

BIG IDEAS

Vehicle operation, service, and maintenance include consideration of **social and environmental impacts**.

Personal service and maintenance interests require the evaluation and refinement of skills.

Tools and **technologies** can be adapted for specific purposes.

Learning Standards

Curricular Competencies	Content
<p><i>Students are expected to be able to do the following:</i></p> <p>Applied Design</p> <ul style="list-style-type: none"> Interpret circumstances of or factors in a particular engine challenge <p>Defining</p> <ul style="list-style-type: none"> Identify potential issues and troubleshoot Identify requirements, intended impacts, and possible unintended negative consequences of service Determine whether activity is collaborative or self-directed <p>Ideating</p> <ul style="list-style-type: none"> Generate ideas to create a range of possibilities and add to others' ideas in ways that create additional possibilities Critically analyze how competing social, ethical, and sustainability considerations impact creation and development of solutions Choose an idea to pursue and maintain an open mind about other potentially viable ideas <p>Prototyping</p> <ul style="list-style-type: none"> Evaluate and apply appropriate sources of information to develop a plan that includes key stages and resources Analyze the design for the life cycle and evaluate its impacts Make changes to tools, materials, and procedures as needed <p>Testing</p> <ul style="list-style-type: none"> Identify and communicate with sources of feedback 	<p><i>Students are expected to know the following:</i></p> <ul style="list-style-type: none"> engine design, repair, and maintenance valve timing, operation, and adjustment compression ratios ignition timing and adjustment intake and exhaust performance, enhancement, and fabrication fuel systems braking systems automatic and manual transmissions wheel size, specification, and function suspension systems relationship between performance enhancements and original equipment manufacturer (OEM) parts engine-related diagnostic equipment hybrid and alternative fuel vehicles design for the life cycle career options and opportunities in engine design and repair interpersonal skills for interacting with clients and customers

Learning Standards (continued)

Curricular Competencies	Content
<ul style="list-style-type: none"> • Develop an appropriate test, conduct the test, and collect and compile data • Evaluate ideas based on information from feedback and testing results to make necessary changes <p>Making</p> <ul style="list-style-type: none"> • Identify appropriate tools, technologies, materials, processes, and time needed • Carry out updated plan, incorporating feedback from self and others and from testing results • Use materials in ways that minimize waste <p>Sharing</p> <ul style="list-style-type: none"> • Decide how and with whom to share their processes, to solicit and generate feedback • Share final plans, products and processes to evaluate their success • Critically reflect on plans, products and processes, and identify new goals • Identify and analyze new possibilities for plans, products and processes, including how they or others might build on them <p>Applied Skills</p> <ul style="list-style-type: none"> • Apply safety procedures for themselves, co-workers, and operators in both physical and digital environments • Individually or collaboratively identify and assess skills needed for automotive service plans, products and processes • Demonstrate competency and proficiency in skills at various levels involving manual dexterity and complex mechanics and maintenance • Develop specific plans to learn or refine identified skills over time <p>Applied Technologies</p> <ul style="list-style-type: none"> • Explore existing, new, and emerging tools, technologies, and systems to evaluate suitability for project interests • Evaluate impacts, including unintended negative consequences, of choices made about technology use • Analyze the role that advancing technologies play in engine-related contexts 	

**APPLIED DESIGN, SKILLS, AND TECHNOLOGIES – Engine and Drivetrain
Grade 12**

Big Ideas – Elaborations

- **social and environmental impacts:** including operator and public safety; emissions and effects on the environment; manufacturing, packaging, disposal, and recycling considerations related to vehicle parts and products
- **technologies:** tools that extend human capabilities

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Curricular Competencies – Elaborations

- **design for the life cycle:** taking into account economic costs, and social and environmental impacts of the product, from the extraction of raw materials to eventual reuse or recycling of component materials
- **impacts:** including the social and environmental impacts of extraction and transportation of raw materials; manufacturing, packaging, and transportation to markets; servicing or providing replacement parts; expected usable lifetime: and reuse or recycling of component materials
- **appropriate test:** includes evaluating the degree of authenticity required for the setting of the test, deciding on an appropriate type and number of trials, and collecting and compiling data
- **share:** may include showing to others or use by others, giving away, or marketing and selling

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Content – Elaborations

- **diagnostic equipment:** for example, scanners, on-board diagnostics (OBD), timing lights
- **interpersonal skills:** for example, professional communications, active listening to identify potential problems, courtesies