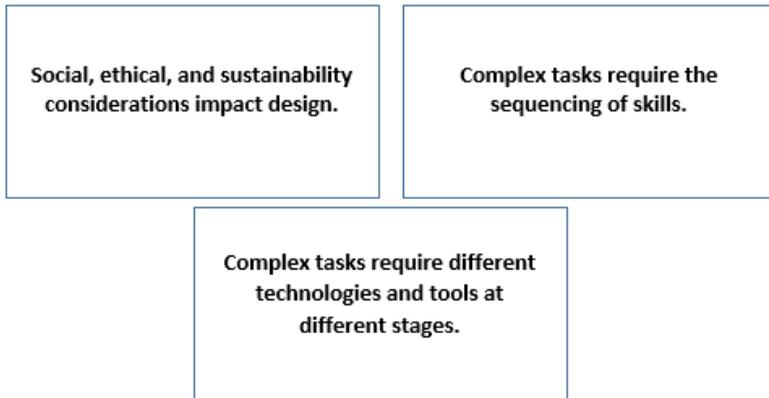


ADST Scope & Sequence

Grade 9 Big Ideas & Learning Standards



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** in order to understand design opportunities

Defining

- Choose a design opportunity
- Identify potential users and relevant contextual factors
- Identify criteria for success, intended impact, and any **constraints**

Ideating

- Take creative risks in generating ideas and add to others' ideas in ways that enhance them
- Screen ideas against criteria and constraints
- Critically analyze and prioritize competing factors, including social, ethical, and sustainability considerations, to meet community needs for preferred futures
- Choose an idea to pursue, keeping other potentially viable ideas open

Available District Resources

Available Grade 9 Resources

- Robotics
- Coding Apps
- Arduino Robots
- mBots robot kits

- Vex Robotics

Grade 9 Content & Computational Thinking

CONTENT

The curriculum is designed to be offered in modules or courses of various lengths. There are more Content learning standards for Grade 9, as schools often offer these as full courses. Schools are required to provide students with the equivalent of a full-year “course” in Applied Design, Skills, and Technologies. This “course” can be made up of one or more of the modules listed below. Schools may choose from among the modules provided in the provincial curriculum or develop new modules that use the Curricular Competencies of Applied Design, Skills, and Technologies 9 with locally developed content. Locally developed modules can be offered in addition to, or instead of, the modules in the provincial curriculum.

Data

Patterns

Algorithms

Digital Citizenship

- Environmental impact (material choice, Power source, longevity of components)
- Consideration towards cyber citizenship (spyware, data collection with malicious intent)

Grade 9

Curricular Competencies (continued)

Prototyping

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

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
- Use materials in ways that minimize waste

Sharing

- Decide on how and with whom to **share** their **product** and processes
- Demonstrate their product to potential users, providing a rationale for the selected solution, modifications, and procedures, using appropriate terminology
- Critically evaluate the success of their product, and explain how their design ideas contribute to the individual, family, community, and/or environment
- Critically reflect on their design thinking and processes, and evaluate their ability to work effectively both as individuals and collaboratively in a group, including their ability to share and maintain an efficient co-operative work space
- Identify new design issues

Available Grade 9 Resources

- Robotics
- Coding Apps
- Arduino Robots
- mBots robot kits

- Vex Robotics

CONTENT

Module examples:

Drafting

Students are expected to know the following:

- drafting technique, including dimensioning and standards
- drafting styles, including perspective, mechanical, and architectural
- **CADD/CAM, CNC** and 3D printing
- function of models
- **basic code**
- digital **output devices**
- **virtual creation** using CAD/CAM

Electronics and Robotics

Students are expected to know the following:

- uses of electronics and robotics
- **components** of an electric circuit
- ways in which various **electrical components** affect the path of electricity
- **Ohm's law**
- **platforms** for PCB (printed circuit board) production
- basic robot behaviors using **input/output devices**, movement- and sensor-based responses, and microcontrollers
- **mechanical devices** for the transfer of mechanical energy
- mechanical advantage and power efficiency, including friction, force, and torque
- robotics **coding**
- various **platforms** for robotics programming

Curricular Competencies (continued)

Applied Skills

- Demonstrate an awareness of precautionary and emergency safety procedures in both physical and digital environments
- Identify the skills and skill levels needed, individually or as a group, in relation to specific projects, and develop and refine them as needed

Applied Technologies

- Choose, adapt, and if necessary learn about appropriate tools and technologies to use for tasks
- Evaluate the personal, social, and environmental impacts, including unintended negative consequences, of the choices they make about technology use
- Evaluate how the land, natural resources, and culture influence the development and use of tools and technologies

Curricular Competencies – Elaborations

- **research:** seeking knowledge from other people as experts (e.g., First Peoples Elders), secondary sources, and collective pools of knowledge in communities and collaborative atmospheres
- **empathetic observation:** aimed at understanding the values and beliefs of other cultures and the diverse motivations and needs of different people
- **Defining:** setting parameters
- **constraints:** limiting factors such as task or user requirements, materials, expense, environmental impact, issues of appropriation, and knowledge that is considered sacred
- **Ideating:** forming ideas or concepts
- **sources of inspiration:** may include experiences; traditional cultural knowledge and approaches, including those of First Peoples; places, including the land and its natural resources and analogous settings; and people, including users, experts, and thought leaders
- **plan:** for example, pictorial drawings, sketches, flow charts

Available Grade 9 Resources

- Robotics
- Coding Apps
- Arduino Robots
- mBots robot kits

- Vex Robotics

CONTENT (continued) Module examples (continued)

Entrepreneurship and Marketing

Students are expected to know the following:

- risks and benefits of entrepreneurship
- the role of social entrepreneurship in First Nations communities
- ways of decreasing production costs through training and technological advancement
- flow of goods and services from producers to consumers
- **identification** of a good or service that ensures brand recognition
- marketing strategies using the 4 Ps: product, price, promotion, and placement
- market segmentation by **demographic, geographic, psychographic, and purchasing pattern**
- evolving consumer needs and wants
- role of online technologies in expanding access to goods and services
- **sources of financing** for a new venture or start-up business
- **measurement** of financial success and failure

Food Studies

Students are expected to know the following:

- **pathogenic microbes** associated with food-borne illnesses
- components of food preparation, including use and adaptations of ingredients, techniques, and equipment
- health, economic, and environmental **factors** that influence availability and choice of food in personal, local, and global contexts
- **ethical issues** related to food systems
- First Peoples traditional food use, including ingredients, harvesting/gathering, storage, preparation, and preservation

Curricular Competencies – Elaborations (continued)

- **iterations:** repetitions of a process with the aim of approaching a desired result
- **sources of feedback:** may include peers; users; keepers of traditional cultural knowledge and approaches, including those of First Peoples; and other experts
- **appropriate test:** consider conditions, number of trials
- **technologies:** things that extend human capabilities
- **share:** may include showing to others, 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

Content – Elaborations

Drafting

- **CADD:** computer-aided drafting and design
- **CAM:** computer-aided manufacturing
- **CNC:** computer numerical control
- **basic:** for example, for the purpose of editing to send to output devices
- **output devices:** for example, plotters, vinyl cutters, and 3D printers; CNC machines
- **virtual creation:** for example, layout and planning of a project, creating plans for a model

Electronics and Robotics

- **components:** power source, conductor, load
- **electrical components:** for example, diodes, LEDs, resistors, capacitors, transistors, ICs (integrated circuits), SCRs (silicon controlled rectifiers), regulators

Available Grade 9 Resources

- Robotics
- Coding Apps
- Arduino Robots
- mBots robot kits

- Vex Robotics

CONTENT

Module examples (continued)

Information and Communications Technologies

Students are expected to know the following:

- **text-based coding**
- binary representation of various data types, including text, sound, pictures, video
- **drag-and-drop mobile development**
- programming **modular components**
- development and collaboration in a **cloud-based environment**
- design and function of networking hardware and topology, including wired and wireless network router types, switches, hubs, **wireless transfer systems**, and client-server relationships
- functions of operating systems, including mobile, open source, and proprietary systems
- current and future **impacts** of evolving web standards and cloud-based technologies
- **design for the web**
- strategies for curating and managing personal digital content, including management, personalization, organization, maintenance, contribution, creation, and publishing of digital content
- **relationships** between technology and social change
- strategies to manage and maintain **personal learning networks**, including **content consumption and creation**
- **keyboarding techniques**

Media Arts

Students are expected to know the following:

- **digital and non-digital** media technologies, their distinguishing characteristics and uses
- techniques for organizing ideas to structure information and story through **media conventions**
- **media production skills**
- **standards-compliant technology**
- **ethical, moral, and legal considerations and regulatory issues**
- technical and symbolic elements that can be used in storytelling
- specific features and purposes of media artworks from the present and the past to explore viewpoints, including those of First Peoples
- specific purposes of media use in the social advocacy of First Peoples in Canada
- influences of digital media in society

Content – Elaborations (continued)

Electronics and Robotics (continued)

- **Ohm’s law:** describes how voltage, current, and resistance are related: $V=IR$
- **platforms:** for example, Fritzing, Eagle, Diptrace, EZ Route
- **input/output devices:** for example, gyro sensors, bump, motion, sound, light, infrared
- **mechanical devices:** for example, gears, belts, pulleys, chains, sprockets, linear actuators, pneumatics, bearings, slides
- **coding:** for example, G-code, C++, Sketch
- **platforms:** for example, VEX, VEX IQ, LEGO Mindstorms/NXT, Arduino, EasyC, RobotC, Scratch for Arduino

Entrepreneurship and Marketing

- **identification:** for example, business name, slogan, logo
- **demographic:** age, gender, occupation, and education of customers
- **geographic:** size and location of a market area
- **psychographic:** general personality and lifestyle preferences of a customer base
- **purchasing pattern:** buying behavior of customers
- **sources of financing:** for example, banks, private lending firms, crowdfunding, government grants
- **measurement:** profit, loss, asset, liability; financial documents to represent health of a business

Food Studies

- **pathogenic microbes:** for example, salmonella, E. coli 0157:H7, staphylococcus
- **factors:** for example, global food systems, balanced eating/nutrition, food waste, food marketing, food trends, ethics
- **ethical issues:** for example, environment, conditions, rights of workers and animals

Available Grade 9 Resources

- Robotics
- Coding Apps
- Arduino Robots
- mBots robot kits
- Vex Robotics

Textiles

Students are expected to know the following:

- natural and manufacturing fibers, including their origins, characteristics, uses, and care
- strategies for using and **modifying** simple patterns
- **elements of design** used in the design of a textile item
- **social factors** that influence textile choices and the impact of those choices on local communities
- role of textiles in First Peoples cultures

CONTENT

Module examples (continued)

Metalwork

Students are expected to know the following:

- **basic metallurgy**
- range of **uses** of metalwork
- **welding**
- fabrication **techniques and processes** using **hand tools** and **stationary equipment**
- foundry processes, including creating patterns and moulds, and **casting**
- recycling and repurposing of materials

Power Technology

Students are expected to know the following:

- energy transmission and applications
- efficiency, including energy loss in the form of thermal energy
- **thermodynamics**
- types of fuels and methods of converting fuels to mechanical energy
- alternative energy sources
- **small engine systems**
- **mechanical measurement devices**
- power technology **hand tools**
- effects of **forces** on devices
- manuals as information sources

Woodwork

Students are expected to know the following:

- importance of woodwork in historical and cultural contexts, locally and throughout Canada
- identification, characteristics, properties, and uses of wood from various tree species
- techniques for adjusting plans and drawings
- woodworking **techniques** and **traditional** and **non-traditional** joinery using a variety of tools and equipment, including **stationary power equipment**
- the relationship between First Peoples culturally modified trees and the sustainable use of wood
- **issues** in the sustainable use of wood

Content -- Elaborations (continued)

Metalwork

- **basic metallurgy:** identification, characteristics, and properties of different metals, and characteristics of metal in a variety of formats and gauges
- **uses:** for example, art metal, jewelry, stained glass, tools, sheet metal boxes, medieval armor
- **welding:** for example, arc, oxygen-acetylene, and MIG welding
- **techniques and processes:** for example, plasma and gas cutting, machining (turning, milling, forming, knurling), boring
- **hand tools:** for example, drill, rotary tool, screwdriver, wrench, hacksaw, jeweler's saw, scribe, square, hammer, punch, clamp and vise, file, chisel, machinist square, shears, aviation snips, box and pan brake, rollers, anvil, socket, tap and die set, Whitney punch, Vernier caliper, micrometer
- **stationary equipment:** for example, sandblaster, band saw, drill press, grinder, sander, buffing wheel, lathe, horizontal band saw, Beverly shear, Whitney punch, benders, hydraulic press, spincaster, forge
- **casting:** for example, lost wax casting, sand casting, investment casting, spin casting

Power Technology

- **thermodynamics:** relationship between heat and other forms of energy
- **small engine systems:** for example, ignition, fuel system, combustion cycle
- **mechanical measurement devices:** for example, torque wrench, feeler gauge, telescopic, micrometer, Vernier caliper, Plastigauge
- **hand tools:** for example, wrench, socket, ratchet, ignition tools, hammer, chisel, punch, extractor, HeliCoil, ring compressor/expander, honing tool, hand valve grinding tool
- **forces:** for example, tension, torsion, torque, shear, bending, compression

Available Grade 9 Resources

- Robotics
- Coding Apps
- Arduino Robots
- mBots robot kits

- Vex Robotics

Content – Elaborations (continued)

Information and Communications Technologies

- **text-based coding:** HTML, CSS, JavaScript
- **drag-and-drop mobile development:** for example, Vizwik
- **modular components:** for example, Arduino, Raspberry Pi, LEGO Mindstorms
- **cloud-based environment:** for example, Cloud 9, GitHub
- **wireless transfer systems:** for example, NFID, Bluetooth, mobile payments
- **impacts:** potential to support collaboration, sharing, and communication; data storage and privacy
- **design for the web:** digital creation and manipulation of videos and images for a web-based purpose
- **relationships:** for example, local and global impacts of evolving communication and mobile devices, socio-economic digital divide, technology and gender, social media and social movements, social media and politics, inequality of access, technology and democracy, information as a commodity
- **personal learning networks:** personalized digital instructional tools to share and authenticate learning
- **content consumption and creation:** web forums, tutorials, videos, digital resources, listservs, global communities, group communication and etiquette, online learning, MOOCS, open courseware, broadcasting
- **keyboarding techniques:** for example, physical hand and foot placement, posture, development of touch typing skills, use of “home row” ASDFJKL techniques

Media Arts

- **digital and non-digital:** for example video production, layout and design, graphics and images, photography (digital and traditional), new emerging media processes (performance art, collaborative work, sound art, network art, kinetic art, biotechnical art, robotic art, space art)
- **conventions:** traditional or culturally accepted ways of doing things based on audience expectations. Each media form has hundreds of conventions that have been built up over time and are widely accepted by audiences.
- **media production skills:** editing and publishing to shape the technical and symbolic elements of images, sounds, and text
- **standards-compliant technology:** layout conventions, mark-up language, current web standards, or other digital media compliance requirements
- **ethical, moral, legal considerations and regulatory issues:** for example, in relation to duplication, copyright, appropriation, and ownership of rights

Content -- Elaborations (continued)

Textiles

- **modifying:** changing length or width of a pattern, adding embellishment, changing closure
- **elements of design:** colour, line, form, space, and texture
- **social factors:** financial, ethical, familial, cultural, spiritual, racial

Woodwork

- **techniques:** for example, shaping, laminating, turning, abrasives, adhesives, finishing
- **traditional:** for example, box joint, splined mitre, lapped joint
- **non-traditional:** for example, biscuits, brads
- **stationary power equipment:** for example, jointer, planer, lathe, router table, table saw, chop saw, band saw, thickness sander, disc/belt sander, spindle sander, mortise machine, drill press, scroll saw
- **issues:** rate of harvest; effects of logging and replanting on ecosystems

**Available
Grade 9
Resources**

- Robotics
- Coding Apps
- Arduino Robots
- mBots robot kits

- Vex Robotics