Beginning Small Engines — Grades 9-12

Standards		Benchmarks	Activities/Examples
1. Students will develop an understanding of the characteristics and scope of technology.	J	The nature and development of technological knowledge and processes are functions of the setting.	Students will list and analyze internal combustion engine cycles.
			Students will analyze the principles of carburetion.
			Students will disassemble, analyze and reassemble magneto ignition systems.
			Students will demonstrate and analyze machine tool operations.
			Students will recognize engine types other than four-cycle.
			Students will recognize, identify, disassemble, and analyze solid state ignition systems.
	K	The rate of technological development and diffusion is increasing rapidly.	Students will analyze the principles of carburetion.
			Students will disassemble, analyze and reassemble magneto ignition systems.
			Students will demonstrate and analyze machine tool operations.
			Students will recognize engine types other than four-cycle.
			Students will recognize, identify, disassemble, and analyze solid state ignition systems.
	L	Inventions and innovations are the results of specific, goal-directed research.	Students will list and analyze internal combustion engine cycles.
			Students will analyze the principles of carburetion.
			Students will disassemble, analyze and reassemble magneto ignition systems.
			Students will demonstrate and analyze machine tool operations.
			Students will recognize engine types other than four-cycle.
			Students will recognize, identify, disassemble, and analyze solid state ignition systems.
	M	Most development of technologies these days is driven by the profit motive and the market.	Students will list and analyze internal combustion engine cycles.
			Students will analyze the principles of carburetion.
			Students will disassemble, analyze and reassemble magneto ignition systems.
			Students will demonstrate and analyze machine tool operations.
			Students will recognize, identify, disassemble, and analyze solid state ignition systems.
2. Students will develop an understanding of the core concepts of technology.	W	Systems thinking applies logic and creativity with appropriate compromises in complex real-life problems.	Students will disassemble, examine and reconstruct a four-cycle engine.
			Students will analyze the principles of carburetion.
			Students will use and demonstrate knowledge of diagnostic test equipment.
			Students will analyze component tolerances through various measuring tools.
			Students will understand and relate technical manuals to engine operation.

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	X	Systems, which are the building blocks of technology, are embedded within larger technological, social, and environmental systems.	Students will list and analyze internal combustion engine cycles.
			Students will disassemble, examine and reconstruct a four-cycle engine.
			Students will analyze the principles of carburetion.
			Students will use and demonstrate knowledge of diagnostic test equipment.
			Students will analyze component tolerances through various measuring tools.
			Students will understand and relate technical manuals to engine operation.
	Y	The stability of a technological system is influenced by all of the components in the system, especially those in the feedback loop.	Students will disassemble, examine and reconstruct a four-cycle engine.
			Students will analyze the principles of carburetion.
			Students will use and demonstrate knowledge of diagnostic test equipment.
			Students will analyze component tolerances through various measuring tools.
	Z	Selecting resources involves trade-offs between competing values, such as availability, cost, desirability, and waste.	Students will understand and classify four-cycle lubrication systems.
	AA	Requirements involve the identification of the criteria and constraints of a product or system, especially those in the feedback loop.	Students will list and analyze internal combustion engine cycles.
			Students will disassemble, examine and reconstruct a four-cycle engine.
			Students will analyze the principles of carburetion.
			Students will use and demonstrate knowledge of diagnostic test equipment.
			Students will analyze component tolerances through various measuring tools.
			Students will understand and relate technical manuals to engine operation.
	CC	New technologies create new processes.	Students will list and analyze internal combustion engine cycles.
			Students will understand and classify four-cycle lubrication systems.
	DD	Quality control is a planned process to ensure that a product, service, or system meets established criteria.	Students will disassemble, examine and reconstruct a four-cycle engine.
			Students will understand and relate technical manuals to engine operation.
	FF	Complex systems have many layers of controls and feedback loops to provide information.	Students will disassemble, examine and reconstruct a four-cycle engine.
			Students will analyze the principles of carburetion.
			Students will use and demonstrate knowledge of diagnostic test equipment.
			Students will analyze component tolerances through various measuring tools.
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3. Students will develop an understanding of the relationships among technologies and the connections between technology and other fields of study.	G	Technology transfer occurs when a new user applies an existing innovation developed for one purpose in a different function.	Students will list and analyze internal combustion engine cycles.
			Students will disassemble, examine and reconstruct a four-cycle engine.
			Students will analyze the principles of carburetion.
			Students will disassemble, analyze and reassemble magneto ignition systems.
			Students will demonstrate and analyze machine tool operations.
			Students will use and demonstrate knowledge of diagnostic test equipment.
			Students will analyze component tolerances through various measuring tools.
			Students will understand and relate technical manuals to engine operation.
			Students will understand and classify four-cycle lubrication systems.
			Students will recognize engine types other than four-cycle.
			Students will recognize, identify, disassemble, and analyze solid state ignition systems.
	H	Technological innovation often results when ideas, knowledge, or skills are shared within a technology, among technologies, or across other fields.	Students will list and analyze internal combustion engine cycles.
			Students will disassemble, examine and reconstruct a four-cycle engine.
			Students will analyze the principles of carburetion.
			Students will disassemble, analyze and reassemble magneto ignition systems.
			Students will demonstrate and analyze machine tool operations.
			Students will use and demonstrate knowledge of diagnostic test equipment.
			Students will analyze component tolerances through various measuring tools.
			Students will understand and relate technical manuals to engine operation.
	I	Technological ideas are sometimes protected through the process of patenting.	Students will disassemble, examine and reconstruct a four-cycle engine.
			Students will analyze the principles of carburetion.
			Students will disassemble, analyze and reassemble magneto ignition systems.
			Students will understand and relate technical manuals to engine operation.
	J	Technological progress promotes the advancement of science and mathematics.	Students will disassemble, examine and reconstruct a four-cycle engine.
			Students will analyze the principles of carburetion.
			Students will disassemble, analyze and reassemble magneto ignition systems.
			Students will understand and relate technical manuals to engine operation.

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4. Students will develop an understanding of the cultural, social, economic, and political effects of technology.	H	Changes caused by the use of technology can range from gradual to rapid and from subtle to obvious.	Students will list and analyze internal combustion engine cycles.
			Students will recognize engine types other than four-cycle.
	I	Making decisions about the use of technology involves weighing the trade-offs between the positive and negative effects.	Students will recognize engine types other than four-cycle.
	J	Ethical considerations are important in the development, selection, and use of technologies.	Students will recognize engine types other than four-cycle.
	K	The transfer of a technology from one society to another can cause cultural, social, economic, and political changes affecting both societies to varying degrees.	Students will list and analyze internal combustion engine cycles.
5. Students will develop an understanding of the effects of technology on the environment.	G	Humans can devise technologies to conserve water, soil, and energy through such techniques as reusing, reducing, and recycling.	Students will analyze component tolerances through various measuring tools.
			Students will understand and classify four-cycle lubrication systems.
	H	When new technologies are developed to reduce the use of resources, considerations of trade-offs are important.	Students will analyze component tolerances through various measuring tools.
			Students will understand and classify four-cycle lubrication systems.
	J	The alignment of technological processes with natural processes maximizes performance and reduces negative impacts on the environment.	

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6. Students will develop an understanding of the role of society in the development and use of technology.	H	Different cultures develop their own technologies to satisfy their individual and shared needs, wants, and values.	Students will recognize engine types other than four-cycle.
	I	The decision whether to develop a technology is influenced by societal opinions and demands, in addition to corporate cultures.	Students will recognize engine types other than four-cycle.
	J	A number of different factors, such as advertising, the strength of the economy, the goals of a company, and the latest fads contribute to shaping the design of and demand for various technologies.	Students will recognize engine types other than four-cycle.
7. Students will develop an understanding of the influence of technology on history.	G	Most technological development has been evolutionary, the result of a series of refinements to a basic invention.	Students will list and analyze internal combustion engine cycles.
			Students will analyze the principles of carburetion.
			Students will analyze component tolerances through various measuring tools.
			Students will understand and classify four-cycle lubrication systems.
			Students will recognize engine types other than four-cycle.
			Students will recognize, identify, disassemble, and analyze solid state ignition systems.
	H	The evolution of civilization has been directly affected by, and has in turn affected, the development and use of tools and materials.	Students will list and analyze internal combustion engine cycles.
			Students will analyze the principles of carburetion.
			Students will analyze component tolerances through various measuring tools.
			Students will understand and classify four-cycle lubrication systems.
			Students will recognize engine types other than four-cycle.
			Students will recognize, identify, disassemble, and analyze solid state ignition systems.
	J	Early in the history of technology, the development of many tools and machines was based not on scientific knowledge but on technological know-how.	Students will analyze the principles of carburetion.

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	N	The Industrial Revolution saw the development of continuous manufacturing, sophisticated transportation and communication systems, advanced construction practices, and improved education and leisure time.	Students will list and analyze internal combustion engine cycles.
			Students will analyze component tolerances through various measuring tools.
			Students will understand and classify four-cycle lubrication systems.
			Students will recognize engine types other than four-cycle.
			Students will recognize, identify, disassemble, and analyze solid state ignition systems.
8. Students will develop an understanding of the attributes of design.	H	The design process includes defining a problem, brainstorming, researching and generating ideas, identifying criteria and specifying constraints, exploring possibilities, selecting an approach, developing a design proposal, making a model or prototype, testing and evaluating the design using specifications, refining the design, creating or making it, and communicating processes and results.	Students will list and analyze internal combustion engine cycles.
			Students will analyze the principles of carburetion.
			Students will disassemble, analyze and reassemble magneto ignition systems.
	I	Design problems are seldom presented in a clearly defined form.	Students will list and analyze internal combustion engine cycles.
			Students will disassemble, analyze and reassemble magneto ignition systems.
	J	The design needs to be continually checked and critiqued, and the ideas of the design must be redefined and improved.	Students will list and analyze internal combustion engine cycles.
			Students will analyze the principles of carburetion.
			Students will disassemble, analyze and reassemble magneto ignition systems.
	K	Requirements of a design, such as criteria, constraints, and efficiency, sometimes compete with each other.	Students will list and analyze internal combustion engine cycles.
			Students will analyze the principles of carburetion.
			Students will disassemble, analyze and reassemble magneto ignition systems.
9. Students will develop an understanding of engineering design.	I	Established design principles are used to evaluate existing designs, to collect data, and to guide the design process.	Students will list and analyze internal combustion engine cycles.
			Students will disassemble, examine and reconstruct a four-cycle engine.
			Students will analyze the principles of carburetion.
	L	The process of engineering design takes into account a number of factors.	Students will list and analyze internal combustion engine cycles.
			Students will disassemble, examine and reconstruct a four-cycle engine.
			Students will analyze the principles of carburetion.