

BIG IDEAS

Mechanical service begins with operator safety.

Social, ethical, and sustainability considerations impact design.

Complex tasks require the sequencing of skills.

Learning Standards

Curricular Competencies	Content
<p><i>Students are expected to be able to do the following:</i></p> <p>Applied Design</p> <p><i>Understanding context</i></p> <ul style="list-style-type: none"> Engage in a period of research and empathetic observation <p><i>Defining</i></p> <ul style="list-style-type: none"> Identify potential users and relevant contextual factors Identify criteria for success, intended impact, and any constraints Determine whether activity is collaborative or self-directed <p><i>Ideating</i></p> <ul style="list-style-type: none"> 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 <p><i>Prototyping</i></p> <ul style="list-style-type: none"> Evaluate a variety of materials for effective use and potential for reuse, recycling, and biodegradability Make changes to tools, materials, and procedures as needed 	<p><i>Students are expected to know the following:</i></p> <ul style="list-style-type: none"> internal and external combustion components of a combustion engine non-fuel power systems disassembly and assembly sequences engine terminology lubrication and antifriction hydraulic and pneumatic systems transfer and conversion of energy hand tools and power tools specific to mechanical repair and maintenance torques and tolerances for specific operations fasteners and fittings energy transmission and conversion systems technologies that reduce energy use and waste historical and potential future impact of energy, power, and transportation systems on society and the environment alternate energy sources

Learning Standards (continued)

Curricular Competencies	Content
<p>Testing</p> <ul style="list-style-type: none"> • Identify sources of feedback • Develop an appropriate test • Conduct the test, collect and compile data, evaluate data, and decide on changes • Iterate the design idea <p>Making</p> <ul style="list-style-type: none"> • Identify and use appropriate tools, technologies, materials, and processes • Make a step-by-step plan and carry it out, making changes as needed • Use materials in ways that minimize waste <p>Sharing</p> <ul style="list-style-type: none"> • Decide on how and with whom to share product and processes • Demonstrate product to users and critically evaluate its success <p>Applied Skills</p> <ul style="list-style-type: none"> • Demonstrate and document an awareness of precautionary and emergency safety procedures • Develop competency and proficiency in skills at various levels involving manual dexterity, mechanics, and maintenance • Identify the skills needed, individually or collaboratively, in relation to specific projects, and develop and refine them <p>Applied Technologies</p> <ul style="list-style-type: none"> • 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 	

Curricular Competencies – Elaborations

- **research:** may include traditional cultural knowledge and approaches of First Peoples and others, secondary sources, collective pools of knowledge in communities and collaborative atmospheres
- **empathetic observation:** may include experiences; traditional cultural knowledge and approaches of First Peoples and those of other cultures; places, including the land and its natural resources and analogous settings; 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 feedback:** may include First Nations, Métis, or Inuit community experts; keepers of other traditional cultural knowledge and approaches; peers, users, and other experts
- **appropriate test:** consider conditions, number of trials
- **technologies:** tools that extend human capabilities
- **share:** may include showing to others or use by others
- **product:** for example, a physical product, process, system, service
- **impacts:** personal, social, and environmental

Content – Elaborations

- **engine terminology:** relating to fundamentals of operation; classification and types
- **lubrication:** for example, oil, grease
- **antifricition:** for example, bearings, bushings
- **conversion systems:** for example, gear, sprocket, pulley, chain, cable
- **alternate energy sources:** for example, wind, solar, geothermal