



Computer Studies Curriculum Grades K-8

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Programme Guidelines

- This is an ambitious and innovative programme that will allow Linden students an accelerated computer studies education. It is our understanding that this curriculum will be updated each year as technology and student needs change.
- Students in grades K-8 will receive at least two hours' of instruction in computer studies each week.
- Although computer studies will be integrated with other subjects as appropriate, it is considered a stand-alone course.
- Although many computer and software skills will be taught, coding skills are the centre of this programme.
- Passive screen-time activities (watching videos, playing video games that students have not created themselves) are kept to an absolute minimum. Teachers are advised to avoid using passive screen time activities as a reward.
- The goal of Linden's elementary computer studies programme is to prepare girls in 9th grade to take the ICS3U (Introduction to Computer Science) course immediately. This readiness will have several advantages, but most notably will allow girls to fit in computer studies courses where they may otherwise opt not to due to full schedules in 11th and 12th grades. It is our hope that we increase the number of girls pursuing computer studies in post-secondary education as a result. Therefore, some of the specific expectations below are taken from the Grade 10 Open course Introduction to Computer Studies [ICS20].

Computer Studies Strands

These strands will be taught in all elementary grades:

Programming

In developmentally appropriate ways, students will learn to write code, and apply it in a variety of contexts such as video games, app development, and robotics. They will also learn about the history of computer programming, and will learn about female and minority programmers, as well as the importance of programming in making the world a safer and more equitable place.

Keyboarding and Use of Input Devices

Students will learn to type and use input devices such as a mouse or a touch-pad, in safe and efficient ways.

Computer Hardware and Electronics

Students will learn the mechanics of how computers function, and in middle school, will undertake electronics projects, including Arduino.

Telecommunications, Cloud Computing, and File Management

Students will learn how computer networks store and retrieve information, and will use local networks and cloud storage to manage their own files effectively. They will learn to use email and other telecommunications tools in different business and personal contexts.

Social Media and Online Citizenship

Students will explore the meaning of creating and fostering online personae in safe and responsible ways. In developmentally-appropriate ways, they will learn to use social media effectively. A discussion of privacy rights will be an important part of this strand.

Online Research and Intellectual Property

Students will learn to use search engines effectively in order to complete research for a variety of purposes. They will explore ways to analyse the accuracy of information online, and will learn to protect intellectual property rights, both for themselves and others.

Desktop Publishing and Multi-Media

Students will synthesize many skills in the creation of digital works in many media, including posters, text documents, slide-shows, and movies.

Specific Expectations

KINDERGARTEN

Programming

By the end of Kindergarten, students will:

- recognize that computers follow instructions written by people;
- play games that involve giving and receiving instructions based on simple steps, both in human and digital contexts;
- begin to use icon-based programming software Scratch Jr to program simple stories.

Keyboarding and Use of Input Devices

By the end of Kindergarten, students will:

- type letters on the left side of the keyboard with a finger on their left hand, and letters on the right side of the keyboard with a finger on their right hand;
- use a mouse to point and click;
- use a touch-screen to open and work in various applications.

Computer Hardware and Electronics

By the end of Kindergarten, students will:

- identify by name such parts of the computer as monitor, keyboard, mouse, and tower;
- identify ways in which the computer gives information to the user (e.g. through monitor, speakers, printer, etc.)

Telecommunications, Cloud Computing, and File Management

By the end of Kindergarten, students will:

- participate as the class writes email together (e.g. an email of thanks for a field trip, or an update to parents about an event) using an account that is maintained by the teacher;
- observe as the teacher saves documents and saves them in a file on the network.

Social Media and Online Citizenship

By the end of Kindergarten, students will:

- look at pictures of diverse people online, and explain what information they understand about the people pictured;
- use the school's website to compare what they see in real life to what they see pictured on the internet.

Online Research and Intellectual Property

By the end of Kindergarten, students will:

- navigate websites by looking for familiar icons;
- reflect on how it feels to have one's work online.

Desktop Publishing and Multi-Media

By the end of Kindergarten, students will:

- use a drawing tool to make digital artworks;
- take photos using a digital camera.

GRADE ONE

Programming

By the end of grade one, students will:

- play games that involve giving and receiving instructions based on simple steps, both in human and digital contexts;
- use icon-based programming in Scratch Jr to tell simple stories.

Keyboarding and Use of Input Devices

By the end of grade one, students will:

- type letters on the left side of the keyboard with fingers on their left hand, and letters on the right side of the keyboard with fingers on their right hand;
- use a mouse to point, click, and drag;
- use a touch-screen to open and work in various applications.

Computer Hardware and Electronics

By the end of grade one, students will:

- explain the main roles of monitor, mouse, keyboard, and tower;
- turn off the computer and monitor correctly at the end of a session.

Telecommunications, Cloud Computing, and File Management

By the end of grade one, students will:

- contribute to a shared class document such as a Google Doc using an account that is maintained by the teacher;

- save changes to a file.

Social Media and Online Citizenship

By the end of grade one, students will:

- contribute to a class article, with photos, to be published on the school's Facebook and web pages;
- help compose a Tweet about a field trip or other school event, by making suggestions and counting characters to ensure a complete post.

Online Research and Intellectual Property

By the end of grade one, students will:

- conduct simple single-word searches using a search engine;
- explore and compare differences when variations on search terms are used.

Desktop Publishing and Multi-Media

By the end of grade one, students will:

- alter digital photos using simple drawing software.

GRADE TWO

Programming

By the end of grade two, students will:

- write short sets of instructions that follow a logical sequential order (e.g. the procedure for an experiment for Science and Technology Fair);
- use icon-based programming in Scratch Jr to tell interactive stories.

Keyboarding and Use of Input Devices

By the end of grade two, students will:

- use a thumb to type the space bar and a baby finger to hold the shift key when making capital letters;
- distinguish between clicks and double-clicks and between left and right clicks of the mouse;
- use the keyboard shortcut for saving a file.

Computer Hardware and Electronics

By the end of grade two, students will:

- identify different ways in which computers and humans communicate with each other.

Telecommunications, Cloud Computing, and File Management

By the end of grade two, students will:

- contribute to a group project using a collaborative tool like Google Docs using an account that is maintained by the teacher.

Social Media and Online Citizenship

By the end of grade two, students will:

- help compose an Instagram post that provides information about a school event (such as field trip), but does not reveal any personal or private information about students.

Online Research and Intellectual Property

By the end of grade two, students will:

- learn how to bookmark web pages for later reference;
- describe some key differences between getting information from a book or newspaper, and getting it from a website.

Desktop Publishing and Multi-Media

By the end of grade two, students will:

- create titles for a school project (such as Science and Technology display boards) by using spell-check, changing font style, size, and colour.

GRADE THREE

Programming

By the end of grade three, students will:

- identify different examples of computer programmers, including women and members of visible minority groups;
- use icon-based programming in Scratch to tell simple stories.

Keyboarding and Use of Input Devices

By the end of grade three, students will:

- use the closest finger to type a letter key when hands in the correct keyboard position, while looking down;
- use the keyboard shortcuts for cutting and pasting.

Computer Hardware and Electronics

By the end of grade three, students will:

- give examples of devices that use wires to send information, and those that use wireless technology.

Telecommunications, Cloud Computing, and File Management

By the end of grade three, students will:

- begin, with teacher supervision, to use and maintain their own school email accounts;
- learn how to copy images and text found online;
- explain the importance of saving files “early and often”.

Social Media and Online Citizenship

By the end of grade three, students will:

- identify the difference between personal and private information;
- explain how personal information can be compiled in order to determine private information.

Online Research and Intellectual Property

By the end of grade three, students will:

- gather information for school projects by conducting online research;
- identify the location of search boxes and address bars when online;
- locate familiar websites by typing the address into the address bar, and by performing a search through a search engine.

Desktop Publishing and Multi-Media

By the end of grade three, students will:

- create text documents using different formatting styles, including double-spacing, text alignment, etc;
- centre titles on a page by using the text alignment tool;
- use spell-check function to improve spelling in a document;
- explain common errors that a word processing spell-check function might make;
- record video files.

GRADE FOUR

Programming

By the end of grade four, students will:

- identify ways in which computer programmers improve the lives of people around the world;
- use icon-based programming in Scratch or KODU Game Lab to solve simple problems.

Keyboarding and Use of Input Devices

By the end of grade four, students will:

- touch-type (type using the correct fingers without looking) on the home row and space bar;
- use the keyboard shortcut for undoing mistakes;
- explain the characteristics of healthy ergonomics/posture when using computer devices.

Computer Hardware and Electronics

By the end of grade four, students will:

- distinguish between input and output data and devices;
- describe how portable computing devices (e.g. PDA, cell phone, GPS, laptop) affect our everyday lives [ICS20 C1.3].

Telecommunications, Cloud Computing, and File Management

By the end of grade four, students will:

- read and write email for a variety of school purposes;
- add attachments to email;
- store and retrieve files from the school network.

Social Media and Online Citizenship

By the end of grade four, students will:

- identify pros and cons of using social media;
- distinguish between “personal” and “professional” information online;
- describe how electronic access to information (e.g. instant messaging, social networking sites, wikis, blogs, video sharing sites) influences our everyday lives, as well as the lives of people in various countries around the world, in both positive and negative ways [ICS20 1.4].

Online Research and Intellectual Property

By the end of grade four, students will:

- identify the difference between a website and a search engine;
- distinguish between sponsored content and other results when using a search engine;
- use advance search functions to find images that are free to use and share.

Desktop Publishing and Multi-Media

By the end of grade four, students will:

- create text documents with embedded images.

GRADE FIVE

Programming

By the end of grade five, students will:

- research an example of a pioneering woman in computer programming;
- use icon-based programming in Scratch or KODU Game Lab, including conditionals (e.g. if this happens, then this happens).

Keyboarding and Use of Input Devices

By the end of grade five, students will:

- touch-type (type using the correct fingers without looking) all letter keys, with a focus on accuracy and not speed;
- use a keyboard shortcut for printing the screen.

Computer Hardware and Electronics

By the end of grade five, students will:

- describe the negative effects of computers and computer use on the environment [ICS20 C2.1];
- describe how and where electronic waste is processed, and identify local companies and institutions that offer such services [ICS20 C2.4].

Telecommunications, Cloud Computing, and File Management

By the end of grade five, students will:

- maintain a well-organized folder on the network to store files;
- conduct projects with others using cloud computing technology (such as collaborating on a document in Google Drive).

Social Media and Online Citizenship

By the end of grade five, students will:

- explain how to responsibly deal with chain emails or social media forwards that intend to manipulate the receiver;
- describe issues associated with access to online services (e.g. reliability of passwords, network security, identity theft, the permanence of information released onto the internet) [ICS20 C1.5].

Online Research and Intellectual Property

By the end of grade five, students will:

- conduct simple experiments that compare the results of different search engines (e.g. Google vs Dogpile)
- cite websites accurately when conducting online research;
- identify strategies to use to assess the validity of information gathered online.

Desktop Publishing and Multi-Media

By the end of grade five, students will:

- record and edit a short audio project;
- create a slide-show (using Impress, PowerPoint, or Prezi, for example) to communicate information to a specific audience;
- enter data into a spreadsheet.

GRADE SIX

Programming

By the end of grade six, students will:

- use a text-based coding language like Python to create programs with loops;
- write clear and maintainable code using proper programming standards (e.g. indentation; naming conventions for constants, variables, and expressions) [ICS20 B3.1];
- use a tracing technique to understand program flow and to identify and correct logic and run-time errors in a computer program [ICS20 B3.3].

Keyboarding and Use of Input Devices

By the end of grade six, students will:

- touch-type on full keyboard, 5-10 words per minute;
- use a USB key to make backups of work.

Computer Hardware and Electronics

By the end of grade six, students will:

- describe ways in which computers are or could be used to reduce resource use and to support environmental protection measures (e.g. computer modelling to reduce use of physical resources; interpretation of large amounts of environmental data; management of natural resources; programmable temperature control to reduce energy consumption) [ICS20 C2.3];
- create series and parallel circuits that include power different types of devices

(intergrated with Science and Technology).

Telecommunications, Cloud Computing, and File Management

By the end of grade six, students will:

- identify various networking applications and protocols (e.g. VoiP, streaming media, FTP, email, instant messaging) [ICS20 A4.1];
- explain the importance of keeping passwords a secret;
- explain the importance of keeping backups of files.

Social Media and Online Citizenship

By the end of grade six, students will:

- identify phishing attempts and explain how to deal with them;
- identify examples of cyberbullying and explain how young people can problem-solve in the context of identifying with bully, bystander, and target of bullying.

Online Research and Intellectual Property

By the end of grade six, students will:

- describe the role of fair use in intellectual property laws;
- use only images that are in the public domain when creating works that will be published in any fashion (including handed in for school projects) and explain the importance of doing so;
- use multiple sources in order to check the validity on information found online.

Desktop Publishing and Multi-Media

By the end of grade six, students will:

- add data to a spreadsheet in order to create digital graphs;
- add tables to text documents;
- create a slide-show with embedded links and graphs, in order to communicate information to an audience.

GRADE SEVEN

Programming

By the end of grade seven, students will:

- create flow-charts with yes/no binaries;
- use a text-based coding language like Python to create programs with conditionals;
- distinguish between conditionals and loops and between variables and constants in a program;
- explain the difference between syntax, logic, and run-time errors [ICS20 B2.6].

Keyboarding and Use of Input Devices

By the end of grade seven, students will:

- touch-type on full keyboard, 15 words per minute.

Computer Hardware and Electronics

By the end of grade seven, students will:

- take apart a computer and identify the main components of the unit;
- describe, in simple terms, the main jobs of each of the internal components of a computer.

Telecommunications, Cloud Computing, and File Management

By the end of grade seven, students will:

- explain the dangers of using simple passwords;
- change default settings on email account in order to optimize use.

Social Media and Online Citizenship

By the end of grade seven, students will:

- examine case histories of ways in which social media advanced social causes, as well as explain how social media has harmed individual or corporate reputations;
- develop a five-point personal “online brand” (e.g. explain what qualities they want to highlight about themselves when posting material online.);
- explain what “doxxing” is and identify ways to deal with it;
- describe legal and ethical issues related to the use of computers (e.g. music and video file downloading, spyware, identity theft, phishing, keystroke logging, packet sniffing, cyberbullying)
- describe safeguards (e.g. effective passwords, secure websites, firewalls, biometric data) for preventing the unethical use of computers. [ICS20 C3.1]

Online Research and Intellectual Property

By the end of grade seven, students will:

- identify and use primary and secondary sources when conducting online research.

Desktop Publishing and Multi-Media

By the end of grade seven, students will:

- create a digital animation (using stop-motion camera, for example) with audio.

GRADE EIGHT

Programming

By the end of grade eight, students will:

- use a text-based coding language like Python to create interactive games that vary output based on user input;
- trouble-shoot programming errors using a variety of problem-solving strategies (e.g. “Rubber Duck Debugging”, reading error codes, discussing with a peer, conducting additional research);
- use a visual problem-solving model (e.g. IPO [Input, Process, Output] chart; HIPO [Hierarchy plus Input, Process, Output] chart and diagram; flow chart; storyboard) to plan the content of a program [ICS20 B2.1];
- use variables, expressions, and assignment statements to store and manipulate numbers and text in a program (e.g. in a quiz program, in a unit conversion program) [ICS20 B2.2];
- write clear and maintainable internal documentation to a specific set of standards

(e.g. program header: author, revision date, program name, program description, table of variable names and descriptions) [ICS20 B3.2];

- use an icon-based coding language to program a robot or create an app;
- research ways in which robotics improve the lives of people around the world.

Keyboarding and Use of Input Devices

By the end of grade eight, students will:

- touch type on full keyboard, 20 adjusted words per minute.

Computer Hardware and Electronics

By the end of grade eight, students will:

- explain the difference between software used for applications (e.g. word processor, spreadsheet, email client) programming (e.g. an integrated development environment) and systems (e.g. operating system tools such as a registry editor and a defragmenting tool) [ICS20 A2.1];
- build circuits using conductors, resistors, and devices in the Arduino environment.

Telecommunications, Cloud Computing, and File Management

By the end of grade eight, students will:

- develop and use an algorithm to generate secure passwords;
- save files in different formats for different purposes.

Social Media and Online Citizenship

By the end of grade eight, students will:

- examine case studies that illustrate how celebrities and corporations use social media to develop a brand;
- read and analyze the privacy agreement for a social media platform of their choice, sorting the agreement into steps that protect the user, and those that benefit the provider;
- explain the impact on privacy of techniques for collecting and processing data (e.g. camera phones, reward programs, targeted advertising, digital rights management, monitoring software) [ICS20 C1.2].

Online Research and Intellectual Property

By the end of grade eight, students will:

- use Boolean search operators AND, OR, and NOT, as well as Google-specific search operators when conducting online research;
- create and use Creative Commons licenses for own work.

Desktop Publishing and Multi-Media

By the end of grade eight, students will:

- add formulae to a spreadsheet in order to manipulate and analyze numerical data;
- create short films with layered audio and video tracks;
- identify ways in which a viewer can determine if a photo has been altered using software such as Photoshop.