Communications Technology 3104

Curriculum Guide 2017

Newfoundland Labrador

Education and Early Childhood Development

Department of Education and Early Childhood Development Mission Statement

The Department of Education and Early Childhood Development will improve provincial early childhood learning and the K-12 education system to further opportunities for the people of Newfoundland and Labrador.

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Acknowledgments

The Department of Education and Early Childhood Development for Newfoundland and Labrador gratefully acknowledges the contribution of the following members of the Communications Technology 3104 Working Group Committee in the completion of this work:

Craig Wells
Exploits Valley High

David Gill
Memorial University of Newfoundland

Garry Walsh
Clarenville High School

John Goldsworthy
St. Kevin's High

Scott Hewlett
Department of Education and Early Childhood Development

Tim Goodyear
Centre for Distance Learning and Innovation

Tony Hillier
Department of Education and Early Childhood Development

Section One: Newfoundland and Labrador Curriculum

Introduction

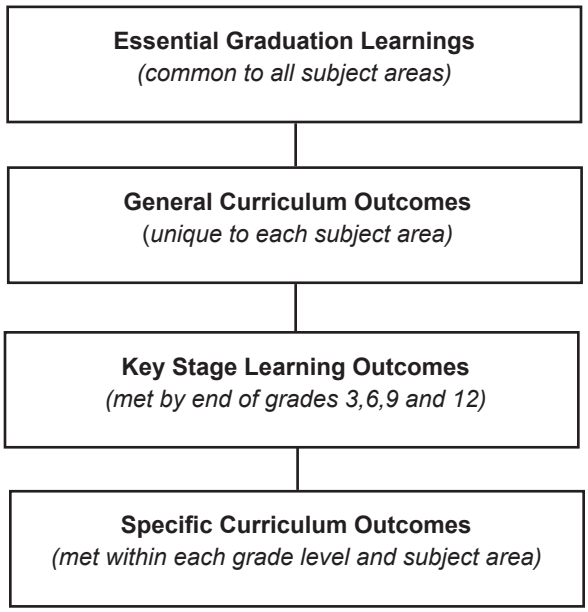
There are multiple factors that impact education: technological developments, increased emphasis on accountability, and globalization. These factors point to the need to consider carefully the education students receive.

The Newfoundland and Labrador Department of Education and Early Childhood Development believes that curriculum design with the following characteristics will help teachers address the needs of students served by the provincially prescribed curriculum:

- Curriculum guides must clearly articulate what students are expected to know and be able to do by the time they graduate from high school.
- There must be purposeful assessment of students' performance in relation to the curriculum outcomes.

Outcomes Based Education

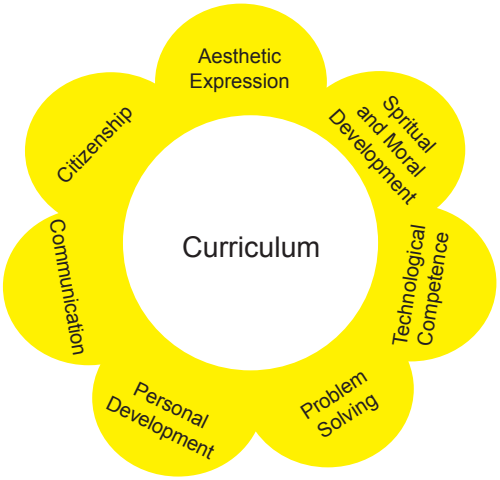
The K-12 curriculum in Newfoundland and Labrador is organized by outcomes and is based on *The Atlantic Canada Framework for Essential Graduation Learning in Schools* (1997). This framework consists of Essential Graduation Learnings (EGLs), General Curriculum Outcomes (GCOs), Key Stage Curriculum Outcomes (KSCOs) and Specific Curriculum Outcomes (SCOs).



Essential Graduation Learnings

EGLs provide vision for the development of a coherent and relevant curriculum. They are statements that offer students clear goals and a powerful rationale for education. The EGLs are delineated by general, key stage, and specific curriculum outcomes.

EGLs describe the knowledge, skills, and attitudes expected of all students who graduate from high school. Achievement of the EGLs will prepare students to continue to learn throughout their lives. EGLs describe expectations, not in terms of individual subject areas, but in terms of knowledge, skills, and attitudes developed throughout the K-12 curriculum. They confirm that students need to make connections and develop abilities across subject areas if they are to be ready to meet the shifting and ongoing demands of life, work, and study.



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

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

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

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

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

Spiritual and Moral Development – Graduates will demonstrate understanding and appreciation for the place of belief systems in shaping the development of moral values and ethical conduct.

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

Curriculum Outcomes

Curriculum outcomes are statements that articulate what students are expected to know and be able to do in each program area in terms of knowledge, skills, and attitudes.

Curriculum outcomes may be subdivided into General Curriculum Outcomes, Key Stage Curriculum Outcomes, and Specific Curriculum Outcomes.

General Curriculum Outcomes (GCOs)

Each program has a set of GCOs which describe what knowledge, skills, and attitudes students are expected to demonstrate as a result of their cumulative learning experiences within a subject area. GCOs serve as conceptual organizers or frameworks which guide study within a program area. Often, GCOs are further delineated into KSCOs.

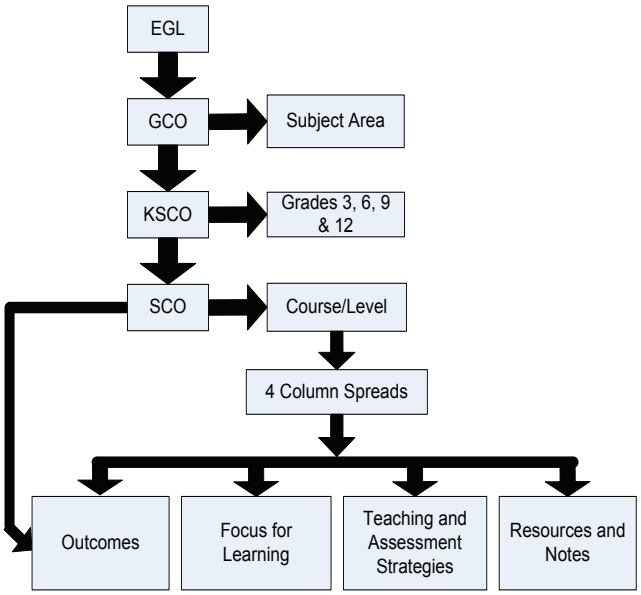
Key Stage Curriculum Outcomes (KSCOs)

Key Stage Curriculum Outcomes (KSCOs) summarize what is expected of students at each of the four key stages of grades three, six, nine, and twelve.

Specific Curriculum Outcomes (SCOs)

SCOs set out what students are expected to know and be able to do as a result of their learning experiences in a course, at a specific grade level. In some program areas, SCOs are further articulated into delineations. *It is expected that all SCOs will be addressed during the course of study covered by the curriculum guide.*

EGLs to Curriculum Guides



Context for Teaching and Learning

Teachers are responsible to help students achieve outcomes. This responsibility is a constant in a changing world. As programs change over time so does educational context. Several factors make up the educational context in Newfoundland and Labrador today: inclusive education, support for gradual release of responsibility teaching model, focus on literacy and learning skills in all programs, and support for education for sustainable development.

Inclusive Education

All students need to see their lives and experiences reflected in their school community. It is important that the curriculum reflect the experiences and values of all genders and that learning resources include and reflect the interests, achievements, and perspectives of all students. An inclusive classroom values the varied experiences and abilities as well as social and ethno-cultural backgrounds of all students while creating opportunities for community building. Inclusive policies and practices promote mutual respect, positive interdependencies, and diverse perspectives. Learning resources should include a range of materials that allow students to consider many viewpoints and to celebrate the diverse aspects of the school community.

Valuing Equity and Diversity

Effective inclusive schools have the following characteristics: supportive environment, positive relationships, feelings of competence, and opportunities to participate. (The Centre for Inclusive Education, 2009)

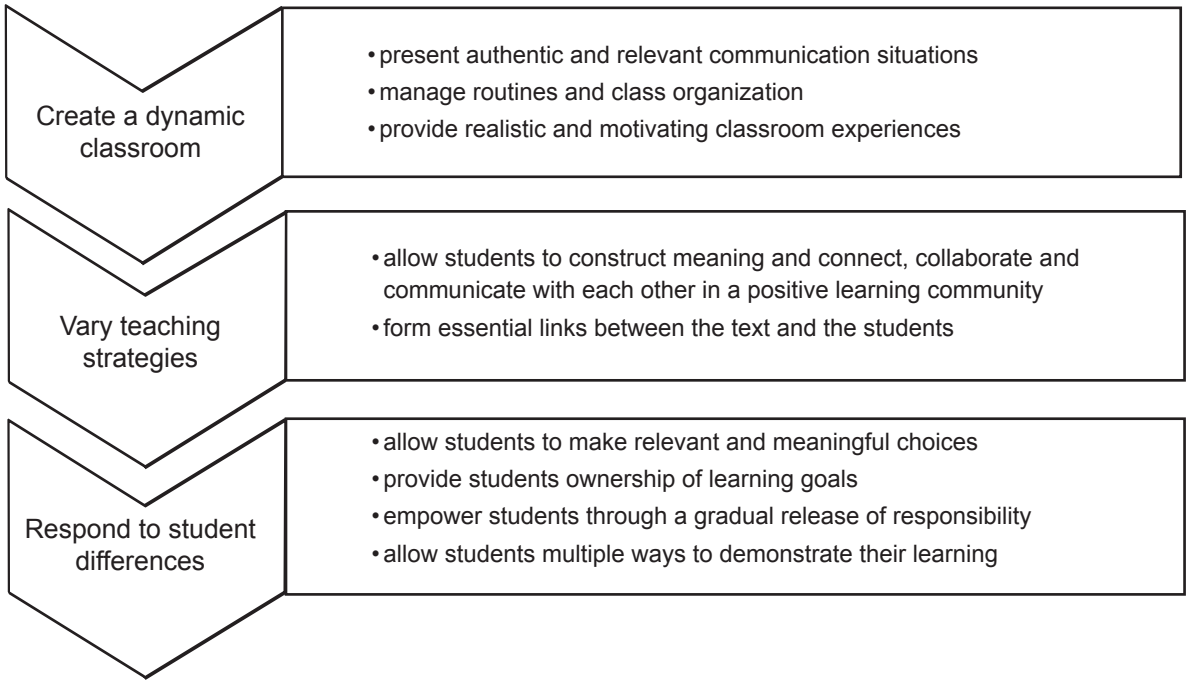
Differentiated Instruction

Differentiated instruction is a teaching philosophy based on the premise that teachers should adapt instruction to student differences. Rather than marching students through the curriculum lockstep, teachers should modify their instruction to meet students' varying readiness levels, learning preferences, and interests. Therefore, the teacher proactively plans a variety of ways to 'get it' and express learning. (Carol Ann Tomlinson, 2008)

Curriculum is designed and implemented to provide learning opportunities for all students according to abilities, needs, and interests. Teachers must be aware of and responsive to the diverse range of learners in their classes. Differentiated instruction is a useful tool in addressing this diversity.

Differentiated instruction responds to different readiness levels, abilities, and learning profiles of students. It involves actively planning so that the process by which content is delivered, the way the resource is used, and the products students create are in response to the teacher's knowledge of whom he or she is interacting with. Learning environments should be flexible to accommodate various learning preferences of the students. Teachers continually make decisions about selecting teaching strategies and structuring learning activities that provide all students with a safe and supportive place to learn and succeed.

Planning for Differentiation



Differentiating the Content

Differentiating content requires teachers to pre-assess students to identify those who require prerequisite instruction, as well as those who have already mastered the concept and may therefore apply strategies learned to new situations. Another way to differentiate content is to permit students to adjust the pace at which they progress through the material. Some students may require additional time while others will move through at an increased pace and thus create opportunities for enrichment or more indepth consideration of a topic of particular interest.

Teachers should consider the following examples of differentiating content:

- Meet with small groups to reteach an idea or skill or to extend the thinking or skills.
- Present ideas through auditory, visual, and tactile means.
- Use reading materials such as novels, websites, and other reference materials at varying reading levels.

Differentiating the Process

Differentiating the process involves varying learning activities or strategies to provide appropriate methods for students to explore and make sense of concepts. A teacher might assign all students the same product (e.g., presenting to peers) but the process students use to create the presentation may differ. Some students could work in groups while others meet with the teacher individually. The same assessment criteria can be used for all students.

Teachers should consider flexible grouping of students such as whole class, small group, or individual instruction. Students can be grouped according to their learning styles, readiness levels, interest areas, and/or the requirements of the content or activity presented. Groups should be formed for specific purposes and be flexible in composition and short-term in duration.

Teachers should consider the following examples of differentiating the process:

- Offer hands-on activities for students.
- Provide activities and resources that encourage students to further explore a topic of particular interest.
- Use activities in which all learners work with the same learning outcomes but proceed with different levels of support, challenge, or complexity.

Differentiating the Product

Differentiating the product involves varying the complexity and type of product that students create to demonstrate learning outcomes. Teachers provide a variety of opportunities for students to demonstrate and show evidence of what they have learned.

Teachers should give students options to demonstrate their learning (e.g., create an online presentation, write a letter, or develop a mural). This will lead to an increase in student engagement.

Differentiating the Learning Environment

The learning environment includes the physical and the affective tone or atmosphere in which teaching and learning take place, and can include the noise level in the room, whether student activities are static or mobile, or how the room is furnished and arranged. Classrooms may include tables of different shapes and sizes, space for quiet individual work, and areas for collaboration.

Teachers can divide the classroom into sections, create learning centres, or have students work both independently and in groups. The structure should allow students to move from whole group, to small group, pairs, and individual learning experiences and support a variety of ways to engage in learning. Teachers should be sensitive and alert to ways in which the classroom environment supports their ability to interact with students.

Teachers should consider the following examples of differentiating the learning environment:

- Develop routines that allow students to seek help when teachers are with other students and cannot provide immediate attention.
- Ensure there are places in the room for students to work quietly and without distraction, as well as places that invite student collaboration.
- Establish clear guidelines for independent work that match individual needs.
- Provide materials that reflect diversity of student background, interests, and abilities.

The physical learning environment must be structured in such a way that all students can gain access to information and develop confidence and competence.

Meeting the Needs of Students with Exceptionalities

All students have individual learning needs. Some students, however, have exceptionalities (defined by the Department of Education and Early Childhood Development) which impact their learning. The majority of students with exceptionalities access the prescribed curriculum. For details of these exceptionalities see www.gov.nl.ca/edu/k12/studentsupportservices/exceptionalities.html

Supports for these students may include

1. Accommodations
2. Modified Prescribed Courses
3. Alternate Courses
4. Alternate Programs
5. Alternate Curriculum

For further information, see Service Delivery Model for Students with Exceptionalities at www.cdli.ca/sdm/

Classroom teachers should collaborate with instructional resource teachers to select and develop strategies which target specific learning needs.

Meeting the Needs of Students who are Highly Able

(includes gifted and talented)

Some students begin a course or topic with a vast amount of prior experience and knowledge. They may know a large portion of the material before it is presented to the class or be capable of processing it at a rate much faster than their classmates. All students are expected to move forward from their starting point. Many elements of differentiated instruction are useful in addressing the needs of students who are highly able.

Teachers may

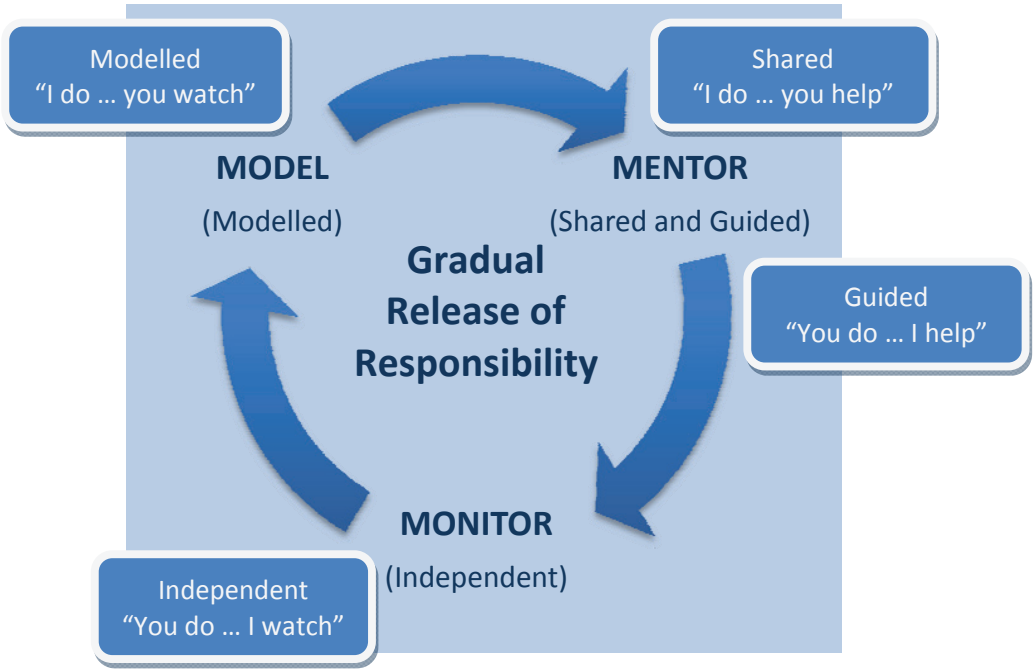
- assign independent study to increase depth of exploration in an area of particular interest;
- compact curriculum to allow for an increased rate of content coverage commensurate with a student's ability or degree of prior knowledge;
- group students with similar abilities to provide the opportunity for students to work with their intellectual peers and elevate discussion and thinking, or delve deeper into a particular topic; and
- tier instruction to pursue a topic to a greater depth or to make connections between various spheres of knowledge.

Highly able students require the opportunity for authentic investigation to become familiar with the tools and practices of the field of study. Authentic audiences and tasks are vital for these learners. Some highly able learners may be identified as gifted and talented in a particular domain. These students may also require supports through the Service Delivery Model for Students with Exceptionalities.

Gradual Release of Responsibility

Teachers must determine when students can work independently and when they require assistance. In an effective learning environment, teachers choose their instructional activities to model and scaffold composition, comprehension, and metacognition that is just beyond the students' independence level. In the gradual release of responsibility approach, students move from a high level of teacher support to independent work. If necessary, the teacher increases the level of support when students need assistance. The goal is to empower students with their own learning strategies, and to know how, when, and why to apply them to support their individual growth. Guided practice supports student independence. As a student demonstrates success, the teacher should gradually decrease his or her support.

Gradual Release of Responsibility Model



Literacy

"Literacy is the ability to identify, understand, interpret, create, communicate and compute, using printed and written materials associated with varying contexts. Literacy involves a continuum of learning in enabling individuals to achieve their goals, to develop their knowledge and potential, and to participate fully in their community and wider society". To be successful, students require a set of interrelated skills, strategies and knowledge in multiple literacies that facilitate their ability to participate fully in a variety of roles and contexts in their lives, in order to explore and interpret the world and communicate meaning. (The Plurality of Literacy and its Implications for Policies and Programmes, 2004, p.13)

Literacy is

- a process of receiving information and making meaning from it; and
- the ability to identify, understand, interpret, communicate, compute, and create text, images, and sounds.

Literacy development is a lifelong learning enterprise beginning at birth that involves many complex concepts and understandings. It is not limited to the ability to read and write; no longer are we exposed only to printed text. It includes the capacity to learn to communicate, read, write, think, explore, and solve problems. Individuals use literacy skills in paper, digital, and live interactions to engage in a variety of activities:

- Analyze critically and solve problems.
- Comprehend and communicate meaning.
- Create a variety of texts.
- Make connections both personally and inter-textually.
- Participate in the socio-cultural world of the community.
- Read and view for enjoyment.
- Respond personally.

These expectations are identified in curriculum documents for specific subject areas as well as in supporting documents, such as *Cross-Curricular Reading Tools* (CAMET).

With modelling, support, and practice, students' thinking and understandings are deepened as they work with engaging content and participate in focused conversations.

Reading in the Content Areas

The focus for reading in the content areas is on teaching strategies for understanding content. Teaching strategies for reading comprehension benefits all students as they develop transferable skills that apply across curriculum areas.

When interacting with different texts, students must read words, view and interpret text features, and navigate through information presented in a variety of ways including, but not limited to

Advertisements	Movies	Poems
Blogs	Music videos	Songs
Books	Online databases	Speeches
Documentaries	Plays	Video games
Magazine articles	Podcasts	Websites

Students should be able to interact with and comprehend different texts at different levels.

There are three levels of text comprehension:

- Independent level – Students are able to read, view, and understand texts without assistance.
- Instructional level – Students are able to read, view, and understand most texts but need assistance to fully comprehend some texts.
- Frustration level – Students are not able to read or view with understanding (i.e., texts may be beyond their current reading level).

Teachers will encounter students working at all reading levels in their classrooms and will need to differentiate instruction to meet their needs. For example, print texts may be presented in audio form, physical movement may be associated with synthesizing new information with prior knowledge, or graphic organizers may be created to present large amounts of print text in a visual manner.

When interacting with information that is unfamiliar to students, it is important for teachers to monitor how effectively students are using strategies to read and view texts:

- Analyze and think critically about information.
- Determine importance to prioritize information.
- Engage in questioning before, during, and after an activity related to a task, text, or problem.
- Make inferences about what is meant but not said.
- Make predictions.
- Synthesize information to create new meaning.
- Visualize ideas and concepts.

Learning Skills for Generation Next

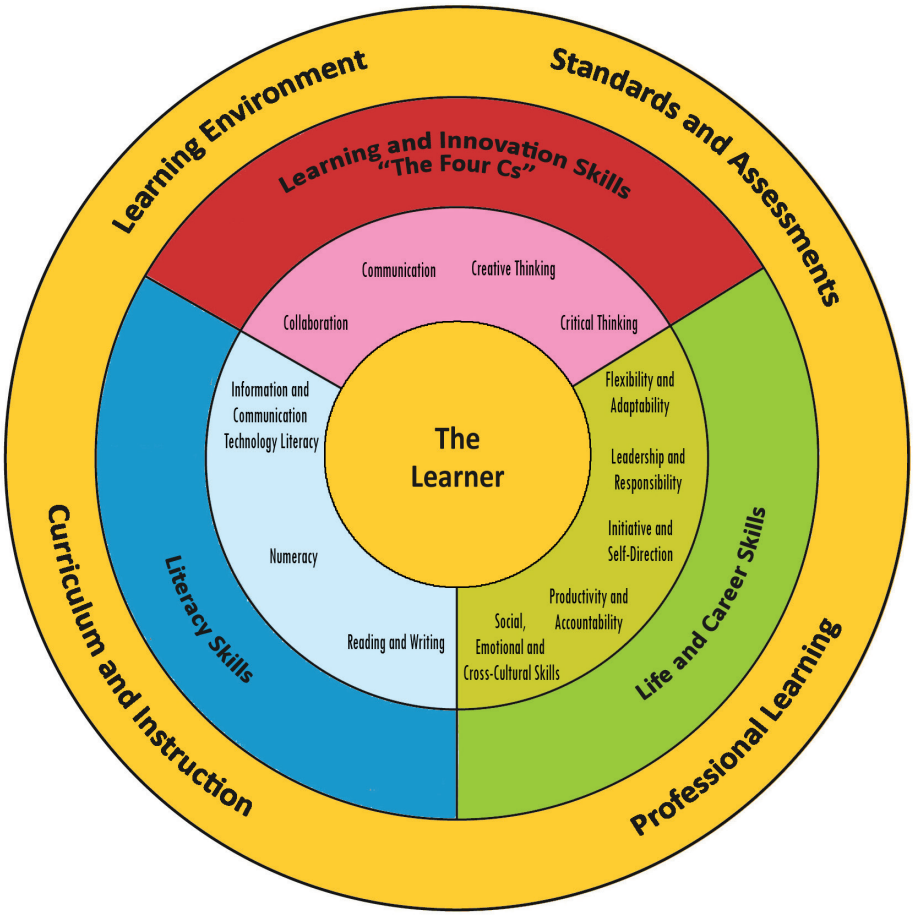
Generation Next is the group of students who have not known a world without personal computers, cell phones, and the Internet. They were born into this technology. They are digital natives.

Students need content and skills to be successful. Education helps students learn content and develop skills needed to be successful in school and in all learning contexts and situations. Effective learning environments and curricula challenge learners to develop and apply key skills within the content areas and across interdisciplinary themes.

Learning Skills for Generation Next encompasses three broad areas:

- Learning and Innovation Skills enhance a person's ability to learn, create new ideas, problem solve, and collaborate.
- Life and Career Skills address leadership, and interpersonal and affective domains.
- Literacy Skills develop reading, writing, and numeracy, and enhance the use of information and communication technology.

The diagram below illustrates the relationship between these areas. A 21st century curriculum employs methods that integrate innovative and research-driven teaching strategies, modern learning technologies, and relevant resources and contexts.



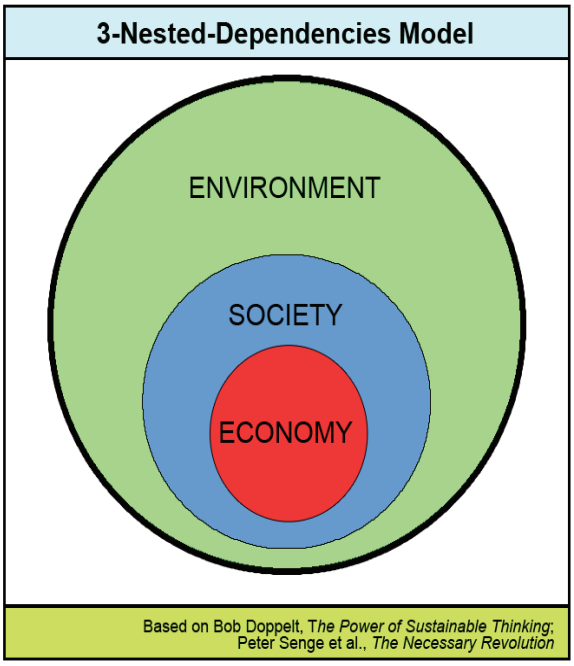
Support for students to develop these abilities and skills is important across curriculum areas and should be integrated into teaching, learning, and assessment strategies. Opportunities for integration of these skills and abilities should be planned with engaging and experiential activities that support the gradual release of responsibility model. For example, lessons in a variety of content areas can be infused with learning skills for Generation Next by using open-ended questioning, role plays, inquiry approaches, self-directed learning, student role rotation, and Internet-based technologies.

All programs have a shared responsibility in developing students' capabilities within all three skill areas.

Education for Sustainable Development

Sustainable development is defined as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs". (Our Common Future, 43)

Sustainable development is comprised of three integrally connected areas: economy, society, and environment.



As conceived by the United Nations Educational, Scientific, and Cultural Organization (UNESCO) the overall goal of Education for Sustainable Development (ESD) is to integrate the knowledge, skills, values, and perspectives of sustainable development into all aspects of education and learning. Changes in human behaviour should create a more sustainable future that supports environmental integrity and economic viability, resulting in a just society for all generations.

ESD involves teaching *for* rather than teaching *about* sustainable development. In this way students develop the skills, attitudes, and perspectives to meet their present needs without compromising the ability of future generations to meet their needs.

Within ESD, the knowledge component spans an understanding of the interconnectedness of our political, economic, environmental, and social worlds, to the role of science and technology in the development of societies and their impact on the environment. The skills necessary include being able to assess bias, analyze consequences of choices, ask questions, and solve problems. ESD values and perspectives include an appreciation for the interdependence of all life forms, the importance of individual responsibility and action, an understanding of global issues as well as local issues in a global context. Students need to be aware that every issue has a history, and that many global issues are linked.

Assessment and Evaluation

Assessment

Assessment is the process of gathering information on student learning.

How learning is assessed and evaluated and how results are communicated send clear messages to students and others about what is valued.

Assessment instruments are used to gather information for evaluation. Information gathered through assessment helps teachers determine students' strengths and needs, and guides future instruction.

Teachers are encouraged to be flexible in assessing student learning and to seek diverse ways students might demonstrate what they know and are able to do.

Evaluation involves the weighing of the assessment information against a standard in order to make a judgement about student achievement.

Assessment can be used for different purposes:

1. Assessment *for* learning guides and informs instruction.
2. Assessment *as* learning focuses on what students are doing well, what they are struggling with, where the areas of challenge are, and what to do next.
3. Assessment *of* learning makes judgements about student performance in relation to curriculum outcomes.

1. Assessment for Learning

Assessment *for* learning involves frequent, interactive assessments designed to make student learning visible. This enables teachers to identify learning needs and adjust teaching accordingly. Assessment *for* learning is not about a score or mark; it is an ongoing process of teaching and learning:

- Pre-assessments provide teachers with information about what students already know and can do.
- Self-assessments allow students to set goals for their own learning.
- Assessment *for* learning provides descriptive and specific feedback to students and parents regarding the next stage of learning.
- Data collected during the learning process from a range of tools enables teachers to learn as much as possible about what a student knows and is able to do.

2. Assessment as Learning

Assessment *as* learning involves students' reflecting on their learning and monitoring their own progress. It focuses on the role of the student in developing metacognition and enhances engagement in their own learning. Students can

- analyze their learning in relation to learning outcomes,
- assess themselves and understand how to improve performance,
- consider how they can continue to improve their learning, and
- use information gathered to make adaptations to their learning processes and to develop new understandings.

3. Assessment of Learning

Assessment *of* learning involves strategies designed to confirm what students know in terms of curriculum outcomes. It also assists teachers in determining student proficiency and future learning needs. Assessment *of* learning occurs at the end of a learning experience and contributes directly to reported results. Traditionally, teachers relied on this type of assessment to make judgements about student performance by measuring learning after the fact and then reporting it to others. Used in conjunction with the other assessment processes previously outlined, assessment *of* learning is strengthened. Teachers can

- confirm what students know and can do;
- report evidence to parents/guardians, and other stakeholders, of student achievement in relation to learning outcomes; and
- report on student learning accurately and fairly using evidence obtained from a variety of contexts and sources.

Involving Students in the Assessment Process

Students should know what they are expected to learn as outlined in the specific curriculum outcomes of a course as well as the criteria that will be used to determine the quality of their achievement. This information allows students to make informed choices about the most effective ways to demonstrate what they know and are able to do.

It is important that students participate actively in assessment by co-creating criteria and standards which can be used to make judgements about their own learning. Students may benefit from examining various scoring criteria, rubrics, and student exemplars.

Students are more likely to perceive learning as its own reward when they have opportunities to assess their own progress. Rather than asking teachers, "What do you want?", students should be asking themselves questions:

- What have I learned?
- What can I do now that I couldn't do before?
- What do I need to learn next?

Assessment must provide opportunities for students to reflect on their own progress, evaluate their learning, and set goals for future learning.

Assessment Tools

In planning assessment, teachers should use a broad range of tools to give students multiple opportunities to demonstrate their knowledge, skills, and attitudes. The different levels of achievement or performance may be expressed as written or oral comments, ratings, categorizations, letters, numbers, or as some combination of these forms.

The grade level and the activity being assessed will inform the types of assessment tools teachers will choose:

Anecdotal Records	Photographic Documentation
Audio/Video Clips	Podcasts
Case Studies	Portfolios
Checklists	Presentations
Conferences	Projects
Debates	Questions
Demonstrations	Quizzes
Exemplars	Role Plays
Graphic Organizers	Rubrics
Journals	Self-assessments
Literacy Profiles	Tests
Observations	Wikis

Assessment Guidelines

Assessments should measure what they intend to measure. It is important that students know the purpose, type, and potential marking scheme of an assessment. The following guidelines should be considered:

- Collect evidence of student learning through a variety of methods; do not rely solely on tests and paper and pencil activities.
- Develop a rationale for using a particular assessment of learning at a specific point in time.
- Provide descriptive and individualized feedback to students.
- Provide students with the opportunity to demonstrate the extent and depth of their learning.
- Set clear targets for student success using learning outcomes and assessment criteria.
- Share assessment criteria with students so that they know the expectations.

Evaluation

Evaluation is the process of analyzing, reflecting upon, and summarizing assessment information, and making judgements or decisions based on the information gathered. Evaluation is conducted within the context of the outcomes, which should be clearly understood by learners before teaching and evaluation take place. Students must understand the basis on which they will be evaluated and what teachers expect of them.

During evaluation, the teacher interprets the assessment information, makes judgements about student progress, and makes decisions about student learning programs.

Section Two: Curriculum Design

Rationale

Technological competence is one of the Essential Graduation Learnings common to all curricular areas in the Newfoundland and Labrador Curriculum. The International Society for Technology in Education (ISTE) outlines Empowered Learner, Knowledge Constructor, Innovative Designer and Creative Communicator as four of its seven standards for students. The Conference Board of Canada Employability Skills Profile lists the ability to communicate, manage information, use numbers and think and solve problems as fundamental employability skills. Technology has become increasingly ubiquitous in the day to day lives of students. Learning how to manage information through technology is an essential form of communications.

Curriculum Outcomes Framework

Technology Education

Technology education engages students directly in constructing technological solutions to everyday, real-world problems. Technology Education employs a wide variety of hands-on activities. Students are exposed to a broad range of technological issues, systems, and problem situations in a systemic, systematic fashion. They employ a wide range of technological resources and processes to design, fabricate, and test solutions to familiar and unfamiliar problems. Outcomes, learning experiences, and evaluation of student achievement reflect and are geared towards engagement. Technology Education provides a naturally integrative function that helps students identify contextual relationships between technological activity and principles, and the underlying scientific, mathematical, and other concepts, principles, laws, and theories.

Communications Technology 3104

This communications technology course is designed to help high school students build practical skills in the management of data, coding for web design and coding for mobile applications.

The overall goal of the course is to help build skills in managing and manipulating data and developing applications to make data manageable to the end user.

Key Stage Curriculum Outcomes

The Key stage curriculum outcomes, based on the general curriculum outcomes, identify what students are expected to know and be able to do at the end of the primary/elementary, intermediate and high school grades in order to meet the essential graduation learnings. Key stage outcomes are identified for each of the dimensions. These key stage curriculum outcomes serve as the basis for the development of specific programs and courses for Technology Education.

Specific Curricular Outcomes

The specific curriculum outcomes are statements that describe what students will know, value, and be able to do as a result of study in a specific course or program at a grade level. These are found in the curriculum guides for each program or course.

General Curriculum Outcomes (GCOs)	Key Stage Curriculum Outcomes (KSCOs) By the end of grade 12, students will be expected to:
GCO 1: Technological Problem Solving Students will be expected to design, develop, evaluate, and articulate technological solutions.	[1.401] articulate problems that may be solved through technological means • assess diverse needs and opportunities • construct detailed design briefs that include design criteria and a work schedule [1.402] conduct design studies to identify a technological solution to a problem • investigate related solutions • document a range of options to solve this problem • determine and justify the best option • determine resource requirements and availability • develop detailed action plans, including technical drawings and sequences of action [1.403] develop (prototype, fabricate, make) technological solutions to problems • match resources and technical processes for specific tasks construct and test models and prototypes as needed • construct the solution with adherence to the design criteria • document activities, decisions, and milestones [1.404] critically evaluate technological solutions and report their findings • develop detailed evaluations of both their own and others' technological solutions, with reference to independently developed criteria • employ a continuous assessment methodology with the purpose of continuous improvement of the design • document and report their changes, the rationale for change,and conclusions

General Curriculum Outcomes (GCOs)	Key Stage Curriculum Outcomes (KSCOs) By the end of grade 12, students will be expected to:
	[1.405] communicate ideas and information about technological solutions through appropriate technical means • accurately present technical information by using a representative sample of analog and digital tools, including, for example, two- and three-dimensional, computer-assisted drafting and modelling tools • create accurately scaled models and prototypes
GCO 2: Technological Systems Students will be expected to operate and manage technological systems.	[2.401] operate, monitor, and adjust technological systems of increasing complexity [2.402] manage technological systems of increasing complexity [2.403] modify programming logic and control systems to optimize the behaviour of systems [2.404] deconstruct complex technological systems into their simpler systems and components [2.405 troubleshoot and maintain systems
GCO 3: History and Evolution of Technology Students will be expected to demonstrate an understanding of the history and evolution of technology, and of its social and cultural implications.	[3.401] evaluate technological systems in the context of convergence where one system has multiple functions, or divergence where multiple systems have the same function [3.402] evaluate the symbiotic roles of technology and science in modern society [3.403] analyse the symbiotic relationship between technology and education, including factors that influence standards for technological literacy and capability, and ways that the community responds [3.404] critically evaluate the effects of accelerating rates of technological change on self and society [3.405] account for effects of cultural diversity on technological solutions • critically examine the effects of cultural diversity onmarket forces and technological products, and viceversa • incorporate knowledge of cultural diversity into development of technological solutions
GCO 4: Technology and Careers Students will be expected to demonstrate an understanding of current and evolving careers and of the influence of technology on the nature of work.	[4.401] assess and evaluate employability profiles for a variety of workplaces and careers and determine the level of technological literacy and capability they would need to achieve for job entry [4.402] employ design and invention as tools to create entrepreneurial activity [4.403] envision their short- and longer-term future and develop a plan for acquiring the technological literacy/capability required to achieve their vision

General Curriculum Outcomes (GCOs)	Key Stage Curriculum Outcomes (KSCOs) By the end of grade 12, students will be expected to:
GCO 5: Technological Responsibility Students will be expected to demonstrate an understanding of the consequences of their technological choices.	[5.401] demonstrate responsible leadership in employing legal and ethical rules and principles. [5.402] demonstrate responsible leadership in employing health and safety rules and standards [5.403] demonstrate responsible leadership in taking proper measures to manage current and future technological risk

Course Overview

Communications Technology 3104 is designed to introduce students to a variety of data manipulation and programming skills. Students acquire the skills and knowledge to become proficient programmers. As they work through the processes and problem solving activities associated with coding, students will improve their computational thinking and logical problem solving abilities. This course is organized in a linear fashion. Although topics from Unit one may be integrated into the other four units, it is recommended that Unit two, three and four be covered sequentially as the skills in one unit prepares students for the next unit.

Unit 1: Introduction to Communications Technology

Unit 2: Data Manipulation

Unit 3: Web Services Technologies

Unit 4: Designing a Mobile Application

Suggested Yearly Plan

Communications Technology 3104 is a 55 hour course. It is a one credit course and is intended to be offered in one semester. Historically, Communications Technology 3104 has been offered in semester two from February to June. Communications Technology 2104 is offered in the first half of the year from September to January. While this arrangement is still recommended, it is important to note that Communications Technology 3104 is not a continuation of Communications Technology 2104. The content of the courses is completely different.

Unit 1 contains three subtopics. This unit should require approximately five hours to complete. A breakdown of the suggested hours of instruction are provided below:

Subtopic	# of classes
Technological Systems and Subsystems	2
Careers and Sustainability	1
Communications Networks	2

Unit 2 contains three subtopics. This unit should require approximately seven hours to complete. A breakdown of the suggested hours of instruction are provided below:

Subtopic	# of classes
Data Concepts	2
Spreadsheets	3
Databases	2

Unit 3 contains two subtopics. This unit should require approximately 15 hours to complete. A breakdown of the suggested hours of instruction are provided below:

Subtopic	# of classes
Infrastructure and Hosting	3
Coding a Web Resource	12

Unit 4 contains one subtopic. This unit should require approximately 28 hours to complete:

Subtopic	# of classes
Mobile App Design	28

How to Use the Four Column Curriculum Layout

Outcomes

Column one contains specific curriculum outcomes (SCO) and accompanying delineations where appropriate. The delineations provide specificity in relation to key ideas.

Outcomes are numbered in ascending order

Delineations are indented and numbered as a subset of the originating SCO.

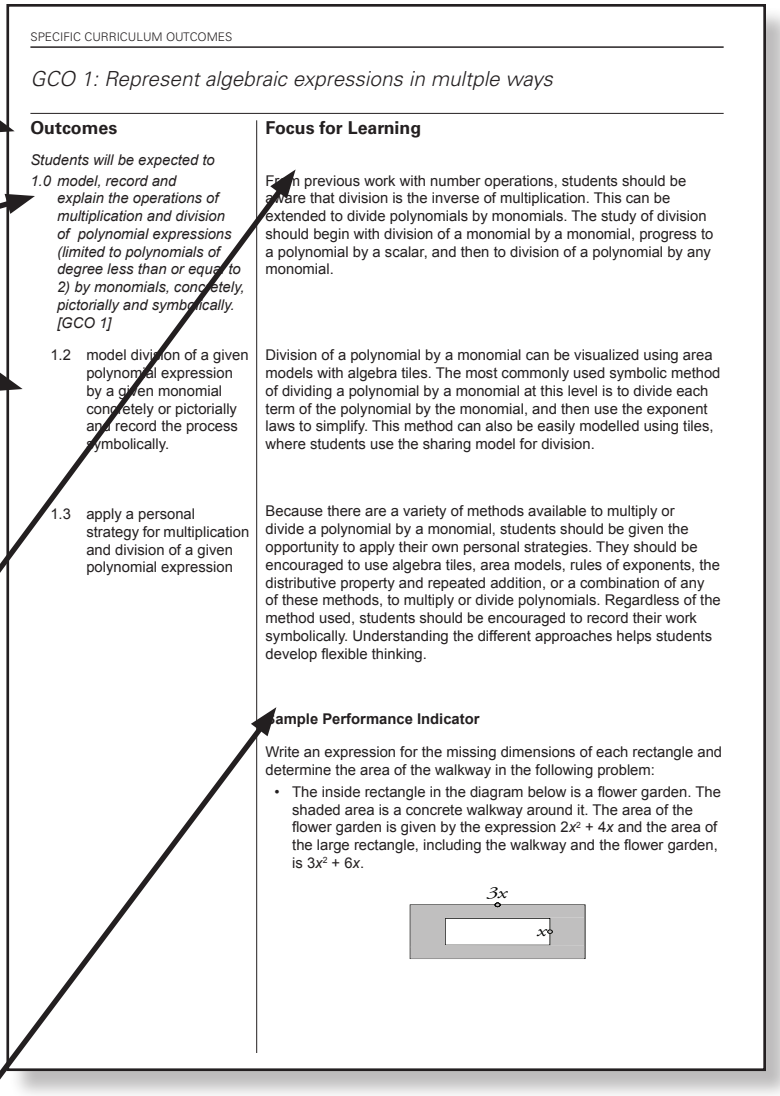
All outcomes are related to general curriculum outcomes.

Focus for Learning

Column two is intended to assist teachers with instructional planning. It also provides context and elaboration of the ideas identified in the first column.

This may include:

- references to prior knowledge
- clarity in terms of scope
- depth of treatment
- common misconceptions
- cautionary notes
- knowledge required to scaffold and challenge student's learning



SPECIFIC CURRICULUM OUTCOMES

GCO 1: Represent algebraic expressions in multple ways

Outcomes	Focus for Learning
Students will be expected to	
1.0 model, record and explain the operations of multiplication and division of polynomial expressions (limited to polynomials of degree less than or equal to 2) by monomials, concretely, pictorially and symbolically. [GCO 1]	From previous work with number operations, students should be aware that division is the inverse of multiplication. This can be extended to divide polynomials by monomials. The study of division should begin with division of a monomial by a monomial, progress to a polynomial by a scalar, and then to division of a polynomial by any monomial.
1.2 model division of a given polynomial expression by a given monomial concretely or pictorially and record the process symbolically.	Division of a polynomial by a monomial can be visualized using area models with algebra tiles. The most commonly used symbolic method of dividing a polynomial by a monomial at this level is to divide each term of the polynomial by the monomial, and then use the exponent laws to simplify. This method can also be easily modelled using tiles, where students use the sharing model for division.
1.3 apply a personal strategy for multiplication and division of a given polynomial expression	Because there are a variety of methods available to multiply or divide a polynomial by a monomial, students should be given the opportunity to apply their own personal strategies. They should be encouraged to use algebra tiles, area models, rules of exponents, the distributive property and repeated addition, or a combination of any of these methods, to multiply or divide polynomials. Regardless of the method used, students should be encouraged to record their work symbolically. Understanding the different approaches helps students develop flexible thinking.
	Sample Performance Indicator
	Write an expression for the missing dimensions of each rectangle and determine the area of the walkway in the following problem:
	• The inside rectangle in the diagram below is a flower garden. The shaded area is a concrete walkway around it. The area of the flower garden is given by the expression $2x^2 + 4x$ and the area of the large rectangle, including the walkway and the flower garden, is $3x^2 + 6x$.

Sample Performance Indicator(s)

This provides a summative, higher order activity, where the response would serve as a data source to help teachers assess the degree to which the student has achieved the outcome.

Performance indicators are typically presented as a task, which may include an introduction to establish a context. They would be assigned at the end of the teaching period allocated for the outcome.

Performance indicators would be assigned when students have attained a level of competence, with suggestions for teaching and assessment identified in column three.

SPECIFIC CURRICULUM OUTCOMES

GCO 1: Represent algebraic expressions in multple ways

Sample Teaching and Assessment Strategies	Resources and Notes
Teachers may use the following activities and/or strategies aligned with the corresponding assessment tasks: Modeling division using the sharing model provides a good transition to the symbolic representation. For example, $\frac{3x+12}{3} = \frac{3x}{3} + \frac{12}{3}$. To model this, students start with a collection of three *x*-tiles and 12 unit tiles and divide them into three groups.  For this example, $x + 4$ tiles will be a part of each group, so the quotient is $x + 4$. **Activation** Students may • Model division of a polynomial by a monomial by creating a rectangle using four x^2-tiles and eight *x*-tiles, where $4x$ is one of the dimensions. Teachers may • Ask students what the other dimension is and connect this to the symbolic representation. **Connection** Students may • Model division of polynomials and determine the quotient (i) $(6x^2 + 12x - 3) \div 3$ (ii) $(4x^2 - 12x) \div 4x$ **Consolidation** Students may • Draw a rectangle with an area of $36a^2 + 12a$ and determine as many different dimensions as possible. Teachers may • Discuss why there are so many different possible dimensions. **Extension** Students may • Determine the area of one face of a cube whose surface area is represented by the polynomial $24s^2$. • Determine the length of an edge of the cube.	**Authorized** • *Math Makes Sense 9* • Lesson 5.5: Multiplying and Dividing a Polynomial by a Constant • Lesson 5.6: Multiplying and Dividing a Polynomial by a Monomial • ProGuide: pp. 35-42, 43-51 • CD-ROM: Master 5.23, 5.24 • See It Videos and Animations: • Multiplying and Dividing a Polynomial by a Constant, Dividing • Multiplying and Dividing a Polynomial by a Monomial, Dividing • SB: pp. 241-248, 249-257 • PB: pp. 206-213, 214-219

Resources and Notes

Column four references supplementary information and possible resources for use by teachers.

These references will provide details of resources suggested in column two and column three.

Suggestions for Teaching and Assessment

This column contains specific sample tasks, activities, and strategies that enable students to meet the goals of the SCOs and be successful with performance indicators. Instructional activities are recognized as possible sources of data for assessment purposes. Frequently, appropriate techniques and instruments for assessment purposes are recommended.

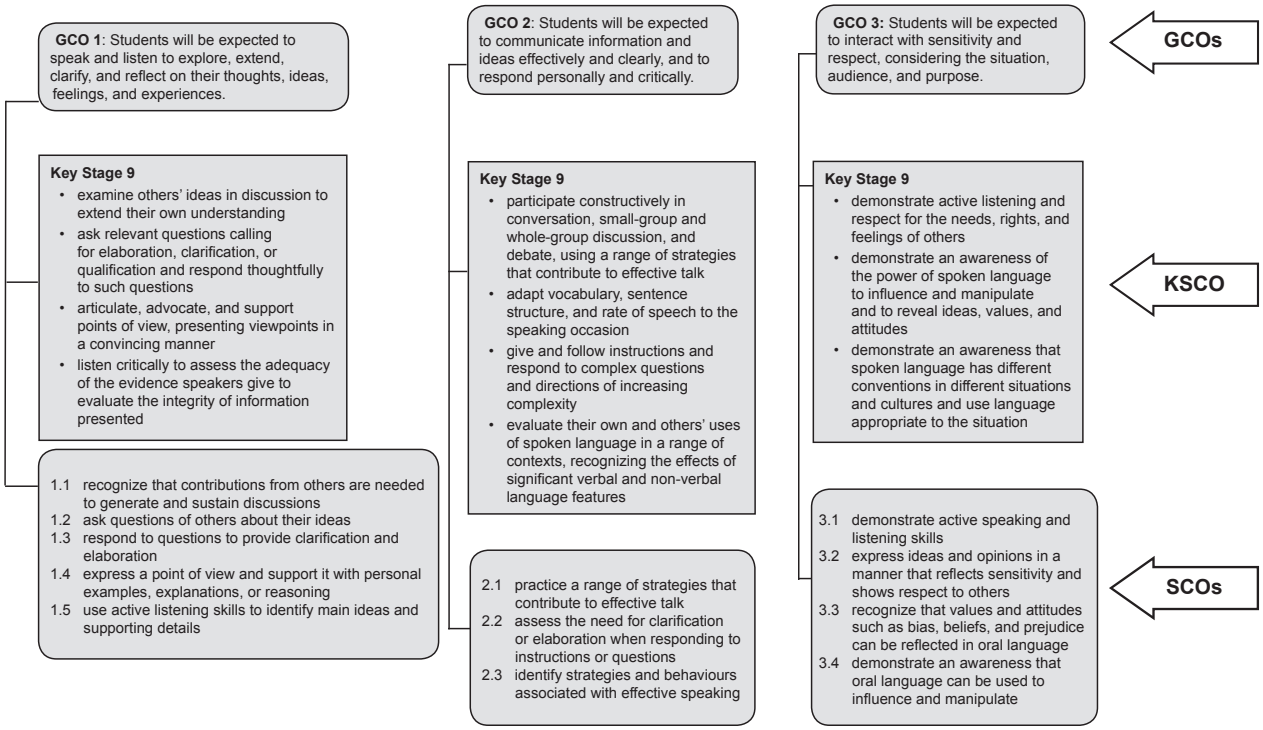
Suggestions for instruction and assessment are organized sequentially:

- Activation - suggestions that may be used to activate prior learning and establish a context for the instruction
- Connection - linking new information and experiences to existing knowledge inside or outside the curriculum area
- Consolidation - synthesizing and making new understandings
- Extension - suggestions that go beyond the scope of the outcome

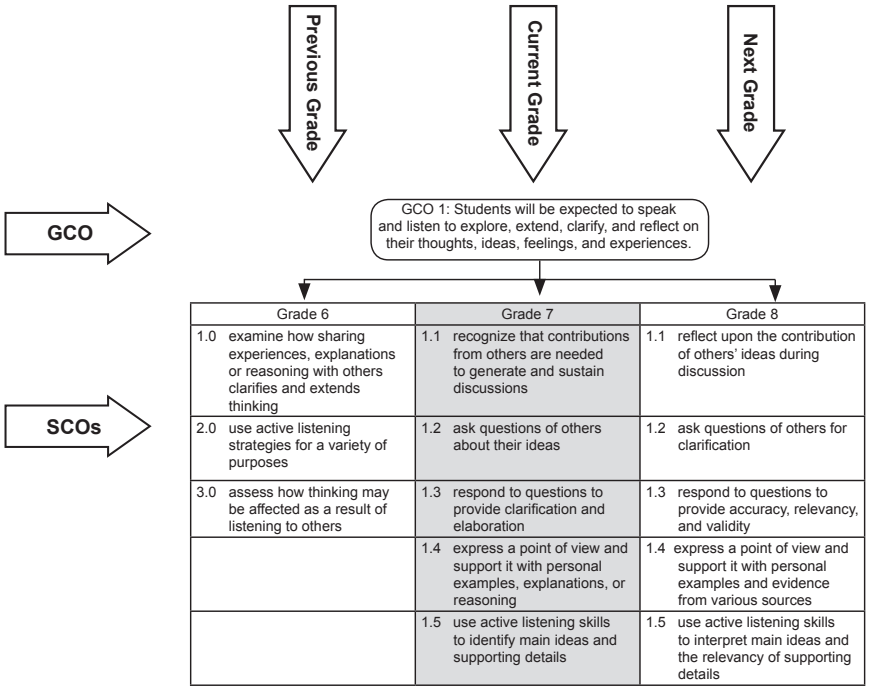
These suggestions provide opportunities for differentiated learning and assessment.

How to use a Strand overview

At the beginning of each strand grouping there is explanation of the focus for the strand and a flow chart identifying the relevant GCOs, KSCOs and SCOs.



The SCOs Continuum follows the chart to provide context for teaching and assessment for the grade/ course in question. The current grade is highlighted in the chart.



Grade 6	Grade 7	Grade 8
1.0 examine how sharing experiences, explanations or reasoning with others clarifies and extends thinking	1.1 recognize that contributions from others are needed to generate and sustain discussions	1.1 reflect upon the contribution of others' ideas during discussion
2.0 use active listening strategies for a variety of purposes	1.2 ask questions of others about their ideas	1.2 ask questions of others for clarification
3.0 assess how thinking may be affected as a result of listening to others	1.3 respond to questions to provide clarification and elaboration	1.3 respond to questions to provide accuracy, relevancy, and validity
	1.4 express a point of view and support it with personal examples, explanations, or reasoning	1.4 express a point of view and support it with personal examples and evidence from various sources
	1.5 use active listening skills to identify main ideas and supporting details	1.5 use active listening skills to interpret main ideas and the relevancy of supporting details

Section Three:
Specific Curriculum Outcomes

Unit 1: Introduction to Communications Technology

Focus

In this introductory unit students will explore some of the overarching themes of the course. They will first investigate technological systems and subsystems; they will explore careers and the sustainability issues that accompany technological advancement. In addition, students will analyze networking concepts through the investigation of global networking fundamentals.

Outcomes Framework

GCO 2: Technological Systems: Students will be expected to operate and manage technological systems.

- 1.0 analyze technology through the investigation of technological systems and subsystems.
- 2.0 define information and communications technology (ICT)
- 3.0 discuss fundamentals of electronic digital telecommunication
- 7.0 illustrate common networking concepts
- 8.0 distinguish common networking hardware

GCO 3: History and Evolution of Technology: Students will be expected to demonstrate an understanding of the history and evolution of technology, and of its social and cultural implications.

- 5.0 discuss the sustainability of technological systems as it applies to economic, social and cultural issues
- 6.0 discuss key stages in the development of global telecommunications

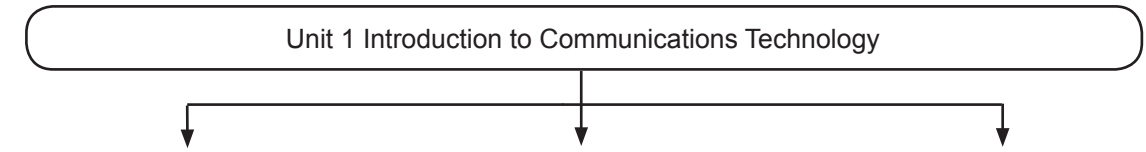
GCO 4: Technology and Careers: Students will be expected to demonstrate an understanding of current and evolving careers and of the influence of technology on the nature of work.

- 4.0 identify careers associated with Information and Communication Technology

GCO 5: Technological Responsibility: Students will be expected to demonstrate an understanding of the consequences of their technological choices.

- 5.0 discuss sustainability of technological systems as it applies to economic, social and cultural issues

SCO Continuum



Grade 8 Control Technology	Integrated Systems 1205	Communications Technology 3104
• define the terms system and subsystem and describe examples of each • trace the evolution of control technologies • examine the technologies of specific careers and workplaces, including the organizational structures of work environments and the effects of newer technologies	• define, describe, and give examples of technological systems and sub-systems • trace the evolution of control technologies • assess and evaluate employability profiles for a variety of workplaces and careers and determine the level of technological literacy and capability they would need to achieve for job entry	• analyze technology through the investigation of technological systems and subsystems • discuss key stages in the development of global telecommunications • identify careers associated with Information and Communication Technology

Suggested Unit Plan

The suggested time for the Introductory unit is five hours. Approaches to the delivery of this unit may vary depending on the teacher's preference. Teachers may wish to infuse the outcomes from this unit into the other units rather than covering content separately.

Technological Systems and Subsystems

Outcomes

Students will be expected to

1.0 analyze technology through the investigation of technological systems and subsystems [GCO 2]

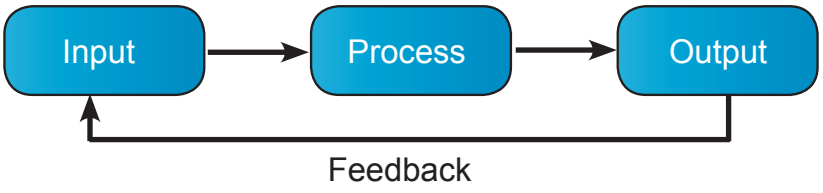
Focus for Learning

This is intended to be an introductory outcome for the study of technological systems. It is an opportunity for students to think critically about the systems and subsystems they use every day.

A system has a purpose or goal. It is an assemblage of components, which collectively perform a function that the individual components could not. A smartphone, for example, is a system designed for personal communication. A subsystem has a specific purpose and is constructed of components. It is usually designed to perform a sub-task within a larger system. The camera or speakers in a smartphone are examples of sub-systems. All systems are defined to have inputs, processes and outputs.

- Open-loop systems are those that perform a task or function, but have no way to determine if there was success. Broadcast radio is open-loop. The signal is sent but the transmitter has no way of determining if it was received.
- A closed-loop system has a feedback loop built in. The response to the system from the feedback loop is used to modify the operation of the system. A household fridge is a closed-loop system since a thermostat controls the on/off cycle and the temperature. It is open-loop in the sense that the refrigerator system has no way of knowing if it is empty or full, or whether the food spoils.

The universal systems model and the communications systems model help us understand systems and subsystems and their convergence and interactions in technological products and processes. All models outline the broad view of systems as having inputs, processes outputs and feedback loops. Students should identify components of relevant systems and subsystems. Students could explore systems in their daily lives and identify their input, process, and output elements.



Students are not expected to memorize lists of components or parts of the process. It is more important for them to apply the model in systems they are familiar with in their daily lives.

Technological Systems and Subsystems

Sample Teaching and Assessment Strategies

Activation

Teachers may

- Teach the Universal Systems Model as a demonstration. The teacher can dismantle a computer system and analyze the subsystems: input, output, and process.
- Teach the Communications Systems Model by outlining the various subsystems that converge into a smartphone and the technical process of how a cellular phone sends and receives a text message.

Connection

Students may

- Create a graphic model of a selected system and label the major subsystems.

Consolidation

Students may

- Use a role play to dramatize the technical processes involved in the Communications Systems Model.
- Label and detail the parts of various systems. These systems should include devices that students are familiar with. Systems could include an all-terrain vehicle, an automobile, a smartphone or gaming console.

Extension

Students may

- Disassemble computer systems and identify the subsystems / components.

Resources and Notes

Authorized

How Computers Work (Teacher Resource [TR])

- pp. 16-42

Suggested

Resource Links: www.k12pl.nl.ca/curr/10-12/te/ct3104/links/unit1.html

I

Unit 1 Introduction to Communications Technology:

- Technology and Science
- What is technology
- Code.org resources

Technological Systems and Subsystems

Outcomes	Focus for Learning
Students will be expected to 2.0 define Information and Communication Technology (ICT) [GCO 2]	This is intended to be an introductory outcome to provide an understanding of the broad field of Information and Communication Technology (ICT). It provides important background knowledge and context for the activities later in the course. ICT is an umbrella term that includes any communication device or application, encompassing radio, television, cellular phones, computer and network hardware or software, satellite systems as well as the various services and applications associated with them. Examples include videoconferencing and distance learning. ICTs are often spoken of in a particular context, such as ICTs in education, health care, or libraries. It is important for students to note that ICT has no universal definition. The concepts, methods and applications involved in ICT are constantly evolving on an almost daily basis. The broadness of ICT covers any product that will store, retrieve, manipulate, transmit or receive information electronically in a digital form, (e.g., personal computers, digital television, email, robots). Devices have become so ubiquitous in the lives of students that they rarely consider them as part of a larger group of technologies. Students should be aware of the ICTs that affect them in their lives. Technology is how humans modify their environment to meet their needs and wants and is referred to as Knowing (Knowledge), Doing (Process), Things (Product) and their effects. **Sample Performance Indicator** Create an inventory of all the ICT that affects you in your daily life.

Technological Systems and Subsystems

Sample Teaching and Assessment Strategies

Activation

Teachers may

- Brainstorm to identify examples of ICT international, national and local businesses that are active within the ICT industry.
- Invite a guest speaker from a local ICT company to the classroom to discuss the impact of ICT on their particular industry.

Connection

Students may

- Research and list examples of ICT companies within the province.
- Profile an ICT company demonstrating the types of work and/or service the company provides.

Extension

- Create an online website that functions as a portfolio of student work.

Resources and Notes

Suggested

Resource Links: www.k12pl.nl.ca/curr/10-12/te/ct3104/links/unit1.html

- Unit 1 Introduction to Communications Technology:
  - Information technology

Technological Systems and Subsystems

Outcomes

Students will be expected to

3.0 discuss fundamentals of electronic digital telecommunication [GCO 2]

Focus for Learning

Students should examine the fundamentals of digital data telecommunication.

Telecommunications begin with messages that are converted into electronic signals. The signals are then sent over a medium to a receiver, where they are decoded back into a form that the person receiving the message can understand. There are a variety of ways to create and decode signals, and many different ways to transmit signals. All telecommunications systems and the Internet depend on harnessing electricity to encode human understandable information into a digital format (binary) to have computing and electronic communication devices transmit, store, receive and decode that information over time and distance.

In order to encode information, it has to be stored in a binary format. Binary is a result of electricity existing in two states, on or off, one or zero. Therefore, all information (text, sound, image, video, etc) processed by a digital device must be converted, stored and transmitted in a binary format.

The term “Bit” is from the shortening of “binary digit”. It is the basic unit of information for computer systems. A “Byte” is eight bits in a single binary word, which allows for up to 256 possible numbers or letters to be stored. One kilobyte (1KB) is 1024 bytes, one megabyte (1MB) is 1024 x 1024 or 1 048 576. One Gigabyte (1GB)1024 x 1024 x 1024 or 1 073 741 824 bytes.

Hexadecimal is a base 16 number system that allows programmers to address large numbers with fewer digits. It uses the characters 0-9, A,B,C,D,E and F, covering off the numbers 0-15. A represents 10, B 11, C 12, etc.

Students should reflect on the fact that the basic digital makeup of computers has not changed. What has changed is the capacities and the speed by which they can process data.

It is important for students to understand that society usually works in a base ten or decimal number system. Digital communications, however, work in the context of binary and hexadecimal number systems. This is not meant to be an in-depth examination of digital communications. It is intended to provide a context only.

Technological Systems and Subsystems

Sample Teaching and Assessment Strategies

Activation

Teachers may

- Use a web based tool to demonstrate text to binary conversions.

Connection

Students may

- Use the calculator on their computer to show number conversion.
- Convert letters and numbers into binary and/or hexadecimal.

Consolidation

Students may

- Use the communication systems model to represent the process of electronic communications such as the SMS Messaging system/text messaging.

Resources and Notes

Authorized

How Computers Work (TR)

- pp. 18-28

Suggested

Resource Links: www.k12pl.nl.ca/curr/10-12/te/ct3104/links/unit1.html

Unit 1 Introduction to Communications Technology

- Data Communications
- Telecommunications

Careers and Sustainability

Outcomes

Students will be expected to

4.0 identify careers associated with Information and Communication Technology [GCO 4]

Focus for Learning

Students should have the opportunity to explore some of the occupations and labour market trends in technology and telecommunications fields.

Teachers should emphasize the following points:

- Careers in technology can be organized into a variety of categories, which include occupations related to satellite, radio, television, cellular phone, computer and network hardware and software systems.
- Careers include design and construction of hardware and software for the ICT sector, as well as, installation, service and maintenance.
- The ever changing nature of ICT ensures there will be future career opportunities for students that do not exist at the present time. As an example, the job of Mobile App Development Specialist did not exist ten years ago.

Students are not expected to conduct in depth research into specific occupations. The intent is to spark curiosity in students. This outcome can be infused into class time throughout the duration of the course rather than addressed in a specific block of time.

Sample Performance Indicator

In your course portfolio, reflect on careers in the ICT industry and identify labour market trends that may affect these careers.

Careers and Sustainability

Sample Teaching and Assessment Strategies

Activation

Teachers may

- Present the Technology cluster of occupations from the My Blueprint website.

Connection

Students may

- Create a graphic organizer to represent the variety of career categories within the ICT industry.

Extension

Students may

- Complete a cross-curricular research project with Career Development on occupations in the ICT sector of the labor market.

Resources and Notes

Authorized

My Blueprint

- www.myblueprint.ca

Suggested

Resource Links: www.k12pl.nl.ca/curr/10-12/te/ct3104/links/unit1.html

Unit 1 Introduction to Communications Technology

- Open Universities
- Indeed

Careers and Sustainability

Outcomes

Students will be expected to

5.0 discuss sustainability of technological systems as it applies to economic, social and cultural issues [GCO 5]

Focus for Learning

Students should discuss some of the most fundamental economic, social, and cultural issues relating to the development and use of technological systems in industry.

Sustainable industries are those that meet the needs of today without compromising the ability of future generations to meet their needs (World Commission on Environment and Development, 1997). In addition to the environment, it is concerned with economic, social and cultural issues. There are many issues that can be reflected on when exploring the sustainability of the use of technological systems in industry:

- If a country has an unskilled labour force and technological systems are introduced in their labour intensive industries, what happens to the displaced unskilled labour force?
- What are the cultural implications of a large displaced unskilled and uneducated labour force?
- What does the future of this society hold? If the unskilled displaced workers have no way to feed their families, they may turn to a life of crime to provide the basics of life. What does this do to the society of the country involved?
- What do you consider to be the consequences of loosing the traditional technologies from a society once the modern technologies have been adopted.

Sample Performance Indicator

Since the 1950s technological change has impacted the fishing industry in Newfoundland and Labrador significantly. In small groups discuss how catching, processing and marketing fish products have changed the industry and explain how these changes have impacted the economy, society and culture of small communities in Newfoundland and Labrador.

Careers and Sustainability

Sample Teaching and Assessment Strategies

Activation

Teachers may

- Provide teams of students with samples of case studies and have them cooperatively discuss key concepts to share with the class.

Extension

Students may

- Hold an in-class formal debate on ethics and sustainability issues in ICT.

Resources and Notes

Suggested

Resource Links: www.k12pl.nl.ca/curr/10-12/te/ct3104/links/unit1.htmll

- Unit 1 Introduction:
  - Five Ways Technology Can Help the Economy
  - Science Technology and Innovation for Sustainable Development

Communications Networks

Outcomes

Students will be expected to

6.0 discuss key stages in the development of global electronic telecommunications [GCO 3]

Focus for Learning

Students should explore the evolution of telecommunications with emphasis on the Internet, wired/wireless, and satellite communications.

The stages should include

- the electrical telegraph;
- the telephone;
- radio and television;
- videotelephony;
- satellite, and
- computer networks and the internet

The internet is the global system of interconnected computers and devices that use the internet protocol suite, Transmission Control Protocol/Internet Protocol(TCP/IP), to link billions of devices worldwide. These devices are connected through a variety of wired and wireless connections that talk to each other through protocols. The Internet carries an extensive range of information resources and services, such as inter-linked hypertext documents and applications of the World Wide Web (WWW), electronic mail, Usenet newsgroups, telephony, and peer-to-peer networks for file sharing.

It is the internet that allows people to access things such as social media sites and mobile applications. The internet is always evolving and has moved from the first generation characterized as Web 1.0 (the passive web) to the Web 2.0 (Interactive web) and looking toward Web 3.0 (semantic web). As it evolved the internet has allowed for a transition from just accessing information to becoming interactive and allowing all users to provide content to the internet. There are currently more mobile web devices than traditional LAN connected devices

Sample Performance Indicator

Create a time line in a course portfolio outlining the stages of the development of electronic telecommunications. Each section of the time line should include a paragraph on the key stage.

Communications Networks

Sample Teaching and Assessment Strategies

Activation

Teachers may

- Present a brief overview of the history of telecommunications and survey current and future trends.

Connection

Students may

- Create a time line to represent the evolution of the internet.
- Create a document that compares and contrasts Web 1.0, Web 2.0, and Web 3.0.

Extension

- Discuss the reasons for the emergence of mobile communications and relate this trend to industry and business applications.

Resources and Notes

Authorized

How Computers Work (TR)

- pp. 250-253

Suggested

Resource Links: www.k12pl.nl.ca/curr/10-12/te/ct3104/links/unit1.html

Unit 1 Introduction to Communications Technology

- History of Communications Technology
- Timeline of Communications Technology

Communications Networks

Outcomes

Students will be expected to

7.0 illustrate common networking concepts [GCO 2]

Focus for Learning

Students should become familiar with various networking components and concepts. These concepts include but are not limited to:

- Cabling (Cat5 or Cat6)
- Client-server
- Internet Service Provider (ISP)
- IP Address
- Local Area Network (LAN)
- Network Interface Card (NIC)
- Peer-to-peer
- Web browser
- Web server
- Wide Area Network (WAN)
- Wired and wireless networks
- Wireless adapter
- Workstation
- Uniform Resource Locator (URL)

It is TCP/IP that allows these devices to communicate with each other. This is the defined method of electronic communications between networked devices. It defines how dotted decimal numbers (internet protocol addresses(IP) are used to control all internet communications. Students can use the ping feature at the command prompt of any personal computer to manipulate the IP address of that computer.

Domain Name Service (DNS) is the system of mapping friendly names (regular titles) to Uniform Resource Locators (URL).

Dynamic Host Configuration protocol (DHCP) is a service that identifies devices on a network while they are searching for connectivity. When the request is received to the DHCP the DHCP sends out an IP to the device so that they can connect to the Internet. Any home with a router wireless or otherwise has a DHCP server built in. It sends IPs out to these devices.

Current mobile technology, and all of its functionality, happens because of these developments. The use of smartphones and other mobile devices enables the internet access almost anywhere. It also has led to a whole new industry providing numerous career opportunities, such as software development, app development and various technicians.

These are new concepts to many students and are important to the understanding of mobile technologies and mobile app development.

Sample Performance Indicator

Compile a personal glossary of networking concepts. Each concept can be linked in some way to the network infrastructure of the school or home.

Communications Networks

Sample Teaching and Assessment Strategies

Activation

Teachers may

- Set up and demonstrate a peer-to-peer and / or wireless network.
- Guide students through a tour of the schools network, highlighting the hardware, software, and functionality.
- Discuss how cell phone systems work.

Connection

Students may

- Create a diagram of a home or school network.
- Research the transmission of data between sender and receiver.

Resources and Notes

Authorized

How Computers Work (TR)

- pp. 254-265

Suggested

Resource Links: www.k12pl.nl.ca/curr/10-12/te/ct3104/links/unit1.html

- Unit 1 Introduction to Communications Technology
  - Digital Ocean
  - Code.org

Communications Networks

Outcomes

Students will be expected to

8.0 distinguish common networking hardware [GCO 2]

Focus for Learning

The emphasis of this outcome will be on gaining knowledge and skills related to computer networking hardware and the mobile web. This outcome will expand on students' knowledge related to computer networks.

Students should become familiar with the following concepts:

- Router is a device that forwards data packets along networks. A router is connected to at least two networks, commonly two LANs or WANs or a LAN and its ISP's network.
- Switches in networks are devices that filters and forwards packets between LAN segments. Switches operate at the data link layer (layer 2) and sometimes the network layer (layer 3) LANs that use switches to join segments are called switched LANs or, in the case of ethernet networks, switched ethernet LANs.
- The wireless router / ethernet switch combo unit is what is found in most people's homes providing them with internet access. They are also found in public places and businesses providing free wireless connectivity for patrons.
- Smartphones are a result of the miniaturization of all of the hardware that comprises a typical computer. The smartphone has its internal storage, memory, circuit boards, processor, wireless adapter, and antenna.

Sample Performance Indicator

Create a map of school and home networks.

Communications Networks

Sample Teaching and Assessment Strategies

Activation

Teachers may

- Bring networking devices into the classroom so that students can make connections between the physical device and what their role is in a computer network.

Connection

Students may

- Create a role play where each student takes on the technical role (character) of the networking device.
- Examine the physical media used to interconnect computers such as Unshielded Twisted Pair cable (UTP) and RJ-45 clips.
- Build and test a network cable.
- Build and test a computer network in the classroom.
- Research the anatomy of a smartphone.

Resources and Notes

Authorized

How Computers Work (TR)

- pp. 254-265

Suggested

Resource Links: www.k12pl.nl.ca/curr/10-12/te/ct3104/links/unit1.html

Unit 1 Introduction to Communications Technology

- Digital Ocean
- Code.org

Section Three:
Specific Curriculum Outcomes

Unit 2: Data Manipulation

Focus

In this unit on data manipulation students will explore concepts in how to organize and present data. Students will cover general topics in data management and will then use spreadsheets and data bases to organize and present data sets. It is important that students explore data management in the context of coding and computational thinking.

Outcomes Framework

GCO 1: Technological Problem Solving: Students will be expected to design, develop, evaluate, and articulate technological solutions.

10.0 distinguish between common data storage formats
13.0 manage data using spreadsheets
14.0 use spreadsheets to analyze and graphically represent data
15.0 recognize relational data bases and identify common applications
16.0 use databases to organize data

GCO 2: Technological Systems: Students will be expected to operate and manage technological systems.

10.0 distinguish between common data storage formats
11.0 discuss data management concepts
12.0 understand common terminology of spreadsheets
13.0 manage data using spreadsheets
14.0 use spreadsheets to analyze and graphically represent data
15.0 recognize relational data bases and identify common applications
16.0 use databases to organize data

Suggested Unit Plan

The suggested time for unit two is seven hours. While there is plenty of flexibility for covering the outcomes for unit two, the location of the unit in the course is significant. This unit is intended to get students thinking about collecting and managing data as a function of coding and mobile application development. It is important that students cover this before they begin unit three and four.

Data Concepts

Outcomes

Students will be expected to

9.0 define data in terms of Information and Communications Technology (ICT) [GCO 2]

Focus for Learning

Students should reflect on what data is in the context of ICT

One of the components of ICT is the storing, manipulating and communication of data. Data refers to distinct pieces of information stored in structured formats. Many software applications manipulate and produce data as an output. Software applications are really collections of instructions for manipulating data. Word Processors, for example, manipulate data to create documents.

Data can exist in a variety of forms. It can exist as numbers or text on pieces of paper, as bits and bytes stored in electronic memory, or as facts stored in a person's mind. Students should note that data is the plural of datum, a single piece of information. In practice, however, people use data as both the singular and plural form of the word. The term data is often used to distinguish binary machine-readable information from textual human-readable information. Some applications, for example, make a distinction between data files (files that contain binary data) and text files (files that contain ASCII data). In database management systems, data files are the files that store the database information, whereas other files, such as index files and data dictionaries, store administrative information, known as meta-data. MP3 format sound files contain both binary encodings of sounds and textual 'meta-data' information about artist, title, song length.

Students will have a very limited knowledge of what data is. Students have grown accustomed to being consumers of data and contributors to data without ever considering the significance of using data and having data collected from them while they are using any device connected to the internet.

Data Concepts

Sample Teaching and Assessment Strategies

Activation

Teachers may

- Facilitate a large group discussion on data usage and collection that occur in their daily activities (e.g., Facebook advertising). This should include the reasons why data collection occurs.

Connection

Students may

- Create a list of all of the possible areas in one day where data is collected from them.

Consolidation

Students may

- Write a journal entry on the worst case scenario where data collection can have a negative impact on them currently or in the future.

Extension

Students may

- In teams debate the following statement: Television advertising is currently considered an inefficient advertising medium. Internet advertising is considered to be a very efficient medium. Is this a true or false statement? Why?

Resources and Notes

Authorized

How Computers Work (Teacher Resource [TR])

- p. 75

Suggested

Resource Links: www.k12pl.nl.ca/curr/10-12/te/ct3104/links/unit2.html

- Unit 2 Data Manipulation
  - Wikipedia
  - Michalsons Blog

Data Concepts

Outcomes

Students will be expected to

10.0 distinguish among common data storage formats [GCO 2]

Focus for Learning

Students rarely take the time to think about file formats and how they are used. They should explore some common data storage formats.

Data collected or manipulated by any software program must have a digital format for storing in order to be saved or transmitted. Most programs create a standardized or proprietary format known as a file type. Some programs share common file types while others have a unique file type. The file format specifies first whether the file is a binary or ASCII file, and second, how the information is organized.

File formats are typically signified by an extension name often three characters long. The most simple and universally recognizable format for saving simple text information is known as an ASCII text file. These files have a descriptive name followed by an extension .txt. This allows many different programs to open and handle this file.

A musical recording can be saved as an MP3 format file, which is a binary file that can only be opened by a sound processing program capable of reading this format. These files are stored with descriptive names..mp3 signifies the extension type.

Digital electronic data is measurable, whether active as an open file in active computer memory, stored in long term passive media such as on a hard drive, flash memory card, in the Cloud, or in the process of being transmitted. Data storage is measured in terms such as bits, byte, kilobit/kilobyte, megabit/megabyte, gigabit/gigabyte and terabyte.

Data Concepts

Sample Teaching and Assessment Strategies

Activation

Teachers may

- Demonstrate the various programs on the student computer and the associated data file format.
- Provide a graphical view of the difference between a binary file and a textual file format; such as program executable versus a web page HTML file.

Connection

Students may

- Examine the amount of storage space they have on a flash drive, internal memory on a smartphone, on a cloud account, etc.
- Experiment with data monitoring settings on their smartphones.
- Identify electronic data storage space requirements and size for various data files.

Consolidation

Students may

- Examine the difference between storage space of images, sound files, and video files.

Extension

Students may

- Examine programs and apps and their corresponding data file extensions/types, and categorize them as binary or textual. This can be presented in a three column chart.

Resources and Notes

Authorized

How Computers Work (TR)

- pp. 138-139

Suggested

Resource Links: www.k12pl.nl.ca/curr/10-12/te/ct3104/links/unit2.html

- Unit 2 Data Manipulation
  - Wikipedia
  - Open Data Handbook

Data Concepts

Outcomes

Students will be expected to

11.0 discuss data management concepts
[GCO 2]

Focus for Learning

Students should be immersed into language and concepts of data management. Students should be able to speak fluently when discussing data management concepts and should understand the importance of organizing their data.

Data management involves

- choosing storage file name,
- folder structure,
- and local and external paths.

It is important for students to be able to

- manipulate files and convert data from one format to another,
- navigate and create local folder structures,
- use cloud based data management,
- data compression,
- and backing up data

Sample Performance Indicator

In small groups, create a matching game using the language and concepts of data management. Use the language to play the game.

Data Concepts

Sample Teaching and Assessment Strategies

Activation

Teachers may

- Demonstrate local file and folder creation and management for a disk based scenario.
- Discuss, with students, storage location options ranging from flash drives to hard drives to cloud based locations.

Connection

Students may

- Create a file management organization plan within a cloud based system such as Google™ Drive.

Consolidation

Students may

- Compress and back up files to an external source, such as a flash drive or cloud source, and then download and extract to a third destination.

Resources and Notes

Authorized

How Computers Work (TR)

- p. 95

Suggested

Resource Links: www.k12pl.nl.ca/curr/10-12/te/ct3104/links/unit2.html

- Unit 2 Data Manipulation
  - GCF LearnFree.org

Spreadsheets

Outcomes

Students will be expected to

12.0 understand common terminology of spreadsheets

Focus for Learning

This outcome introduces students to common terminology of spreadsheets, a common data manipulation tool.

A spreadsheet program allows the user to arrange data in rows and columns of tables. Data can be summarized and manipulated within each column, row, or whole table. The user can analyze a single table or an entire group of tables of interrelated data. Data can also be represented visually based on selected data pieces.

Students should understand the basic terminology of spreadsheet setup including:

- column
- row
- cell
- cell address
- cell format
- merging/splitting cells
- range
- protect
- hide
- group

Spreadsheets

Sample Teaching and Assessment Strategies

Activation

Teachers may

- Demonstrate the use of a spreadsheet and explain the key terms.

Consolidation

Students may

- Build skills by creating a spreadsheet using personal data such as personal telephone logs.
- Use a data collection activity from Math class to organize a database file.

Resources and Notes

Authorized

How Computers Work (TR)

- pp. 84-89

Suggested

Resource Links: www.k12pl.nl.ca/curr/10-12/te/ct3104/links/unit2.html

- Unit 2 Data Manipulation
  - GCF LearnFree.org spreadsheet basics
  - GCF LearnFree.org Google sheets

Spreadsheets

Outcomes

Students will be expected to

13.0 manage data using spreadsheets [GCO 1]

Focus for Learning

In the previous outcome students acquired the terminology and concepts required to set up a spreadsheet. They should use a spreadsheet to manage a data set

The core functions of spreadsheets involve entry of numerical and textual data, and the use of mathematical operators such as addition, subtraction, multiplication, division. Once columns and rows of data are populated the user is able to use

- absolute/relative formulas to operate on ranges of data,
- formula structure such as order of operations,
- functions such as average, count, max, and min,
- sorting,
- sorting using or/and,
- searching,
- search and replace, and
- concatenation.

Students should be able to manipulate the database they created by introducing formulas, functions, sorting and searching the data. They should also complete calculations with columns and rows of data.

Spreadsheets

Sample Teaching and Assessment Strategies

Activation

Teachers may

- Demonstrate the use of mathematics operators and formula in a spreadsheet and explain the key concepts.

Connection

Students may

- Practice manipulating their database using mathematical formulas and operators.

Consolidation

Students may

- Manage a spreadsheet using personal data, such as personal telephone logs.

Resources and Notes

Authorized

How Computers Work (TR)

- pp. 84-89

Suggested

Resource Links: www.k12pl.nl.ca/curr/10-12/te/ct3104/links/unit2.html

- Unit 2 Data Manipulation
  - GCF LearnFree.org spreadsheet basics
  - GCF: LearnFree.org Google Sheets

Spreadsheets

Outcomes

Students will be expected to

14.0 use spreadsheets to analyze and graphically represent data [GCO 1]

Focus for Learning

Working with spreadsheets students experience the power of and versatility of manipulating data.

Spreadsheets enable the representation of data that is selected in various visual summary styles and formats. There are many built in tools to summarize and analyze patterns in the data entered. Students should explore creating a visual presentation of data through

- chart types and features;
- modifying and displaying data;
- creating a chart using a wizard;
- creating a chart using non-adjacent data series;
- creating a combination chart; and
- modifying a chart: move, resize, and change chart type; move delete chart elements; modify plot area, chart area, legends, and axes.

Performance Indicator

Take a spreadsheet that you have either compiled on your own or one that the teacher has provided, and represent it graphically in two distinct ways using the tools in the spreadsheet software.

Spreadsheets

Sample Teaching and Assessment Strategies

Activation

Teachers may

- Demonstrate the use of graphical representation in spreadsheets.

Connection

Students may

- Complete tutorials on how to graphically represent data in spreadsheet software.

Consolidation

Students may

- Use a spreadsheet to graphically represent personal data such as telephone logs from your smartphone or weather data from either an online source or the school's weather station.

Resources and Notes

Authorized

How Computers Work (TR)

- pp. 84-89

Suggested

Resource Links: www.k12pl.nl.ca/curr/10-12/te/ct3104/links/unit2.htmll

- Unit 2 Data Manipulation
  - GCF LearnFree.org spreadsheet basics
  - GCF LearnFree.org Google sheets

Databases

Outcomes

Students will be expected to

15.0 recognize relational databases and identify common applications [GCO 2]

Focus for Learning

Students should recognize stand-alone and server based databases and more specifically how mobile apps are designed to manipulate that data for the end user.

A relational database is a collection of data that is stored in a computer system. Databases allow users to enter, access, and analyze data quickly and easily. A database is like a spreadsheet with tables consisting of rows and columns and many of the same features and functions. Databases, however, have a greater functionality for analyzing sets of data stored in related tables. In addition, their connectivity to computer programs facilitates the input and extraction of data.

Databases can be set up as stand-lone on a single computer and stored locally on a disk or they can be stored externally on an internet connected server and accessed through a web page. Data entry is most often done through a front end (what the user sees) program that may be part of the database design, such as with Microsoft© Access. Quite often many database files are stored centrally within a company on a server that is accessed through front end program or web page. In this case the database files are said to be the back end.

Databases are widely used in the public service and industry. They would include

- online telephone directories, and
- province wide medical records stored digitally in one central location and accessed all over the province.

Mobile applications are quite often designed so that the end user can manipulate large amounts of data. Examples of these applications include

- Twitter™,
- Facebook™,
- The Weather Network™, and
- Google™.

Databases

Sample Teaching and Assessment Strategies

Activation

Teachers may

- Identify the use of databases in stand-alone and web based applications.

Connection

Students may

- Create a list of databases that has their personal information included and research to find out how those databases are set up and where they actually reside.

Extension

Students may

- Explore a series of data sets and describe how a mobile app could enhance the use of this data set with the end user. Data sets could include library card holders, Canadian postal codes, or weather data.

Resources and Notes

Authorized

How Computers Work (TR)

- p. 82

Suggested

Resource Links: www.k12pl.nl.ca/curr/10-12/te/ct3104/links/unit2.htmll

- Unit 2 Data Manipulation
  - GCF LearnFree.org Access

Databases

Outcomes

Students will be expected to

16.0 use databases to organize data [GCO 1]

Focus for Learning

Students should organize a given data set into a database. This is intended to be a very introductory experience in using a database. What is most important is that students see first hand the power of a well constructed database.

What sets databases apart from any other way of storing data is connectivity and the relationships that can be set up between tables of data. Another word for a database is a relational database. A relational database is able to understand how lists and the objects within them relate to one another. Students should explore a working database and manipulate

- record (rows),
- field (columns),
- tables,
- field properties,
- inputting and formatting data,
- modifying tables,
- validation rules,
- forms,
- primary/secondary keys, and
- relationships.

Sample Performance Indicator

Use a dataset of your own or one supplied by the teacher to compile a working database.

Databases

Sample Teaching and Assessment Strategies

Activation

Teachers may

- Demonstrate the use of a database and explain the key terms and applications.

Connection

Students may

- Manipulate data in an existing database and explore the features of a database such as tables, relationships between tables, forms, queries and reports.

Consolidation

Students may

- Create a database using personal data. This data could be your personal contacts in your phone, or your friends on a social media service.

Resources and Notes

Authorized

How Computers Work (TR)

- pp. 81-83

Suggested

Resource Links: www.k12pl.nl.ca/curr/10-12/te/ct3104/links/unit2.htmll

- Unit 2 Data Manipulation
  - GCF LearnFree.org Access

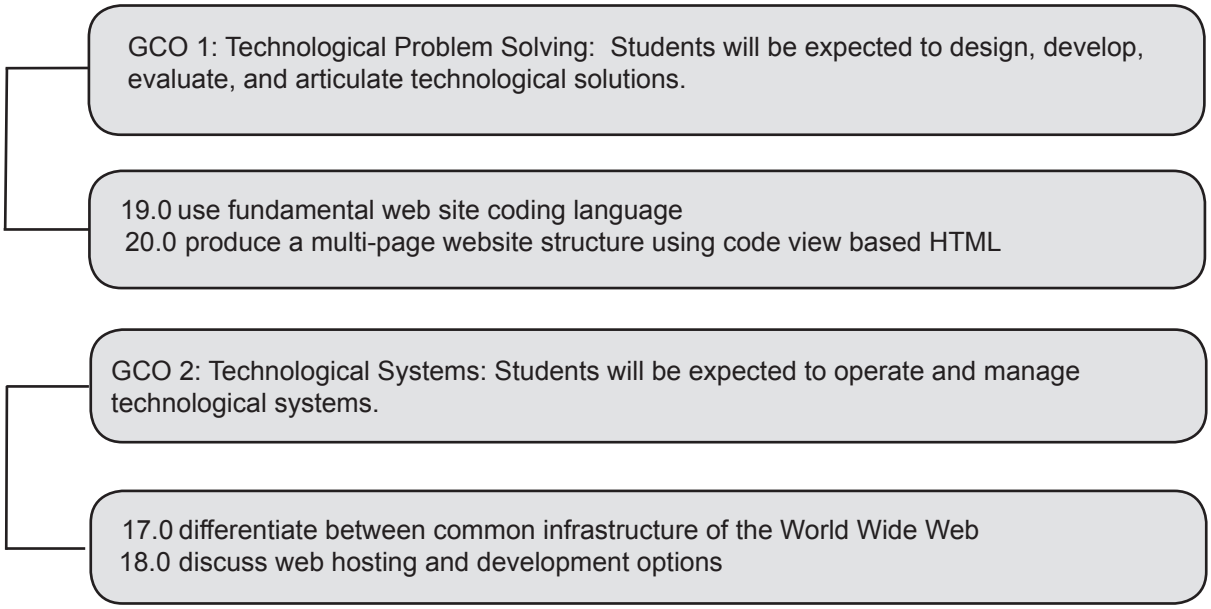
Section Three:
Specific Curriculum Outcomes

Unit 3: Web Services Technologies

Focus

In this unit on web technologies students will explore topics that relate to the technologies that run the internet. Once students have a concept of how the internet manages data they can then get started coding in Hyper Text Markup Language (HTML). The ultimate goal is for students to get a first experience at programming a web resource.

Outcomes Framework



Suggested Unit Plan

The suggested time for unit three is 15 hours. Learning any new programming language is a time consuming process and the time allotted for this unit reflects that. While there is plenty of flexibility for covering the outcomes for unit three, the location of the unit in the course is significant. This unit is intended to get students coding in a HTML environment before they go on to a more advanced language for application development. It is important that students complete this unit before they begin unit four.

Infrastructure and Hosting

Outcomes

Students will be expected to

17.0 differentiate between common infrastructure of the World Wide Web [GCO 2]

Focus for Learning

Students should explore some of the common infrastructure that works together to serve digital content to personal computers and mobile devices. The infrastructure includes the following:

- Website: A structured collection of linked files and folders that includes the coded content in various scripting languages, such as Hyper Text Markup Language (HTML). It will also incorporate various media content. (e.g., graphical images, sound files, video files) and other linked documents such as PDFs and text documents. The collection of files that compose a website are connected by topic, theme or commercial purpose. A single themed, individual document or file is known as a web page and is coded primarily in HTML. Many websites are a combination of scripting languages and even use databases. In the database driven web site, information such as product listings, email addresses, real estate listings and images are stored in the table formats of databases on the server.
- Web server: A publicly accessible computer that has a fully qualified domain name (FQDN), a static IP address, and software such as Apache or Internet Information Server (IIS). These technologies combine to allow communication of website content through the hypertext transmission protocol (HTTP).
- Web browser: A software application program that is used on a computer or a mobile device. Browsers allow the user to request website content through the typing of URLs (website addresses). The browser handles the request being sent to the web server. It rebuilds the web page graphically in the user's browser according to the coding and designs embedded by the programmer.
- Uniform Resource Locator (URL): A reference to a web resource that specifies its location on a computer network and a mechanism for retrieving it (commonly termed a web address). Most web browsers display the URL of a web page above the page in an address bar. A typical URL could have the form of http://www.acme.com/folder/index.html, which indicates a protocol (http), a hostname (www.acme.com), local server folder path (/folder/) and a web page file name (index.html).

Students should be able to speak fluently about the common infrastructure types and indicate their uses in the online world.

Sample Performance Indicator

Select a commercial website that you have used in the past. Map out how you envision the pieces of infrastructure that hosts this site.

Infrastructure and Hosting

Sample Teaching and Assessment Strategies

Activation

Teachers may

- Discuss and demonstrate the key concepts associated with www infrastructure.

Connection

Students may

- Trace the steps involved in the transmission of a web page file and linked contents from a web server to a recreated page on an end user's web browser. This may be documented in paragraph or graphic organizer format.

Consolidation

Students may

- Create a graphic organizer to show the steps involved in creating and publishing a website for a major company.

Extension

Students may

- Write a business plan section advising the options and technical work required for a business to develop a website presence.

Resources and Notes

Authorized

How Computers Work (Teacher Resource [TR])

- pp. 286-296

Suggested

Resource Links: www.k12pl.nl.ca/curr/10-12/te/ct3104/links/unit3.html

- Unit 3 Web Services Technologies
  - World Wide Web
  - Code.org

Infrastructure and Hosting

Outcomes

Students will be expected to

18.0 discuss web hosting and development options [GCO 2]

Focus for Learning

The World Wide Web is so ubiquitous in the lives of students that they rarely consider how resources are hosted and served out to the end user. The focus for this outcome is to get students thinking about options for hosting web resources.

Students should consider hosting and development options such as:

- Local Web Server: Many organizations have their own web server. The web server has software such as Internet Information Server (IIS) or Apache©. This software manages the web server communications with web browsers as they send requests for content. This web server has to be registered in the domain name system through the parent organization and or the Internet Service Provider (ISP), such as Bell© or Eastlink©.
- Online web host options: Many options exist for creating a website presence by having your content hosted on free or purchased space on web servers outside your organization. There are a number of online web hosting options. These include having
  - an off-site dedicated web server with software you can access and control remotely;
  - Content on a service such as Weebly.com©, WordPress.com© or Google Sites©, which will allow content to be developed through easy to use templates. In the instance of free hosting your site would appear as a sub web such as www.yoursite.weebly.com. Another option is to purchase a domain name from a hosting service with a web address appearing as www.yoursite.com without the hosting organization's domain name.
  - There are many additional ways to have a personal or business web presence, including Facebook©, Twitter©, or Google Sites©.

Sample Performance Indicator

Provide a solution to the following problem:

A small business approaches you requesting information on having a website created. Explain to the owner the options available to them for hosting and development. Recommend the best solution based on the ICT expertise in the company.

Infrastructure and Hosting

Sample Teaching and Assessment Strategies

Activation

Teachers may

- Discuss and demonstrate web hosting and development options.
- Invite a local expert in web design and hosting to present on their experiences in this field.

Connection

Students may

- Research web hosting setup of various local businesses or national organizations. A brief report could show examples of local web servers and online hosting web servers

Consolidation

Students may

- Create a list of options for web hosting for a small business.

Extension

Teachers may

- Create an online website that functions as a portfolio of student work.

Students may

- Write a business plan section advising the options and technical work required for a business to develop a website presence.

Resources and Notes

Suggested

Resource Links: www.k12pl.nl.ca/curr/10-12/te/ct3104/links/unit3.html

- Unit 3 Web Services Technologies
  - Web Hosting

Coding a Web Resource

Outcomes

Students will be expected to

19.0 use fundamental website coding language [GCO 1]

Focus for Learning

Students should explore and practice the fundamentals of website coding.

Consideration should be given to understanding the common scripting and styling languages used.

HTML is the basis of the basic web page and controls the content and presentation elements. Web designers like to separate the textual content and parts of the site using HTML. While the styling and presentation of the page can be controlled directly in HTML, it is best to control it by using Cascading Style Sheets (CSS). CSS defines styles for documents, including the design, layout and variations in display for different devices and screen sizes. The coder can create the CSS in the <head> of a document with an embedded style sheet, or attach a separate file that defines the styles with an external style sheet. This file would be saved and hosted on a site.

Students should explore three methods of creating web pages. They are

- simple text editors saving files in HTML format;
- online tools using What You See is What you Get (WYSIWYG) editors and code view, such as W3Schools.com and Google Sites in HTML edit view; and
- web development software such as Visual Studio Community, MS Web Expressions or Dreamweaver.

Students should explore HTML5 command options such as

- structural tags (html, head, title, body);
- attributes and values;
- headings and paragraphs;
- text Formatting;
- tables;
- lists;
- colour controls (using words and hexadecimal),
- links (relative and absolute); and
- media files (images, audio, and embedded media).

Sample Performance Indicator

Students should integrate advanced scripting languages (CSS and Javascript) with HTML:

- Create inline style using CSS tags.
- Create a linked separated CSS file to control the style.
- Use a javascript embedded in the HTML file.
- Use a javascript linked in a separated file.

Coding a Web Resource

Sample Teaching and Assessment Strategies

Activation

Teachers may

- Model the creation of the essential and most frequently used tags in HTML files using a text editor.
- Demonstrate testing and debugging using a web browser.
- Demonstrate the use of both the Style tag as a section of a HTML file and an externally referenced CSS file.

Connection

Students may

- Create single web page files using text based HTML coding and testing with a web browser.
- Experiment with controlling the presentation style with a CSS external file.

Extension

Students may

- Research and integrate a Javascript (inline or linked).

Resources and Notes

Suggested

Resource Links: www.k12pl.nl.ca/curr/10-12/te/ct3104/links/unit3.html

- Unit 2 Web Services Technologies
  - Notepad++ Download
  - W3 Schools
  - HTML Hotdog
  - Code Academy

Coding a Web Resource

Outcomes

Students will be expected to

20.0 produce a multi-page website structure using code view based HTML [GCO 1]

Focus for Learning

Students have acquired the skills to author their own web resource based completely on code.

This will involve pre-production planning of the design and linked structure, and gathering digital images, audio and video and other documents, such as PDFs or Doc, that can be downloaded from the site.

During the production phase, students write the code for each web page of their website. They could use several tools to help produce the web page files. Their collection of files will form a thematically unified website. Testing and debugging the site in a web browser is an important part of production phase.

Post-production will involve posting the website on a web server or integrating it into a site such as weebly.com or Google Sites. An alternative during post-production could involve placing the website on a student shared folder to be viewed internally.

Sample Performance Indicator

Create a multiple-page website using HTML5 and advanced web coding techniques.

Coding a Web Resource

Sample Teaching and Assessment Strategies

Activation

Teachers may

- Review the planning, production and publishing of a structured web site with various assets including: html files (web pages), folders, media files such as images, sounds, videos, documents such as PDFs, Word docs, and any other files that may related to the sites purpose.
- Provide example structure and contents that students can model.

Consolidation

Students may

- Produce a multi-page website structure using code view based Hypertext Markup Language (HTML).
- Publish this structure to a local web server or hosted external site such as Weebly© or Google Sites©.

Resources and Notes

Suggested

Resource Links: www.k12pl.nl.ca/curr/10-12/te/ct3104/links/unit3.html

- Unit 2 Web Services Technologies
  - Notepad++ Download
  - W3 Schools
  - HTML Hotdog
  - Code Academy

Section Three:
Specific Curriculum Outcomes

Unit 4: Mobile App Design

Focus

Unit 4 is the culminating unit of the course. In this unit students will design and create a mobile application. Students will explore the fundamentals of the programming process and the tools needed to create a program. They will then follow a design process to code their own program and will test the program on an emulator or output it to a mobile device.

Outcomes Framework

GCO 1: Technological Problem Solving: Students will be expected to design, develop, evaluate, and articulate technological solutions.

23.0 using a design process, create an application and publish on a mobile device

GCO 2: Technological Systems: Students will be expected to operate and manage technological systems.

21.0 discuss the process of mobile application development
22.0 examine fundamental mobile application program elements

Suggested Unit Plan

The suggested time for unit four is 28 hours. While there is plenty of flexibility for covering the outcomes for unit four, the location of the unit in the course is significant as it requires a coding project as a culminating activity. This unit is intended to get students creating, testing and modifying code.

Mobile App Design

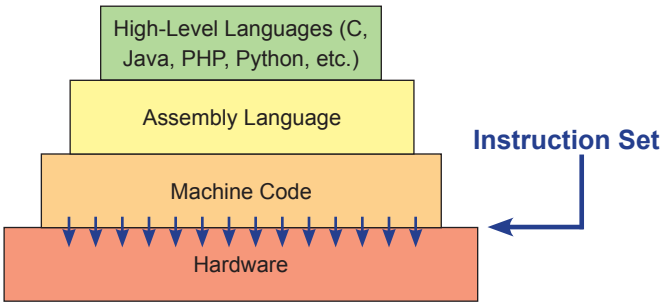
Outcomes

Students will be expected to

21.0 discuss the process of mobile application development [GCO 2]

Focus for Learning

Mobile app development is really application programming targeting mobile devices. Programming and mobile app design are the result of technological knowledge and process to harness a computer. It is to create a set of instructions for a computer to accomplish a specific task. The computer uses a set of directives through a programming language known to both the programmer and the computer operating system. Computer programming languages may be classified into several generations. This term refers not to the relative age of the language, but how close it is to the actual code understood by the CPU itself.



Most modern applications were created using high level programming language such as Visual Basic, Java, C# (C Sharp). Sometimes developers use rapid application development tools that are easier to learn and can be tested and deployed more quickly. For the purposes of this course students should use a rapid application development tool that can be classified as an interpreted language and uses coding that is close to English. Most modern tools for programming this way have an integrated development environment (IDE) that provides tools that make it easy to design the graphical user interface (GUI) and allows easy access to the code behind the GUI.

Mobile application development is the process by which application software is developed for hand-held devices, such as mobile phones and tablets. These mobile device applications can be installed locally on the device. Other mobile apps are hosted on a web server (server-side) to provide an “application-like” experience within a Web browser.

This should be a brief overview of the programming and mobile app development field. Teachers should aim to integrate some of these concepts throughout this unit rather than as an explicit section.

Mobile App Design

Sample Teaching and Assessment Strategies

Activation

Teachers may

- Overview how computer programs are created and the uniqueness of mobile applications.
- Differentiate between low level and high level programming languages.
- Outline the popular options in programming languages.
- Identify some high level languages, rapid application development languages, integrated development environments, and very high level languages.

Resources and Notes

Authorized

How Computers Work (Teacher Resource [TR])

- pp. 64-72

Supplementary

Resource Links: www.k12pl.nl.ca/curr/10-12/te/ct3104/strategies/guide.html

- Coding Teacher Resource Guide

Suggested

Resource Links: www.k12pl.nl.ca/curr/10-12/te/ct3104/links/unit4.html

- Unit 4 Mobile App Design
  - Introduction to Computer Science
  - 10 Steps to Create a Successful Mobile Application
  - From High Level to Low Level Computer Languages

Mobile App Design

Outcomes

Students will be expected to

22.0 examine fundamental mobile application program elements [GCO 2]

Focus for Learning

Students should build the language and skills necessary to code a mobile app. Students should become familiar with the following programming elements:

- User interface design: most interface development environments (IDEs) allow the user to start with the visual design of the desired output. This will include using pre-designed controls such as buttons, text boxes, labels, check boxes, and image boxes. Students need to able to select appropriate controls and set properties during the design and edit process.
- Program Algorithms and Logic: In computer programs, the set of instructions that are expressed in a logical sequence of statements to guide a working program or section of a program, are called algorithms. Students will need to be able to construct an algorithm.
- Variables: A variable is a container or storage location that has a name and can hold a value, such as a number or a string of characters that can be manipulated in a program. Variables should be a familiar mathematics concept for students.
- Syntax: The rules of grammar and the symbols and defined keywords and order of a programming language are known as its syntax.
- Key words, Statements, Command and Functions: All programming languages have reserved words known as key words, defined by the language to have special functions. A single executable line of instruction is known as a statement. It will usually contain key words. A set of statements that relate to manipulating data or parts of a program can be reused and called into action from several places by giving the block of statements a name known as a command. If a command accepts input values and returns output values it is known as a function.
- Program Flow, Decision and Control Structures: Most programs need to be able to make decisions on which way to proceed based on information. This is known as program flow and it is affected by blocks of code known as decision or control structures. It is generally accepted that there are three main structures in a high level programming language. The first is a series of statements that get executed from first to last in a straight sequence. The second is conditional branching where, based on the outcome of a decision, the program can proceed to execute some statements but not others. The If-Then structure and the Switch-Case structure are examples common across all high level languages. The third major structure is the ability to execute a block of code over and over again. The ability to repeat a code block is called looping.

Mobile App Design

Sample Teaching and Assessment Strategies

Activation

Teachers may

- Guide students in the creation of a simple graphical user interface in a computer programming integrated development environment (IDE).
- Overview the following stages to creating a simple computer program:
  1. Design Mode
  2. Design the GUI
  3. Assign Properties
  4. Create code behind/write scripts
  5. Run Time Mode
  6. Test and Debug Mode
  7. Compile/Publish

Connection

Students may

- Engage in tutorial driven activities that guide students through the design and coding and compiling process.
- Select optional guided programming activities and modify the program to suit the student's own ideas.

Consolidation

Students may

- Collaborate to share experiences, debug, and support each other during the development process.
- Reverse engineer and dissect ready-made code (i.e., tutorials) so that students can ascertain what lines of code are responsible for what.

Resources and Notes

Supplementary

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Mobile App Design

Outcomes

Students will be expected to

23.0 using a design process, create an application and publish on a mobile device [GCO 1]

Focus for Learning

This outcome represents the culminating activity for this unit. Students will use the design process to create an app. The degree of difficulty will vary; however, students will all have the opportunity to compile code and output it to a mobile device.

Briefly overview the stages of the application design process:

1. Clearly define the problem and desired solution.
2. Design the graphical user interface (GUI).
3. Add the controls and objects.
4. Add code (script).
5. Test code.
6. Evaluate app.
7. Publish app.

Discuss virtual device emulators as a way of testing mobile applications.

Sample Performance Indicator

Document the design process used to create an app.

Upload an application from a computer and test on a mobile device.

Mobile App Design

Sample Teaching and Assessment Strategies

Activation

Teachers may

- Provide advanced guided tutorial options that students are required to emulate and modify to their own purposes.
- Challenge students to produce a programming solution for a real world problem by providing students with the basic algorithm and assigning the design and detailing as the desired solution.
- Demonstrate the final compiling and publishing options for Windows, Mac, Android, and iOS platforms for publishing to a mobile device.
- Clarify the app publishing process and options for mobile platforms.

Consolidation

Students may

- Use a design process to create an application and publish on a mobile device.
- Compile and install their app on a mobile device using email, Google Drive, or direct mobile connections.

Resources and Notes

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