require expertise for success;
- may unfairly advantage some students who routinely use graphic application to enhance their projects;
- may create inequity of access because of cost and hardware and software limitations.

Illustrations
Elementary
- *identify the emotional quality of lines (e.g., smooth, flowing, horizontal lines create a feeling of peace and harmony; sharp, jagged, vertical lines create a feeling of energy and unease)* (4a36)

Students use the free-hand tools of a paint program (e.g., pencil and brush tools) to create a series of line drawings that represent ordinary objects (e.g., books, buildings, sports equipment). They then recreate the drawings by using paint tools that create smooth lines (e.g., rectangle and curve tools). Students share their work in small groups and compare the emotional effect of each set of drawings.

Secondary
- *identify and implement perception-enhancing design devices to create images* (VC1.03)

Students manipulate a traditional painting to create a parody by changing the original intention or meaning of the work (e.g. changing the portrait of Da Vinci's Mona Lisa and its sublime background to a portrait of a figure called "Moe Lisa" in front of a industrial park). Photo and digital-image editing software applications are used to do this.

Internet Technologies

Description
The Internet (Net) is a worldwide computer network connecting users to each other for communication. This "network of networks" was originally conceived for academic and military research and now connects educational institutions, private and public services, commercial enterprises, and individuals. Computer users connected to the Internet can read and post messages, download software and media files, research information by browsing directories and following hyperlinks on diverse websites, communicate with experts, and search catalogues of major libraries around the world. The Internet provides an open, unmonitored forum to which anyone can contribute and publish different viewpoints. Because of its open structure, the Internet requires that students learn critical searching and communication skills in order to find and use relevant, valid information in a timely, safe, and ethical manner.

Method
The teacher:
- teaches terminology associated with the Internet (e.g., WWW, URL, web pages, search engine, browser, hyperlinks, frames);
- coordinates with the teacher-librarian to focus research and search strategies, such as Boolean operators and key word searching skills, that can be transferred to other information sources;
- raises student awareness of issues of security, safety, bias, authority, and currency of information;
- reinforces the school's "Acceptable Use Policy" for Internet use:
- provides problems and assignments that are appropriate for Internet investigations;
- plans time and access to computers to work on investigations.

Considerations
Internet technologies:
- may be expensive to set up for schools (e.g., service contracts, connectivity issues, subscriptions to content);
- require specific knowledge and skills to use effectively (e.g., appropriate search strategies by keyword or directory; identification of source and authority of information; maintenance of safe and ethical practices);
- raise issues of safety and security for students;
- raise issues of plagiarism, intellectual freedom, and copyright;
- require critical thinking about bias, authority, reliability, and the currency and quality of information.

Illustrations
Elementary
- *describe ways in which weather conditions affect the activities of humans and other animals* (5s123)

Students track and compare meteorological data in four centres around the world for a two-week period, using on-line web-based resources.

Secondary
- *locate and use effectively geographic material from secondary sources to research a geographic issue* (M13.03D)

Following a series of links, some of which may have been previously bookmarked, students use the Internet to participate in a fact-finding mission and debate regarding modern practices in forestry, mining, and fishing. Students carefully analyse on-line information for bias and perspective.

Media Presentation

Description
A media presentation involves the use of various media to present information and ideas. The presentation could involve such formats as audiotape or videotape, presentation slide shows, or multimedia graphics using sound systems, television or computer monitors, overhead projections. The presentations can increase interest in a topic by providing currency and variety and by appealing to different learning styles, such as visual-spatial styles. Presentations may be interactive and involve some form of audience participation. Presentation graphics software automates the creation of visual aids for lectures, skills training sessions, and group presentations, often in the form of colourful and animated slides and handouts.

Method
The teacher:
- plans for relevant use of student and teacher media presentations in the classroom;
- models the planning process, from inception of the idea to the booking of the equipment and the use of the appropriate presentation format;
- establishes guidelines for the safe and ethical use of media presentations;
- may preview student productions before they are presented to ensure suitability for all students in the class;
- provides opportunities and access to a wide range of technology tools;
- outlines clear expectations for all aspects of the student presentation;
- assists students in planning and organizing their presentations in order to support relevancy, accuracy, currency, creativity, and variety.

Considerations
Media presentations:
- may be effective assessment tools for gathering culminating findings (for instance, in an electronic or media portfolio);
- require care to use only the relevant portions of larger works.

Illustrations
Elementary

- *create and present drama anthologies independently and in a group, manipulating various techniques of drama and dance and incorporating multimedia technology* (7a68)

Students listen to several clips of radio dramas and develop a list of elements that elicit various audience responses (e.g., laughter, anger, joy, and sadness). Using multimedia technology, the students then create their own dramas, incorporating both audio and visual elements.

Secondary

- *design and complete an organizer comparing the benefits and disadvantages of selected energy megaprojects* (HE2.02P)

Students view a televised debate between representatives of an energy company and local environmentalists. Using an organizer, students compare the benefits and disadvantages of the selected energy project featured in the televised debate.

Media Production

Description
Media production involves the use of a variety of technological and media tools for student-created work that conveys information or represents a culminating performance or project. Tools used in media production include cameras, video or digital editing equipment, television, video players, audio recorders and players, slide projectors, computers, and the appropriate software required to use these tools. Media productions provide the opportunity to integrate and present text, graphics, sound, video, and animation in unique and exciting ways. The use of technological tools for media production encourages students and teachers to learn new skills, solve problems, create and demonstrate new ways of learning, extend thinking in flexible and challenging ways, and reflect on their products. Students learn by creating products using emerging skills and by talking about and reflecting on their products.

Method
The teacher:

- models the appropriate use of media productions for teaching and learning in the classroom (e.g., using only appropriate clips rather than the entire video to demonstrate a point);
- provides access to required equipment and instruction in it;
- provides appropriate topics, access to information sources, and a framework for the creation of media works;
- confers with students to monitor progress and assist with problems encountered;
- ensures that students have a basic understanding of the components of media presentations;
- encourages creativity in presentations and products;

- reinforces the key components of media literacy so that content is respected and not sacrificed for extraneous technological innovations.

Considerations

Media productions:
- require access to appropriate equipment for the proposed format of the production;
- require that students have an understanding of issues of bias, stereotyping, violence, point of view, and manipulation as they relate to their own works.

Illustrations

Elementary

- *identify uses of electricity in the home and community and evaluate the impact of these uses on both our quality of life and the environment* (6s53)

In small groups, students select an electrical device. They prepare a videotaped "infomercial" to promote how it should be used and to demonstrate its effect on their lives.

Secondary

- *present prepared conversations in dialogues or dramatizations* (OC1.05P)

In small groups, students prepare and present humorous talk-show interviews based on stories from daily newspapers. The shows are videotaped and shared with other classes.

Multimedia Applications

Description

Multimedia applications are computer software programs that integrate a variety of elements such as sound, animation, text, and graphics into a presentation format. Multimedia applications allow students to practise their skills in a variety of technologies to create a multimedia production. Such applications may be non-linear and allow students to compose, communicate, and create new knowledge in innovative ways. The use of multimedia applications for personalizing learning and demonstrating understanding is highly motivating for students. Multimedia authoring software enables the creation and editing of multimedia documents for presentation and publication to a variety of audiences (for example, the classroom, Internet). Hypermedia is multimedia that provides hypertext links among elements such as computer text, visual material, and sound files.

Method

The teacher:
- models the use of multimedia applications by creating classroom presentations;
- provides a relevant framework and purpose for using multimedia applications;
- creates a forum where work can be presented and analysed;
- provides students with guidance on the self-evaluation of process and product in the creation of multimedia presentations;
- provides access and time to use the tools required for multimedia presentation;

- provides guidance in the use of multimedia applications to ensure inclusion and analysis of content versus the use of effects for "show."

Considerations
Multimedia applications:
- require large memory and processing power in the computers used;
- require additional time outside of class to create meaningful presentations;
- require a rigorous selection process to ensure quality, relevancy, and value.

Illustrations
Elementary
- *identify Canadians who have contributed to space science and technology* (6s119)

Students, working in small groups, create a multimedia presentation highlighting one Canadian who has made a significant contribution to space science and technology. Students can use images in the public domain and student-produced audio files for the presentation.

Secondary
- *demonstrate understanding of the importance of managing an ergonomically correct work environment* (IM3.01)

Students use different information technologies to create a multimedia presentation demonstrating the various aspects of an ergonomically correct workplace. Demonstrations of sound ergonomic practices might be captured on video and played for the audience, or the principles can be outlined with text and graphics through a slide presentation program.

On-line Public Access Catalogues

Description
On-line public access catalogues (OPAC) are library catalogues that are accessible for searching over a computer network. They are databases of organized information that can be searched by subject headings, keywords, authors' names, or a variety and combination of elements and strategies. Students are taught these transferable skills to make them effective and efficient researchers of on-line information sources throughout the world. The school library information centre provides access to public, academic, and specialized library catalogues, while maintaining its own OPAC for immediate access to on-site resources selected to support curriculum. On-line public access catalogues are efficient means of sharing cataloguing information that is in a consistent and standardized format. Searching capabilities and information retrieval are faster and more extensive than manual catalogues.

Method
The teacher-librarian/teacher:
- ensures access to searching strategy instruction in order for students to develop efficient and transferable searching skills;

- provides opportunities for students to develop their research skills by using all the capabilities of the electronic access;
- provides opportunities for students to extend thinking by searching related terms and topics and recording their findings;
- provides access to resources beyond the school through interlibrary loans;
- develops appropriate assignments to ensure that students must use the wide-ranging features of the OPAC to locate relevant materials.

Considerations
On-line public access catalogues:
- operate on similar, transferable principles for searching, although the interface (appearance of screen) and method of searching may vary;
- provide access to public, academic, and specialized libraries as well as school-based resources;
- improve access and collection development offered through the school library;
- allow a wide variety of searching strategies (e.g., refining searches, storing found citations, printing bibliographies);
- should be used in conjunction with other search/find strategies such as browsing, scanning, and using indexed and reference material.

Examples
Elementary
- *investigate physical and behavioural characteristics and the process of growth of different types of animals* (2s2)

Students choose an animal they are interested in and begin to structure key words describing their animal. When they have three or four such descriptors, they work in pairs to search the OPAC for suitable resources. Once they have accessed and read the resource materials, students record their findings on an organizer under the headings Physical Characteristics, Behavioural Characteristics, and Growth Process.

Secondary
- *locate and use effectively geographic material from primary and secondary sources* (MIV.01B)

The teacher-librarian teaches students how to search the OPAC in the school library to locate information from a variety of primary sources (e.g., census or weather data) and secondary sources (e.g., travel guides or encyclopedias) for input into their travel brochure project. Students go back on-line and where possible locate similar sources in the related OPAC in their local public library system. Students select the most appropriate titles from the search results and create brief annotations that will engage the reader of the travel brochure.

Spreadsheet Applications

Description
Spreadsheet applications are software programs that record and manipulate numerical data in a variety of organized and accurate ways. They are used to perform mathematical calculations on numeric information for budgetary purposes, financial or statistical analyses, or the analysis of data from a variety of scientific or other experiments. Spreadsheets perform a useful function in making comparisons and contrasts and for converting numerical information into charts and graphs for visual display. Well-designed reports are easily generated and printed through spreadsheet applications. Spreadsheets can be formatted in varying column widths and text styles, incorporating appropriate labels, formulas, and cell references for specific purposes. They are a useful tool for many curriculum areas, such as data management and probability, scientific simulations, investment management, and grading and reporting.

Method
The teacher:
- models the use of spreadsheet applications for numeric data management and analysis;
- helps students use spreadsheets to tabulate information gathered for projects using surveys or polls;
- encourages the use of the graphical aspects of a spreadsheet program to present graphs and charts as visual representation of information;
- assists student in practising mathematical skills by requiring students to devise and use general formulas for repetitive operations;
- schedules time for students to enter data and formulate spreadsheets on a regular basis.

Considerations
Spreadsheet applications:
- have cross-curricular applications for recording, manipulating, and analysing data;
- may consolidate whole-class data-gathering projects and display results;
- may consolidate and display data collected from various school projects, such as reading programs, fund raising, and charity donations;
- can be integrated into other applications, such as word processing and presentations.

Illustrations
Elementary
- *construct and read a wide variety of graphs, charts, diagrams, maps, and models for specific purposes* (6z37)

Students locate statistical information about one of Canada's trading partners and record imports in a spreadsheet application. They also display this information in the form of bar graphs and pie graphs.

Secondary

- *demonstrate a knowledge of technologies used in geographic inquiry* (MI1.01B)

Using data on bilateral aid for selected countries, students create a spreadsheet to include the fields "Countries" and "Total Bilateral Aid." Students then take the material generated by the spreadsheet and integrate it with a GIS (Geographic Information Systems) program that has world data for further analysis.

Time-Management Applications

Description
Time-management applications are effective tools for organizing time, setting goals and priorities, assessing personal use of time, and making realistic decisions. Students learn to use a time-management device or application to schedule study time and keep track of all their classes, activities, and appointments. Students can develop recording sheets to track projects, assignments, and due dates on a daily, weekly, or monthly basis and have them monitored by the teacher or parents if necessary. Using computer-based applications, students can effectively edit and modify the entries as events and times change. Time-management applications can be used individually, at desktop stations and with portable devices, as well as part of work groups within a network-based scheduling system.

Method
The teacher:
- models effective use of time-management applications (e.g., class schedules, course outlines, and goal-setting exercises);
- makes the use of time-management organizers an integral part of each student's daily routine (e.g., recording homework, tracking assignments, setting goals);
- negotiates due dates for assignments and tests so students can practise setting time lines and adhering to them;
- monitors the use of the time-management strategies through periodic checks;
- assists students in reorganizing their schedules when the tasks or time lines change.

Considerations
Time-management applications:
- may be in print format (e.g., daybook, agenda, student handbook) or electronic format (e.g., scheduler or contact/task manager, which requires access to computers for entry and modification on a regular basis);
- should include an evaluative component (e.g., "Is my time management effective? Am I meeting all my commitments on time?");
- provide opportunities to develop a lifelong skill for setting priorities and managing time commitments.

Illustrations
Elementary
- *incorporate time-management and organizational skills in the goal-setting process* (5p39)

Students set a realistic goal related to a physical activity of their choice. Students then create a template and record the number of minutes they spend on that physical activity and reflect on what improvement they have seen over that time period.

Secondary
- *demonstrate ability to select the most appropriate software applications for creating a particular business document* (SA3.01)

Students use a spreadsheet application as a time-management tool to create a weekly agenda. Using the formula function, they calculate the total number of hours spent on school activities versus recreational activities.

Thinking Skill Strategies

The rapidly changing world that our students face today demands creative and flexible thinkers who can evaluate information, generate new solutions, and make thoughtful and ethical decisions. Thinking skill strategies develop critical thinking, questioning skills, analytical skills, and reflective practices in students' approach to learning. These strategies are also designed to foster creative and independent thinking and learning. A vital component of the thinking process involves self-reflection where students are taught to think about their own thinking processes, monitor and evaluate their own thinking and learning, and modify their learning accordingly. Students are thereby able to understand their own learning styles, develop the habits of mind that result in commitment to tasks and goal setting, and accept responsibility for their learning and their personal attitudes towards that learning.

Thinking skill strategies involve:
* organizational frameworks such as concept maps and mind maps that extend the thinking processes;
* representational strategies such as graphs, maps, charts, and visual organizers that facilitate communication and transfer of learning to other situations;
* evaluative processes such as experimenting, fair test, and inquiry-based research that test assumptions and hypotheses for new learning.

Through consistent exposure to and practice in thinking skill strategies, students can develop their own understanding and ability to deal with new situations, make complex decisions, and meet their individual and community needs now and in the future.

Independent Learning Strategies

Analysing Bias/Stereotype	Map Making
Anticipation Guide	Media Analysis
Brainstorming	Mental Calculation
Case Study	Metacognitive Reflection
Classifying	Mind Map
Concept Clarification	Model Making
Concept Mapping	Oral Explanation
Estimating	Problem Posing
Experimenting	Problem Solving
Expressing Another Point of View	Process Notes
Fair Test	Semantic Feature Analysis
Graphing	Seriation
IDEAL Problem Solving	Statistical Analysis
Issue-Based Analysis	Think Aloud
Lateral Thinking	Visual/Graphic Organizers
Manipulatives	Writing to Learn

Analysing Bias/Stereotype

Description
Analysing bias and stereotype is a process that examines beliefs about inequities based on race, ethnicity, gender, class, points of view or perceptions, and any number of physical or mental attributes of individuals. It allows students to examine their own personal prejudices as well as systemic discrimination and to understand how social, political, economic, organizational, and cultural structures in society contribute to these perceptions. Students learn the skills to make critical assessments of their reading, listening, and viewing in order to be aware of biases and stereotypes reflected therein. Students consider how the variety of motivations, controls, and constraints related to media directly influence our perceptions and views.

Method
The teacher:
- provides a safe and secure classroom environment that allows for open discussion on issues of bias and stereotyping;
- invites students to share concerns, analyse situations, and explore strategies such as role playing to change behaviour and thinking;
- provides opportunities (for instance, guest speakers) for informed discussion;
- provides opportunities to recognize and celebrate cultural similarities and differences;
- provides resources that can illustrate issues concerning bias and stereotyping.

Considerations
Analysing bias/stereotypes:
- requires a safe and secure classroom and school environment;
- requires broad exposure to create awareness about the many types of bias and stereotypes that students may encounter in their daily lives.

Illustrations
Elementary
- *describe early explorers' perceptions of Aboriginal peoples' way of life* (6z16)

Students read selections from a variety of primary sources written by early explorers (e.g., letters, diaries, reports) and identify to what extent the explorers' perceptions towards Aboriginal peoples may have demonstrated biased and stereotypic thinking and/or resulted in discriminatory behaviour.

Secondary
- *determine criteria to evaluate websites in terms of validity, bias, and usefulness* (ER3.02)

Students draw up the criteria to evaluate bias and stereotyping in web sites and use the criteria to compare two sites about the same topic found on the Internet, the first site found using a directory and the second found using a key word in a search engine. They record their observations on a chart and draw conclusions.

Anticipation Guide

Description

An anticipation guide is a series of statements presented to students with which they must agree or disagree, supporting their responses with reasons. It can be used in all subjects to assist in assessing background knowledge about a topic prior to study or to identify gaps or misconceptions in student knowledge. Anticipation guides are also effective for providing new knowledge when students are reading, viewing, or listening to text, especially non-fiction. An anticipation guide can also take the form of a prediction. In this case, students are asked to make predictions about a topic, giving reasons to support their responses. Anticipation guides can help motivate student learning by building student confidence in what they already know about a topic and by providing students with a purpose for reading, viewing, or listening.

Method

The teacher:
- can use anticipation guides to assess prior knowledge or provide new knowledge by:
- selecting three to eight short, factual statements from text to be read, viewed, or listened to;
- modelling the strategy by using a "think aloud" to demonstrate whether he or she agreed or disagreed with the first statement, and the reasons for doing so;
- asking students to respond to the statements individually, then providing opportunities for students to engage in dialogue in small groups or large groups concerning their responses;
- analysing student responses to assess their degree of prior knowledge and the gaps or misconceptions in the particular topic that will need further instruction;
- can use anticipation guides for prediction by:
- describing the general aspects of a theory, situation, or narrative;
- asking students to make a prediction about the topic or story;
- requiring students to support their predictions or hypotheses with reasons;
- analysing student responses when appropriate to assess their degree of prior knowledge and the gaps or misconceptions in the particular topic that will need further instruction.

Considerations

Anticipation guides:
- should be used in a risk-free environment where inaccurate or absent knowledge is not discouraged initially;
- should be used sensitively to dispel biases, inaccuracies, and stereotypes;
- should be used for diagnostic assessment only.

Illustrations

Elementary
- *identify some features of books and other materials and use these features to help them understand the printed text* (Ke21)

The teacher shows the students the cover and illustrations of a picture book and asks them to predict what the story is about. Students defend their prediction with evidence from the illustrations.

Secondary
- *use some basic reading strategies, with teacher guidance* (AREV.03L)

Prior to reading a selected piece of informational text on water pollution, the teacher reads ten general statements about pollution aloud, one by one. The students think about each statement, and then indicate whether they agree or disagree and give reasons for their opinions.

Brainstorming

Description
Brainstorming is a group process for generating questions, ideas, and examples and is used to illustrate, expand, or explore a central idea or topic. Brainstorming involves students sharing whatever material comes to mind and recording every idea, without making judgments about the material being generated. When introducing a topic, brainstorming can be used for assessing what students already know or wish to learn and for providing direction for learning and reflection. Brainstorming stimulates fluent and flexible thinking and can also extend problem-solving and problem-finding skills.

Method
The teacher/group leader:
- poses a relevant problem or topic, or elicits one from students;
- asks students to contribute questions, ideas, or examples spontaneously, emphasizing the importance of quantity over quality of material;
- ensures that the material is recorded appropriately (e.g., using blackboard, flip charts, slips of paper, colour coding);
- intervenes if ideas are being evaluated;
- ensures that a plan for the follow-up use of ideas generated in the brainstorming session is developed.

Considerations
Brainstorming:
- can be used in whole groups or small groups;
- depends on establishing the comfort level of students to take risks and of teachers to trust students' unevaluated responses;
- provides opportunities for teachers to stretch thinking by elaborating on suggested ideas.

Illustrations
Elementary
- *demonstrate an understanding of the rights of Canadians* (5Z35)

Students form groups of four or five to brainstorm as many rights of the child as they can think of. One group, consisting of a representative from each of the previous groups, then forms to negotiate and generate a ten-point "Declaration of the Rights of the Child," which is then shared and commented on by the whole group.

Secondary
- *identify an authentic practical challenge of a problem related to the use of electricity* (PH2.02)

Students brainstorm ideas for projects that they might design and construct to address a problem or challenge related to electricity or electronics. The group then discusses the merits of each project. They create a list of five different projects from which they each choose one to research.

Case Study

Description
A case study is a process in which a particular real-life instance is examined as an exemplar of general principles. Case studies can be pursued as real or simulated problems. One common approach to case study is role playing, where students come to understand the problem clearly and identify possible solutions. A case study is also used to provide an opportunity for in-depth study of an issue or problem students currently face or have faced. It requires students to actively participate throughout the investigation by gathering materials from current events and examining issues in the curriculum through real-life application (for example, situations in history, problems in family life, entrepreneurial ventures). Case studies are useful for identifying social problems and issues, providing options for dealing with them, and analysing the values underlying these options.

Method
The teacher:
- designs task requirements and sets time lines;
- prepares scenarios and investigative tools in advance, such as a folder with relevant information;
- plans composition of small groups;
- monitors progress of groups and intervenes as necessary;
- assists students in planning how they will represent their learning.

Considerations
Case studies:
- require substantial teacher preparation;
- may involve negotiation with students on research processes and representation formats;
- require substantial allocation of time for students to investigate and solve problems;
- may involve the use of drama for investigation and representation.

Illustrations
Elementary

- *identify strategies to deal positively with stress and pressures that result from relationships with family and friends* (5p9)

Students read a case study involving young people and peer pressure. They are asked to discuss how they think the young people should respond in the situation described. Students could use role-play to respond to the situation.

Secondary

- *predict, on the basis of a case study, the costs associated with a specific life event* (SS1.04)

Students read three case studies from a variety of sources (e.g., academic journal, popular magazine, book of essays) about a specific life event (e.g., getting married, going to college or university, moving into a place of one's own). Then they write a brief report highlighting the changing costs associated with the event.

Classifying

Description
Classifying is a form of thinking in which established or student-generated criteria are used to sort data into identified sets, groups, or patterns. It involves collecting, organizing, displaying, and interpreting data to solve problems and make decisions and predictions based on the data. Classifying is used to help understand relationships and sets of ideas, to construct systems for understanding, and to manage ideas. It can be done with concrete materials or in the abstract, with ideas. It is particularly useful when the focus is on personalized understanding and long-term retention of concepts or generalizations and when students need to investigate or discover systems in order to benefit from further instruction.

Method
The teacher:
- demonstrates/teaches the problem-solving processes involved in classifying;
- plans active learning opportunities for students to experience classifying;
- encourages students to develop alternative classification systems for the same data.

Considerations
Classifying:
- requires that students manipulate concrete materials, such as attribute blocks and natural materials, before working abstractly to conceptualize groupings and relationships among groups;
- may require students to generate ideas to be classified (e.g., the sorting of toy vehicles into cars, trucks, and motorbikes; descriptive words that evoke feelings; mathematical problems or statistics);

- requires debriefing of the classification activities to promote deeper understanding of structures and the benefits of constructing organizing principles.

Illustrations
Elementary
- *classify rocks and minerals according to chosen criteria, relying on their observations* (4s105)

Each group of students sorts through a collection of rocks and minerals gathered from a variety of sources and activities (e.g., classroom collection, field trip). They brainstorm criteria to classify the rocks and minerals (e.g., colour, texture, shape) and then classify each piece according to the criteria. As a class, students compare each group's findings and determine the success and comprehensiveness of their own group's method of classification.

Secondary
- *demonstrate an understanding of how human activities affect the environment* (HE1.01B)

Following a short on-site visit, students complete a waste audit of waste produced in the cafeteria. Students classify items according to criteria regarding waste management that they have previously created (e.g., by type of waste such as food or container; by type of container such as recyclable or non-recyclable). They examine their classified data to determine which waste-related behaviour would have the most effect on the environment.

Concept Clarification

Description
Concept clarification is a process that defines a concept by identifying its critical attributes, providing examples, and creating analogies to help students visualize or remember the concept. Concept clarification can be used either to introduce new concepts or to extend known concepts and stimulate new ways of thinking. It uses a frame or visual organizer in the clarification process, often employing increasingly complex frames or models as student competency improves. Concept clarification is often used in math, science, and social science to focus on precise information about the characteristics or criteria of concepts.

Method
The teacher:
- models concept clarification strategies;
- involves students in questioning and refining the critical attributes;
- encourages alternative ways of thinking through the use of analogy;
- provides prepared concept clarification frames;
- decides when more complex frames are required;
- provides prompts to help students better understand the critical attributes of a concept.

Considerations

Concept clarification:
- provides students with an investigative tool to define concepts;
- is a time-consuming but effective strategy for developing concepts;
- ensures that students understand the concept and have not just memorized a definition.

Illustrations

Elementary
- *understand specialized words or terms, as necessary* (3e47)

The teacher helps students to distinguish between raw materials and processed materials by having them brainstorm and sort the materials that go into the making of various products such as cars, houses, and books.

Secondary
- *demonstrate understanding of the impact of emotions on learning* (PK3.02)

The teacher introduces the concept of emotional intelligence by asking students to discuss a related quote. After group discussion on the five dimensions of emotional intelligence, students are asked to give three or more examples of how each dimension is portrayed.

Concept Mapping

Description
Concept mapping is a visual strategy often used to teach scientific processes. It shows various relationships among concepts and indicates the order and sequence of the concepts. It is useful as an organizer to identify the key concepts that were presented in a lecture or a text. A concept map is created as a tree-like structure, with the most inclusive concept at the top and the most general ones connected with lines to the first concept. A third level can be added until all the important ideas and relationships are identified. Concept maps can also contain events, objects, themes, activities, or other items related to the concepts being taught.

Method
The teacher:
- models the use of concept mapping by using the strategy whenever appropriate;
- can use a concept map as an assessment device for students to demonstrate clear understanding;
- demonstrates that cross-linking of concepts between one section and another reveals relationships between them.

Considerations
Concept mapping:
- can have connecting lines labelled with verbs to reinforce meanings of relationships;
- can be used by both teachers and students to identify important concepts and their relationships.

Illustrations

Elementary

- *demonstrate an understanding of the characteristics of the provinces* (4z35)

In small groups, students research the characteristics of the provinces using a concept map to summarize their findings. At the top of the tree-like structure is the name of the province. In the middle are generic descriptors used by all groups (for example, geographic features and main industries). At the bottom, the concept map branches out to specify the features (for example, mountains and prairies).

Secondary

- *demonstrate an understanding of the major concepts, principles, and purposes of international law* (RDV.03)

The teacher leads a class discussion about the purposes of international law (for example, Peace, Trade, Cooperation). In small groups, students investigate one of these purposes and create a concept map that illustrates related concepts (for example, second-level concepts of Prosperity, Stability, and Cultural Exchange under the main concept of Peace). When students have developed further conceptual levels, they discuss connections revealed among key concepts.

Estimating

Description

Estimating is a strategy used to obtain an approximate answer. Estimating may be used in mathematics and other subjects when an exact answer is not required. It encourages risk taking by allowing various answers and a margin of error. Estimating promotes discussion, leads to investigation, and involves logical thinking. It is used to check the reasonableness of mathematics work and to assess students' understanding of mathematical concepts. Estimating has both curriculum and real-life applications.

Method

The teacher:
- models the thinking process of estimating;
- encourages shared responses;
- demonstrates that there is an appropriate time and place for estimation;
- provides varied opportunities for students to estimate.

Considerations

Estimating:
- requires practice and support;
- may be followed by an investigation to determine the exact answer;
- requires acceptance, by teacher and peers, of a wide range of responses.

Illustrations

Elementary

- *estimate, measure, and record the capacity of containers using non-standard units* (2m38)

Students, working at the water table, estimate the capacity of a large non-standard container. They are given a small container and asked to predict how many times it will have to be filled to fill the large container. Students record their estimates and then confirm them through exact measurement.

Secondary

- *plan and budget for a family's meals for one week and prepare a list of all ingredients* (PR3.06)

Students estimate the cost of meals they have organized and prepared in class and develop a one-week family meal plan with an appropriate budget. Students are then asked to verify the cost of the ingredients by visiting a grocery store and recording actual prices.

Experimenting

Description

Experimenting involves carrying out investigations to test predictions, hypotheses, or prior knowledge and understanding. It focuses on problem solving and decision making and is a link to real-world, authentic learning. Experiments are central to science, technology, and mathematics, but may also be applied to other disciplines, such as the arts, to make connections between concrete and abstract learning. Experimenting requires that students follow an established procedure, such as the scientific method, which is structured so that students hypothesize, investigate, test, explore, manipulate, and organize information and record their observations. Experimenting also encourages students to use cooperative skills effectively in communication when interpreting experimental findings. Experiments enhance student motivation, understanding, and active involvement and can be initiated by the teacher or the student.

Method

The teacher:

- determines and teaches the specific strategies, skills, or processes that will help students conduct their experiments;
- ensures that students understand and apply the appropriate scientific inquiry processes;
- assists students in generating questions from their knowledge, experience, and interests;
- provides necessary materials and resources;
- ensures that students follow established safety procedures;
- recognizes and follows up learning needs and opportunities that result from experimentation.

Considerations

Experimenting:
- takes into account the appropriate developmental stages of students;
- takes into account whether students will work through a guided approach or an open-ended format;
- takes place only when teachers are assured that all students can use materials and equipment safely.

Illustrations

Elementary
- *experiment with simple machines (e.g., pump ramp, marble run)* (Ks13)

Students work at the science table to explore ramps and then discuss their observations.

Secondary
- *demonstrate the skills required to plan and conduct an inquiry into the properties of elements and compounds* (CH2.03)

Students select one variable and design a controlled experiment to test the effects of that variable on the corrosion process.

Expressing Another Point of View

Description

Expressing another point of view is a strategy used to develop critical thinking and the ability to look at issues from more than one perspective. It includes identification of which person's point of view is being considered, the needs and concerns of the person identified, investigation of information about the person identified, and a summary of that person's position. Expressing another point of view can be used with reading, writing, and viewing activities in most subject areas. It is central in social studies and language when using scenarios such as: "What would you have done if you were …?" and "What might you have said if …?" In taking on the persona of another, students learn to examine issues and characters and form conclusions without letting personal bias interfere.

Method

The teacher:
- provides opportunities for students to engage in activities that encourage expressing point of view;
- selects reading/writing/oral/visual activities that present issues from many perspectives;
- models positive attitudes about different points of view;
- provides some frames to respond to the experience, such as: "What did I think before I examined the issue from another point of view, and what do I think now?"

Considerations

Expressing another point of view:

- can take many forms (e.g., journal writing, job descriptions, formal debating);
- requires practice to keep personal views from entering into the scenarios;
- provides opportunities for metacognitive processing as students reflect on how they look at things differently after using the point of view strategy.

Illustrations

Elementary

- *demonstrate an understanding of the growth and development of the West from the points of view of the Canadian government, Aboriginal peoples, Metis, and new immigrants;* (8h17)

Using a variety of primary and secondary sources, students identify the different viewpoints and supporting evidence regarding the growth and development of the Canadian West. They then complete an organizer that identifies the different sides of the question and summarizes their own position.

Secondary

- *summarize the impact of trade on employment and job creation in Canada* (NB2.01)

Students select the pro or con side of the following question: Should a Canadian government have the power to protect local industries affected by international trade practices? Students engage in appropriate research and take turns sitting at the front to explain their point of view, from alternating positions.

Fair Test

Description

A fair test is an investigation carried out under strictly controlled conditions to test a theory and to ensure accuracy and reliability of results. In a fair test, all variables are identified and controlled except the one under investigation. A fair test requires an effective method of reporting and communicating the results of tests. A fair test is used in science and technology investigations and inquiries when active exploration and hands-on investigation will best promote learning to apply theories and concepts. It follows the scientific method of asking a question, making a hypothesis, setting up appropriate test conditions, conducting the test, making observations, drawing conclusions, and repeating the cycle. Fair tests should be able to be replicated by others with the same results. Fair tests can be conducted using computer software that simulates real conditions.

Method

The teacher:
- selects which investigations are suited to fair tests;
- makes equipment and materials available to support the design of fair tests;
- instructs students in identifying and controlling variables;
- encourages students to question and design their own fair tests;
- helps students to identify how to connect learning to real-life situations;
- ensures the development of specialized vocabulary required in conducting fair tests.

Considerations

Fair tests:

- should encourage students to record relevant data collected from conducting fair tests, by using charts, tables, graphs, and computer-assisted applications such as spreadsheets;
- involve ensuring proper safety equipment and procedures are in place.

Illustrations

Elementary

- *design and make a suitable structure that will support a given mass and perform a specific function* (3s83)

The teacher organizes students in groups in order to build a bridge for use by a defined load. Each group must use a different type of found material (for instance, Popsicle sticks, cardboard, and plastic straws). They hypothesize and test the shape and strength required and predict the maximum load limit for the materials used in their group.

Secondary

- *design and conduct an investigation to examine the effects of one factor on soil composition and fertility and on water quality in an ecosystem* (BY2.06)

Each group of students decides on a variable to be tested and designs a fair test (e.g., to examine the effects of altering soil pH on the fertility of plants and on the concentration of dissolved oxygen in water). The report produced at the end should include a hypothesis, a description of the fair test, all relevant observations, a graph of the results, analysis of the data, and a conclusion.

Graphing

Description

Graphing is a visual tool for problem solving that involves describing and interpreting the world with numbers and representing these understandings in a variety of visual formats (for instance, circle, bar, line graphs). It involves collecting, organizing, displaying, and interpreting data and requires making decisions and predictions based on the data. Graphing is used effectively to link estimation, measurement, statistics, and probability to other content areas such as social and environmental sciences.

Method

The teacher:

- helps students to recognize that many kinds of data come in many forms and that collecting, organizing, displaying, and thinking about them can be done in many ways;
- assists student in using appropriate terminology about graphs and graphing;
- identifies number-based problems that are interesting when expressed in graphs;
- involves students in asking questions regarding statistics and their graphing;
- presents applications of graphing to practical questions;

- helps students to use graphing tools to discover patterns and make predictions;
- assists students in actively exploring situations by experimenting and simulating probability models;
- uses graphing strategies to connect mathematics, language, and other subjects together in authentic ways.

Considerations
Graphing:
- enables students to make predictions and modify them as more data are collected for a class project over a set time frame;
- may require the use of computers to store and display data that can be integrated into student projects
- requires students to analyse the visual representation of quantitative information.

Illustrations
Elementary
- *use appropriate vocabulary to describe inquiries and observations* (4z11)

Students work in groups to record the temperature and weather conditions for one of Canada's regions over the period of the unit. Groups then graph their statistics and develop generalizations about their region to share with the rest of the class.

Secondary
- *solve density problems using the formula density = mass/volume* (CH1.13)

Students calculate densities in collaborative small groups, and then plot one graph of mass versus volume data showing lines for all five solutions. The teacher reviews graphing techniques, line of best fit, and qualitative determination of the slope of the line using one set of results.

IDEAL Problem Solving

Description
IDEAL problem solving is a strategy to help students identify and work through a problem. This strategy uses a specific frame or model that can be applied to a variety of problem-solving situations, particularly in mathematics. IDEAL is a mnemonic device (Identify, Decide, Equation/Estimate, Answer, Look back) to recall the steps in the model. The steps include: identify the information given and what information must be found out; decide what steps must be taken; write out the equation and estimate the answer; find the answer; look back and check the answer with the estimate. The IDEAL problem-solving strategy is used most frequently in mathematics when estimation and problem solving are linked, but has applications in other curriculum areas.

Method

The teacher:

- models the strategy to students, providing examples, at first, to reinforce the use of the strategy;
- has the model displayed in the classroom for frequent reference;
- provides sufficient opportunities for students to use the strategy;
- encourages the use of the IDEAL model for independent problem solving;
- ensures students understand the value and importance of making estimations based on sound reasoning.

Considerations

IDEAL problem solving:

- requires students to see that all problem solving has similar components, with some specific variations (e.g., compare the scientific problem-solving model with one for the social sciences);
- requires students to know appropriate techniques for accurate estimating in mathematics;
- helps students see mathematics as more than calculation.

Illustrations

Elementary

- *make inferences and convincing arguments that are based on data analysis* (7m103)

Students gather population statistical data from a previous Canadian census and use the IDEAL model to predict whether population will increase in the following five years. Students then check their estimate with current census information.

Secondary

- *demonstrate and use both decision-making and assertion skills with respect to media influences and peer pressure related to alcohol, tobacco, and other drugs* (HL3.05)

The teacher guides students through the steps of the IDEAL model, using a relevant drug-related problem. The model should include the following steps: identifying the problem; discussing the decision options and their consequences; evaluating the options and selecting a choice; acting on the decision; learning from the decision.

Issue-Based Analysis

Description

Issue-based analysis is a strategy used to develop the higher-level thinking skills of analysis and synthesis. It involves summarizing the material, distinguishing fact and opinion, identifying sources, and analysing biases in primary and secondary source materials commonly using a visual organizer or frame. In issue-based analysis, students generate

questions to examine issues, especially of current interest, when connections to the present and implications for the future are required.

Method

The teacher:

- selects appropriate material that is issue-based;
- uses prepared frames or organizers to help students analyse material;
- demonstrates how to do issue-based analysis;
- helps students understand that most issues are complex and frequently include diverse points of view;
- helps students look at the consequences and long-term effects of many decisions.

Considerations

Issue-based analysis:

- often investigates areas that may contain sensitive issues for certain populations;
- requires experience and practice in balancing subjective and objective analysis.

Illustrations

Elementary

- *investigate a cause-and-effect relationship between the environment and the economy* (4z61)

Students select an issue card, and then complete the issue analysis chart. In the centre oval, students identify the issue. In the surrounding ovals, students make points "pro" or "con" as they arise in the discussion.

Secondary

- *locate and use explicit information and ideas from texts in forming opinions and developing generalizations* (LI1.04P)

Students examine a news story and an editorial/opinion piece based on the same current event. The students review the difference between fact and opinion and identify examples of each in the samples. Students then write a paragraph, stating their conclusions on the same topic with supporting evidence.

Lateral Thinking

Description

Lateral thinking describes a process of solving problems in divergent or unorthodox ways. This type of thinking recognizes that the mind perceives things from many angles and is thus able to generate many creative solutions to problems and challenges. Lateral thinking involves reviewing the problem, situation, or challenge from multiple perspectives, often by breaking up the elements and recombining them in a different way (perhaps randomly). It develops skills in bringing the positive and negative aspects of a situation to the fore and evaluating the whole picture.

Method
The teacher:
- ensures that as many perspectives as possible are brought forward so that all aspects may be considered;
- helps students to break up the elements of a problem or situation and recombine them in a different way;
- models the process by using it on a regular basis in the classroom
- shares significant examples of lateral thinking used to solve problems in real-life situations;
- helps students to internalize the process by looking at all perspectives in order.

Considerations
Lateral thinking:
- can be applied as a whole-class exercise, in small groups, or by individual learners;
- can be applied in any subject area;
- may be understood as a series of steps (e.g., Edward de Bono's model: escaping preconceptions, applying conceptual stepping stones to move ahead, and juxtaposing ideas);
- involves the recognition of dominant ideas that polarize thinking (e.g., cultural bias, historic patterns);
- requires consistent practice to make it a viable strategy for daily problem solving.

Illustrations
Elementary
- *investigate the bio-economical costs and benefits of the recycling and waste-disposal industries* (7s19)

Students brainstorm a list of the various kinds of materials they routinely recycle. Working in small groups, each group is assigned one type of material and used lateral thinking to investigate possible ways to recycle this material economically. After each group shares its findings, students look at the original list and identify the advantages and disadvantages of recycling each material.

Secondary
- *discuss the advantages and disadvantages of consumer credit* (PF2.40)

On the chalkboard the teacher writes "Neither a borrower nor a lender be" (*Hamlet*, 1.3). The teacher asks the students: "What did Shakespeare mean by this? If we were to apply this quote to the use of credit, what would it mean?" In groups of four, students use lateral thinking to list the benefits and challenges of credit. Over the next few days, they add to the list and evaluate further information gathered through interviews with family members, neighbours, teachers, or community members. The teacher combines groups to merge the lists. The combined lists are then shared with the whole class, and each of the benefits and challenges is discussed.

Manipulatives

Description

Manipulatives are materials that appeal to the senses and can be touched, moved about, and rearranged. Working with manipulatives helps bridge the gap between the concrete and abstract and strengthens the ability to generalize and transfer ideas. The process enables students to recognize and use patterns as a problem-solving tool and creates opportunities for them to explore, justify, represent, solve, construct, investigate, and predict. This strategy allows for different levels of cognitive development and encourages students to think about concepts while working with the materials. Manipulatives promote communication of ideas and provide a problem-solving and decision-making focus linked to real-world learning.

Method

The teacher:

- makes a wide variety of manipulatives available and promotes choice in using them;
- guides students to use manipulatives to connect new learning to previous learning;
- selects a variety of appropriate materials for expectations and age levels;
- provides opportunities for students to communicate their understanding through talk, pictures, and writing;
- probes to detect faulty reasoning.

Considerations

Manipulatives:

- may require that materials be adapted to different concepts;
- require organized storage for easy access;
- require consideration of the durability of equipment;
- require the maintenance and updating of the manipulative collection (e.g., film container cylinders, coloured macaroni, buttons, rocks);
- suit all developmental stages.

Illustration

Elementary

- *identify the Canadian provinces, territories, and their capitals on a map* (3z45)

Students cut out the shapes of the provinces and territories and reassemble them to form a jigsaw puzzle map of Canada.

Secondary

- *describe the materials used and steps followed in the creation of a particular artwork* (VA1.02)

A collection of objects used in the creation of a particular artwork (e.g., models, art materials, preliminary drawings, and art reproductions) is arranged for easy viewing. Based upon their observations and previous personal knowledge, students then rearrange these objects or images in the order they think the artist used.

Map Making

Description

Map making involves representing physical, demographic, or numerical data through visual formats (for example, maps, globes, diagrams, time lines). The strategy provides students with an opportunity to use visual representation of data to organize and understand information. When students sketch out preliminary understandings or representations, map making becomes a tool for thinking, planning, and making decisions. Students can invent their own symbols and create legends as well as learn the universal symbols used in traditional map making. Map making enables students to construct understanding of their physical and social worlds, recognize new patterns, and synthesize ideas.

Method

The teacher:

- assists students in constructing maps as a way of representing data and organizing ideas;
- models sketching, hypothesizing, and trial-and-error representation;
- assists students in verifying sketches and data collected;
- teaches components, conventions, and terminology of maps;
- explains the history, uses, and applications of a variety of map formats.

Considerations

Map making:

- may involve sketching as an appropriate way of constructing and representing reality;
- is relevant in geography, history, and physical sciences as well as other disciplines (e.g., mapping the scene in a novel; mapping the stage in a play; mapping the electrical wiring in design technology: mapping the problem-solving process in mathematics);
- encourages and supports visual learners;
- may involve colour coding with mapping to enhance retention and recall of information;
- may involve the use of appropriate software (e.g., drawing programs, multimedia, animations) and web-based applications.

Illustrations

Elementary

- *make and read simple maps of familiar areas in their local community* (1z43)

After working together to create a map of the classroom, students are asked to draw a map of the school that includes all applicable aspects of map making (e.g., legend, symbols, scale).

Secondary

- *use cartographic conventions correctly when constructing maps* (M12.13B)

Using appropriate conventions, students create a map of Canada's ecozones and detail a planned route through each zone that uses a variety of methods of transportation.

Media Analysis

Description
Media analysis is the examination of commercial media works for the purpose of decoding the work – that is, determining the purpose, intended audience, mood, message, and techniques used to create the work. Media analysis promotes critical thinking and evaluation of everyday media and allows students to use media techniques to create and enhance their own works. Key concepts of media analysis include recognition that media construct reality, have commercial implications, contain ideological and value messages, and have social and political implications. Students must be able to make a conscious critical assessment of the media by maintaining a critical distance and resisting manipulation by media producers.

Method
The teacher:
- teaches the skills necessary to conduct an investigation into all facets of media (e.g., critical analysis, detecting bias and value messages, identification of techniques, audience, and format);
- selects and presents a variety of media works for the purpose of critical analysis;
- guides discussion to extract the aims of the media work and the success of the techniques used to achieve the aims;
- provides opportunities to construct as well as to deconstruct media works.

Considerations
Media analysis:
- requires frequent and varied opportunities for analysis to extend student thinking;
- requires consideration of issues of copyright when viewing and presenting media works;
- requires the development of a class atmosphere that considers the emotional nature and response to some media.

Illustrations
Elementary
- *identify and analyse the formulas used in different categories of media works* (8e64)

Students view several short documentaries to identify effective methods of providing information and suggesting perspectives.

Secondary
- *identify factors that influence media production, distribution, and advertising* (MD1.04P)

Students read or listen to a selection of advertising slogans/songs on a theme. The teacher and students discuss one of the selections, identifying the viewpoint of the author/songwriter and how it is presented poetically. In small groups, students choose one of the advertising slogans/songs from the selection, analyse it in the same way as the previous selection, present it to the class, and then create their own slogans/songs.

Mental Calculation

Description
Mental calculation is a method whereby students calculate in their head a series of operations to solve problems. Mental calculations may be used to assist with quick recall and memorization and as an aid to check whether solutions arrived at by using a calculator are likely to be correct. An artist may use mental calculations to determine the percentage of warm colours in relation to cool colours to achieve the desired effect. A runner may use mental calculations to determine the average time taken to run a set distance over a two-week period. Mental calculations are often directed by the teacher and based on the skill level and previous knowledge of the students. Students build confidence and expertise as they build skills using mental calculation. Mental calculations can take the form of a game.

Method
The teacher:
- carefully constructs the activity to match the ability level of the student;
- establishes and communicates a transferable purpose for the activity (e.g., helps students find patterns);
- sets small tasks initially;
- encourages students to voice how they think (e.g., "How did you get that answer?").

Considerations
Mental calculations:
- require a high level of focus on the part of the student;
- may offer some students opportunities for immediate success or cause or increase mathematical anxiety in other students;
- need constant practice.

Illustrations
Elementary
- *mentally add and subtract one-digit and two-digit numbers* (3m28)

The teacher creates a math bingo game. Students complete their bingo cards by correctly answering simple number problems presented orally by the teacher (e.g., "What is 15–8?").

Secondary
- *solve simple problems using the formulas for the surface area and volume of prisms, pyramids, cylinders, cones, and spheres* (MG2.01)

Small groups of students create problem cards. On one side of the card they write the dimensions of a shape and the value to be calculated (volume or surface area), and on the other side they write the correct answer. The teacher uses the cards as a whole-class activity to practise mentally solving surface area and volume problems.

Metacognitive Reflection

Description
Metacognitive reflection (metacognition) is a process in which students think about their thinking. Metacognitive reflection allows students to step outside the situation to examine the thinking process itself and gain control over their thinking and behaviour. Students use metacognitive reflection to set goals and plan actions ("Did I use a successful strategy the last time I encountered this problem and what should I do now?"), monitor progress and adjust performance ("What are some other solutions to this problem?"), and evaluate the final outcome ("What have I learned from this experience?"). Metacognitive reflection helps students identify their strengths and areas for growth, make connections to prior knowledge and past experience, and transfer their skills and knowledge across all subjects and curriculum areas.

Method
The teacher:
- models his or her own thinking process aloud or through written work;
- models effective questioning strategies and acknowledges skilful thinking;
- encourages students to listen actively, answer each other, and draw each other out;
- encourages conscious planning, monitoring and evaluation of thinking processes on a daily basis;
- encourages the use of a thinking log to record reactions to and reflections about learning that has occurred.

Considerations
- Metacognitive reflection:
- varies from student to student based on the ability to think introspectively, personality characteristics, and learning and language facility;
- requires that students respect different viewpoints;
- requires that these skills begin to be developed at an early age and are consistently developed throughout schooling.

Illustrations
Elementary
- *identify their own feelings and reactions in various situations, and compare them with those of a character they have portrayed* (4a68)

Students are asked to work in role, then articulate how their own personal response to the situation differs from the character they were portraying.

Secondary

- *demonstrate the ability to apply self-assessment strategies to improve their interdisciplinary products and activities* (IE2.03)

Students reflect on their research assignment in their journals. They first record how their interdisciplinary project developed. They then identify specific learning strategies they employed, diagnose their effectiveness, suggest additional strategies they might use next time, and assess how effective their learning was in meeting the goals of their research assignment.

Mind Map

Description
A mind map is a visual note-making strategy that allows students to sketch a central idea of their topic and then create tree-like branches of additional information surrounding the central one. Mind maps can display key concepts and relationships, but differ from concept maps in that they are much more global in their approach. Mind maps can generate ideas or test prior knowledge, allow the free flow of ideas, and organize ideas in clusters on a page for understanding. The central element or focus is at the centre of the page; key words represent ideas and are connected to the central focus with lines. Colours and symbols may be used to make associations and provide mnemonic signals for recall.

Method
The teacher:
- models the use of mind maps on a regular basis to access prior knowledge or generate new ideas about a topic;
- provides an environment that allows for risk taking and the free flow of thoughts and ideas;
- uses mind maps as a preparation strategy for planning, writing, and evaluating projects;
- uses a mind map to create a record of a meeting with input from all participants;
- demonstrates how mind maps allow students to build on the ideas of others;
- understands that mind maps are particularly useful for visual learners and stimulate creative input;
- helps students see how mind maps can be used to synthesize information in a visual format (e.g., after reading a novel, create a mind map of important aspects for a report).

Considerations
Mind maps:
- may be used for whole-class, small-group, or individual work;
- may be used to demonstrate that the separate parts of a presentation or visual display are united into a whole around a central theme or idea;
- enable all ideas to be represented initially, with accuracy and relevance reserved for later renditions.

Illustrations

Elementary

- *recognize and name the warm and cool colours and describe their emotional impact* (3a26)

Students are asked to create a mind map with "Colours" as the central word. The map branches out to identify different colours, then various uses of each colour in their daily lives, and finally their moods and feelings related to the colours and their uses. They make connections among parts of the map to discuss reactions to warm and cool colours.

Secondary

- *assess the impact of technological change and natural change on an ecosystem BY3.01D*

Working in groups, students complete a mind map to display the effect on an ecosystem of forest fire, flood, and the natural infection of one species.

Model Making

Description

Model making is the creation of two- or three-dimensional constructions used to represent ideas and interpretations and demonstrate knowledge and understanding. It emphasizes the importance of information carried by visual, tactile, or concrete features and often attempts to represent mental constructs of the universe (through physical details, shape, dimension, and scale). Model making can be used in all subject areas as a process activity, which may either result in a prescribed representation or operation, or change substantially as it progresses. Materials, experiences, and circumstances can play a major part in revising plans. Model making can be used as a final culminating activity to demonstrate understanding.

Method

The teacher:
- encourages model making as a form of summarizing or representing learning or gaining new information and insight;
- provides information sources and resources that inform details of the model;
- provides a variety of materials and media tools as necessary;
- helps students identify and integrate concepts and skills needed to produce the model;
- encourages conferences with students to develop their ideas and information;
- counsels students so that they plan a project that is achievable.

Considerations

Model making:
- requires a quantity and a variety of materials and resources;
- needs space for storage and display;

- requires monitoring to assist students in using and applying skills in all areas of the curriculum in an integrated manner.

Illustrations
Elementary
- *demonstrate an understanding of the distinguishing features of a country in another region* (6z32)

Students are asked to construct a model of the four main islands of Japan, concentrating on each island's distinguishing features.

Secondary
- *design, draw, and construct series and parallel circuits that perform a specific function* (PH2.08)

Students are supplied with a 6V power source, pieces of wire, four identical light bulbs, and alligator leads. Working in groups, students build two different types of circuits, so that each circuit lights two bulbs.

Oral Explanation

Description
Oral explanation describes a process in which students talk to share their understanding and justify their reasoning. Students may use oral explanation to clarify thinking and become aware of what they know and do not know. Through oral explanation, teachers can assess student understanding and reasoning overtly and quickly. The process builds responsibility and accountability and encourages active listening when students are engaged by a topic.

Method
The teacher:
- models the process;
- creates a secure atmosphere that encourages risk taking and exploration of ideas;
- encourages students to extend their thinking;
- values student efforts and supports the message that we can learn from our mistakes;
- provides oral opportunities in a variety of contexts.

Considerations
Oral explanations:
- require time for students to feel comfortable (time for rehearsal may be helpful, especially when oral presentations are assessed or evaluated);
- require a climate of trust and cooperation;
- require the teaching and reviewing of appropriate audience behaviour (e.g., active listening, politeness).

Illustrations
Elementary

- *demonstrate an understanding of the characteristics of the provinces* (4z35SS)

In small groups, students research different Canadian provinces using an organizer with the following headings: population, natural resources, industries, and cultural contributions. Throughout their research, students break to explain why their province is important to Canada.

Secondary
- *use appropriate language to express opinions and offer advice* (AOR2.02L)

In pairs, students role-play a discussion between an expert and a younger student about the importance of a particular safety issue.

Problem Posing

Description
Problem posing is a component of problem solving whereby students and teachers apply critical and creative skills to define, identify, and develop new problems that challenge the thinking of others. It combines information and ideas from various sources and uses this information in novel ways to deliberately create problems to solve. Problem posing is used to develop flexible thinking (looking at a problem from a variety of perspectives) and to extend thinking by raising questions beyond the obvious or usual ones asked. Effective problem posing encourages divergent thinking and a variety of solutions, answers, and processes.

Method
The teacher:
- models the process of problem posing;
- helps students construct problems that get at the heart of an issue or discipline;
- demonstrates how higher-level problems are developed and composed, often from simpler formulations;
- provides resources and ideas that students can use to create their own problems.

Considerations
Problem posing:
- enables students to experience problem solving in all curricular areas;
- allows all students to engage in both posing and solving problems;
- often requires group activity to brainstorm, analyse, and evaluate problems to be posed;
- may require time to break down complex problems into identifiable constituent problems.

Illustrations
Elementary
- *design, construct, and test a structure that can fly* (6z35)

Students prepare to create a simple paper airplane and report on the airplane's flight. They are asked to identify problems regarding the changes in flight based on different conditions. After creating the plane and running a series of subsequent tests, students make adjustments to the design to better meet those changes.

Secondary

- *demonstrate the ability to follow a recipe, make substitutions, and alter portions as necessary* (PR3.09)

Students are asked to adapt a recipe to accommodate the following problems: the need to change an ingredient not available; to substitute one ingredient for another; to change the number of portions, adjusting both metric and imperial measures.

Problem Solving

Description
Problem solving is a process in which students apply critical and logical thinking to perceive and resolve the gap between a present situation and a desired goal. Problem-solving strategies are used in all grades and subjects to engage students in new learning situations, extend thinking, and communicate ideas. Problem solving is also part of a process of inquiry where students understand a problem, make a plan, carry out the plan, check the results, and communicate the results. Problem solving is applied to authentic tasks based on real-life experiences (for example, following connected instructions in building a structure or overcoming obstacles in pursuing a course of action in the community).

Method
The teacher:
- models and teaches a variety of problem-solving strategies;
- poses a variety of questions throughout the process;
- organizes students and materials to maximize engagement and productivity;
- circulates and observes;
- encourages students to communicate ideas;
- supports and intervenes when necessary;
- provides an environment where it is safe and enjoyable to solve problems.

Considerations
Problem solving:
- requires time for students to feel comfortable with the process;
- benefits from grouping students appropriately;
- may require defining roles within the group;
- requires meeting the needs of individual students;
- develops social and communication skills (e.g., respect, taking turns, listening).

Illustrations
Elementary

- *recognize that a solution to a problem may result in creating new problems in other areas, and that a solution to a problem may be found while one is working on solving a problem in another area;* (7s98)

In small groups, students review their science logs related to matter and materials, energy and control, structures and mechanisms, and/or earth and space systems. Each group identifies unexpected results or problems that arose in their science inquiries and explores possible answers and solutions.

Secondary

- *pose problems, identify variables, and formulate hypotheses associated with relationships* (RE1.01)

Students are given Exhibit A, a photocopy of a set of footprints found outside the mathematics' workroom. As a class, students discuss which characteristics can be determined from the clues (for instance, height and weight) and suggest which methods will work best to solve the identity. Students work in groups with graphing calculators and use data collection to establish a correlation that will help them determine the information about the subject.

Process Notes

Description
The use of process notes is a problem-solving strategy in which students outline in written form the process or steps they used in attempting to solve a problem. Process notes are used in all grades and in all subject areas and are especially useful in mathematics and science. Process notes assist students in recording and assessing their problem-solving strategies as they think about a problem in a different way.

Method
The teacher:
- models using process notes to solve problems;
- schedules regular opportunities for students to make process notes and to share their problem-solving strategies with their peers;
- facilitates an environment where it is safe to share unsuccessful problem-solving strategies;
- encourages the use of visual representations (e.g., concept maps, diagrams) in addition to text when making process notes.

Considerations
Process notes:
- involve the student recording each step in his or her problem-solving process;
- require individual time for students to share problem-solving models;
- develop the concept that problems can be solved in a variety of ways.

Illustrations
Elementary
- *use a knowledge of probability to pose and solve simple problems* (5m124)

Students look at meteorological data from a given period of time and predict the likelihood of specific weather patterns in a given month. Each student records and explains the steps he or she took to make that prediction.

Secondary
- *communicate solutions to problems in appropriate mathematical forms and justify the reasoning used in solving the problem* (NA4.03)

Students brainstorm to discuss the problem and various strategies for solving it. Students then work individually to complete the tasks and record their step-by-step approach to solving the problem.

Semantic Feature Analysis

Description
Semantic feature analysis is a strategy used to help understand and compare the meanings of words or concepts. Students create a grid or chart with a set of words or concepts listed on the left side and the features of the words or concepts, or other criteria, across the top. If the feature or criteria applies to the word or concept, a plus sign (+) is marked in the intersecting square. If not, a minus sign (–) is marked. Students can then use the information in the chart to prepare oral and written reports. Semantic feature analysis may be used in all subject areas to introduce new concepts and words and to help students clarify concepts by examining critical attributes.

Method
The teacher:
- determines that semantic feature analysis is the appropriate methodology to introduce new words or concepts to students;
- works with simple, known concepts at first to help familiarize students with the approach;
- provides support in giving students the chart to conduct the analysis;
- provides support in defining the features or criteria of the word or concepts;
- models how to transfer the chart into a written or an oral report.

Considerations
Semantic feature analysis:
- may use abstract concepts in the later years;
- requires a number of practice/modelling sessions before students become proficient at using this strategy;
- can be difficult for certain students, as it challenges them to generate the critical attributes for comparison.

Illustrations

Elementary

- *evaluate product manuals or help screens focusing on clarity, thoroughness, and general "user friendliness" and identify ways of making the product easier to use* (8s114)

Working with a partner, students complete an evaluation of a help screen, a menu, or a technical manual using established criteria and indicators such as clarity, accuracy, and thoroughness.

Secondary

- *describe the key elements of a variety of systems of government (e.g., Western congressional and parliamentary systems, African single-party systems, Swiss federalism, Swedish social democracy, Russian and Chinese communism, Islamic theocracies* (SE3.02)

Students use a semantic feature analysis to compare a variety of systems of government. They construct a grid with the following down the left hand side: Western parliamentary system, congressional system of the United States, African single-party systems, Swiss federalism, Swedish social democracy, Chinese communism, Islamic theocracies. Across the top of the grid, they identify key criteria: representational government, democratic elections, checks and balances, fixed terms of office.). Students then mark plus and minus signs in the intersecting boxes of the grid to identify the respective features of the systems of government.

Seriation

Description

Seriation is a strategy whereby students put three or more objects or ideas in a linear order based on measurable characteristics or attributes. Seriation is used to develop the ability to compare measurable attributes and identify patterns. It is also used to track growth in logical reasoning abilities, problem-solving strategies, and observation skills. Seriation can assist students whose language development does not yet allow them to express and explain their thinking. It makes visible the student's ability to order and compare by allowing the use of concrete materials rather than working in the abstract. Seriation can be applied to experiences where it is important to sequence events in logical order, such as in the performance of a play, conducting an experiment in a prescribed order, or following the daily school timetable in a predetermined manner.

Method

The teacher:
- provides graphic organizers (e.g., ranking ladder or sequence chart) to assist students;
- varies the number of objects or ideas to be ordered;
- provides appropriate concrete materials to be ordered;
- observes and records the process as well as the result of the task;
- provides feedback to the student.

Considerations

Seriation:

- requires that students are able to compare two ideas or objects as a prerequisite;
- requires that criteria be clearly defined.

Illustrations

Elementary

- *measure and compare the length, weight, mass, capacity, and temperature of objects* (Km2)

Students order a number of familiar objects according to size. They also compare the size of the objects to their weight and prepare a simple graph to display their findings.

Secondary

- *compare electrical energy production technologies including risks and benefits* (PH3.03)

Students place different types of electrical energy production in a logical order in three categories (based on statistics for cost of production, safety risks, and environmental considerations). Students then choose the best method for electrical energy production and justify their answers.

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Statistical Analysis

Description

Statistical analysis involves the analysis of numerical data (statistics) that have been obtained through observation. Statistics can be used to make inferences – that is, to draw conclusions based on a relationship that has been identified between variables in a set of data. Generally, statistics are used to make inferences about a large group (population) based on observations of a small group (sample). The sample must be representative of the data being studied. Statistical analysis may form the basis of decision making when students analyse data they have gathered. The process involves understanding basic principles and terminology of research design and analysis, such as types of bias in sampling and aspects of validity and reliability of data.

Method

The teacher:

- teaches the basic principles of research design and methodology;
- introduces the terminology and definitions that relate to statistical analysis;
- provides opportunities for students to design relevant research projects and analyse the results;
- provides real-life problems for students to investigate;
- allows for the whole class or small groups to gather and analyse the data;
- provides appropriate software such as spreadsheets and databases to assist in the recording and manipulation of the data;

- provides opportunities for students to present their findings to a larger audience.

Considerations

Statistical analysis:

- may have either a conceptual focus or be concerned with real-life problems;
- relies on inferences and assumptions that can lead to divergent results, since analysts may proceed from different assumptions or claim assumptions that do not apply to the research situation.

Illustrations

Elementary

- *demonstrate an understanding of the different connections Canada shares with its trading partners* (6z25)

Students choose one of Canada's trading partners to research. Using statistical data from an appropriate reference source (e.g., almanac), students examine export and import patterns between Canada and this trading partner over a specified period of time. Students explain the historical patterns and predict future trends.

Secondary

- *use statistical operations appropriately when analysing geographic information* (M12.14B)

Students make inferences about future population growth and immigration patterns in various Canadian cities based on current and historical census data (for instance, data from Statistics Canada). The students chart the information in appropriate graph formats to visually depict their conclusions.

Think Aloud

Description

Think aloud is a strategy whereby the teacher or student verbalizes (self-talks) a thinking/learning process during its use. Think aloud is used as a strategy for all students when learning a difficult or challenging concept and reinforcing the learning. It is a demonstration of thinking that can be assessed by teacher observation in all curriculum areas. To assist language learning (ESL), think aloud can be conducted as either an individual interview or a peer interview, with data collected through an audio or video recorder, checklist, or record sheet.

Method

The teacher:

- uses the strategy to demonstrate thinking and learning;
- uses the strategy to model and teach elements of a process;
- helps students identify when to use the strategy.

Considerations

Think aloud:
- could be distracting to other students who are concentrating;
- requires concentration and focus throughout the process.

Illustrations

Elementary

- *use symbols, colour and cardinal directions on maps of Canada* (2z36)

Students look at a large map of the simplified school floor plan and pose questions to the teacher (e.g., If you were at "x" and wanted to go to "y," which way would you go?). The teacher demonstrates to the class how to think and talk out loud to solve the problem. Students then work in pairs to do the same activity using a map of Canada.

Secondary

- *make pronouns agree with their antecedents in number and gender* (WR5.09B)

The teacher reviews the correct use of pronouns, focusing on person and case. The teacher then works with the class to orally edit an error-riddled and humorous narrative.

Visual/Graphic Organizers

Description

Visual/graphic organizers are the varied types of frames, matrices, grids, webs, and similar forms used to help students structure thinking and present knowledge in a visible format. Visual/graphic organizers assist students in accessing prior knowledge and connecting it to new concepts learned. Organizers help students apply higher-order thinking skills such as comparing and synthesizing information and provide vehicles for the analysis of information such as cause and effect and sequencing. Visual organizers can provide organizational support for independent work, an opportunity to collect thoughts related to a topic before starting a task, and a way to review and consolidate thinking after the completion of a topic or reading.

Method

The teacher:
- models and demonstrates the use of visual organizers on a consistent basis;
- introduces a wide variety of visual organizers for various practical applications;
- uses visual organizers to access prior knowledge before starting a unit or topic;
- uses visual organizers to show connections among concepts in numerous areas (e.g., science and art, classical studies and geography);
- uses a variety of organizers to stimulate thinking or consolidate learning.

Considerations

Visual/graphic organizers:

- present essential information, thereby simplifying and structuring the learning task;
- make it easier to extrapolate and remember key ideas;
- can be a dynamic form of "thinking out loud" and problem solving which changes according to the learning context, rather than pre-set pages that students complete;
- can be used in all subject areas.

Illustrations

Elementary

- *locate relevant information about the regional interests of each colony, using a variety of sources* (8h10)

Students submit a fishbone organizer indicating the major headings and subheadings (e.g., economic advantages or disadvantages) they have developed as part of their inquiry project into the regional interests of the colonies that joined Confederation.

Secondary

- *use knowledge of elements of drama, such as plot and subplot, character development, and revelation* (L12.01P)

Students read a story with clearly developed characters. They then create and complete an organizer, using a sample with categories such as character's name, character traits, and techniques used to reveal character, and textual evidence.

Writing to Learn

Description

Writing to learn describes a process in which students develop new knowledge and understanding through writing in a variety of formats. Writing to learn may be used by the teacher to assess students' understanding in a particular area of study and by students to assess their own understanding. Writing to learn allows students to draw on prior knowledge, engage in new learning experiences confidently, and communicate new learning. It supports reflection and improves communication skills by helping students focus and synthesize their thoughts. Students can use the strategy as a follow-up to a lesson to summarize text, responses, and process.

Method

The teacher:

- models reflection, as part of the writing process (often by modelling thinking aloud);
- models and teaches a variety of types of writing and how they support learning and communication;
- makes the purpose for writing clear;
- provides ample time for students to be successful;
- encourages and supports an atmosphere for risk taking.

Considerations

Writing to learn:
- requires time for students to talk in the pre-composition stage and to share their writing;
- may include the use of illustrations to represent thoughts;
- requires time for students to extend their reflections and feel comfortable writing in different program areas.

Illustrations

Elementary
- *communicate ideas and information for a variety of purposes and to specific audiences* (6e1)

Students are asked to report in writing on a local community event. Through peer conferencing, students clarify their messages. The class decides which pieces should be submitted to the local community newspaper.

Secondary
- *write short, structured compositions of personal relevance* (AWR1.02)

Using magazines and illustrations, students create a visual interior arrangement of an ideal room. Students write a descriptive paragraph based on the teacher's model, reinforcing previously discussed vocabulary.

A Selected Bibliography

Teaching/Learning Strategies

This bibliography presents selected English-language articles, books, and other printed sources – published between 1996 and the present – regarding teaching/learning practices and principles in schools. This list is intended to assist teachers designing instructional units using the *Ontario Curriculum Unit Planner*. While every effort has been made to provide appropriate information for educators, this list is not intended to be a definitive treatment of the topic. For additional online information, please check the Planner website **www.ocup.org**.

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