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| **APPLIED DESIGN, SKILLS and TECHNOLOGIES 8 - Planning KDU** |
| **CORE COMPETENCIES** **COMMUNICATION**  | **CORE COMPETENCIES** **THINKING (CRITICAL/CREATIVE)** | **CORE COMPETENCIES****(PERSONAL/SOCIAL)** |
| **CURRICULAR COMPETENCIES** | **BIG IDEA (Understand…)** | **What do we want students to DO? (Activities, lessons…)**  | **Content (& Elaborations)****(Know)** |
| **Applied Design*****Understanding context**** Engage in a period of 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)* and empathetic observation *(aimed at understanding the values and beliefs of other cultures and the diverse motivations and needs of different people)*  in order to understand design opportunities

***Defining*** *(setting parameters)** Choose a design opportunity
* Identify key features or potential users and their requirements
* Identify criteria for success and any 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)** aimed at understanding the values and beliefs of other cultures and the diverse motivations and needs of different people
* 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

***Prototyping**** Identify and use 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)*  and information
* Choose a form for prototyping and develop a plan *(pictorial drawings, sketches, flow charts)*  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 *(repetitions of a process with the aim of approaching a desired result)* of prototyping

***Testing**** Identify sources of feedback *(peers; users; keepers of traditional cultural knowledge and approaches, including those of First Peoples; and other experts)*
* Develop an appropriate test *(consider conditions, number of trials)* 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, and 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 *(may include showing to others, use by others, giving away, or marketing and selling)* their product
* Demonstrate their product
* Explain their process, using appropriate terminology, and provide reasons for their selected solution and modifications
* Reflect on their design thinking and processes
* Evaluate their product against criteria
* Identify how their product contributes to the individual, family, community, and/or environment
* Identify new design issues
* 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

**Applied Skills*** Demonstrate an awareness of precautionary and emergency safety procedures in both physical and digital environments
* Identify and evaluate the skills and skill levels needed, individually or as a group, in relation to a specific task, and develop 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
 | Design can be responsive to identified needs.Complex tasks require the acquisition of additional skills.Complex tasks may require multiple tools and technologies. | *Questions to support inquiry with students:* * What makes good design?

  | *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***Computational Thinking*** software programs as specific and sequential instructions with algorithms that can be reliably repeated by others
* debugging algorithms and programs by breaking problems down into a series of sub-problems
* binary number system (1s and 0s) to represent data
* Programming languages, including visual programming *(Scratch, Alice, Greenfoot, BlueJ] in relation to text-based programming [HTML])* and programming modular components *(Arduino, LEGO Mindstorms)*

**Drafting*** drafting technique, including dimensioning and standards
* drafting styles, including perspective, mechanical, and architectural
* CADD/CAM, CNC *(computer numerical control)* and 3D printing
* function of models
* basic *(for the purpose of editing to send to output devices)* code
* digital output devices *(plotters, vinyl cutters, and 3D printers; CNC machines)*
* virtual creation *(layout and planning of a project, creating plans for a model)* using CAD/CAM

**Electronics and Robotics*** components (power source, conductor, load) of an electric circuit
* ways in which various electrical components *(diodes, LEDs, resistors, capacitors, transistors, ICs (integrated circuits), SCRs (silicon controlled rectifiers), regulators)* affect the path of electricity
* Ohm’s law *(describes how voltage, current, and resistance are related: V=IR)*
* Platforms *(VEX, VEX IQ, LEGO Mindstorms/NXT, Arduino, EasyC, RobotC, Scratch for Arduino)* for PCB (printed circuit board) production
* basic robot behaviours using input/output devices *(gyro sensors, bump, motion, sound, light, infrared)* , movement- and sensor-based responses, and microcontrollers
* mechanical devices *(gears, belts, pulleys, chains, sprockets, linear actuators, pneumatics, bearings, slides)* for the transfer of mechanical energy
* mechanical advantage and power efficiency, including friction, force, and torque
* robotics coding *(G-code, C++, Sketch)*
* various platforms *(VEX, VEX IQ, LEGO Mindstorms/NXT)* for robotics programming

**Entrepreneurship and Marketing*** 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 *(business name, slogan, logo)* of a good or service that ensures brand recognition
* marketing strategies using the 4 Ps: product, price, promotion, and placement
* market segmentation by demographic *(* *age, gender, occupation, and education of customers)*, geographic *(site and location of market area)*, psychographic *(* *general personality and lifestyle preferences of a customer base)* , and purchasing pattern *(buying behaviour of customers)*
* evolving consumer needs and wants role of online technologies in expanding access to goods and services
* sources of financing *(banks, private lending firms, crowdfunding, government grants)* for a new venture or start-up business
* measurement *(profit, loss, asset, liability; financial documents to represent health of a business)* of financial success and failure

**Food Studies*** pathogenic microbes *(salmonella, E. coli 0157:H7, staphylococcus)* associated with food-borne illnesses
* components of food preparation, including use and adaptations of ingredients, techniques, and equipment
* health, economic, and environmental factors *(global food systems, balanced eating/nutrition, food waste, food marketing, food trends, ethics)* that influence availability and choice of food in personal, local, and global contexts
* ethical issues *(environment, conditions, rights of workers and animals)* related to food systems
* First Peoples traditional food use, including ingredients, harvesting/gathering, storage, preparation, and preservation

**Information and Communications Technologies** * text-based coding *(* *HTML, CSS, JavaScript)*
* binary representation of various data types, including text, sound, pictures, video
* drag-and-drop mobile development *(Vizwik)*
* programming modular components *(Arduino, Raspberry Pi, LEGO Mindstorms)*
* development and collaboration in a cloud-based environment *(Cloud 9, GitHub)*
* design and function of networking hardware and topology, including wired and wireless network router types, switches, hubs, wireless transfer systems *(NFID, Bluetooth, mobile payments)*, and client-server relationships
* functions of operating systems, including mobile, open source, and proprietary systems
* current and future impacts *(potential to support collaboration, sharing and communication; data storage and privacy)* of evolving web standards and cloud-based technologies
* design for the web *(digital creation and manipulation of videos and images for a web-based purpose)*
* strategies for curating and managing personal digital content, including management, personalization, organization, maintenance, contribution, creation, and publishing of digital content
* relationships *(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)* between technology and social change
* strategies to manage and maintain personal learning networks *(personalized digital instructional tools to share and authenticate learning)* , including 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 *(physical hand and foot placement, posture, development of touch typing skills, use of “home row” ASDFJKL techniques)*

**Media Arts*** Digital and non-digital media technologies *(video production, layout and design, graphics and images, photography (digital and traditional), emerging media processes (performance art, collaborative work, sound art, network art, kinetic art, biotechnical art, robotic art, space art))*, their distinguishing characteristics and uses, including layout and design, graphics and images, and video production techniques for using images, sounds, and text to represent characterizations and points of view of people including themselves, as well as settings and ideas
* story principles *(electing and organizing the elements of structure, intent, characters, settings and points of view within the conventions of a genre)* and genre conventions *(traditional or culturally accepted ways of doing things based on audience expectations)*
* media technologies and techniques *(preparing rough lumber, choosing appropriate tool sizes, cutting, drilling, painting, using simple hardware and fasteners)*  to shape space, time, movement, and lighting within images, sounds, and text for specific purposes
* processes for manipulating and testing digital media data
* issues in ethical media practices, including cultural appropriation, moral copyright, reproduction, and privacy
* elements *(composition, time, space, sound, movement, lighting)* of media arts used to communicate meaning
* influences of digital media, including on communication and self-expression

**Metalwork*** basic metallurgy *(identification, characteristics, and properties of different metals, and characteristics of metal in a variety of formats and gauges)*
* range of uses *(art metal, jewellery, stained glass, tools, sheet metal boxes, medieval armour)* of metalwork
* welding *(arc, oxygen-acetylene, and MIG welding)*
* fabrication techniques and processes *(plasma and gas cutting, machining (turning, milling, forming, knurling), boring)* using hand tools *(wrench, socket, ratchet, ignition tools, hammer, chisel, punch, extractor, HeliCoil, ring compressor/expander, honing tool, hand valve grinding tool)* and stationary equipment *(*s*andblaster, band saw, drill press, grinder, sander, buffing wheel, lathe, horizontal band saw, Beverly shear, Whitney punch, benders, hydraulic press, spincaster, forge)*
* foundry processes, including creating patterns and moulds, and casting *(lost wax casting, sand casting, investment casting, spin casting)*
* recycling and repurposing of materials

**Power Technology*** energy transmission and applications
* efficiency, including energy loss in the form of thermal energy
* thermodynamics *(relationship between heat and other forms of energy)*
* types of fuels and methods of converting fuels to mechanical energy
* alternative energy sources
* small engine systems *(ignition, fuel system, combustion cycle)*
* mechanical measurement devices *(torque wrench, feeler gauge, telescopic, micrometer, Vernier caliper, Plastigauge)*
* power technology hand tools *(wrench, socket, ratchet, ignition tools, hammer, chisel, punch, extractor, HeliCoil, ring compressor/expander, honing tool, hand valve grinding tool)*
* effects of forces *(tension, torsion, compression, shear, friction)* on devices
* manuals as information sources

**Textiles*** natural and manufactured fibres, 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

**Woodwork*** 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 *(shaping, laminating, turning, abrasives, adhesives, finishing)* and traditional *(box joint, splined mitre, lapped joint)* and non-traditional *(biscuits, brads)* joinery using a variety of tools and equipment including stationary power equipment *(jointer, planer, lathe, router table, table saw, chop saw, band saw, thickness sander, disc/belt sander, spindle sander, mortise machine, drill press, scroll saw)*
* the relationship between First Peoples culturally modified trees and the sustainable use of wood
* issues *(rate of harvest; effects of logging and replanting on ecosystems)*  in the sustainable use of wood
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