



Standards for Information and Communication Technologies (ICT)

Kindergarten to Grade 12

September 2002

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Kindergarten to Grade 12

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INTRODUCTION

*Increasing reliance on computers, telecommunication networks,
and information technologies in society and the workplace
makes it essential for students to become computer literate
and to develop information literacy skills.*

(Program Planning and Assessment, 9)

Information and Communication Technologies (ICT) offers opportunities to change how students acquire and demonstrate knowledge and how teachers assist learning. ICT provides varied learning opportunities, allowing learners to locate information, to share ideas, and to work with others in ways not previously available to them. Learning Information and Communication Technologies skills is not enough. Students must apply this learning, within the context of the Ontario Curriculum, to solve problems, to make decisions, to develop projects, and to communicate.

Role of Information and Communication Technologies (ICT)

ICT can serve as a learning tool by providing students with meaningful opportunities to grow as learners and to develop essential academic and life skills. These include:

- | | |
|---|---|
| <input type="checkbox"/> critical thinking | <input type="checkbox"/> co-operation |
| <input type="checkbox"/> sharing | <input type="checkbox"/> flexibility |
| <input type="checkbox"/> self-confidence | <input type="checkbox"/> sensitivity |
| <input type="checkbox"/> collaboration | <input type="checkbox"/> creativity |
| <input type="checkbox"/> responsibility | <input type="checkbox"/> communication |
| <input type="checkbox"/> synthesizing information | <input type="checkbox"/> sense of humour |
| <input type="checkbox"/> problem solving | <input type="checkbox"/> self-motivation |
| <input type="checkbox"/> adaptability | <input type="checkbox"/> divergent thinking |
| <input type="checkbox"/> decision making | <input type="checkbox"/> self-reflection |

As part of a balanced classroom program, ICT can play an integral role in fostering the development of these skills and contributing to the success of all students.

ICT is a tool, not an end in itself. The Ontario Curriculum addresses ICT in several ways. ICT learning expectations are identified across all subject areas, and ICT skills are woven into all curriculum areas and courses of study. ICT is embedded into research and inquiry skills. Students and staff are expected to use ICT as a learning tool.

Equitable Access

Information and Communication Technologies can enable students to work and express ideas in an environment relatively free of gender stereotyping and other biases. In comparison with other forms of communication, electronic networks have the greatest potential for allowing students to interact equitably regardless, for instance, of gender or exceptionality. They also allow students with any impediment to social interaction to interact with others in ways that build confidence. Learning programs integrating ICT are crucial, especially to students who, because of background or economic circumstances, do not have access to Information and Communication Technologies in their homes. Equity of access to information, instruction, and technologies in schools will improve learning for all students, including those with special needs. (*Information Studies: Kindergarten to Grade 12, 10*)

When incorporating ICT into the classroom, it is essential to address the following expectations.

All students will:

- have equitable access to ICT
- learn about both the positive and negative impact of ICT on our global and local communities
- develop strategies to utilize ICT to create inclusive works
- adhere to the TDSB Equity and Human Rights policies regarding anti-discrimination and anti-harassment

ICT Standards

Standards provide a road map for students, teachers, and administrators, indicating what students will achieve. They provide consistency for students' achievement of these skills throughout the TDSB. Clear standards give teachers a guide for assessing and evaluating the achievement of these skills.

These standards are not a course of study, nor are they intended to stand alone. Teachers will infuse the ICT standards within all subject curriculums, as ICT skills are best learned within the context of subject applications. Activities, projects, and problems that replicate real-life situations are effective ways of learning these skills.

Description of the Standards in This Document

These standards are a guide for teachers and students to be used in conjunction with each subject curriculum. ICT skills are listed grade by grade. Teachers will determine when it is appropriate to introduce the skills, based on the students' needs and maturation. Students need to practise and use these skills in a variety of areas throughout the curriculum. This guide **indicates the grade level by which a student will master the skills.**

Format

The document offers a page-by-page, per-grade description of ICT skills. The Grade Reference Charts demonstrate the continuity in the development of these skills from Kindergarten to Grade 12 and allow educators to quickly review the skills acquired in previous grades, or those needed in future grades. Combining these skills with those of Information Literacy will help students integrate both sets of skills in their learning and provide more opportunities for developing critical-thinking skills.

General Standards

The general standards are organized into the following strands:

Social and Ethical Issues

Students understand the ethical, cultural, and societal issues related to ICT.
Students will practise responsible use of ICT systems, information, and software.

Research and Inquiry

Students use and transfer ICT knowledge to locate, retrieve, organize, manipulate, analyze, synthesize, and evaluate information for specific research tasks.^Δ

Communication and Collaboration

Students collaborate using ICT. Students use ICT to communicate knowledge in a variety of forms and media, for different purposes and audiences.

Productivity and Applications

Students understand how to use the range of ICT tools for research, inquiry, problem solving, decision making, creativity, communication, and collaboration.

Critical and Creative Thinking

Using ICT, students will enhance their critical and creative thinking skills, including problem solving and decision making.

Note: Critical and creative thinking skills are embedded in each of the other four strands. They form an essential component of the learning of all students, not just within ICT, but in all areas of the curriculum.

Specific Skills

Specific skills are listed under each of four general standards in each grade. In many cases illustrative examples have been provided to clarify meaning and provide a curricular context for teachers and students. The examples provided are intended to clarify each standard and to reinforce that the learning of ICT skills must occur within the context of the Ontario Curriculum.

In the Grade 9–12 section of the document, some of the examples appended include a course code. Again, the intention is to provide a curricular context for the integration of ICT.

It is recognized, and indeed encouraged, that many other examples from many other courses of study can be utilized to achieve the attainment of these standards.

Implementation of the Standards

In many schools across the TDSB, teachers are achieving these standards with their students through unique and interesting learning opportunities. It is very important to remember that these skills cannot be taught in isolation, but must be integrated within the curriculum. When properly used, ICT becomes transparent to the learning task at hand. It is used for its ability to complement and extend student learning, not simply because it is there.

Staff development opportunities for teachers are necessary to demonstrate how these standards are incorporated into the classroom curriculum. Sessions to facilitate sharing of ideas, for teachers and central staff, should be ongoing.

Schools need to integrate ICT standards in the appropriate context, and personalize the experience. Staff need to discuss and plan the location of ICT resources and facilitate student access to ICT so that students can integrate these skills into daily classroom activities and projects.

Who can help with implementation?

- Teachers, by sharing ideas and learning opportunities to infuse ICT into their curriculum
- Teacher Librarians and Academic Services Associates and Contacts, by supporting teachers and students in connecting ICT with the curriculum
- Central District Wide Coordinators and Instructional Leaders in all subject areas, including Library and Learning Resources and Academic Services IT Leaders, by providing teachers and students with professional development and support
- Toronto District School Board staff, by providing staff development for teachers, ongoing support for sustaining technology, access to contemporary technologies, software, and telecommunication networks
- Parents, by providing support
- Administrators in the school, by providing support and planning

How do ICT Standards fit with other Toronto District School Board planning?

The Information and Communication Technologies Plan requires the development and implementation of these standards.

Evaluation templates in the School Improvement Plan will require teachers and administrators to indicate what they are planning and how they will infuse Information and Communication Technologies and Information Literacy skills in the curriculum.

Indicators for assessment of Information and Communication Technologies in the classroom are consistent with these standards. As on-line learning opportunities become more prevalent, students will need to achieve these standards in order to use on-line learning efficiently and effectively.

Kindergarten

Social and Ethical Issues

Students understand the ethical, cultural, and societal issues related to ICT.

Students practise responsible use of ICT systems, information, and software.

By the end of Kindergarten, students will:

- ❑ respect the members of a group when sharing a computer (*e.g., take turns when sharing a mouse*);
- ❑ with assistance, recognize and begin to practise equitable use of ICT;
- ❑ act in a responsible manner when using ICT (*e.g., keep food and drink away from the computer*).

Communication and Collaboration

Students collaborate using ICT. Students use ICT to communicate knowledge in a variety of forms and media, for different purposes and audiences.

By the end of Kindergarten, students will:

- ❑ explore drawing tools;
- ❑ begin to communicate ideas using pictures and text (*e.g., use KidPix to retell a personal event or story*).

Research and Inquiry

Students use and transfer ICT knowledge to locate, retrieve, organize, manipulate, analyze, synthesize, and evaluate information for specific research tasks.^Δ

By the end of Kindergarten, students will:

- ❑ begin to associate ICT as a source of information (*e.g., to answer questions and search for pictures*);
- ❑ begin to investigate information pictorially (*e.g., identify and discuss images*).

Productivity and Applications

Students understand how to use the range of ICT tools for research, inquiry, problem solving, decision making, creativity, communication, and collaboration.

By the end of Kindergarten, students will:

- ❑ begin to explore tool software (*e.g., KidPix*);
- ❑ begin to use tool software to solve problems and to explore concepts (*e.g., sort stamps by their properties*);
- ❑ launch applications found on the computer desktop;
- ❑ identify parts of the computer (*e.g., monitor, mouse, keyboard*).

Critical and Creative Thinking

Using ICT, students will enhance their critical and creative thinking skills, including problem solving and decision making.

Grade 1

Social and Ethical Issues

Students understand the ethical, cultural, and societal issues related to ICT.

Students practise responsible use of ICT systems, information, and software.

By the end of Grade 1, students will:

- ❑ work co-operatively with peers when using ICT (*e.g., build on the ideas of others*);
- ❑ recognize and practise equitable use of ICT (*e.g., ensure equitable access and use for both boys and girls*);
- ❑ demonstrate care for ICT equipment (*e.g., handle and store CD-ROMs appropriately*).

Communication and Collaboration

Students collaborate using ICT. Students use ICT to communicate knowledge in a variety of forms and media, for different purposes and audiences.

By the end of Grade 1, students will:

- ❑ create a diagram using drawing tools to depict a personally significant place (*e.g., classroom, park, bedroom*);
- ❑ with assistance, communicate ideas and information using pictures and text (*e.g., publish a narrative using KidPix SlideShow*);
- ❑ work collaboratively with peers (*e.g., assist others, share ideas, offer peer teaching and troubleshooting*).

Research and Inquiry

Students use and transfer ICT knowledge to locate, retrieve, organize, manipulate, analyze, synthesize, and evaluate information for specific research tasks.^Δ

By the end of Grade 1, students will:

- ❑ use question-starter words (*e.g., develop 5-W questions to guide searches about the needs of animals*);
- ❑ read visuals to discover information (*e.g., examine pictures of birds to discover common characteristics*);
- ❑ explore multimedia programs (*e.g., use the sound features of a story CD-ROM to learn new vocabulary*).

Productivity and Applications

Students understand how to use the range of ICT tools for research, inquiry, problem solving, decision making, creativity, communication, and collaboration.

By the end of Grade 1, students will:

- ❑ accomplish curriculum-based tasks by using tool software (*e.g., create a pictograph in KidPix*);
- ❑ begin to edit text and images within a document (*e.g., modify colour of font, add clip art, erase images*);
- ❑ activate ICT (*e.g., turn on monitor, find applications, print*);
- ❑ begin saving files and opening previously saved work.

Critical and Creative Thinking

Using ICT, students will enhance their critical and creative thinking skills, including problem solving and decision making.

Grade 2

Social and Ethical Issues

Students understand the ethical, cultural, and societal issues related to ICT.

Students practise responsible use of ICT systems, information, and software.

By the end of Grade 2, students will:

- ❑ demonstrate care and use of equipment including peripherals (*e.g., use headphones appropriately*);
- ❑ practise equitable and balanced use of ICT (*e.g., support access for students with different learning styles and abilities*);
- ❑ identify the role ICT plays in everyday life.

Research and Inquiry

Students use and transfer ICT knowledge to locate, retrieve, organize, manipulate, analyze, synthesize, and evaluate information for specific research tasks.^Δ

By the end of Grade 2, students will:

- ❑ identify information needs prior to research (*e.g., chart prior knowledge and identify new learning needs using a KWL chart*);
- ❑ find information from print and/or preselected electronic resources (*e.g., identify and listen to the sounds of woodwind instruments*);
- ❑ make simple notes to record and organize information electronically (*e.g., use a teacher-prepared template to record information about family traditions*).

Critical and Creative Thinking

Using ICT, students will enhance their critical and creative thinking skills, including problem solving and decision making.

Grade 2

Communication and Collaboration

Students collaborate using ICT. Students use ICT to communicate knowledge in a variety of forms and media, for different purposes and audiences.

By the end of Grade 2, students will:

- use drawing tools to create images as part of a presentation in order to demonstrate and share knowledge about a specific curriculum topic (*e.g., the life cycle of a butterfly*);
- process information from more than one source and retell what has been discovered * (*e.g., illustrate information learned from a non-fiction text*);
- use e-mail with assistance (*e.g., compose a class e-mail message to thank a special classroom visitor*).

Productivity and Applications

Students understand how to use the range of ICT tools for research, inquiry, problem solving, decision making, creativity, communication, and collaboration.

By the end of Grade 2, students will:

- accomplish curriculum-based tasks by using tool software (*e.g., create a simple report comparing the properties of liquids and solids*);
- edit text and images within a document (*e.g., modify font, style, and image size*);
- choose appropriate applications to complete tasks;
- use text to communicate thoughts, ideas, or feelings (*e.g., use word processing software to create a story, poem, or letter*);
- identify peripherals and their use (*e.g., printer, scanner, digital camera*);
- open files from, and save files to, a designated folder.

Critical and Creative Thinking

Using ICT, students will enhance their critical and creative thinking skills, including problem solving and decision making.

Grade 3

Social and Ethical Issues

Students understand the ethical, cultural, and societal issues related to ICT.

Students practise responsible use of ICT systems, information, and software.

By the end of Grade 3, students will:

- ❑ demonstrate responsibility and an awareness of appropriate conduct when using ICT (*e.g., follow class procedures for logging on and off computers*);
- ❑ demonstrate understanding of the importance of equitable and balanced use of ICT;
- ❑ respect the work and privacy of others (*e.g., recognize the difference between personal and public file folders*);
- ❑ demonstrate awareness of the functions and uses of ICT.

Research and Inquiry

Students use and transfer ICT knowledge to locate, retrieve, organize, manipulate, analyze, synthesize, and evaluate information for specific research tasks.^Δ

By the end of Grade 3, students will:

- ❑ begin to formulate questions to guide research;
- ❑ enter simple search words to locate information (*e.g., search for books by a favourite author in a library catalogue*);
- ❑ explore topics using a variety of resources (*e.g., examine electronic encyclopedias, library catalogues, and teacher-selected Internet sites to discover information about a specific topic*);
- ❑ summarize data by recording key words and ideas from gathered information (*e.g., make jot notes while searching an on-line encyclopedia for information*);
- ❑ enter data into teacher-selected organizers to organize and review information (*e.g., compare and contrast by using graphic organizers such as Venn diagrams, T-charts*);
- ❑ begin to self evaluate the research process (*e.g., ask “Did I use a variety of resources?”*).

Critical and Creative Thinking

Using ICT, students will enhance their critical and creative thinking skills, including problem solving and decision making.

Grade 3

Communication and Collaboration

Students collaborate using ICT. Students use ICT to communicate knowledge in a variety of forms and media, for different purposes and audiences.

By the end of Grade 3, students will:

- ❑ create visual images by using paint and draw programs for a particular audience and purpose* (*e.g., explore the concept of lines of symmetry in two-dimensional shapes*);
- ❑ begin to share information using graphic organizers (*e.g., Venn diagram to compare characteristics of urban and rural communities*);
- ❑ with assistance, begin to share ideas and information using tool software (*e.g., AppleWorks Slideshow to explain how pioneers used natural resources*);
- ❑ begin to communicate electronically with people inside and outside the classroom (*e.g., communicate with e-pals on TEL*).

Productivity and Applications

Students understand how to use the range of ICT tools for research, inquiry, problem solving, decision making, creativity, communication, and collaboration.

By the end of Grade 3, students will:

- ❑ accomplish curriculum-based tasks by using tool software (*e.g., create a report explaining how different features of plants help them survive*);
- ❑ edit text and images within a document (*e.g., use spell-check, format headings, place and modify images to enhance presentation of information*);
- ❑ begin to use and apply data-management software (*e.g., use spreadsheets to construct bar graphs and pictographs*);
- ❑ navigate within a document, CD-ROM, or software program that contains links;
- ❑ begin to send ideas and information using e-mail;
- ❑ begin to develop keyboarding skills (*e.g., begin to use and apply skill lessons from All the Right Type, Almena Method*);
- ❑ copy and move files from a designated folder to disk.

Critical and Creative Thinking

Using ICT, students will enhance their critical and creative thinking skills, including problem solving and decision making.

Grade 4

Social and Ethical Issues

Students understand the ethical, cultural, and societal issues related to ICT.

Students practise responsible use of ICT systems, information, and software.

By the end of Grade 4, students will:

- ❑ follow acceptable-use policies (*e.g., TDSB Code of On-line Conduct*);
- ❑ demonstrate an understanding of intellectual property (*e.g., cite web sites and other sources of images, video, and graphics*);
- ❑ demonstrate correct ergonomics (*e.g., posture, time on computer, proximity to screen, adequate lighting*);
- ❑ develop an awareness of safe behaviour while using ICT (*e.g., respect confidentiality of passwords and personal information*);
- ❑ demonstrate an awareness of the advantages and challenges of using ICT.

Research and Inquiry

Students use and transfer ICT knowledge to locate, retrieve, organize, manipulate, analyze, synthesize, and evaluate information for specific research tasks.^Δ

By the end of Grade 4, students will:

- ❑ formulate questions to guide research (*e.g., develop questions to explore how humans affect natural habitats*);
- ❑ develop use of search terms (*e.g., search the library catalogue by author, title, keyword*);
- ❑ browse on-line resources by subject (*e.g., use the subject categories of an on-line encyclopedia to locate information about the habitats of plants*);
- ❑ explore, locate, and retrieve information from on-line resources (*e.g., keep jot notes on a teacher-provided organizer while searching an electronic encyclopedia to explore the roles of people in medieval society*);
- ❑ investigate various media formats and how they are organized (*e.g., analyze the features of text in a web site, an on-line newspaper, and an on-line encyclopedia*);
- ❑ use prepared databases and spreadsheets to enter and organize data (*e.g., collect information about the foods friends prefer and compare to Canada's Food Guide*);
- ❑ review information to determine if needs are met (*e.g., ask "Have I answered all my inquiry questions?"*).

Critical and Creative Thinking

Using ICT, students will enhance their critical and creative thinking skills, including problem solving and decision making.

Grade 4

Communication and Collaboration

Students collaborate using ICT. Students use ICT to communicate knowledge in a variety of forms and media, for different purposes and audiences.

By the end of Grade 4, students will:

- ❑ synthesize and share information using graphic organizers (*e.g., storyboard a writing plan in AppleWorks*);
- ❑ share ideas and information using tool software (*e.g., create a HyperStudio stack describing the natural resources and physical regions of a Canadian province*);
- ❑ communicate and collaborate electronically with people inside and outside the classroom (*e.g., TEL exchange projects, Class Conference on TEL*);
- ❑ begin to identify the advantages and disadvantages of using ICT for specific tasks (*e.g., publishing a narrative*).

Productivity and Applications

Students understand how to use the range of ICT tools for research, inquiry, problem solving, decision making, creativity, communication, and collaboration.

By the end of Grade 4, students will:

- ❑ accomplish curriculum-based tasks by using tool software (*e.g., publish a procedure that includes sound, text, and images*);
- ❑ use and apply data-management software (*e.g., use spreadsheets and/or databases to classify observed rocks and minerals by colour, texture, and shape*);
- ❑ independently access and navigate within a document, CD-ROM, or software program that contains links;
- ❑ access e-mail and personal electronic storage space using individual network ID;
- ❑ with assistance, use Internet search engines and other on-line search resources;
- ❑ with assistance, integrate the use of peripherals into projects and presentations (*e.g., scanner, digital camera*);
- ❑ continue to develop keyboarding skills.

Critical and Creative Thinking

Using ICT, students will enhance their critical and creative thinking skills, including problem solving and decision making.

Grade 5

Social and Ethical Issues

Students understand the ethical, cultural, and societal issues related to ICT.

Students practise responsible use of ICT systems, information, and software.

By the end of Grade 5, students will:

- ❑ exhibit legal and ethical behaviours when using information and ICT (*e.g., observe copyright laws, reference sources*);
- ❑ identify equity implications of ICT (*e.g., biases and omissions in visuals of software programs*);
- ❑ understand the consequences of misuse (*e.g., using inappropriate sites, plagiarizing a report*);
- ❑ demonstrate awareness of current changes in ICT and the effect those changes have on the workplace.

Research and Inquiry

Students use and transfer ICT knowledge to locate, retrieve, organize, manipulate, analyze, synthesize, and evaluate information for specific research tasks.^Δ

By the end of Grade 5, students will:

- ❑ follow an inquiry and research plan based on the four stages (*prepare for research, access resources, process information, transfer learning*);
- ❑ formulate new questions as research progresses (*e.g., use word processing software to record reflections and new questions arising from searches*);
- ❑ select and use appropriate search tools to gather and manage information from a variety of electronic reference materials (*e.g., select government sites to investigate the function of the federal government*);
- ❑ identify and distinguish points of view expressed in electronic sources on a particular topic (*e.g., explore different periodical databases to discover varied viewpoints on an environmental issue*);
- ❑ analyze electronic sources for accuracy or relevance to the purpose (*e.g., critique web sites for copyright date and reliability, skim sites for usefulness*);
- ❑ create and use simple organizers and outlines (*e.g., to collect and organize information, to sort facts, to find similarities, to evaluate and classify data*);
- ❑ review and analyze information to determine if needs are met.

Critical and Creative Thinking

Using ICT, students will enhance their critical and creative thinking skills, including problem solving and decision making.

Grade 5

Communication and Collaboration

Students collaborate using ICT. Students use ICT to communicate knowledge in a variety of forms and media, for different purposes and audiences.

By the end of Grade 5, students will:

- ❑ synthesize and present information using graphic organizers and spreadsheets (*e.g., use a spreadsheet or table to compare characteristics of early civilizations*);
- ❑ present and share ideas and information using tool software (*e.g., create a HyperStudio stack or web page describing the structure and function of the digestive system*);
- ❑ independently communicate and collaborate electronically with people inside and outside the classroom (*e.g., consult an expert, use Silver Birch Banter Conference on TEL*);
- ❑ be sensitive to the characteristics of the audience when presenting information (*e.g., consider the length of presentation if intended audience is younger students in the school*);
- ❑ evaluate the advantages and disadvantages of different kinds of print and electronic presentations (*e.g., compare graphing using a spreadsheet vs. graphing on paper*).

Productivity and Applications

Students understand how to use the range of ICT tools for research, inquiry, problem solving, decision making, creativity, communication, and collaboration.

By the end of Grade 5, students will:

- ❑ accomplish curriculum-based tasks by using tool software (*e.g., create an autobiography that includes sound, text, and images*);
- ❑ solve problems that involve numerical operations by using tools such as calculators and spreadsheets (*e.g., use a spreadsheet to explore patterns in number operations*);
- ❑ with assistance, create documents that contain some links and a simple navigation system (*e.g., create a HyperStudio stack or web page describing the structure of Canada's federal government*);
- ❑ begin to use e-mail to submit assigned work;
- ❑ use Internet search engines and other on-line search resources;
- ❑ integrate the use of peripherals into projects and presentations (*e.g., scanner, digital camera*);
- ❑ develop competent keyboarding skills.

Critical and Creative Thinking

Using ICT, students will enhance their critical and creative thinking skills, including problem solving and decision making.

Grade 6

Social and Ethical Issues

Students understand the ethical, cultural, and societal issues related to ICT.

Students practise responsible use of ICT systems, information, and software.

By the end of Grade 6, students will:

- ❑ demonstrate ethical and legal use of information (*e.g., using proper documentation of all sources of information*);
- ❑ demonstrate understanding of equity implications of ICT (*e.g., using inclusive language, images and content*);
- ❑ explain the rationale of the acceptable use policy and Code of On-line conduct;
- ❑ describe the concept and importance of ethical uses of ICT (*e.g., following on-line protocols*).

Research and Inquiry

Students use and transfer ICT knowledge to locate, retrieve, organize, manipulate, analyze, synthesize, and evaluate information for specific research tasks.^Δ

By the end of Grade 6, students will:

- ❑ design and follow a plan to be used during an inquiry process, and make revisions to the plan as necessary* (*e.g., follow the four-stage research process, and consider timelines, assessment criteria, presentation expectations*);
- ❑ use boolean searching strategies (*e.g., use “Canada AND natural resources” to narrow a search; but use “fishing OR lobsters” to broaden a search*);
- ❑ select and use a variety of electronic resources to build a knowledge base (*e.g., on-line encyclopedias, databases, and Internet sites*);
- ❑ synthesize information by developing generalizations, making decisions, and drawing conclusions to create something new (*e.g., follow the inquiry-based process and scaffolding of a web quest to complete a task*);
- ❑ compare formats of print, electronic, and multimedia reference materials to facilitate the selection of resources and information (*e.g., consider the advantages and disadvantages of each*);
- ❑ create visual organizers to sequence, classify, and analyze information;
- ❑ reflect on and describe the processes involved in completing a project.

Critical and Creative Thinking

Using ICT, students will enhance their critical and creative thinking skills, including problem solving and decision making.

Grade 6

Communication and Collaboration

Students collaborate using ICT. Students use ICT to communicate knowledge in a variety of forms and media, for different purposes and audiences.

By the end of Grade 6, students will:

- ❑ synthesize and present information using graphic organizers and databases (*e.g., create a database of products imported and exported by Canada and its trading partners*);
- ❑ begin to create multimedia presentations that include sounds and images from a variety of sources (*e.g., visual images, clip art, sound clips, and animated images*)*;
- ❑ collaborate with people within and beyond the classroom using e-mail, TEL conferences, and the Internet (*e.g., Writers in Electronic Residence*);
- ❑ determine an appropriate method to communicate and present information based on the intended audience (*e.g., spreadsheet vs. database, SlideShow vs. poster etc.*).

Productivity and Applications

Students understand how to use the range of ICT tools for research, inquiry, problem solving, decision making, creativity, communication, and collaboration.

By the end of Grade 6, students will:

- ❑ accomplish curriculum-based tasks by using tool software (*e.g., complete a project describing the physical characteristics of the solar system that includes sound, text, images, and animation*);
- ❑ solve problems requiring the sorting, organizing, and classifying of data (*e.g., use the “find” and “sort” features of a database to reach conclusions about a particular data set*);
- ❑ create documents that contain links and navigation systems (*e.g., create a HyperStudio stack or web page profiling early explorers*);
- ❑ use e-mail to receive and submit assigned work via a class conference on TEL (*including uploading and downloading files*);
- ❑ efficiently use Internet search engines and other on-line search resources;
- ❑ demonstrate keyboarding skills required to complete assigned tasks.

Critical and Creative Thinking

Using ICT, students will enhance their critical and creative thinking skills, including problem solving and decision making.

Grade 7

Social and Ethical Issues

Students understand the ethical, cultural, and societal issues related to ICT.

Students practise responsible use of ICT systems, information, and software.

By the end of Grade 7, students will:

- ❑ analyze features of our information-based society;
- ❑ analyze features and examples of ethical and unethical uses of information and ICT (*e.g., recognize and challenge web sites that promote discriminatory ideas*);
- ❑ explain the principles and practice of confidentiality and privacy in communicating information (*e.g., forwarding e-mail only with the consent of the sender*);
- ❑ identify how ICT is changing how tasks are performed.

Research and Inquiry

Students use and transfer ICT knowledge to locate, retrieve, organize, manipulate, analyze, synthesize, and evaluate information for specific research tasks.^Δ

By the end of Grade 7, students will:

- ❑ develop a plan for a research project and formulate questions to guide the inquiry;
- ❑ select appropriate search engines, subject directories, and URLs to meet information needs (*e.g., identify resources that can support someone experiencing harassment*);
- ❑ use references, cross references, and hyperlinks to expand approaches to a topic;
- ❑ examine the authority, validity, and reliability of print and on-line resources (*e.g., use a teacher-prepared tool to analyze web sites on drug addiction before conducting research*);
- ❑ develop appropriate organizers for collecting information for specific research tasks (*e.g., use organization tools such as timelines, knowledge trees, legends, and indexes to record and organize information*);
- ❑ analyze how data was collected and discuss the reasonableness of results.

Critical and Creative Thinking

Using ICT, students will enhance their critical and creative thinking skills, including problem solving and decision making.

Grade 7

Communication and Collaboration

Students collaborate using ICT. Students use ICT to communicate knowledge in a variety of forms and media, for different purposes and audiences.

By the end of Grade 7, students will:

- ❑ synthesize and present information using a combination of graphic organizers and data-management software (*e.g., tables, graphs, spreadsheets, and databases*);
- ❑ prepare multimedia presentations for a variety of purposes and audiences (*e.g., a slideshow, movie, or web page describing daily life in New France*);
- ❑ collaborate with peers, teachers, and others to exchange information, using a variety of ICT communication tools (*e.g., TEL Conferences, class web pages*);
- ❑ consider the relative strengths of print, electronic, and blended modes of presentation in order to determine the most appropriate method(s) of conveying information to an intended audience.

Productivity and Applications

Students understand how to use the range of ICT tools for research, inquiry, problem solving, decision making, creativity, communication, and collaboration.

By the end of Grade 7, students will:

- ❑ accomplish curriculum-based tasks by using tool software (*e.g., a multimedia project that includes sound, text, images, video, and animation*);
- ❑ apply the analysis tools found in database and spreadsheet applications to solve problems and generate reports;
- ❑ create and modify documents that contain links and non-linear navigation systems (*e.g., create a web page or HyperStudio stack about interactions within ecosystems*);
- ❑ use e-mail to receive, edit, and submit assigned work via a class conference on TEL (*including downloading, modifying, and uploading files*);
- ❑ select Internet search engines and other on-line search resources based on an assigned task and purpose;
- ❑ begin to employ content-specific software and simulations to explore and analyze data and information to support learning and research (*e.g., create and analyze designs that include transformed images using The Geometer's Sketchpad*).

Critical and Creative Thinking

Using ICT, students will enhance their critical and creative thinking skills, including problem solving and decision making.

Grade 8

Social and Ethical Issues

Students understand the ethical, cultural, and societal issues related to ICT.

Students practise responsible use of ICT systems, information, and software.

By the end of Grade 8, students will:

- ❑ indicate current changes in information technologies and the effect these changes have on the workplace and society;
- ❑ demonstrate a responsible and ethical attitude to the use of ICT by using electronic networks in an ethical manner;
- ❑ recognize the implications of copyright infringement;
- ❑ demonstrate an understanding of ethical practice when using e-mail and on-line discussion conferences;
- ❑ describe information anxiety and overload in contemporary society.

Research and Inquiry

Students use and transfer ICT knowledge to locate, retrieve, organize, manipulate, analyze, synthesize, and evaluate information for specific research tasks.^Δ

By the end of Grade 8, students will:

- ❑ plan and conduct a search, using a wide variety of electronic sources (*e.g., use on-line encyclopedias, periodical databases, validated Internet sites to explore the tools, materials, and design principles used by selected artists*);
- ❑ recognize elements of potentially successful research questions;
- ❑ use advanced search techniques to limit the number of search results to a query (*e.g., + or —, Boolean, etc.*);
- ❑ develop a process to manage volumes of information that can be made available through electronic sources (*e.g., bookmark selected sites or create a personal hotlist*);
- ❑ research the accuracy, relevance, appropriateness, comprehensiveness, and bias of electronic information sources (*e.g., use a prepared template to evaluate sites before using*);
- ❑ synthesize findings and formulate conclusions using tool software (*e.g., create a visual organizer to compare the automatic functions of the human eye with the functions in an automatic camera*);
- ❑ make inferences and convincing arguments based on data analysis;
- ❑ self-evaluate and set goals for improvement (*e.g., create and maintain a learning log*).

Critical and Creative Thinking

Using ICT, students will enhance their critical and creative thinking skills, including problem solving and decision making.

Grade 8

Communication and Collaboration

Students collaborate using ICT. Students use ICT to communicate knowledge in a variety of forms and media, for different purposes and audiences.

By the end of Grade 8, students will:

- ❑ interpret, synthesize, and present information using a combination of graphic organizers and data-management software (*e.g., reports, flow charts, graphs, templates, spreadsheets, and databases*);
- ❑ design and present multimedia projects (*e.g., web pages, newsletters, slideshows, movies*);
- ❑ collaborate with peers, teachers, and others using a variety of ICT communication tools to contribute to projects for local and global audiences (*e.g., participate in Canada SchoolNet Grassroots projects*);
- ❑ evaluate presentation methods and modify them for particular needs to effectively convey information to an intended audience.

Productivity and Applications

Students understand how to use the range of ICT tools for research, inquiry, problem solving, decision making, creativity, communication, and collaboration.

By the end of Grade 8, students will:

- ❑ accomplish curriculum-based tasks by using tool software (*e.g., a multimedia presentation that includes sound, text, images, video, and animation*);
- ❑ apply the analysis and synthesis tools found in database and spreadsheet applications in order to solve more complex problems and generate reports;
- ❑ create, modify, and evaluate documents that contain links and non-linear navigation systems (*e.g., create a web page or HyperStudio stack about the Charlottetown Conference*);
- ❑ use e-mail to receive, edit, and submit assigned work via a class conference on TEL (*including downloading, modifying, compressing, decompressing, and uploading files*);
- ❑ evaluate and select Internet search engines, directories, and sites based on specific criteria (*e.g., intended audience, purpose for research, evidence of bias*);
- ❑ employ content-specific software and simulations to explore and analyze data and information to support learning and research (*e.g., investigate the Pythagorean relationship using The Geometer's Sketchpad*).

Critical and Creative Thinking

Using ICT, students will enhance their critical and creative thinking skills, including problem solving and decision making.

Grade 9

Social and Ethical Issues

Students understand the ethical, cultural, and societal issues related to ICT.

Students practise responsible use of ICT systems, information, and software.

By the end of Grade 9, students will:

- ❑ identify the impact of ICT on the world and probable future directions in technological development (*e.g., Canadian and world cultures, education, health, business*);
- ❑ demonstrate legal and ethical behaviours when using ICT (*e.g., properly citing and referencing all sources of information*);
- ❑ appreciate the principles of intellectual property and copyright law (*e.g., investigate copyright for print, music, images, and multimedia*);
- ❑ identify issues regarding storage, privacy, and security of information (*e.g., investigate the implications of the collection of private information by government agencies, such as Statistics Canada*);
- ❑ discuss ways of controlling information (*e.g., filtering and censorship*).

Research and Inquiry

Students use and transfer ICT knowledge to locate, retrieve, organize, manipulate, analyze, synthesize, and evaluate information for specific research tasks.^Δ

By the end of Grade 9, students will:

- ❑ develop a research plan (*e.g., identify task requirements and establish timelines*);
- ❑ articulate and use the four stages of the research process to meet information needs when using electronic and print resources;
- ❑ access, assemble, and organize diverse viewpoints from electronic sources to assess their validity for specific topics (*e.g., create charts and tables to compare and contrast information*);
- ❑ evaluate the authority, reliability, and relevance of electronic sources and information (*e.g., develop criteria to assess web sites*);
- ❑ use tool software to synthesize findings and formulate conclusions (*e.g., create a visual organizer to regroup and organize data to make connections*);
- ❑ use advanced database strategies to record, sort, and organize information (*e.g., discriminate between attribute and location data in a G.I.S.—CGC 1D*);
- ❑ reflect on the research process (*e.g., create and maintain a learning log*).

Critical and Creative Thinking

Using ICT, students will enhance their critical and creative thinking skills, including problem solving and decision making.

Grade 9

Communication and Collaboration

Students collaborate using ICT. Students use ICT to communicate knowledge in a variety of forms and media, for different purposes and audiences.

By the end of Grade 9, students will:

- ❑ interpret, synthesize, present, and review information using a combination of graphic organizers and data-management software (*e.g., compare the benefits and disadvantages of Canada’s energy mega projects—CGC1P*);
- ❑ continue to design and present multimedia projects (*e.g., create a simple composition using the elements of melody, rhythm, and form, and a variety of media—AMU1O*);
- ❑ collaborate with peers, teachers, and others using a variety of ICT communication tools to develop projects for local and global audiences;
- ❑ evaluate presentation methods and modify them for particular needs to effectively convey information to an intended audience.

Productivity and Applications

Students understand how to use the range of ICT tools for research, inquiry, problem solving, decision making, creativity, communication, and collaboration.

By the end of Grade 9, students will:

- ❑ accomplish curriculum-based tasks by using integrated tool software effectively and efficiently (*e.g., produce artworks using traditional and new technologies; video, computer, scanner, photocopier, digital camera—AV11O*);
- ❑ create databases and spreadsheets to organize and analyze information in a variety of ways;
- ❑ create, modify, and evaluate web pages that contain multiple links and non-linear navigation systems (*e.g., plan and write a sample web page on how to use a provincial park campsite responsibly and another on the pleasures of camping—ENG1D*);
- ❑ test solutions to problems by using integrated software, such as computer-assisted design or simulation/modelling software (*e.g., use a variety of computer software applications for research, to solve problems, and to document the design process—TT11O*);
- ❑ solve a problem by articulating a plan of action and identifying appropriate materials and tools (*e.g., use Fathom to create the graphs of a variety of linear and non-linear relations from their equations and classify the relations according to the shapes of their graphs—MPM1D*).

Critical and Creative Thinking

Using ICT, students will enhance their critical and creative thinking skills, including problem solving and decision making.

Grade 10

Social and Ethical Issues

Students understand the ethical, cultural, and societal issues related to ICT.

Students practise responsible use of ICT systems, information, and software.

By the end of Grade 10, students will:

- ❑ analyze the impact of ICT on society and on probable future directions in technological development (*e.g., medicine, genetic engineering, artificial intelligence*);
- ❑ demonstrate legal and ethical behaviours when using ICT and appreciate the consequences of illegal and unethical behaviours (*e.g., copyright and plagiarism*);
- ❑ identify and use methods of determining the ownership of intellectual property (*e.g., sourcing the ownership of a music clip*);
- ❑ identify implications of controlling information (*e.g., censorship, filtering*);
- ❑ discuss the legal consequences of interfering with on-line communication (*e.g., hacking and harassment*).

Research and Inquiry

Students use and transfer ICT knowledge to locate, retrieve, organize, manipulate, analyze, synthesize, and evaluate information for specific research tasks.^Δ

By the end of Grade 10, students will:

- ❑ critique own questions as essential and non-essential;
- ❑ use various on-line libraries for information needs and describe their features;
- ❑ analyze and evaluate primary sources of information (*e.g., interpret statistical information in varied media, such as on-line handbooks, almanacs, and reports*);
- ❑ analyze electronic resources for validity (*e.g., identify perspective, bias, inclusiveness, stereotyping, intent, and credibility for a specific research task*);
- ❑ use flow chart, webbing, and database software to synthesize findings and formulate conclusions (*e.g., produce an analysis of how and why recent innovations in telecommunications are changing life today—CHC2D*);
- ❑ self-evaluate the application of the four-stage research process (*e.g., use electronic journal to track product and process of research*).

Critical and Creative Thinking

Using ICT, students will enhance their critical and creative thinking skills, including problem solving and decision making.

Grade 10

Communication and Collaboration

Students collaborate using ICT. Students use ICT to communicate knowledge in a variety of forms and media, for different purposes and audiences.

By the end of Grade 10, students will:

- ❑ interpret, synthesize, present, and review information using a combination of graphic organizers and data-management software (*e.g., demonstrate the ability to organize selected career information effectively, using word-processing, database, spreadsheet, and information management software—GLC2O*);
- ❑ design, present, and review multimedia projects (*e.g., use computer technology and software to digitize movement-related effects—ATC2O*);
- ❑ collaborate with peers, teachers, and others, using a wide variety of ICT communication tools, to develop and review projects for local and global audiences (*e.g., create a personal anthology of poetry in print and as a web page with links to related sites—ENG2D*);
- ❑ evaluate presentation and transition methods and modify them for particular needs to effectively and efficiently convey information to an intended audience.

Productivity and Applications

Students understand how to use the range of ICT tools for research, inquiry, problem solving, decision making, creativity, communication, and collaboration.

By the end of Grade 10, students will:

- ❑ accomplish curriculum-based tasks by using integrated tool software effectively and efficiently (*e.g., acquire information from a variety of materials including CD-ROMs, computer software—FSF2P*);
- ❑ create advanced databases and spreadsheets to output information in a variety of ways (*e.g., analyze a population case study by producing population growth curves for each of the populations in the study, and use the graphs to explain how different factors affect population size and to predict the effect of varying factors—SNC2D*);
- ❑ create, modify, and evaluate web pages that contain multiple links and complex non-linear navigation systems;
- ❑ test and evaluate a problem by creating a simulation or a model (*e.g., use a relational database to make basic temporal queries on election patterns—CHC2D*);
- ❑ evaluate choices and the progress in problem solving, then redefine the plan of action as appropriate.*

Critical and Creative Thinking

Using ICT, students will enhance their critical and creative thinking skills, including problem solving and decision making.

Grade 11

Social and Ethical Issues

Students understand the ethical, cultural, and societal issues related to ICT.

Students practise responsible use of ICT systems, information, and software.

By the end of Grade 11, students will:

- ❑ describe the societal impact of ICT on communications (*e.g., e-mail, video conferencing*);
- ❑ understand and practise protocol and responsibilities for the use of information from electronic resources (*e.g., using e-mail and on-line discussion groups*);
- ❑ understand the consequences of interference with personal privacy and security (*e.g., cookies, selling e-mail lists*);
- ❑ discuss the societal and financial consequences of computer attacks (*e.g., viruses, worms*);
- ❑ identify and describe economic and environmental issues associated with the production and disposal of ICT hardware;
- ❑ make informed choices among ICT systems, resources, and services.

Research and Inquiry

Students use and transfer ICT knowledge to locate, retrieve, organize, manipulate, analyze, synthesize, and evaluate information for specific research tasks.^Δ

By the end of Grade 11, students will:

- ❑ form questions into a thesis statement and reflect on the continuing appropriateness of the thesis statement (*e.g., research and report on the economic, environmental, and cultural impact of travel and tourism associated with international sporting events—CGG3O*);
- ❑ consult a wide variety of sources that reflect varied viewpoints on particular topics (*e.g., collect data from a range of print and electronic media, interviews, government and community agencies—CPC3O*);
- ❑ demonstrate discriminatory selection of relevant information (*e.g., analyze sources for bias, and compare them with other sources*);
- ❑ investigate and solve problems of organization and manipulation of information during an inquiry (*e.g., create and use complex graphic organizers*);
- ❑ use/create a web page to organize links to other sources of information;
- ❑ re-examine the currency of research and modify product in light of new findings.

Critical and Creative Thinking

Using ICT, students will enhance their critical and creative thinking skills, including problem solving and decision making.

Grade 11

Communication and Collaboration

Students collaborate using ICT. Students use ICT to communicate knowledge in a variety of forms and media, for different purposes and audiences.

By the end of Grade 11, students will:

- ❑ use and evaluate different combinations of graphic organizers and data-management software (*e.g., present ideas, understandings, and arguments effectively in a variety of contexts using graphic organizers and displays—CPC3O*);
- ❑ continue to design, present, and review multimedia projects (*e.g., create a slideshow presentation on the hyperbola, which integrates sketches and animations from The Geometer’s Sketchpad—MCR3U*);
- ❑ manage collaboration among peers, teachers, and others, using a wide variety of ICT communication tools, to develop and review projects for local and global audiences (*e.g., identify how Aboriginal peoples promote their beliefs and values through technology, such as CD-ROMs, web sites, Kids from Kanata Project, Aboriginal television and radio stations—NBV3C*);
- ❑ design and adapt presentation and transition methods for a variety of audiences and purposes.

Productivity and Applications

Students understand how to use the range of ICT tools for research, inquiry, problem solving, decision making, creativity, communication, and collaboration.

By the end of Grade 11, students will:

- ❑ accomplish curriculum-based tasks by using integrated tool software effectively and efficiently (*e.g., use computer software to prepare and present publicity and marketing documents—TFH3E*);
- ❑ create advanced relational databases and spreadsheets to output information in a variety of ways;
- ❑ create, modify, and evaluate web pages to organize links and reference other sources of information (*e.g., create web links to illustrate the role of law in protecting the rights of certain groups or individuals including women, children, Aboriginal peoples, minorities, and victims of crimes—CLU3E*);
- ❑ begin to understand the function of virtual modelling in problem solving and project development (*e.g., create a flow model for G.I.S.—CGT3E*);
- ❑ use ICT tools to document problem-solving processes and project development from conception to completion (*e.g., develop and maintain a project plan that covers all aspects of the development process for a computer program—ICS3M*).

Critical and Creative Thinking

Using ICT, students will enhance their critical and creative thinking skills, including problem solving and decision making.

Grade 12

Social and Ethical Issues

Students understand the ethical, cultural, and societal issues related to ICT.

Students practise responsible use of ICT systems, information, and software.

By the end of Grade 12, students will:

- ❑ analyze advantages and disadvantages of widespread use and reliance on ICT in the workplace and society, and identify consequences to make informed civic, social, and economic decisions;
- ❑ identify capabilities and limitations of contemporary and emerging ICT resources and assess the potential of these systems to address personal, lifelong-learning, and workplace needs;
- ❑ apply ethical and legal standards in planning, using, and evaluating ICT and intellectual property (*e.g., demonstrate responsible use of resources, processes, and systems of technology*);
- ❑ demonstrate and advocate for legal and ethical behaviour among peers, family, and community regarding the use of ICT and information;
- ❑ evaluate ICT-based options, including distance and distributed education for lifelong learning (*e.g., investigate advantages and disadvantages of distance learning and virtual libraries*).

Research and Inquiry

Students use and transfer ICT knowledge to locate, retrieve, organize, manipulate, analyze, synthesize, and evaluate information for specific research tasks.^Δ

By the end of Grade 12, students will:

- ❑ create and follow an independent research plan (*e.g., use time or project management software to assist in conducting an inquiry*);
- ❑ plan and perform complex searches using a variety of search strategies;
- ❑ select and apply appropriate ICT tools for research, information analysis, problem solving, and decision making in content areas (*e.g., analyze and assess the newspaper, television, radio, and Internet coverage of a conflict or uprising —ENG4U*);
- ❑ identify and analyze the appropriate ICT resources for research and problem solving (*e.g., evaluate print and electronic sources about food and nutrition for bias, accuracy, validity, authority, and relevance —HFA4M*);
- ❑ investigate and solve problems of prediction, calculation, and inference during an inquiry (*e.g., manipulate data by using charting and graphing technologies in order to test inferences and probabilities*);
- ❑ analyze and synthesize information to determine patterns and links among ideas;
- ❑ recognize and integrate personal learning styles in research and problem solving.

Critical and Creative Thinking

Using ICT, students will enhance their critical and creative thinking skills, including problem solving and decision making.

Grade 12

Communication and Collaboration

Students collaborate using ICT. Students use ICT to communicate knowledge in a variety of forms and media, for different purposes and audiences.

By the end of Grade 12, students will:

- ❑ routinely use and evaluate different combinations of graphic organizers and data-management software (*e.g., effectively use current information technology to compile quantitative data and present statistical analysis of data—HHS4M*);
- ❑ continue to design, present, and review multimedia projects (*e.g., produce a digital portfolio of artworks using analog and digital encoding procedures; CD-ROM, interactive multimedia work, Internet site—ASM4O*);
- ❑ manage and evaluate sustained collaboration among peers, teachers, and others, using a wide variety of ICT communication tools, to develop and review projects for local and global audiences;
- ❑ design, adapt, and review presentation and transition methods for a variety of audiences and purposes.

Productivity and Applications

Students understand how to use the range of ICT tools for research, inquiry, problem solving, decision making, creativity, communication, and collaboration.

By the end of Grade 12, students will:

- ❑ accomplish curriculum-based tasks by using integrated tool software effectively and efficiently (*e.g., create electronically, a multimedia interview presentation—BTX4E*);
- ❑ create advanced relational databases and spreadsheets, linked to other software programs, to output information in a variety of ways;
- ❑ create, modify, post, and evaluate web sites featuring multiple link pages on the World Wide Web or on a local network;
- ❑ understand the function of virtual modelling in problem solving and project development (*e.g., investigate the structures of biological molecules and functional groups using computer-generated, three-dimensional images and/or by building molecular models of simple carbohydrates, amino acids, simple polypeptides—SBI4U*);
- ❑ make informed choices among ICT systems, resources, and services (*e.g., appropriate use of raster and/or vector data within a specific G.I.S. platform—CGO4M*).

Critical and Creative Thinking

Using ICT, students will enhance their critical and creative thinking skills, including problem solving and decision making.

GRADE REFERENCE CHARTS

	Social and Ethical Issues	Research and Inquiry	Communication and Collaboration	Productivity and Applications
KINDERGARTEN	<ul style="list-style-type: none"> <input type="checkbox"/> respect the members of a group when sharing a computer (<i>e.g., take turns when sharing a mouse</i>) <input type="checkbox"/> with assistance, recognize and begin to practise equitable use of ICT <input type="checkbox"/> act in a responsible manner when using ICT (<i>e.g., keep food and drink away from the computer</i>) 	<ul style="list-style-type: none"> <input type="checkbox"/> begin to associate ICT as a source of information (<i>e.g., to answer questions and search for pictures</i>) <input type="checkbox"/> begin to investigate information pictorially (<i>e.g., identify and discuss images</i>) 	<ul style="list-style-type: none"> <input type="checkbox"/> explore drawing tools <input type="checkbox"/> begin to communicate ideas using pictures and text (<i>e.g., use KidPix to retell a personal event or story</i>) 	<ul style="list-style-type: none"> <input type="checkbox"/> begin to explore tool software (<i>e.g., KidPix</i>) <input type="checkbox"/> begin to use tool software to solve problems and to explore concepts (<i>e.g., sort stamps by their properties</i>) <input type="checkbox"/> launch applications found on the computer desktop <input type="checkbox"/> identify parts of the computer (<i>e.g., monitor, mouse, keyboard</i>)
GRADE 1	<ul style="list-style-type: none"> <input type="checkbox"/> work co-operatively with peers when using ICT (<i>e.g., build on the ideas of others</i>) <input type="checkbox"/> recognize and practise equitable use of ICT (<i>e.g., ensure equitable access and use for both boys and girls</i>) <input type="checkbox"/> demonstrate care for ICT equipment (<i>e.g., handle and store CD-ROMs appropriately</i>) 	<ul style="list-style-type: none"> <input type="checkbox"/> use question-starter words (<i>e.g., develop 5-W questions to guide searches about the needs of animals</i>) <input type="checkbox"/> read visuals to discover information (<i>e.g., examine pictures of birds to discover common characteristics</i>) <input type="checkbox"/> explore multimedia programs (<i>e.g., use the sound features of a story CD-ROM to learn new vocabulary</i>) 	<ul style="list-style-type: none"> <input type="checkbox"/> create a diagram using drawing tools to depict a personally significant place (<i>e.g., classroom, park, bedroom</i>) <input type="checkbox"/> with assistance, communicate ideas and information using pictures and text (<i>e.g., publish a narrative using KidPix SlideShow</i>) <input type="checkbox"/> work collaboratively with peers (<i>e.g., assist others, share ideas, peer teaching, and troubleshooting</i>) 	<ul style="list-style-type: none"> <input type="checkbox"/> accomplish curriculum-based tasks by using tool software (<i>e.g., create a pictograph in KidPix</i>) <input type="checkbox"/> begin to edit text and images within a document (<i>e.g., modify colour of font, add clip art, erase images</i>) <input type="checkbox"/> activate ICT (<i>e.g., turn on monitor, find applications, print</i>) <input type="checkbox"/> begin saving files and opening previously saved work
GRADE 2	<ul style="list-style-type: none"> <input type="checkbox"/> demonstrate care and use of equipment including peripherals (<i>e.g., use headphones appropriately</i>) <input type="checkbox"/> practise equitable and balanced use of ICT (<i>e.g., support access for students with different learning styles and abilities</i>) <input type="checkbox"/> identify the role ICT plays in everyday life 	<ul style="list-style-type: none"> <input type="checkbox"/> identify information needs prior to research (<i>e.g., chart prior knowledge and identify new learning needs using a KWL chart</i>) <input type="checkbox"/> find information from print and/or preselected electronic resources (<i>e.g., identify and listen to the sounds of woodwind instruments</i>) <input type="checkbox"/> make simple notes to record and organize information electronically (<i>e.g., use a teacher-prepared template to record information about family traditions</i>) 	<ul style="list-style-type: none"> <input type="checkbox"/> use drawing tools to create images as part of a presentation in order to demonstrate and share knowledge about a specific curriculum topic (<i>e.g., the life cycle of a butterfly</i>) <input type="checkbox"/> process information from more than one source and retell what has been discovered * (<i>e.g., illustrate information learned from a non-fiction text</i>) <input type="checkbox"/> use e-mail with assistance (<i>e.g., compose a class e-mail message to thank a special classroom visitor</i>) 	<ul style="list-style-type: none"> <input type="checkbox"/> accomplish curriculum-based tasks by using tool software (<i>e.g., create a simple report comparing the properties of liquids and solids</i>) <input type="checkbox"/> edit text and images within a document (<i>e.g., modify font, style, and image size</i>) <input type="checkbox"/> choose appropriate applications to complete tasks <input type="checkbox"/> use text to communicate thoughts, ideas, or feelings (<i>e.g., use word processing software to create a story, poem, or letter</i>) <input type="checkbox"/> identify peripherals and their use (<i>e.g., printer, scanner, digital camera</i>) <input type="checkbox"/> open files from, and save files to, a designated folder

	Social and Ethical Issues	Research and Inquiry	Communication and Collaboration	Productivity and Applications
GRADE 3	<ul style="list-style-type: none"> <input type="checkbox"/> demonstrate responsibility and an awareness of appropriate conduct when using ICT (<i>e.g., follow class procedures for logging on and off computers</i>) <input type="checkbox"/> demonstrate understanding of the importance of equitable and balanced use of ICT <input type="checkbox"/> respect the work and privacy of others (<i>e.g., recognize the difference between personal and public file folders</i>) <input type="checkbox"/> demonstrate awareness of the functions and uses of ICT 	<ul style="list-style-type: none"> <input type="checkbox"/> begin to formulate questions to guide research <input type="checkbox"/> enter simple search words to locate information (<i>e.g., search for books by a favourite author in a library catalogue</i>) <input type="checkbox"/> explore topics using a variety of resources (<i>e.g., examine information in electronic encyclopedias, library catalogues, and teacher-selected Internet sites to discover information about a specific topic</i>) <input type="checkbox"/> summarize data by recording key words and ideas from gathered information (<i>e.g., make jot notes while searching an on-line encyclopedia for information</i>) <input type="checkbox"/> enter data into teacher-selected organizers to organize and review information (<i>e.g., compare and contrast by using graphic organizers such as Venn diagrams, T-charts</i>) <input type="checkbox"/> begin to self evaluate the research process (<i>e.g., ask "Did I use a variety of resources?"</i>) 	<ul style="list-style-type: none"> <input type="checkbox"/> create visual images by using paint and draw programs for a particular audience and purpose* (<i>e.g., explore the concept of lines of symmetry in two-dimensional shapes</i>) <input type="checkbox"/> begin to share information using graphic organizers (<i>e.g., Venn diagram to compare characteristics of urban and rural communities</i>) <input type="checkbox"/> with assistance, begin to share ideas and information using tool software (<i>e.g., AppleWorks Slideshow to explain how pioneers used natural resources</i>) <input type="checkbox"/> begin to communicate electronically with people inside and outside the classroom (<i>e.g., communicate with e-pals on TEL</i>) 	<ul style="list-style-type: none"> <input type="checkbox"/> accomplish curriculum-based tasks by using tool software (<i>e.g., create a report explaining how different features of plants help them survive</i>) <input type="checkbox"/> edit text and images within a document (<i>e.g., use spell-check, format headings, place and modify images to enhance presentation of information</i>) <input type="checkbox"/> begin to use and apply data-management software (<i>e.g., use spreadsheets to construct bar graphs and pictographs</i>) <input type="checkbox"/> navigate within a document, CD-ROM, or software program that contains links; <input type="checkbox"/> begin to send ideas and information using e-mail <input type="checkbox"/> begin to develop keyboarding skills (<i>e.g., begin to use and apply skill lessons from All the Right Type, Almena Method</i>) <input type="checkbox"/> copy and move files from a designated folder to disk

	Social and Ethical Issues	Research and Inquiry	Communication and Collaboration	Productivity and Applications
GRADE 4	<ul style="list-style-type: none"> <input type="checkbox"/> follow acceptable-use policies (e.g., <i>TDSB Code of On-line Conduct</i>) <input type="checkbox"/> demonstrate an understanding of intellectual property (e.g., <i>cite web sites and other sources of images, video, and graphics</i>) <input type="checkbox"/> demonstrate correct ergonomics (e.g., <i>posture, time on computer, proximity to screen, adequate lighting</i>) <input type="checkbox"/> develop an awareness of safe behaviour while using ICT (e.g., <i>respect confidentiality of passwords and personal information</i>) <input type="checkbox"/> demonstrate an awareness of the advantages and challenges of using ICT 	<ul style="list-style-type: none"> <input type="checkbox"/> formulate questions to guide research (e.g., <i>develop questions to explore how humans affect natural habitats</i>) <input type="checkbox"/> develop use of search terms (e.g., <i>search the library catalogue by author, title, keyword</i>) <input type="checkbox"/> browse on-line resources by subject (e.g., <i>use the subject categories of an on-line encyclopedia to locate information about the habitats of plants</i>) <input type="checkbox"/> explore, locate, and retrieve information from on-line resources (e.g., <i>keep jot notes on a teacher-provided organizer while searching an electronic encyclopedia to explore the roles of people in medieval society</i>) <input type="checkbox"/> investigate various media formats and how they are organized (e.g., <i>analyze the features of text in a web site, an on-line newspaper, and an on-line encyclopedia</i>) <input type="checkbox"/> use prepared databases and spreadsheets to enter and organize data (e.g., <i>collect information about the foods friends prefer and compare to Canada's Food Guide</i>) <input type="checkbox"/> review information to determine if needs are met (e.g., <i>ask "Have I answered all my inquiry questions?"</i>) 	<ul style="list-style-type: none"> <input type="checkbox"/> synthesize and share information using graphic organizers (e.g., <i>storyboard a writing plan in AppleWorks</i>) <input type="checkbox"/> share ideas and information using tool software (e.g., <i>create a HyperStudio stack describing the natural resources and physical regions of a Canadian province</i>) <input type="checkbox"/> communicate and collaborate electronically with people inside and outside the classroom (e.g., <i>TEL exchange projects, Class Conference on TEL</i>) <input type="checkbox"/> begin to identify the advantages and disadvantages of using ICT for specific tasks (e.g., <i>publishing a narrative</i>) 	<ul style="list-style-type: none"> <input type="checkbox"/> accomplish curriculum-based tasks by using tool software (e.g., <i>publish a procedure that includes sound, text, and images</i>) <input type="checkbox"/> use and apply data-management software (e.g., <i>use spreadsheets and/or databases to classify observed rocks and minerals by colour, texture, and shape</i>) <input type="checkbox"/> independently access and navigate within a document, CD-ROM, or software program that contains links <input type="checkbox"/> access e-mail and personal electronic storage space using individual network ID <input type="checkbox"/> with assistance, use Internet search engines and other on-line search resources <input type="checkbox"/> with assistance, integrate the use of peripherals into projects and presentations (e.g., <i>scanner, digital camera</i>) <input type="checkbox"/> continue to develop keyboarding skills

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GRADE 5	<ul style="list-style-type: none"> <input type="checkbox"/> exhibit legal and ethical behaviours when using information and ICT (e.g., observe copyright laws, reference sources) <input type="checkbox"/> identify equity implications of ICT (e.g., biases and omissions in visuals of software programs) <input type="checkbox"/> understand the consequences of misuse (e.g., using inappropriate sites, plagiarizing a report) <input type="checkbox"/> demonstrate awareness of current changes in ICT and the effect those changes have on the workplace 	<ul style="list-style-type: none"> <input type="checkbox"/> follow an inquiry and research plan based on the four stages (<i>prepare for research, access resources, process information, transfer learning</i>) <input type="checkbox"/> formulate new questions as research progresses (e.g., use word processing software to record reflections and new questions arising from searches) <input type="checkbox"/> select and use appropriate search tools to gather and manage information from a variety of electronic reference materials (e.g., select government sites to investigate the function of the federal government) <input type="checkbox"/> identify and distinguish points of view expressed in electronic sources on a particular topic (e.g., explore different periodical databases to discover varied viewpoints on an environmental issue) <input type="checkbox"/> analyze electronic sources for accuracy or relevance to the purpose (e.g., critique web sites for copyright date and reliability, skim sites for usefulness) <input type="checkbox"/> create and use simple organizers and outlines (e.g., to collect and organize information, to sort facts, to find similarities, to evaluate and classify data) <input type="checkbox"/> review and analyze information to determine if needs are met 	<ul style="list-style-type: none"> <input type="checkbox"/> synthesize and present information using graphic organizers and spreadsheets (e.g., use a spreadsheet or table to compare characteristics of early civilizations) <input type="checkbox"/> present and share ideas and information using tool software (e.g., create a HyperStudio stack or web page describing the structure and function of the digestive system) <input type="checkbox"/> independently communicate and collaborate electronically with people inside and outside the classroom (e.g., consult an expert, use Silver Birch Banter Conference on TEL) <input type="checkbox"/> be sensitive to the characteristics of the audience when presenting information (e.g., consider the length of presentation if intended audience is younger students in the school) <input type="checkbox"/> evaluate the advantages and disadvantages of different kinds of print and electronic presentations (e.g., compare graphing using a spreadsheet vs. graphing on paper) 	<ul style="list-style-type: none"> <input type="checkbox"/> accomplish curriculum-based tasks by using tool software (e.g., create an autobiography that includes sound, text, and images) <input type="checkbox"/> solve problems that involve numerical operations by using tools such as calculators and spreadsheets (e.g., use a spreadsheet to explore patterns in number operations) <input type="checkbox"/> with assistance, create documents that contain some links and a simple navigation system (e.g., create a HyperStudio stack or web page describing the structure of Canada's federal government) <input type="checkbox"/> begin to use e-mail to submit assigned work <input type="checkbox"/> use Internet search engines and other on-line search resources <input type="checkbox"/> integrate the use of peripherals into projects and presentations (e.g., scanner, digital camera) <input type="checkbox"/> develop competent keyboarding skills

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GRADE 6	<ul style="list-style-type: none"> <input type="checkbox"/> demonstrate ethical and legal use of information (e.g., using proper documentation of all sources of information) <input type="checkbox"/> demonstrate understanding of equity implications of ICT (e.g., using inclusive language, images and content) <input type="checkbox"/> explain the rationale of the acceptable use policy and Code of On-line conduct <input type="checkbox"/> describe the concept and importance of ethical uses of ICT (e.g., following on-line protocols) 	<ul style="list-style-type: none"> <input type="checkbox"/> design and follow a plan to be used during an inquiry process, and make revisions to the plan as necessary* (e.g., follow the four-stage research process, and consider timelines, assessment criteria, presentation expectations) <input type="checkbox"/> use boolean searching strategies (e.g., use “Canada AND natural resources” to narrow a search; but use “fishing OR lobsters” to broaden a search) <input type="checkbox"/> select and use a variety of electronic resources to build a knowledge base (e.g., on-line encyclopedias, databases, and Internet sites) <input type="checkbox"/> synthesize information by developing generalizations, making decisions, and drawing conclusions to create something new (e.g., follow the inquiry-based process and scaffolding of a web quest to complete a task) <input type="checkbox"/> compare formats of print, electronic, and multimedia reference materials to facilitate the selection of resources and information (e.g., consider the advantages and disadvantages of each) <input type="checkbox"/> create visual organizers to sequence, classify, and analyze information <input type="checkbox"/> reflect on and describe the processes involved in completing a project 	<ul style="list-style-type: none"> <input type="checkbox"/> synthesize and present information using graphic organizers and databases (e.g., create a database of products imported and exported by Canada and its trading partners) <input type="checkbox"/> begin to create multimedia presentations that include sounds and images from a variety of sources (e.g., visual images, clip art, sound clips, and animated images)* <input type="checkbox"/> collaborate with people within and beyond the classroom using e-mail, TEL conferences, and the Internet (e.g., Writers in Electronic Residence) <input type="checkbox"/> determine an appropriate method to communicate and present information based on the intended audience (e.g., spreadsheet vs. database, SlideShow vs. poster etc.) 	<ul style="list-style-type: none"> <input type="checkbox"/> accomplish curriculum-based tasks by using tool software (e.g., complete a project describing the physical characteristics of the solar system that includes sound, text, images, and animation) <input type="checkbox"/> solve problems requiring the sorting, organizing, and classifying of data (e.g., use the “find” and “sort” features of a database to reach conclusions about a particular data set) <input type="checkbox"/> create documents that contain links and navigation systems (e.g., create a HyperStudio stack or web page profiling early explorers) <input type="checkbox"/> use e-mail to receive and submit assigned work via a class conference on TEL (including uploading and downloading files) <input type="checkbox"/> efficiently use Internet search engines and other on-line search resources <input type="checkbox"/> demonstrate keyboarding skills required to complete assigned tasks

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GRADE 7	<ul style="list-style-type: none"> <input type="checkbox"/> analyze features of our information-based society <input type="checkbox"/> analyze features and examples of ethical and unethical uses of information and ICT (<i>e.g., recognize and challenge web sites that promote discriminatory ideas</i>) <input type="checkbox"/> explain the principles and practice of confidentiality and privacy in communicating information (<i>e.g., forwarding e-mail only with the consent of the sender</i>) <input type="checkbox"/> identify how ICT is changing how tasks are performed 	<ul style="list-style-type: none"> <input type="checkbox"/> develop a plan for a research project and formulate questions to guide the inquiry <input type="checkbox"/> select appropriate search engines, subject directories, and URLs to meet information needs (<i>e.g., identify resources that can support someone experiencing harassment</i>) <input type="checkbox"/> use references, cross references, and hyperlinks to expand approaches to a topic <input type="checkbox"/> examine the authority, validity, and reliability of print and on-line resources (<i>e.g., use a teacher-prepared tool to analyze web sites on drug addiction before conducting research</i>) <input type="checkbox"/> develop appropriate organizers for collecting information for specific research tasks (<i>e.g., use organization tools such as timelines, knowledge trees, legends, and indexes to record and organize information</i>) <input type="checkbox"/> analyze how data was collected and discuss the reasonableness of results 	<ul style="list-style-type: none"> <input type="checkbox"/> synthesize and present information using a combination of graphic organizers and data-management software (<i>e.g., tables, graphs, spreadsheets, and databases</i>) <input type="checkbox"/> prepare multimedia presentations for a variety of purposes and audiences (<i>e.g., a slideshow, movie, or web page describing daily life in New France</i>) <input type="checkbox"/> collaborate with peers, teachers, and others to exchange information, using a variety of ICT communication tools (<i>e.g., TEL Conferences, class web pages</i>) <input type="checkbox"/> consider the relative strengths of print, electronic, and blended modes of presentation in order to determine the most appropriate method(s) of conveying information to an intended audience 	<ul style="list-style-type: none"> <input type="checkbox"/> accomplish curriculum-based tasks by using tool software (<i>e.g., a multimedia project that includes sound, text, images, video, and animation</i>) <input type="checkbox"/> apply the analysis tools found in database and spreadsheet applications to solve problems and generate reports <input type="checkbox"/> create and modify documents that contain links and non-linear navigation systems (<i>e.g., create a web page or HyperStudio stack about interactions within ecosystems</i>) <input type="checkbox"/> use e-mail to receive, edit, and submit assigned work via a class conference on TEL (<i>including downloading, modifying, and uploading files</i>) <input type="checkbox"/> select Internet search engines and other on-line search resources based on an assigned task and purpose <input type="checkbox"/> begin to employ content-specific software and simulations to explore and analyze data and information to support learning and research (<i>e.g., create and analyze designs that include transformed images using The Geometer's Sketchpad</i>)

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GRADE 8	<ul style="list-style-type: none"> <input type="checkbox"/> indicate current changes in information technologies and the effect these changes have on the workplace and society <input type="checkbox"/> demonstrate a responsible and ethical attitude to the use of ICT by using electronic networks in an ethical manner <input type="checkbox"/> recognize the implications of copyright infringement <input type="checkbox"/> demonstrate an understanding of ethical practice when using e-mail and on-line discussion conferences <input type="checkbox"/> describe information anxiety and overload in contemporary society 	<ul style="list-style-type: none"> <input type="checkbox"/> plan and conduct a search, using a wide variety of electronic sources (<i>e.g., use on-line encyclopedias, periodical databases, validated Internet sites to explore the tools, materials, and design principles used by selected artists</i>) <input type="checkbox"/> recognize elements of potentially successful research questions <input type="checkbox"/> use advanced search techniques to limit the number of search results to a query (<i>e.g., + or —, Boolean, etc.</i>) <input type="checkbox"/> develop a process to manage volumes of information that can be made available through electronic sources (<i>e.g., bookmark selected sites or create a personal hotlist</i>) <input type="checkbox"/> research the accuracy, relevance, appropriateness, comprehensiveness, and bias of electronic information sources (<i>e.g., use a prepared template to evaluate sites before using</i>) <input type="checkbox"/> synthesize findings and formulate conclusions using tool software (<i>e.g., create a visual organizer to compare the automatic functions of the human eye with the functions in an automatic camera</i>) <input type="checkbox"/> make inferences and convincing arguments based on data analysis <input type="checkbox"/> self-evaluate and set goals for improvement (<i>e.g., create and maintain a learning log</i>) 	<ul style="list-style-type: none"> <input type="checkbox"/> interpret, synthesize, and present information using a combination of graphic organizers and data-management software (<i>e.g., reports, flow charts, graphs, templates, spreadsheets, and databases</i>) <input type="checkbox"/> design and present multimedia projects (<i>e.g., web pages, newsletters, slideshows, movies</i>) <input type="checkbox"/> collaborate with peers, teachers, and others using a variety of ICT communication tools to contribute to projects for local and global audiences (<i>e.g., participate in Canada SchoolNet Grassroots projects</i>) <input type="checkbox"/> evaluate presentation methods and modify for particular needs in order to effectively convey information to an intended audience 	<ul style="list-style-type: none"> <input type="checkbox"/> accomplish curriculum-based tasks by using tool software (<i>e.g., a multimedia presentation that includes sound, text, images, video, and animation</i>) <input type="checkbox"/> apply the analysis and synthesis tools found in database and spreadsheet applications in order to solve more complex problems and generate reports <input type="checkbox"/> create, modify, and evaluate documents that contain links and non-linear navigation systems (<i>e.g., create a web page or HyperStudio stack about the Charlottetown Conference</i>) <input type="checkbox"/> use e-mail to receive, edit, and submit assigned work via a class conference on TEL (<i>including downloading, modifying, compressing, decompressing, and uploading files</i>) <input type="checkbox"/> evaluate and select Internet search engines, directories, and sites based on specific criteria (<i>e.g., intended audience, purpose for research, evidence of bias</i>) <input type="checkbox"/> employ content-specific software and simulations to explore and analyze data and information to support learning and research (<i>e.g., investigate the Pythagorean relationship using The Geometer's Sketchpad</i>)

	Social and Ethical Issues	Research and Inquiry	Communication and Collaboration	Productivity and Applications
GRADE 9	<ul style="list-style-type: none"> ❑ identify the impact of ICT on the world and probable future directions in technological development (e.g., <i>Canadian and world cultures, education, health, business</i>) ❑ demonstrate legal and ethical behaviours when using ICT (e.g., <i>properly citing and referencing all sources of information</i>) ❑ appreciate the principles of intellectual property and copyright law (e.g., <i>investigate copyright for print, music, images, and multimedia</i>) ❑ identify issues regarding storage, privacy, and security of information (e.g., <i>investigate the implications of the collection of private information by government agencies, such as Statistics Canada</i>) ❑ discuss ways of controlling information (e.g., <i>filtering and censorship</i>) 	<ul style="list-style-type: none"> ❑ develop a research plan (e.g., <i>identify task requirements and establish timelines</i>) ❑ articulate and use the four stages of the research process to meet information needs when using electronic and print resources ❑ access, assemble, and organize diverse viewpoints from electronic sources in order to assess their validity for specific topics (e.g., <i>create charts and tables to compare and contrast information</i>) ❑ evaluate the authority, reliability and relevance of electronic sources and information (e.g., <i>develop criteria to assess web sites</i>) ❑ use advanced database strategies to record, sort, and organize information (e.g., <i>discriminate between attribute and location data in a G.I.S.—CGC 1D</i>) ❑ use tool software to synthesize findings and formulate conclusions (e.g., <i>create a visual organizer to regroup and organize data to make connections</i>) ❑ reflect on the research process (e.g., <i>create and maintain a learning log</i>) 	<ul style="list-style-type: none"> ❑ interpret, synthesize, present, and review information using a combination of graphic organizers and data-management software (e.g., <i>compare the benefits and disadvantages of Canada’s energy mega projects—CGC1P</i>) ❑ continue to design and present multimedia projects (e.g., <i>create a simple composition using the elements of melody, rhythm, and form, and a variety of media—AMU1O</i>) ❑ collaborate with peers, teachers, and others using a variety of ICT communication tools to develop projects for local and global audiences ❑ evaluate presentation methods and modify them for particular needs to effectively convey information to an intended audience 	<ul style="list-style-type: none"> ❑ accomplish curriculum-based tasks by using integrated tool software effectively and efficiently (e.g., <i>produce artworks using traditional and new technologies: video, computer, scanner, photocopier, digital camera—AV11O</i>) ❑ create databases and spreadsheets to organize and analyze information in a variety of ways ❑ create, modify, and evaluate web pages that contain multiple links and non-linear navigation systems (e.g., <i>plan and write a sample web page on how to use a provincial park campsite responsibly and another on the pleasures of camping—ENG1D</i>) ❑ test solutions to problems by using integrated software, such as computer-assisted design or simulation/modelling software (e.g., <i>use a variety of computer software applications for research, to solve problems, and to document the design process—TT11O</i>) ❑ solve a problem by articulating a plan of action and identifying appropriate materials and tools (e.g., <i>use Fathom to create the graphs of a variety of linear and non-linear relations from their equations and classify the relations according to the shapes of their graphs—MPM1D</i>)

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GRADE 10	<ul style="list-style-type: none"> ❑ analyze the impact of ICT on society and on probable future directions in technological development (<i>e.g., medicine, genetic engineering, artificial intelligence</i>) ❑ demonstrate legal and ethical behaviours when using ICT and appreciate the consequences of illegal and unethical behaviours (<i>e.g., copyright and plagiarism</i>) ❑ identify and use methods of determining the ownership of intellectual property (<i>e.g., sourcing the ownership of a music clip</i>) ❑ identify implications of controlling information (<i>e.g., censorship, filtering</i>) ❑ discuss the legal consequences of interfering with on-line communication (<i>e.g., hacking and harassment</i>) 	<ul style="list-style-type: none"> ❑ critique own questions as essential and non-essential ❑ use various on-line libraries for information needs and describe their features ❑ analyze and evaluate primary sources of information (<i>e.g., interpret statistical information in varied media, such as on-line handbooks, almanacs, and reports</i>) ❑ analyze electronic resources for validity (<i>e.g., identify perspective, bias, inclusiveness, stereotyping, intent, and credibility for a specific research task</i>) ❑ use flow chart, webbing, and database software to synthesize findings and formulate conclusions (<i>e.g., produce an analysis of how and why recent innovations in telecommunications are changing life today—CHC2D</i>) ❑ self-evaluate the application of the four-stage research process (<i>e.g., use electronic journal to track product and process of research</i>) 	<ul style="list-style-type: none"> ❑ interpret, synthesize, present, and review information using a combination of graphic organizers and data-management software (<i>e.g., demonstrate the ability to organize selected career information effectively, using word-processing, database, spreadsheet, and information management software—GLC2O</i>) ❑ design, present, and review multimedia projects (<i>e.g., use computer technology and software to digitize movement-related effects—ATC2O</i>) ❑ collaborate with peers, teachers, and others, using a wide variety of ICT communication tools, to develop and review projects for local and global audiences (<i>e.g., create a personal anthology of poetry in print and as a web page with links to related sites—ENG2D</i>) ❑ evaluate presentation and transition methods and modify them for particular needs to effectively and efficiently convey information to an intended audience 	<ul style="list-style-type: none"> ❑ accomplish curriculum-based tasks by using integrated tool software effectively and efficiently (<i>e.g., acquire information from a variety of materials including CD-ROMs, computer software—FSF2P</i>) ❑ create advanced databases and spreadsheets to output information in a variety of ways (<i>e.g., analyze a population case study by producing population growth curves for each of the populations in the study, and use the graphs to explain how different factors affect population size and to predict the effect of varying factors—SNC2D</i>) ❑ create, modify, and evaluate web pages that contain multiple links and complex non-linear navigation systems ❑ test and evaluate a problem by creating a simulation or a model (<i>e.g., use a relational database to make basic temporal queries on election patterns—CHC2D</i>) ❑ evaluate choices and the progress in problem solving, then redefine the plan of action as appropriate *

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GRADE 11	<ul style="list-style-type: none"> ❑ describe the societal impact of ICT on communications (<i>e.g., e-mail, video conferencing</i>) ❑ understand and practise protocol and responsibilities for the use of information from electronic resources (<i>e.g., using e-mail and on-line discussion groups</i>) ❑ understand the consequences of interference with personal privacy and security (<i>e.g., cookies, selling e-mail lists</i>) ❑ discuss the societal and financial consequences of computer attacks (<i>e.g., viruses, worms</i>) ❑ identify and describe economic and environmental issues associated with the production and disposal of ICT hardware ❑ make informed choices among ICT systems, resources, and services 	<ul style="list-style-type: none"> ❑ form questions into a thesis statement and reflect on the continuing appropriateness of the thesis statement (<i>e.g., research and report on the economic, environmental, and cultural impact of travel and tourism associated with international sporting events—CGG3O</i>) ❑ consult a wide variety of sources that reflect varied viewpoints on particular topics (<i>e.g., collect data from a range of print and electronic media, interviews, government and community agencies—CPC3O</i>) ❑ demonstrate discriminatory selection of relevant information (<i>e.g., analyze sources for bias, and compare them with other sources</i>) ❑ investigate and solve problems of organization and manipulation of information during an inquiry (<i>e.g., create and use complex graphic organizers</i>) ❑ use/create a web page to organize links to other sources of information ❑ re-examine the currency of research and modify product in light of new findings 	<ul style="list-style-type: none"> ❑ use and evaluate different combinations of graphic organizers and data-management software (<i>e.g., present ideas, understandings, and arguments effectively in a variety of contexts using graphic organizers and displays—CPC3O</i>) ❑ continue to design, present, and review multimedia projects (<i>e.g., create a slideshow presentation on the hyperbola which integrates sketches and animations from The Geometer’s Sketchpad—MCR3U</i>) ❑ manage collaboration among peers, teachers, and others, using a wide variety of ICT communication tools, to develop and review projects for local and global audiences (<i>e.g., identify how Aboriginal peoples promote their beliefs and values through technology such as, CD-ROMs, web sites, Kids from Kanata Project, Aboriginal television and radio stations—NBV3C</i>) ❑ design and adapt presentation and transition methods for a variety of audiences and purposes 	<ul style="list-style-type: none"> ❑ accomplish curriculum-based tasks by using integrated tool software effectively and efficiently (<i>e.g., use computer software to prepare and present publicity and marketing documents—TFH3E</i>) ❑ create advanced relational databases and spreadsheets to output information in a variety of ways ❑ create, modify, and evaluate web pages to organize links and reference other sources of information (<i>e.g., create web links to illustrate the role of law in protecting the rights of certain groups or individuals including women, children, Aboriginal peoples, minorities, and victims of crimes—CLU3E</i>) ❑ begin to understand the function of virtual modelling in problem-solving and project development (<i>e.g., create a flow model for G.I.S.—CGT3E</i>) ❑ use ICT tools to document problem solving processes and project development from conception to completion (<i>e.g., develop and maintain a project plan that covers all aspects of the development process for a computer program—ICS3M</i>)

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GRADE 12	<ul style="list-style-type: none"> ❑ analyze advantages and disadvantages of widespread use and reliance on ICT in the workplace and society, and identify consequences to make informed civic, social, and economic decisions ❑ identify capabilities and limitations of contemporary and emerging ICT resources and assess the potential of these systems to address personal, lifelong-learning, and workplace needs ❑ apply ethical and legal standards in planning, using, and evaluating ICT and intellectual property (e.g., demonstrate responsible use of resources, processes, and systems of technology) ❑ demonstrate and advocate for legal and ethical behaviour among peers, family, and community regarding the use of ICT and information ❑ evaluate ICT-based options, including distance and distributed education for lifelong learning (e.g., investigating advantages and disadvantages of distance learning and virtual libraries) 	<ul style="list-style-type: none"> ❑ create and follow an independent research plan (e.g., use time or project management software to assist in conducting an inquiry) ❑ plan and perform complex searches using a variety of search strategies ❑ select and apply appropriate ICT tools for research, information analysis, problem solving, and decision making in content areas (e.g., analyze and assess the newspaper, television, radio, and Internet coverage of a conflict or uprising—ENG4U) ❑ identify and analyze the appropriate ICT resources for research and problem solving (e.g., evaluate print and electronic sources about food and nutrition for bias, accuracy, validity, authority, and relevance—HFA4M) ❑ investigate and solve problems of prediction, calculation, and inference during an inquiry (e.g., manipulate data by using charting and graphing technologies in order to test inferences and probabilities) ❑ analyze and synthesize information to determine patterns and links among ideas ❑ recognize and integrate personal learning styles in research and problem solving 	<ul style="list-style-type: none"> ❑ routinely use and evaluate different combinations of graphic organizers and data-management software (e.g., effectively use current information technology to compile quantitative data and present statistical analysis of data—HHS4M) ❑ continue to design, present, and review multimedia projects (e.g., produce a digital portfolio of artworks using analog and digital encoding procedures; CD-ROM, interactive multimedia work, Internet site—ASM4O) ❑ manage and evaluate sustained collaboration among peers, teachers, and others, using a wide variety of ICT communication tools, to develop and review projects for local and global audiences ❑ design, adapt, and review presentation and transition methods for a variety of audiences and purposes 	<ul style="list-style-type: none"> ❑ accomplish curriculum-based tasks by using integrated tool software effectively and efficiently (e.g., create electronically, a multimedia interview presentation—BTX4E) ❑ create advanced relational databases and spreadsheets, linked to other software programs, to output information in a variety of ways ❑ create, modify, post, and evaluate web sites featuring multiple link pages on the World Wide Web or on a local network ❑ understand the function of virtual modelling in problem solving and project development (e.g., investigate the structures of biological molecules and functional groups using computer-generated, three-dimensional images and/or by building molecular models of simple carbohydrates, amino acids, simple polypeptides—SBI4U) ❑ make informed choices among ICT systems, resources, and services (e.g., appropriate use of raster and/or vector data within a specific G.I.S. platform—CGO4M)

GLOSSARY

Boolean – a mathematical system developed by the English mathematician and computer pioneer George Boole. A Boolean search consists of operators such as “and,” “not,” or “or,” and is commonly used in programming and in Internet search engines.

browser – software that allows users to find and see information on the Internet. The most common browsers are Netscape and Internet Explorer.

clip art – artwork, available through computer software, that can be copied and used in personal work.

collaborative learning on-line – technologies that link together people in several locations so that they can interact with one another.

cookie – a small file that a Web server automatically sends to a user’s computer when browsing certain web sites.

data-management software – applications that enable users to organize and analyze a series of data for a specific purpose. Examples of this type of software are (but are not limited to) Filemaker Pro, AppleWorks Spreadsheet, or Excel.

distance learning – any type of educational situation in which the instructor and learners are separated by time or location, or both.

e-learning – learning in which content is delivered via electronic media, the Internet, broadcast, audiovisual tapes, or CD-ROM. The terms *on-line learning* and *e-learning* are often used interchangeably.

e-mail (electronic mail) – sending messages from one computer user to another.

graphics – refers to photographs, illustrations, charts, icons, buttons, and other graphic design elements.

hacking – the process of illegally breaking into other computer systems to damage and/or steal information.

home page – a document with an address (URL) on the World Wide Web, maintained by a person or organization.

hypertext – text within a document that has been marked up and highlighted to allow a user to select words or pictures within the document, click on them, and connect to further information.

ICT (Information and Communication Technologies) – the study of developing and using technology to process information and aid communication.

Internet – an international network of networks, primarily used to connect education and research networks, begun by the United States government.

intranet – a World Wide Web-like network that is available only to people working internally in an organization.

Log in (or logon) – the process users must complete to gain access to a computer, network, bulletin board or other service that requires authorization.

multimedia – the use of multiple forms of communication, such as text, audio, and/or video.

on-line learning – the delivery of education and training through networks such as the Internet or intranets. Learners are able to learn at any time and any place. The terms *on-line learning* and *e-learning* are often used interchangeably.

p.d.f. (Portable Document Format) – a document format that allows scalable graphics and type to be displayed and printed from any computer and from any platform (Macintosh, Windows, Unix)–regardless of the fonts or software programs used to create the original document.

peripherals – devices connected to, or part of, a computer. Peripherals include monitors, printers, scanners, mice, external hard drives, floppy drives, CD-ROM drives, speakers, keyboards, and stylus pens.

query – a question or request to find a particular file, web site, record, or set of records in a search engine or database.

search engine – a web site that acts as a card catalogue for the Internet. Search engines attempt to index and locate desired information by searching for keywords specified by the user.

streaming – playing audio or video in real time as it is downloaded from the Internet, as opposed to it first being stored in a file.

TEL (Toronto Education Link) – an on-line communication system used by students, educators, and employees of the Toronto District School Board. It is used for sending e-mail, collaborating and conferencing.

tool software – this is a general term for an application that is capable of performing multiple tasks. Kid Pix and AppleWorks are examples of tool software.

URL (Uniform Resource Locator) – the address of a home page on the World Wide Web (e.g. <http://www.webpage.com>).

web quest – an on-line learning exercise that directs users to specified web sites, in order to find information and complete a task.

World Wide Web – a graphical, hypertext-based Internet tool that provides access to home pages created by individuals, businesses, and other organizations.

worm (Write Once Read Many) – a destructive software program containing code capable of gaining access to computers or networks and once within the computer or network causing that computer or network harm by deleting, modifying, distributing, or otherwise manipulating the data.

Acknowledgements

Our appreciation to the following groups for permission to use and adapt their work:

- ❑ Standards identified with an asterisk (*) have been used with permission from Alberta Learning's *Information and Communication Technology (K-12) Program of Studies*.
- ❑ Some standards have been adapted (for educational purposes) with permission from *National Educational Technology Standards for Students: Connecting Curriculum and Technology*, published by International Society for Technology in Education (ISTE) NETS Project.
- ❑ General standards identified with (Δ) have been used with the permission of the Ontario Library Association. Many of the specific skills in the Social and Ethical Issues and the Research and Inquiry strands have been adapted from *Information Studies: Kindergarten to Grade 12*, with the permission of the Ontario Library Association. The full document is available on-line at <<http://www.ola.aamlib.ca>>.

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In May and June 2002, a series of focus groups were held across the TDSB. The input and ideas of the teachers, instructional leaders, and administrators who attended these meetings played a central role in the development of the standards contained within this document.