BRITISH
COLUMBIA
Ministry of Education

BIG IDEAS

User needs and interests drive the design process.	Social, ethical, and sustainability issues are influenced by design.	Complex tasks require different technologies and tools at different stages.

Learning Standards

Curricular Competencies	Content
Students are expected to be able to do the following:	*Students are expected to know the following:*

Curricular Competencies

Students are expected to be able to do the following:

Applied Design

Understanding context

- Engage in a period of **research** and **empathetic observation**

Defining

- Identify potential users, societal impacts, and other relevant contextual factors for a chosen design opportunity
- Identify criteria for success, intended impact, and any **constraints** or possible unintended impacts

Ideating

- Screen ideas against criteria and constraints
- Critically analyze and prioritize competing **factors** to meet community needs for preferred futures
- Maintain an open mind about potentially viable ideas

Prototyping

- Identify and use **sources of inspiration** and information
- Choose a form for prototyping and develop a **plan** that includes key stages and resources
- Prototype, making changes to tools, materials, and procedures as needed
- Record **iterations** of prototyping

Content

Students are expected to know the following:

- design opportunities
- **computer hardware**, peripherals, internal and external components, and standards
- distinctions between **software types**, cloud-based and desktop applications
- intermediate features of **business applications**, including word processing, spreadsheets, and presentations
- **operating system shortcuts** and **command line operations**
- **preventive maintenance** of hardware and software
- **computer security risks**
- hardware and software **troubleshooting**
- **wired and wireless computer networking**
- **evolution of digital technology** and the impact on traditional models of computing
- **risks and rewards** associated with big data, multi-device connectivity, and the Internet of Things
- principles of **computational thinking**
- introductory computer **programming concepts and constructs**

Learning Standards (continued)

Curricular Competencies	Content
Testing • Identify **sources of feedback** • Develop an **appropriate test** of the prototype • Conduct the test, collect and compile data, evaluate data, and decide on changes • Iterate the prototype or abandon the design idea ***Making*** • Identify and use appropriate tools, **technologies**, materials, and processes for production • Make a step-by-step plan for production and carry it out, making changes as needed ***Sharing*** • Decide on how and with whom to **share product** and processes • Demonstrate the product to potential users, providing a rationale for the selected solution, modifications, and procedures • Use appropriate terminology • Critically reflect on their design thinking and processes, and identify new design goals • Assess their ability to work effectively both as individuals and collaboratively in a group, including ability to share and maintain an efficient collaborative workspace **Applied Skills** • Demonstrate an awareness of precautionary and emergency safety procedures in both physical and digital environments • Identify the skills needed in relation to specific projects, and develop and refine them **Applied Technologies** • Choose, adapt, and if necessary learn more about appropriate tools and technologies to use for tasks • Evaluate **impacts**, including unintended negative consequences, of choices made about technology use • Evaluate the influences of land, natural resources, and culture on the development and use of tools and technologies	• **planning and writing** simple programs, including games • **impacts of computers and technology on society** • **ethical considerations** of technology use, including **cultural appropriation** and **environmental sustainability** • **digital literacy** and digital citizenship • impacts of technology use on personal **health and wellness**

- **research:** seeking knowledge from other people as experts, secondary sources, and collective pools of knowledge in communities and collaborative atmospheres both online and offline
- **empathetic observation:** may include experiences and people, including users, experts, and thought leaders
- **constraints:** limiting factors such as task or user requirements, materials, expense, environmental impact
- **factors:** including social, ethical, and sustainability
- **sources of inspiration:** may include personal experiences; exploration of First Peoples perspectives and knowledge; the natural environment and places, including the land and its natural resources and analogous settings; cultural influences; people, including users, experts, and thought leaders
- **plan:** for example, pictorial drawings, sketches, flow charts
- **iterations:** repetitions of a process with the aim of approaching a desired result
- **sources of feedback:** may include peers; users; First Nations, Métis, or Inuit community experts; other experts and professionals
- **appropriate test:** consider conditions, number of trials
- **technologies:** tools that extend human capabilities
- **share:** may include showing to others or use by others, giving away, or marketing and selling
- **product:** for example, a physical product, a process, a system, a service, or a designed environment
- **impacts:** personal, social, and environmental

- **computer hardware:** for example, central processing unit (CPU), random-access memory (RAM), read-only memory (ROM), cache, hard drive, solid-state drive (SSD), motherboard, power supply, video card, sound card, printer, monitor, scanner, keyboard, mouse, speakers, flash memory, universal serial bus (USB) (2, 3, C), megahertz, megabytes, gigabytes
- **software types:** for example, systems software, utility software, application software
- **business applications:** software tools for communicating, presenting, organizing, and formatting data
- **operating system shortcuts:** for example, cut, copy, paste, print, print window, print screen, screen refresh
- **command line operations:** for example, establishing file structures, copying, deleting, moving files
- **preventive maintenance:** for example, physical and cloud data backup solutions, digital security measures, software updates, patches
- **computer security risks:** for example, malware, Trojans, viruses, phishing scams, identity fraud, ransomware

- **troubleshooting:** identifying problem, establishing a theory of probable cause, testing theory to determine cause, taking action, testing and preventing, reporting
- **wired and wireless computer networking:** for example, network cards, routers, switches, cables, modems, network types
- **evolution of digital technology:** for example, introduction of mobile devices, smartphones, tablets, Internet of Things
- **risks and rewards:** for example, data collection, personal information, privacy concerns, remote hacking, information as a commodity, personal safety, convenience, functionality
- **computational thinking:** key components include decomposition, patterns and generalizations, abstraction, and algorithmic thinking
- **programming concepts and constructs:** classes, objects, data types, constants and variables, expressions and instructions, order of operations, precedence of arithmetic operators, assignment and relational operators, decision and looping structures, Boolean operators, comparison operators, arithmetic operators
- **planning and writing:**
  - using visual problem-solving models
  - using variables, expressions, and assignment statements to store and manipulate numbers and text in a program
  - using decision structure for two or more choices
  - effectively using looping structures
  - distinguishing between syntax, logic, and run-time errors
- **impacts of computers and technology on society:** global communication, social media, e-commerce, mobile payment solutions, globalization, human interactions, digital divide, crowdfunding, technology and social change, technology in humanitarian work, technology to assist people with diverse abilities
- **ethical considerations:** may include big data use, equality of access, copyright and fair use, gender issues and technology, cyberbullying, white hat/black hat hacking, hacking for social causes, e-waste, recycling, conflict mineral exploitation
- **cultural appropriation:** use of a cultural motif, theme, "voice", image, knowledge, story, song, or drama, shared without permission or without appropriate context or in a way that may misrepresent the real experience of the people from whose culture it is drawn
- **environmental sustainability:** e-waste, recycling and disposal, power consumption, renewable energy, server farms
- **digital literacy:** curating a positive online portfolio, digital footprints/dossier, safe online information sharing, cyberbullying, online empathy, reporting online hate/bullying, support and resources, appropriate and professional ways to engage in online forums/communication spaces
- **health and wellness:** for example, cyber addictions; ergonomic issues; and other risks and potential side-effects of overuse of digital tools, including games, gambling, and social media