Section IV

Wisconsin Standards for Technology and Engineering

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Wisconsin Standards for Technology and Engineering (TE)

Curriculum opportunities related to Technology and Engineering support career growth within the 16 areas identified by the U.S. Department of Education's Career Clusters and transcend every career setting. Regardless of a student's future endeavors as an employee and/or as an entrepreneur, the **Wisconsin Standards for Technology and Engineering** address increased academic, technical and employability knowledge and skills that are critical for students to be college and career ready. Within technology and engineering related learning priorities across multiple content area standards, the following career clusters are specifically emphasized: Architecture & Construction; Arts, AV Technology & Communication; Manufacturing; STEM; and Transportation, Distribution & Logistics. The effective delivery of Career and Technical Education through Technology and Engineering content area standards can be best observed through quality programs that provide local communities access to the following educational experiences:

- Work-Based Learning Programs such as State Certified Skills Cooperative Education Certificate and Youth Apprenticeship;
- The Career and Technical Student Organization SkillsUSA; and
- classroom delivery of learning priorities that document the integration of academic and technical skills.

Courses in Technology and Engineering

Middle level and high school programs that are taught by licensed Technology and Engineering teachers provide the ability for students to build their academic capacity through rigorous curriculum offerings. Students that are introduced to basic knowledge and skills at early grade levels can effectively engage in exploratory middle level course work in preparation for a career focused high school academic plan that leads to college and career readiness through postsecondary options.

Local districts that desire to develop programs of study across career clusters must work to ensure a balanced approach to the multiple aspects of coursework available within Technology and Engineering. The following areas are identified within the National Center for Educational Statistics (NCES) course codes:

- Communications and Audio/Visual--Subject Area 11;
- Manufacturing--Subject Area 13; and,
- Architecture and Construction--Subject Area 17; and,
- Transportation, Distribution and Logistics—Subject Area 20; and,
- Engineering and Technology—Subject Area 21.

The **Wisconsin Standards for Technology and Engineering** have ten distinct areas. Included in the ten areas is a content area titled Broad-based, which is foundational. Each standard area is unique and set-up in an easy to use manner for all classroom teachers.

Technology and Engineering Standards		
Broad-based	Architecture and Construction	Environmental Technologies
	Biotechnology	Manufacturing
	Information and Communication Technology	Power and Energy
	Electronics	Transportation
	Engineering	

The following chart outlines a curriculum alignment of the content area standards into a variety of course types that may be developed within local school districts.

Note: The chart identifies the primary standard source (P) for a specific type of course. Additionally, the secondary standard sources (s) may also be used to complement the primary standard source within a type of course. The types of courses listed are not inclusive of all technology and engineering courses. School districts may have a variety of names for these types of courses.

P=Primary source/s=secondary source

	Wisconsin Common Career Technical Standards						Technology and Engineering Standards									
Type of Course	Global Awareness	Life & Career Skills, Career Development, & Employability Skills	Information, Media & Technology	Sustainability, Environmental, & Safety	Leadership	Communication, Creativity, Collaboration, & Critical Thinking	Architecture and Construction	Biotechnology	Broad-based	Communication and Information Technology	Electronics	Engineering	Environmental Technologies	Manufacturing	Power and Energy	Transportation
3D Solid Modeling	s	s	s	s	s	s	s		s	s		**P**				
Aerospace Engineering	s	s	s	s	s	s		s	s	s	s	**P**	s	s	s	s
Architecture	s	s	s	s	s	s	**P**	s	s	s	s	s	s	s		
Audio/Visual Production	s	s	s		s	s			s	**P**	s					
Auto Collision Repair	s	s	s	s	s	s			s	s		s				s
Automotive Mechanics	s	s	s	s	s	s			s	s	s	s	s		s	**P**
Biotechnical Engineering	s	s	s	s	s	s		s	s	s	s	**P**	s	s		
Cabinetmaking	s	s	s	s	s	s	s		s	s	s	s		**P**		
CAD Design	s	s	s	s	s	s	**P**	s	s		s	s		s		
Carpentry	s	s	s	s	s	s	**P**		s		s	s	s		s	
Civil Engineering and Architecture	s	s	s	s	s	s	**P**	s	s		s	**P**	s	s	s	s
Computer Integrated Manufacturing	s	s	s	s	s	s			s			**P**	s	**P**		
Desktop Publishing	s	s	s	s	s	s			s	**P**	s					s
Digital Electronics	s	s	s	s	s	s			s	**P**	**P**	s				
Drafting	s	s	s	s	s	s	**P**		s	s		**P**	s			
Engineering Design and Development	s	s	s	s	s	s	s	s	s	s	s	**P**	s	s	s	s
Graphics Technology	s	s	s	s	s	s			s	**P**						
Home Maintenance	s	s	s	s	s	s	**P**		s		s		s			s
Intro to Transportation	s	s	s	s	s	s			s	s	s	s	s	s	**P**	**P**
IT Essentials: PC Hardware and Software	s	s	s	s	s	s			s	**P**	s	s	s			
Manufacturing	s	s	s	s	s	s	s		s	s		s	s	**P**		
Material Science	s	s	s	s	s	s		s	s				**P**			

P=Primary source/s=secondary source

	Wisconsin Common Career Technical Standards						Technology and Engineering Standards									
Type of Course	Global Awareness	Life & Career Skills, Career Development, & Employability Skills	Information, Media & Technology	Sustainability, Environmental, & Safety	Leadership	Communication, Creativity, Collaboration, & Critical Thinking	Architecture and Construction	Biotechnology	Broad-based	Communication and Information Technology	Electronics	Engineering	Environmental Technologies	Manufacturing	Power and Energy	Transportation
Metalworking	s	s	s	s	s	s			s			s	**P**	s		
Photography	s	s	s	s	s	s			s	**P**						
Plastics Processing	s	s	s	s	s	s			**P**					**P**		
Printing Technology	s	s	s	s	s	s			s	**P**						
Residential Wiring	s	s	s	s	s	s	**P**		s		s	s				
Robotics	s	s	s	s	s	s	s		s	s	s	**P**	s	s	s	s
Power and Energy	s	s	s	s	s	s			s	s	s	s	s	s	**P**	s
Principles of Engineering	s	s	s	s	s	s	s		s		s	**P**	s		s	
Small Engine Mechanics	s	s	s	s	s	s			s						**P**	s
Technology and Engineering Leadership	s	s	s	s	**P**	s										
Welding		s	s	s	s	s	s		s		s	s	s	**P**	s	s
Woodworking		s	s	s	s	s	s		s				s	**P**		
Workplace Experience (COOP)	s	s	s	s	s	s	s	s	**P**	s	s	s	s	s	s	s

P**rogram Structure**

The progression of instruction related to the Technology and Engineering standards should be developed throughout the PK-12 system as reflected by the learning priorities that are identified within the three grade bands featured in this document. The leadership of a Technology and Engineering licensed teacher at each of the grade levels can be critical to the fluidity of standards development across the PK-12 grade bands, provide flexibility of delivery options, support best practices that are researched based within content instruction, develop additional resources with other academic classroom teachers in related areas of instruction and develop a collaborative relationship with elementary classroom teachers who are teaching fundamental skills to only their own students.

A variety of program structures may be used by local districts to deliver Technology and Engineering standards to students including, but not limited to the following:

Grades PK-5	Grades 6-8	Grades 9-12
1. Foundational skills are incorporated into elementary level course work in multiple disciplines.	1. A dedicated career exploration program that integrates course work that introduces and/or expands upon Technology and Engineering. 2. Exploratory units in foundational elective programs that support career development and skills needed across content areas. **3.** Elective course options for students in Career and Technical Education subjects, including Technology and Engineering.	1. An integrated sequence of courses within Technology and Engineering that develops course work related to Programs of Study in multiple career pathways associated with Career Clusters. 2. A balanced Technology and Engineering Program that supports student career development in: a. Architecture and Construction; b. Communication and Audio/Visual; c. Education and Training; d. Manufacturing; e. Science, Technology, Engineering and Mathematics (STEM); and f. Transportation, Distribution and Logistics. 3. A Career Cluster Academy program that provides dedicated curriculum and resources that feature capstone coursework, postsecondary credit attainment and/or industry connections through certifications.

Delivery of Technology and Engineering Courses

Technology and engineering courses should be delivered as a coherent sequence within a pathway. Pathway knowledge builds on foundation knowledge and skills. These courses should include differentiated instruction to meet the needs of all learners.

These are multiple ways that students access Technology and Engineering courses within the K-12 system.

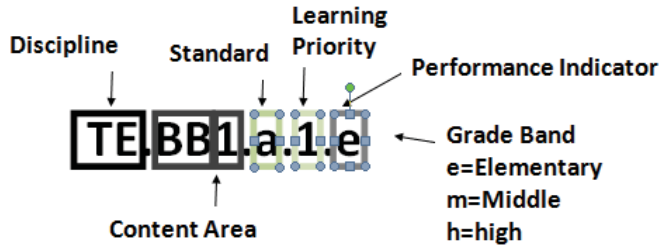
- Face-to-Face Classroom and Lab Instruction
- Digital Learning (models may include blended, hybrid and online distance learning at multiple grade levels)
- Transcripted Credit (partnering with local Technical College or University should be strongly considered)
- Youth Options
- Work-Based Learning (State Certified Skill Standards, Youth Apprenticeship, etc.)

In Wisconsin, each district determines the best setting for courses within the school. When developing a balanced Technology and Engineering program, consideration should be given to how a local program can support current local, state and national initiatives. Standards associated with a quality program in Technology and Engineering should be used for program self-evaluation, improvement and goal-setting. Areas of particular interest include quality educators; curriculum instruction and student assessment; parent and community involvement; and program planning.

Standard Structure

The **Wisconsin Standards for Career and Technical Education**, including the **Wisconsin Common Career Technical Standards,** each follow a similar structure.

Standard Coding



Performance Indicator by Grade Band: Measurable degree to which a standard has been developed and/or met

Standard Formatting

Discipline
Content Area

Standard: Broad statement that tells what students are expected to know or be able to do

Learning Priority: Breaks down the broad statement into manageable learning pieces

Technology and Engineering (TE) **Content Area: BB/Broad-based**			
Standard: BB1: Students will analyze the core concepts of technology.			
	Performance Indicators (By Grade Band)		
Learning Priority	**PK-5**	**6-8**	**9-12**
BB1.a: Analyze and use technological systems.	**BB1.a.1.e:** Compare and contrast systems found in nature and others made by humans.	**BB1.a.3.m:** Identify inputs, processes, outputs and, at times, feedback components for technological systems.	**BB1.a.5.h:** Describe how systems can fail because of design flaws, defect parts, poorly matched parts or they were used beyond their design capabilities.
	BB1.a.2.e: Indentify that systems have parts or components that work together to accomplish a goal.	**BB1.a.4.m:** Explain how common energy, power and transportation systems have provisions that detect, bypass or compensate for failures within a system.	**BB1.a.6.h:** Describe how the outputs of one subsystem are the inputs of another subsystem given a prominent energy, power and transportation system.

Grade Bands

Grade bands of PK-5, 6-8 and 9-12 align to typical elementary, middle and high school levels.

- Grade band PK-5 performance indicators represent knowledge and skills that should be integrated throughout the elementary curriculum. Career and technical education teachers in districts are an excellent resource to assist in the development of curriculum and activities.
- Career and technical education should be part of the core curriculum for all middle school students. Awareness, exploration and building foundational skills for career pathways occur in middle school. The performance indicators in grade band 6-8 showcase these foundational skills with an emphasis on career development.
- Career and technical education at the high school level must go beyond awareness and exploration. Students should be developing specific knowledge and skills that are transferrable to other coursework, a job-site or postsecondary options. Performance indicators for grades 9-12 align specifically to industry standards and expectations for career clusters and pathways.

Technology and Engineering (TE)

Content Area: BB/Broad-based

Standard: BB1: Students will analyze the core concepts of technology.

	Performance Indicators (By Grade Band)		
Learning Priority	**PK-5**	**6-8**	**9-12**
BB1.a: Analyze and use technological systems.	**BB1.a.1.e:** Compare and contrast systems found in nature and others made by humans.	**BB1.a.3.m:** Identify inputs, processes, outputs and, at times, feedback components for technological systems.	**BB1.a.5.h:** Describe how systems can fail because of design flaws, defect parts, poorly matched parts or they were used beyond their design capabilities.
	BB1.a.2.e: Identify that systems have parts or components that work together to accomplish a goal.	**BB1.a.4.m:** Explain how common energy, power and transportation systems have provisions that detect, bypass or compensate for failures within a system.	**BB1.a.6.h:** Describe how the outputs of one subsystem are the inputs of another subsystem given a prominent energy, power and transportation system.
BB1.b: Analyze and use tools and materials.	**BB1.b.1.e:** Explain that tools are used to design, make, use, assess technology and extend human capabilities such as holding, lifting, carrying, fastening, separating and computing.	**BB1.b.3.m:** Students will describe how resources are the things needed to complete a task (e.g., tools, machines, materials, information, energy, people, capital and time).	**BB1.b.5.h:** Select appropriate resources and explain how trade-offs between competing values, such as availability, cost, desirability and waste influenced their decision.
	BB1.b.2.e: Recognize that materials have many different properties that are leveraged in making things.	**BB1.b.4.m:** Use appropriate tools to measure and layout a piece of material (e.g., length, width, thickness, angles, circles, arcs and volume) within tolerances.	**BB1.b.6.h:** Choose and perform the material processing operations of forming (e.g., bending, pressing, drawing, rolling), bonding (e.g., gluing, soldering, brazing, spot welding, gas welding, arc welding), fastening (e.g., screws, nuts & bolts, rivets, clips, pins, nails) and finishing (e.g., surface preparation, cleaning, treatment, coating).

	Performance Indicators (By Grade Band)		
Learning Priority	**PK-5**	**6-8**	**9-12**
BB1.c: Analyze and use mechanisms.	**BB1.c.1.e:** Identify the types, functions and applications, of simple mechanical components (e.g. levers, linkages, cranks, cams, gears, pulleys & belts, sprockets & chains).	**BB1.c.2.m:** Explain the relationship between the inputs and outputs of linear, rotary and compound motion mechanisms in terms of direction, distance and force.	**BB1.c.4.h:** Build, test and trouble shoot simple linear, rotary and compound mechanisms.
		BB1.c.3.m: Define mechanical concepts such as force, work, power, torque, velocity, mechanical advantage and gear ratio.	**BB1.c.5.h:** Given a linear, rotary and/or compound motion mechanism, students will measure and calculate units such as work, power, torque, gear ratios and mechanical advantage.
BB1.d: Analyze and use electricity and electronic systems.	**BB1.d.1.e:** Describe atomic structure, the components of the atom, their charges and importance to electronics technology.	**BB1.d.2.m:** Define basic electrical concepts (i.e., voltage, direct and alternating current, resistance, power, polarity, conductor, insulator, series circuit, parallel circuit, series-parallel circuit, inductance, capacitance, continuity, digital, analog).	**BB1.d.5.h:** Describe the role of thermal, optical and mechanical transducers in sending electrical control signals to modify how a system performs.
	.	**BB1.d.3.m:** Measure current, voltage and resistance in series, parallel and series-parallel circuits and components.	**BB1.d.6.h:** Perform a voltage drop test and describe the relationship between voltage, current and resistance with a multimeter.
		BB1.d.4.m: Locate and identify shorts to power & ground, opens and high resistance problems in circuits and components.	**BB1.d.7.h:** Inspect and test components such as switches, connectors, relays, solid state devices and conductors and take appropriate action.

	Performance Indicators (By Grade Band)		
Learning Priority	**PK-5**	**6-8**	**9-12**
BB1.e: Analyze, explain and use control systems.	**BB1.e.1.e:** Discuss that an open-loop system has no feedback path and requires human intervention, while a closed-loop system uses feedback.	**BB1.e.3.m:** Explain how control systems sense what is happening in a system, compare it to what people want to happen within the system and trigger subsystems that will make needed adjustments.	**BB1.e.5.h:** Identify the multiple controls that sense information from a number of areas, evaluate the system and act accordingly given a flawed complex system.
	BB1.e.2.e: Discuss that controls are mechanisms or particular steps that people perform using information about the system that causes systems to change.	**BB1.e.4.m:** Explain how quality control is a planned process to ensure that a product, service or system meets established criteria.	**BB1.e.6.h:** Select and perform an appropriate maintenance is the process in order for the product or system to continue functioning properly, to extend its life or to upgrade its capability given a flawed product or system.
BB1.f: Identify and analyze structures.	**BB1.f.1.e:** Identify and correlate human made structures that are inspired by structures that occur in nature.	**BB1.f.3.m:** Identify and describe basic types of structures (i.e., mass, bearing wall, framed) as they relate to their function.	**BB1.f.5.h:** Calculate and define the different loads acting on structures (i.e., static, dynamic, stress, strain, compression, tension).
	BB1.f.2.e: Recognize that materials have properties that inspire their use in structures (e.g. wood, plastic, aluminum, brick, concrete, cast iron, steel).	**BB1.f.4.m:** Use scientific inquiry to test, collect data and make conclusions about the performance of different materials and their application in the making of structures (i.e., tensile, compression, sheer testing).	**BB1.f.6.h:** Justify the application of structural materials and their trade-offs in the design of structures based on design requirements through optimization (i.e., engineering design process).

Wisconsin Standards for Technology and Engineering (TE)

Content Area: AC/Architecture and Construction

Standard: AC1: Students will be able to select and use architecture and construction technologies.

	Performance Indicators (By Grade Band)		
Learning Priority	**PK-5**	**6-8**	**9-12**
AC1.a: Analyze construction requirements, materials, structures, techniques and maintenance.	**AC1.a.1.e:** Recognize that people live, work and go to school in buildings, which are of different types: houses, apartments, office buildings and schools.	**AC1.a.5.m:** Select designs for structures based on factors such as building codes and requirements, style, convenience, cost, climate, culture and function.	**AC1.a.9.h:** Assess how infrastructure is the underlying base or basic framework of a system.
	AC1.a.2.e: Identify types of temporary and permanent structures.	**AC1.a.6.m:** Explain the function of foundations and why structures rest on a foundation.	**AC1.a.10.h:** Analyze how structures are constructed using a variety of processes and procedures.
	AC1.a.3.e: Describe how structures need to be maintained.	**AC1.a.7.m:** Discuss how modern communities are usually planned according to guidelines.	**AC1.a.11.h:** The design of structures includes a number of requirements.
	AC1.a.4.e: Identify multiple systems that are used in buildings.	**AC1.a.8.m:** Identify a variety of materials and subsystems that buildings generally contain.	**AC1.a.12.h:** Analyze how structures require maintenance, alteration or renovation periodically to improve them or to alter their intended use.
			AC1.a.13.h: Explain how structures can include prefabricated materials.
AC1.b: Apply measurement systems in the planning and layout process used in the residential construction industry.	**AC1.b.1.e:** Recognize and identify the rooms in a home.	**AC1.b.6.m:** Calculate based on family size, approximate the number of rooms and room types required for a single-family home.	**AC1.b.11.h:** Identify design solutions for residential construction problems.
	AC1.b.2.e: Identify and count the parts of simple structures (i.e., Legos, marshmallow and spaghetti, etc.).	**AC1.b.7.m:** Calculate the required materials for simple structures.	**AC1.b.12.h:** Calculate required materials for residential construction applications.
	AC1.b.3.e: Demonstrate scale and proportion (i.e. a toy car is a scale model of a full-sized car).	**AC1.b.8.m:** Demonstrate basic dimensioning skills including the use of: dimension, extension, center and leader lines.	**AC1.b.13.h:** Convert scaled blueprint drawing measurements to full dimensions for a given construction project.

	Performance Indicators (By Grade Band)		
Learning Priority	**PK-5**	**6-8**	**9-12**
	AC1.b.4.e: Demonstrate use of the Standard Measuring System to the 1/4" and the Metric Measuring System to centimeters.	**AC1.b.9.m:** Demonstrate use of the Standard Measuring System to the 1/16" and the Metric Measuring System to millimeters.	**AC1.b.14.h:** Apply conventional construction measurement processes accurately (i.e., geometric and trigonometric functions).
	AC1.b.5.e: Add, subtract, multiply and divide in the Standard Measuring System to the 1/4" and the Metric Measuring System to centimeters.	**AC1.b.10.m:** Add, subtract, multiply and divide in the Standard Measuring System to the 1/16" and the Metric Measuring System to millimeters.	**AC1.b.15.h:** Use conventional construction formulas to determine production requirements.
AC1.c: Demonstrate the safe and appropriate use of hand tools common to the residential and commercial construction industry.	**AC1.c.1.e:** Identify and explain the use of simple hand tools such as hammers, screwdrivers, handsaws, etc.	**AC1.c.3.m:** Demonstrate proficiency in the use of simple hand tools such as hammers, screwdrivers, handsaws, planes, sandpaper, nail sets, tin shears, framing squares, utility knives, chalk lines, etc.	**AC1.c.5.h:** Demonstrate and use the common hand tools of the trade safely and properly.
	AC1.c:.2.e: Identify where to obtain and store simple hand tools.	**AC1.c.4.m:** Demonstrate proficiency in obtaining and storing simple hand tools.	**AC1.c.6.h:** Maintain and care for hand tools used in residential and commercial construction.
AC1.d: Demonstrate the safe and appropriate use of portable power tools that are common to the residential construction industry and are appropriate to the individual student's level.	**AC1.d.1.e:** Discuss that all tools must be properly cared for.	**AC1.d.2.m:** Demonstrate the safe and proper use of power tools.	**AC1.d.5.h:** Demonstrate the use of portable power tools, such as circular saws, table saws, saber saws, drills, planers and sanders, safely and properly.
		AC1.d.3.m: Demonstrate the safe and proper use of pneumatic tools.	**AC1.d.6.h:** Demonstrate the use of portable pneumatic tools, such as rough framing nail guns, interior finishing and brad nail guns, hammers, impact wrenches, drills and compressors, safely and appropriately.
		AC1.d.4.m: Demonstrate proficiency in the proper care of all tools used in a class or lab.	**AC1.d.7.h:** Maintain and care for portable power tools and portable pneumatic tools.

	Performance Indicators (By Grade Band)		
Learning Priority	**PK-5**	**6-8**	**9-12**
AC1.e: Demonstrate project management procedures and processes as they occur in a construction project.	**AC1.e.1.e:** Recognize simple drawings as representations of structures.	**AC1.e.6.m:** Recognize construction blueprints and specifications.	**AC1.e.12.h:** Interpret and use residential construction blueprints and specifications.
	AC1.e.2.e: Recognize that many events occur to construct any project.	**AC1.e.7.m:** Demonstrate proficiency in preparing an estimate from simple drawings and specifications.	**AC1.e.13.h:** Estimate materials from blueprints and specifications.
	AC1.e.3.e: Recognize that building codes ensure that structures are safe.	**AC1.e.8.m:** Explain the events that occur to construct any project.	**AC1.e.14.h:** Explain the sequencing of events for specific construction projects.
	AC1.e.4.e: Discuss the importance of keeping records.	**AC1.e.9.m:** Explain how building codes vary based on geological, environmental and political influences.	**AC1.e.15.h:** Solve common residential construction problems such as framing, plumbing and electrical, by using the official codes adopted by the state and local building standards commission.
	AC1.e.5.e: Explain the importance of communication.	**AC1.e.10.m:** Demonstrate proficiency in creating a simple project log.	**AC1.e.16.h:** Create and maintain a construction log that utilizes common industry practices.
		AC1.e.11.m: Explain the importance of positive and constructive communication skills.	**AC1.e.17.h:** Analyze customer service/relations as applied to project management and wholesale and retail sales.
AC1.f: Demonstrate the value and necessity of practicing occupational safety in the construction industry facility and job site.	**AC1.f.1.e:** Discuss how electricity is useful but dangerous.	**AC1.f.3.m:** Explain electrical safety standards and proper wiring methods.	**AC1.f.5.h:** Demonstrate the safe use of electrical connection methods and electrical wiring procedures.
	AC1.f.2.e: Recognize that all work environments are places where accidents and injuries can occur.	**AC1.f.4.m:** Recognize the potential accidents and injuries that may occur in a given work environment.	**AC1.f.6.h:** Demonstrate the safety procedures and practices in various work environment settings pertaining to residential and commercial construction.

	Performance Indicators (By Grade Band)		
Learning Priority	**PK-5**	**6-8**	**9-12**
AC1.g: Demonstrate the variety of building phases, systems and techniques used in architecture and construction.	**AC1.g.1.e:** Discuss how structures are based on drawings and completed according to schedules and timelines.	**AC1.g.5.m:** Create a drawing and completion schedule for a simple project.	**AC1.g.9.h:** Develop building plans and schedules by using processes common to residential and commercial construction.
	AC1.g.2.e: Describe simple processes and materials that are used to construct a structure.	**AC1.g.6.m:** Identify the common processes and materials used to construct a structure.	**AC1.g.10.h:** Demonstrate proficiency in the practical application of the processes and materials (e.g., structural, electrical, mechanical, finish) appropriate to architectural design and construction.
	AC1.g.3.e: Identify that many factors can affect the location and type of structure.	**AC1.g.7.m:** Describe the importance of placing and engineering the structure.	**AC1.g.11.h:** Prepare the site layout utilizing common surveying equipment and/or create a site plan.
	AC1.g.4.e: List the many different professions required to complete a construction project.	**AC1.g.8.m:** Recognize that many phases are required to complete a construction project.	**AC1.g.12.h:** Analyze the phases of residential and commercial construction.
AC1.h: Demonstrate the impact of financial, technical, environmental, political, societal and labor trends on the past and future of the construction industry.	**AC1.h.1.e:** Recognize that all structures are constructed to meet the needs and wants of society.	**AC1.h.5.m:** Describe historically that construction began to meet the basic need of shelter.	**AC1.h.9.h:** Explain significant historical trends in the construction industry.
	AC1.h.2.e: Recognize that structures can only be constructed with available resources.	**AC1.h.6.m:** Identify that structures are planned and constructed based on financial constraints.	**AC1.h.10.h:** Develop financial plans for construction projects.
	AC1.h.3.e: Recognize that construction impacts the environment.	**AC1.h.7.m:** Distinguish how construction can impact the environment both positively and negatively.	**AC1.h.11.h:** Explain the environmental regulations that influence residential and commercial design.
	AC1.h.4.e: Discuss the importance of energy efficiency.	**AC1.h.8.m:** Identify the importance of energy efficient, safe, comfortable and healthy structures.	**AC1.h.12.h:** Identify the skills and building techniques that are utilized to construct energy efficient, safe, healthy and comfortable structures.

Wisconsin Standard for Technology and Engineering (TE)

Content Area: BT/Biotechnology

Standard: BT1: Students will be able to select and use medical technologies.

	Performance Indicators (By Grade Band)		
Learning Priority	**PK-5**	**6-8**	**9-12**
BT1.a: Analyze the role of medicine in people's lives.	**BT1.a.1.e:** Discuss that vaccinations protect people from getting certain diseases.	**BT1.a.5.m:** Discuss that vaccines are designed to prevent diseases from developing and spreading; medicines are designed to relieve symptoms and stop diseases from developing.	**BT1.a.9.h:** Discuss medical technologies include prevention and rehabilitation, vaccines and pharmaceuticals, medical and surgical procedures, genetic engineering and the systems within which health is protected and maintained.
	BT1.a.2.e: Explain medicine helps people who are sick to get better.	**BT1.a.6.m:** Explain vaccines developed for use in immunization require specialized technologies to support environments in which sufficient amounts of vaccines are produced.	**BT1.a.10.h:** Recognize telemedicine reflects the convergence of technological advances in a number of fields, including medicine, telecommunications, virtual presence, computer engineering, informatics, artificial intelligence, robotics, materials science and perceptual psychology.
	BT1.a.3.e: Recognize there are many products designed specifically to help people take care of themselves.	**BT1.a.7.m:** Recognize advances and innovations in medical technologies are used to improve health care.	**BT1.a.11.h:** Recognize the science of biochemistry and molecular biology has made it possible to manipulate the genetic information found in living creatures.
	BT1.a.4.e: Recognize technological advances have made it possible to create new devices, to repair or replace certain parts of the body and to provide a means for mobility.	**BT1.a.8.m:** Discuss sanitation processes used in the disposal of medical products help to protect people from harmful organisms and disease and shape the ethics of medical safety.	**BT1.a.12.h:** Recognize genetic engineering involves modifying the structure of DNA to produce novel genetic make-ups.

Standard: BT2: Students will be able to select and use biotechnologies related to life's nutritional needs.			
	Performance Indicators (By Grade Band)		
Learning Priority	**PK-5**	**6-8**	**9-12**
BT2.a: Identify the importance of agriculture and biotechnology in animal and food science.	**BT2.a.1.e:** Discuss that the use of technologies in agriculture make it possible for food to be available year round and to conserve resources.	**BT2.a.4.m:** Recognize technological advances in life science directly affect the time and number of people required to produce food for a large population.	**BT2.a.8.h:** Recognize agriculture includes a combination of businesses that use a wide array of products and systems to produce, process and distribute food, fiber, fuel, chemicals and other useful products.
	BT2.a.2.e: Discuss the many different tools necessary to control and make up the parts of an ecosystem.	**BT2.a.5.m:** Discuss the wide range of specialized equipment and practices are used to improve the production of food, fiber, fuel and other useful products and in the care of animals.	**BT2.a.9.h:** Discuss biotechnology has applications in such areas as agriculture, pharmaceuticals, food and beverages, medicine, energy, the environment and genetic engineering.
	BT2.a.3.e: Explain the importance of proper nutrition.	**BT2.a.6.m:** Artificial ecosystems are human-made environments that are designed to function as a unit and are comprised of humans, plants and animals.	**BT2.a.10.h:** Recognize that biotechnology applies the principles of biology to create commercial products or processes.
		BT2.a.7.m: Explain why various methods of food preserving work.	**BT2.a.11.h:** Demonstrate how enzymes are used in the food processing industry.
BT2.b: Identify the importance of agriculture and biotechnology in plant and food science.	**BT2.b.1.e:** Explain why insect control is important to plant production.	**BT2.b.4.m:** Compare the advantages and disadvantages of genetically modified plants.	**BT2.b.7.h:** Explain how biotechnologies, such as genetic engineering, are being used in production of plants.
	BT2.b.2.e: Explain processes used in agriculture require different procedures, products or systems.	**BT2.b.5.m:** Explain artificial ecosystems are human-made complexes that replicate some aspects of the natural environment.	**BT2.b.8.h:** Explain that engineering design and management of life science and natural resource systems require knowledge of artificial ecosystems and the effects of technological development on flora and fauna.

	Performance Indicators (By Grade Band)		
Learning Priority	**PK-5**	**6-8**	**9-12**
	BT2.b.3.e: Discuss many processes used in agriculture require different procedures, products or systems.	**BT2.b.6.m:** Discuss the development of refrigeration, freezing, dehydration, preservation and irradiation provide long-term storage of food and reduce the health risks caused by tainted food.	**BT2.b.9.h:** Conservation is the process of controlling soil erosion, reducing sediment in waterways, conserving water and improving water quality.
Standard: BT3: Students will discuss and demonstrate how biotechnology is used in controlling waste.			
BT3.a: Select, use and demonstrate how biotechnology effects waste.	**BT3.a.1.e:** Explain most agricultural waste can be recycled.	**BT3.a.5.m:** Discuss fertilizers that benefit growth come from various forms.	**BT3.a.9.h:** Research packaging products made from crops to enhance biodegradable.
	BT3.a.2.e: Practice ethical standards of integrity, honesty and fairness in scientific practices and professional conduct.	**BT3.a.6.m:** Communicate orally and in writing in a clear, well-organized manner that effectively informs and clarifies scientific principles and lab techniques to staff and stakeholders.	**BT3.a.10.h:** Offer technical support, customer assistance and cost-benefit analyses in the application of biotechnical approaches to the development of products and services.
	BT3.a.3.e: Recognize packaging products made from various products enhance biodegradability.	**BT3.a.7.m:** Develop an action plan that includes the continuous pursuit of education, training and research to keep current on biotechnology practices and trends for personal and professional development.	**BT3.a.11.h:** Comply with and adhere to national, state and local standards, policies, protocols and regulations for laboratory and manufacturing activity.
	BT3.a.4.e: Define Ecology.	**BT3.a.8.m:** Discuss how biotechnology and agriculture plays a role in benefiting our environment.	**BT3.a.12.h:** Explain how oil spills can be combated with biotechnology.

Standard: BT4: Students will be able to select and use bioenergy technologies.			
	Performance Indicators (By Grade Band)		
Learning Priority	**PK-5**	**6-8**	**9-12**
BT4.a: Select, use and identify bioenergy technologies.	**BT4.a.1.e:** Discuss plant growth, cell structure and functions, seed formation and germination.	**BT4.a.4.m:** Examine the cellulosic process used in science to create bioenergy.	**BT4.a.9.h:** Conduct experiments and research in plant biotechnology.
	BT4.a.2.e: Evaluate the impact of plant biotechnology on bioenergy.	**BT4.a.5.m:** Assess the importance of ethical issues related to plant biotechnology.	**BT4.a.10.h:** Evaluate plant genetics and heritability in relation to plant science and biotechnology.
	BT4.a.3.e: Evaluate the science of refining feedstock to biofuels.	**BT4.a.6.m:** Evaluate plant reproduction as it pertains to plant biotechnology.	**BT4.a.11.h:** Analyze the advantages and disadvantages of using traditional starch-based biofuels versus using lingocellulosic feedstocks.
		BT4.a.7.m: Evaluate the scientific importance of bioenergy to the creation alternative fuel sources.	**BT4.a.12.h:** Evaluate the economic impact of bioenergy food vs. fuel.
		BT4.a.8.m: Evaluate the importance of plant biotechnology in life science and our society.	**BT4.a.13.h:** Identify the available technology used in a bio-refinery and the scientific and regulatory advantages and disadvantages for bioenergy.

Wisconsin Standards for Technology and Engineering (TE)

Content Area: EL/Electronics

Standard: EL1: Students will develop, use and apply basic electronics and electricity concepts.

	Performance Indicators (By Grade Band)		
Learning Priority	**PK-5**	**6-8**	**9-12**
EL1.a: Apply electronic theory to practice.	**EL1.a.1.e:** Describe the causes and effects of static electricity.	**EL1.a.5.m:** Describe atomic structure, the components of the atom, their charges and importance to electronics technology.	**EL1.a.12.h:** Explain electronic physics terminology of work and energy.
	EL1.a.2.e: Identify materials that are conductors and materials that are insulators, (i.e. heat and cold).	**EL1.a.6.m:** Construct electrical systems and explain material's tendency toward being a conductor or insulator.	**EL1.a.13.h:** Calculate current, voltage or resistance using Ohms Law and Kirchoff's Voltage Law.
	EL1.a.3.e: Explain the different forms of energy and their applications.	**EL1.a. 7.m:** Identify the fundamental and supplementary units that are the bases of the International System of Units (SI).	**EL1.a.14.h:** Describe Watts Law.
	EL1.a.4.e: Demonstrate the law of charges.	**EL1.a.8.m:** Describe current, voltage, resistance, power and their application to DC electronics.	**EL1.a.15.h:** Define Joules and Kilowatt-hour as an energy unit.
		EL1.a.9.m: Summarize Ohms law.	**EL1.a.16.h:** Demonstrate standard metric conversions.
		EL1.a.10.m: Identify the scientific symbols used in DC electronics.	**EL1.a.17.h:** Convert fixed numbers to scientific notation.
		EL1.a.11.m: Explain Peta, Tera, Giga, Mega, kilo, milli, micro, nano, pico and their SI symbols.	**EL1.a.18.h**: Explain the difference between conventional current theory and electron current theory.

Standard: EL2: Students will develop the ability to use symbols, measurements and schematics to build, test and troubleshoot electronic circuits and systems.			
	Performance Indicators (By Grade Band)		
Learning Priority	**PK-5**	**6-8**	**9-12**
EL2.a: Construct and measure a basic circuit using electronic components.	**EL2.a.1.e:** Explain how the Law of Charges holds an atom together.	**EL2.a.4.m:** Identify the following electronic components and their usages: source, load, insulator conductor and control device.	**EL2.a.8.h:** Explain the basic operation of the following electronic components: Capacitors, Resistors, Diodes, Transistors, Insulators, Conductors, Switches, Fuses, Circuit Breakers, Batteries and Power Supplies.
	EL2.a.2.e: Describe the properties of a magnet.	**EL2.a. 5.m:** Build a DC motor to identify the primary parts and demonstrate how it functions.	**EL2.a.9.h:** Recognize the following electronic components by constructing simple circuits: Capacitors, Resistors, Diodes, Transistors, Insulators, Conductors, Switches, Fuses, Circuit Breakers, Batteries and Power Supplies.
	EL2.a.3.e: Construct and demonstrate basic circuits using snap circuits to demonstrate source, load, connector and control.	**EL2.a.6.m:** Identify electrical generation including mechanical, solar, chemical, thermocouple, piezo and fuel cells.	**EL2.a.10.h:** Demonstrate multimeter and usage.
		EL2.a.7.m: Construct a basic circuit using a solder-less breadboard to demonstrate a source, load, connector, safety device and control device.	**EL2.a.11.h:** Explain the reasons for flux usage and describe it's interaction between metals.
			EL2.a.12.h: List types of solder and reasons for choosing each.
			EL2.a.13.h: Describe and demonstrate the differences between good and bad mechanical and electrical solder connections.
			EL2a.14.h: Analyze the process of manufacturing a printed circuit board and construct a soldered circuit.

	Performance Indicators (By Grade Band)		
Learning Priority	**PK-5**	**6-8**	**9-12**
EL2.b: Demonstrate electronic measurement to series, parallel and combination circuits.	**EL2.b.1.e:** Construct an electromagnet to demonstrate its characteristics and functions.	**EL2.b.3.m:** Construct a series circuit and explain its basic concepts.	**EL2.b.5.h:** Explain how a series circuit is used in DC electronic equipment.
	EL2.b.2.e: Explain the properties and laws of magnetism.	**EL2.b.4.m:** Construct a parallel circuit, explain its basic concepts and be able to calculate resistance total.	**EL2.b.6.h:** Calculate an unknown current, voltage or resistance in a series circuit, using Ohms law.
			EL2.b.7.h: Explain how a parallel circuit is used in DC electronic equipment.
			EL2.b.8.h: Calculate an unknown current, voltage or resistance in a parallel circuit, using Ohms law.
			EL2.b.9.h: Apply Kirchoff's Current Law to a constructed circuit.
			EL2.b.10.h: Explain multimeter construction, components and usage and distinguish between digital and analog meters.
Standard: EL3: Students will analyze and use digital electronics.			
EL3.a: Analyze, develop, use and apply digital electronics.	**EL3.a.1.e:** Identify that there are different numbering systems used in different applications.	**EL3.a.2.m:** Demonstrate basic logic decision making using switches.	**EL3.a.5.h:** Identify and describe the operation of common electronic components.
		EL3.a.3.m: Identify different numbering systems including binary and hexadecimal.	**EL3.a.6.h:** Perform basic soldering techniques and printed circuit board construction.
		EL3.a.4.m: Interpret a flowchart based on a decision making logic sequence and write a basic program.	**EL3.a.7.h:** Analyze simple analog and digital circuits using common electronic test equipment and tools.

	Performance Indicators (By Grade Band)		
Learning Priority	**PK-5**	**6-8**	**9-12**
			EL3.a.8.h: Determine the characteristics of analog and digital signals.
			EL3.a.9.h: Translate data specifications into truth tables and extract logical expressions.
			EL3.a.10.h: Use Boolean algebra and DeMorgan's Theorem to simplify logic expressions.
			EL3.a.11.h: Convert binary, hexadecimal and octo numbers to base 10.
			EL3.a.12.h: Add, subtract, multiply and divide binary, hexadecimal and octo numbers.
Standard: EL4: Students will analyze and use combinational logic analysis and design.			
EL4.a: Design and build a combinational logic circuit that satisfies a need, to design constraints.	**EL4.a.1.e:** Investigate the history of computers and the decision making processes that they use(d).	**EL4.a.2.m:** Distinguish between the functions of Inverter and OR gates.	**EL4.a.6.h:** Describe the operation of basic logic components, including gates, inverters and flip-flops.
		EL4.a.3.m: Create a truth table that controls the decision making for a basic decision.	**EL4.a.7.h:** Design a combinational logic circuit using basic logic gates.
		EL4.a.4.m: Use switches to create circuits that function as AND and OR gates.	**EL4.a.8.h:** Simulate and prototype a logic circuit.
		EL4.a.5.m: Determine the logic, sensors, gates, outputs and other components needed to emulate existing electronic devices that utilize logic.	**EL4.a.9.h:** Design a combinational logic circuit incorporating negative logic.

	Performance Indicators (By Grade Band)		
Learning Priority	**PK-5**	**6-8**	**9-12**
			EL4.a.10.h: Simulate and prototype a logic circuit employing negative logic.
			EL4.a.11.h: Design half-adder, full-adder and binary adder logic circuits using exclusive logic.
			EL4.a.12.h: Design a combinational logic circuit using a programmable logic device.
			EL4.a.13.h: Simulate and prototype a combinational logic circuit employing a programmable logic device.
Standard: EL5: Students will analyze and use sequential logic analysis and design.			
EL5.a: Design and build a sequential logic circuit that satisfies a need to design constraints.	**EL5.a.1.e:** Develop a unique numeric language, encode a message into their language, transmit the message and allow another student to decode with a developed decoding key.	**EL5.a.2.m:** Design, construct and test device solutions for emulating common electronic devices that utilize data acquisition.	**EL5.a.3.h:** Design, simulate and prototype a basic flip-flop application.
			EL5.a.4.h: Design, simulate, asynchronous counters and prototype SSI and MSI.
			EL5.a.5.h: Describe the components of a state machine.
			EL5.a.6.h: Design, simulate and prototype state machines using discrete or programmable logic.
			EL5.a.7.h: Analyze and design basic flip-flop applications, including event detection circuits, data synchronizers, shift registers and frequency dividers.

Standard: EL6: Students will explain the role of microcontrollers in process control and demonstrate use.			
	Performance Indicators (By Grade Band)		
Learning Priority	**PK-5**	**6-8**	**9-12**
EL6.a: Program and construct a microcontroller that satisfies a need to design constraints.	**EL5.b.1.e:** explain where energy comes from and how to reduce energy consumption at home.	**EL6.a.2.m:** Communicate using electronic circuit diagrams.	**EL6.a.3.h:** Program and test an autonomous robot.
			EL6.a.4.h: Flowchart a microcontroller program, which contains inputs, memory, processor and outputs, to manipulate some type of mechanical device.
			EL6.a.5.h: Program a microcontroller to maneuver a robot.
			EL6.a.6.h: Discuss the makeup and parts of a microprocessor and how a microprocessor interprets code.
Standard: EL7: Demonstrate safe and appropriate use of tools, machines and materials in electronics technology.			
EL7.a: Demonstrate, apply and measure electronic safety concepts applied to circuits.	**EL7.a.1.e:** Follow laboratory safety rules and procedures.	**EL7.a.2.m:** Select appropriate tools, procedures and/or equipment.	**EL7.a.6.h:** Demonstrate the safe usage of appropriate tools, procedures and operation of equipment.
		EL7.a.3.m: Demonstrate good organization at workstation within total laboratory.	**EL7.a.7.h:** Describe personal safety precautions for working with electric and electronic devices electrical shock.
		EL7.a.4.m: Explain precautions needed in the area of electronic safety.	**EL7.a.8.h:** List various degrees of current the human body can tolerate.
		EL7.a.5.m: Describe solder safety as it pertains to burns and potential fires or damage to facilities or customer products.	**EL7.a.9.h:** Explain the concept of First Aid and its particular importance to workers in electric and electronic fields.

	Performance Indicators (By Grade Band)		
Learning Priority	**PK-5**	**6-8**	**9-12**
			EL7.a.10.h: List applicable governing fire safety regulations NEC (National Electrical Code) and NFPA 70 (National Fire Protection Association).
			EL7.a.11.h: Explain the cause of solder fumes and the effects of lead poisoning.
			EL7.a.12.h: List causes and precautions to prevent or reduce solder splatter.

Wisconsin Standards for Technology and Engineering (TE)

Content Area: ENG/Engineering

Standard: ENG1: Students will analyze and demonstrate the attributes of design.

	Performance Indicators (By Grade Band)		
Learning Priority	**PK-5**	**6-8**	**9-12**
ENG1.a: Analyze engineering design theory.	**ENG1.a.1.e:** Design is a creative process.	**ENG1.a.5.m:** Design is a creative planning process that leads to useful products and systems.	**ENG1.a.9.h:** Examine how the design needs to continually be evaluated and the ideas of the design must be redefined and improved.
	ENG1.a.2.e: Everyone can design solutions to a problem.	**ENG1.a.6.m:** There is no perfect design.	**ENG1.a.10.h:** Interpret design problems are seldom presented in a clearly defined form.
	ENG1.a.3.e: Discuss the design process is a purposeful method of planning practical solutions to problems.	**ENG1.a.7.m:** Explain how the design process has many criteria which ultimately lead to a solution.	**ENG1.a.11.h:** Argue design processes vary slightly. However, key elements of any design process include: defining a problem, identifying criteria, generating solutions, creating a model or prototype, testing and evaluating, refining the design and communicating processes and results.
	ENG1.a.4.e: Requirements for a design include such factors as the desired elements and features of a product or system or the limits that are placed on the design.	**ENG1.a.8.m:** Requirements for a design are made up of criteria and constraints.	**ENG1.a.12.h:** Requirements of a design, such as criteria, constraints and efficiency, sometimes compete with each other.

Standard: ENG2: Students will analyze and demonstrate engineering design.			
	Performance Indicators (By Grade Band)		
Learning Priority	**PK-5**	**6-8**	**9-12**
ENG2.a: Analyze the attributes of engineering design.	**ENG2.a.1.e:** Discuss the engineering design process includes identifying a problem, looking for ideas, developing solutions and sharing solutions with others.	**ENG2.a.3.m:** Design involves a set of steps, which can be performed in different sequences and repeated as needed.	**ENG2.a.6.h:** Established design principles are used to evaluate existing designs, to collect data and to guide the design process.
	ENG2.a.2.e: Explore when designing an object, it is important to be creative and consider all ideas.	**ENG2.a.4.m:** Examine how brainstorming is an individual or group design process step used to generate ideas to solve a problem.	**ENG2.a.7.h:** Recognize that engineering design is influenced by personal characteristics, such as creativity, resourcefulness and the ability to visualize and think abstractly.
		ENG2.a.5.m: Discuss the engineering design process involves defining a problem, generating ideas, selecting a solution, testing the solution(s), making the item, evaluating it and presenting the results.	**ENG2.a.8.h:** Analyze the process of engineering design accounts for a number of factors to make decisions.
ENG2.b: Describe and apply engineering design.	**ENG2.b.1.e:** Expressing ideas to others, verbally and through sketches and models, is an important part of the design process.	**ENG2.b.3.m:** Modeling, testing, evaluating and modifying are used to transform ideas into practical solutions.	**ENG2.b.4.h:** A prototype is a working model used to test a design concept by making actual observations and necessary adjustments.
	ENG2.b.2.e: Discuss how models are used to communicate and test design ideas and processes.		
Standard: ENG3: Students will demonstrate and analyze the role of troubleshooting, research and development, invention and innovation and experimentation in problem solving.			
ENG3.a: Discuss the importance of the problem solving process.	**ENG3.a.1.e:** Asking questions and making observations helps a person to figure out how things work.	**ENG3.a.4.m:** Explain troubleshooting is a problem-solving method used to identify the cause of a malfunction in a system.	**ENG3.a.5.h:** Explain technological problems must be researched before they can be solved.

	Performance Indicators (By Grade Band)		
Learning Priority	**PK-5**	**6-8**	**9-12**
	ENG3.a.2.e: Discuss all products and systems are subject to failure. Many products and systems, however, can be improved.		**ENG3.a.6.h:** Not all problems are technological and not every problem can be solved using technology.
	ENG3.a.3.e: Explain troubleshooting is a way of finding out why something does not work so that it can be improved.		**ENG3.a.7.h:** Research and development is a specific problem-solving approach that is used intensively in business and industry to prepare devices and systems for the marketplace.
ENG3.b: Analyze the procedures for innovation and invention.	**ENG3.b.1.e:** Invention and innovation are creative ways to turn ideas into real things.	**ENG3.b.3.m:** Invention is a process of turning ideas and imagination into devices and systems. Innovation is the process of modifying an existing product or system to improve it.	**ENG3.b.5.h:** Describe how many technological problems require a multidisciplinary approach.
	ENG3.b.2.e: Describe that the process of experimentation, which is common in science, can also be used to solve technological problems.	**ENG3.b.4.m:** Explain some technological problems are best solved through experimentation.	
Standard: ENG4: Students will develop abilities to apply the design process.			
ENG4.a: Research the background information of a proposed design.	**ENG4.a.1.e:** Discuss brainstorm people's needs and wants and pick some problems that can be solved through the design process.	**ENG4.a.3.m:** Specify criteria and constraints for the design.	**ENG4.a.5.h:** Identify the design problem to solve and determine how to address it.
	ENG4.a.2.e: Identify and collect information about everyday problems that can be solved by technology and generate ideas and requirements for solving a problem.	**ENG4.a.4.m:** Demonstrate two-dimensional and three-dimensional representations of the designed solution.	**ENG4.a.6.h:** Identify criteria and constraints and determine how these will affect the design process.

	Performance Indicators (By Grade Band)		
Learning Priority	**PK-5**	**6-8**	**9-12**
ENG4.b: Design solutions based on gathered information.	**ENG4.b.1.e:** Investigate how things are made and how they can be improved.	**ENG4.b.3.m:** Apply a design process to solve problems in and beyond the laboratory-classroom.	**ENG4.b.4.h:** Refine a design by using prototypes and modeling to ensure quality, efficiency and productivity of the final product.
	ENG4.b.2.e: Build or construct an object using the design process.		**ENG4.b.5.h:** Develop and produce a product or system using a design process.
ENG4.c: Evaluate completed solutions and provide feedback.	**ENG4.c.1.e:** Discuss the process of designing involves presenting some possible solutions in visual form and then selecting the best solution(s) from many.	**ENG4.c.4.m:** Test and evaluate the design in relation to pre-established criteria and constraints and refine as needed.	**ENG4.c.6.h:** Evaluate final solutions and communicate observation, processes and results of the entire design process, using verbal, graphic, quantitative, virtual and written means, in addition to design models.
	ENG4.c.2.e: Test and evaluate the solutions for the design problem.	**ENG4.c.5.m:** Make a product or system and document the solution.	**ENG4.c.7.h:** Evaluate the design solution using conceptual, physical and mathematical models at various intervals of the design process in order to check for proper design and to note areas where improvements are needed.
	ENG4.c.3.e: Improve the design solutions.		
Standard: ENG5: Students will develop the abilities to use and maintain technological products and systems.			
ENG5.a: Use information to describe and design systems.	**ENG5.a.1.e:** Discover how things work.	**ENG5.a.4.m:** Identify information provided in manuals, protocols or by experienced people to identify how things work.	**ENG5.a.6.h:** Diagnose a system that is malfunctioning and use tools, materials, or machines to repair it.
	ENG5.a.2.e: Demonstrate and use hand tools correctly and safely and name them correctly.	**ENG5.a.5.m:** Demonstrate and use tools, materials and machines safely to create, diagnose, adjust and repair systems.	**ENG5.a.7.h:** Document processes and procedures and communicate them to different audiences using appropriate oral and written techniques.

	Performance Indicators (By Grade Band)		
Learning Priority	**PK-5**	**6-8**	**9-12**
	ENG5.a.3.e: Recognize and use everyday symbols such as numbers and symbols to communicate key ideas.		
ENG5.b: Use tools to maintain systems.	**ENG5.b.1.e:** Select and safely use tools, products and systems for specific tasks.	**ENG5.b.4.m:** Operate and maintain systems in order to achieve a given purpose.	**ENG5.b.7.h:** Operate systems so that they function in the way they were designed.
	ENG5.b.2.e: Use computers and technology to access and organize information.	**ENG5.b.5.m:** Use computers, calculators and technology in various applications.	**ENG5.b.8.h:** Use computers and calculators to access, retrieve organize, process, maintain, interpret and evaluate data and information in order to communicate.
	ENG5.b.3.e: Discuss following step-by-step directions to assemble a product.		**ENG5.b.9.h:** Troubleshoot, analyze and maintain systems to ensure proper function, accuracy and precision.
Standard: ENG6: Students will develop the abilities to assess the impact of products and systems.			
ENG6.a: Collect information about products and systems.	**ENG6.a.1.e:** Collect information about everyday products and systems by asking questions.	**ENG6.a.2.m:** Design and use instruments and technology to gather data.	**ENG6.b.3.h:** Collect information and evaluate its quality.
ENG6.b: Interpret data from collected information to assess impacts of products and systems.	**ENG6.b.1.e:** Determine if the human use of a product or system creates positive or negative results.	**ENG6.b.4.m:** Collect data to analyze and interpret trends in order to identify the positive and negative effects of a technology.	**ENG6.b.7.h:** Synthesize data, analyze trends and draw conclusions regarding the effects of technology on the individual, society and the environment.
	ENG6.b.2.e: Compare, contrast and classify collected information in order to identify patterns.	**ENG6.b.5.m:** Identify trends and monitor potential consequences of technological development.	**ENG6.b.8.h:** Use assessment techniques, such as trend analysis and experimentation, to make decisions about the future development of technology.
	ENG6.b.3.e: Investigate and assess the influence of a specific technology on the individual, family, community and environment and decide when it could be used.	**ENG6.b.6.m:** Interpret and evaluate the accuracy of the information obtained and determine if it is useful.	**ENG6.b.9.h:** Design forecasting techniques to evaluate the results of altering natural systems.

Wisconsin Standards for Technology and Engineering (TE)

Content Area: ET/Environmental Technologies

Standard: ET1: Students will be able to select and use environmental technologies.

	Performance Indicators (By Grade Band)		
Learning Priority	**PK-5**	**6-8**	**9-12**
ET1.a: Analyze waste management systems and technologies.	**ET1.a.1.e:** Explain that humans produce waste.	**ET1.a.5.m:** Analyze how humans produce waste and how managing waste is a societal and environmental problem on home, local, state, national and global levels.	**ET1.a.9.h:** Develop creative technological solutions that re-purpose waste or reduce waste in a personal or industrial setting (i.e., recycled material clothing, using municipal waste to generate electricity).
	ET1.a.2.e: Explain that waste comes in many forms (i.e., human and animal waste, garbage).	**ET1.a.6.m:** Describe the process of disposing of waste is a product of technology (i.e., manufacturing, construction, information technologies).	**ET1.a.10.h:** Model a solution of how waste can be managed and reduced effectively in industrial or residential contexts. (i.e., companies generating electricity from manufacturing waste).
	ET1.a.3.e: Recognize that waste increases as population increases, thereby increasing the scale of the problem.	**ET1.a.7.m:** Compare waste management systems from countries with varying technologies and infrastructures.	**ET1.a.11.h:** Analyze and model technological solutions for managing waste on a large scale in developed and underdeveloped countries.
	ET1.a.4.e: Recognize that some waste materials can be recycled or reused and some cannot.	**ET1.a.8.m:** Examine how the materials a product is made out of impact how it is disposed of.	**ET1.a.12.h:** Explain a product life cycle.
ET1.b: Describe energy technologies.	**ET1.b.1.e:** Illustrate why humans, tools and machines need energy to do things.	**ET1.b.4.m:** Illustrate and make basic models of sustainable energy technologies (i.e., wind, solar, geothermal, hydrogen, biomass and hydropower).	**ET1.b.7.h:** Compare advanced models of sustainable energy technologies that are solutions for an energy related problem (i.e., wind, solar, geothermal, hydrogen, biomass and hydropower).
	ET1.b.2.e: Identify that energy is the ability to do work and that energy comes in many forms.	**ET1.b.5.m:** Compare the cost and availability of sustainable energy sources.	**ET1.b.8.h:** Analyze the efficiency and carbon footprint of sustainable energy sources.

	Performance Indicators (By Grade Band)		
Learning Priority	**PK-5**	**6-8**	**9-12**
	ET1.b.3.e: Explain that potential and kinetic energy exist all around us (i.e., food, wind, fossil fuels).	**ET1.b.6.m:** Discuss ways in which humans harness, store and transmit different types of energy.	**ET1.b.9.h:** Analyze how control systems are used in the harnessing, storing and transmission of energy (i.e., Smart grid).
ET1.c: Describe environmental quality and management technologies.	**ET1.c.1.e:** Explain why humans depend on the earth's resources for needs (i.e., food, shelter, water) and wants (i.e., entertainment,).	**ET1.c.3.m:** Discuss that technologies to sustain our resources must be created for humans to live (i.e., that sustainability means controlling/monitoring pollution and resource use/depletion).	**ET1.c.5.h:** Evaluate products based on the life cycle assessment of the product (i.e., total environmental impacts including carbon footprint).
	ET1.c.2.e: Categorize resources into land, air and water.	**ET1.c.4.m:** Investigate and model environmental air, water and land quality technologies (i.e., from carbon capture to rain barrels).	**ET1.c.6.h:** Design a new product or redesign an existing product following sustainable design principles.

Wisconsin Standards for Technology and Engineering (TE)

Content Area: ICT/Information and Communication Technologies

Standard: ICT1: Students will analyze, select and use information and communication technologies.

	Performance Indicators (By Grade Band)		
Learning Priority	**PK-5**	**6-8**	**9-12**
ICT1.a: Analyze how communication happens, the different forms of communication and how it affects society.	**ICT1.a.1.e:** Describe how information is data that has been organized.	**ICT1.a.7.m:** Dramatize how information and communication systems allow information to be transferred from human to human, human to machine and machine to human.	**ICT1.a.13.h:** Assess how information and communication technologies include the inputs, processes and outputs associated with sending and receiving information.
	ICT1.a.2.e: Discuss how technology enables people to communicate by sending and receiving information.	**ICT1.a.8.m:** Diagram how communication systems are made up of a source, encoder, transmitter, receiver, decoder and destination.	**ICT1.a.14.h:** Predict how information and communication systems allow information to be transferred in the future.
	ICT1.a.3.e: Identify symbols which can be used when communicating. (i.e., a logo)	**ICT1.a.9.m:** Discuss how the design of a message is influenced by such factors as the intended audience, medium, purpose and nature of the message.	**ICT1.a.15.h:** Evaluate how information and communication systems can be used to inform, persuade, entertain, control, manage and educate.
	ICT1.a.4.e: Identify how knowledge can be acquired and sent through a variety of technological sources, including print and electronic media.	**ICT1.a.10.m:** Analyze how the use of symbols, measurements and drawings promotes clear communication by providing a common language to express ideas.	**ICT1.a.16.h:** Predict how communication systems could evolve in the future to facilitate understandings in a common language.
	ICT1.a.5.e: Define communication technology.	**ICT1.a.11.m:** Evaluate print and electronic sources of knowledge for their validity and accuracy.	
	ICT1.a.6.e: Demonstrate that letters, characters, icons and signs are symbols that represent ideas, quantities, elements and operations.	**ICT1.a.12.m:** Predict how symbols might evolve in the future to represent new things.	

	Performance Indicators (By Grade Band)		
Learning Priority	**PK-5**	**6-8**	**9-12**
ICT1.b: Describe how communication is an ever evolving process.	**ICT1.b.1.e:** Describe how people communicate with one another.	**ICT1.b.5.m:** Analyze how communication can be initiated.	**ICT1.b.9.h:** Asses how communications can be used to manipulate people.
	ICT1.b.2.e: Classify the types of communication we use daily.	**ICT1.b.6.m:** Illustrate how communication we use daily has grown through the years.	**ICT1.b.10.h:** Predict how communication will change in the future.
	ICT1.b.3.e: Predict how humans will communicate in the future.	**ICT1.b.7.m:** Predict how communication will change in the future.	**ICT1.b.11.h:** Contrast one type of designed communication of today with another.
	ICT1.b.4.e: Recognize that there are many types of communication.	**ICT1.b.8.m:** Identify what constitutes communication.	
ICT1.c: Analyze graphic communications in an ever increasingly technological world.	**ICT1.c.1.e:** Describe what the difference is between graphic communications and verbal communication.	**ICT1.c.4.m:** Identify the parts of a graphic message.	**ICT1.c.7.h:** Create a graphic message.
	ICT1.c.2.e: Discuss how graphic communications can be used to influence how you see the world.	**ICT1.c.5.m:** Prepare a graphic communication message.	**ICT1.c.8.h:** Summarize how a message can be used to manipulate an audience.
	ICT1.c.3.e: List ways messages can be communicated without talking to someone.	**ICT1.c.6.m:** Examine how we send messages without speaking.	**ICT1.c.9.h:** Generate an authentic graphic Communication example.
ICT1.d: Analyze the principles of effective printed, projected and multimedia communication in a variety of formats and contexts.	**ICT1.d.1.e:** Identify the principals of an effective message.	**ICT1.d.2.m:** Describe how different ages and cultures understand the same message differently.	**ICT1.d.4.h:** Design an effective communication product for multiple age groups.
		ICT1.d.3m: Explain the principals of an effective message.	**ICT1.d.5.h:** Create an effective message which can be printed, projected or conveyed in various ways.
ICT1.e: Analyze and use various technologies to design and develop websites.	**ICT1.e.1.e:** Discuss how a networking system works.	**ICT1.e.5.m:** Install various wireless components.	**ICT1.e.9.h:** Explain various licensing requirements.
	ICT1.e.2.e: Discuss the internet and how users connect to the internet.	**ICT1.e.6.m:** Install various network devices.	**ICT1.e.10.h:** Compare the differences between local area networks and wide area networks.

	Performance Indicators (By Grade Band)		
Learning Priority	**PK-5**	**6-8**	**9-12**
	ICT1.e.3.e: Discuss how various devices communicate (i.e., printers, hubs, computers, etc.).	**ICT1.e.7.m:** Discuss the importance of troubleshooting and technical support in technical devices and networks.	**ICT1.e.11.h:** Identify the need for security measures with networks to protect privacy and data.
	ICT1.e.4.e: Discuss networking security.	**ICT1.e.8.m:** Install software on a device.	**ICT1.e.12.h:** Install various networking technology equipment (i.e., routers, switches, hubs, etc.).
			ICT1.e.13.h: Explain the relationship between hardware and software, taking into account e-mail, the internet, etc.
			ICT1.e.14.h: Design a network system (include power needs, bandwidth requirements, hardware, software, etc.).
			ICT1.e.15.h: Perform the functions of a network administrator (i.e., maintaining a network system, management, user login management, system user policies, etc.).
			ICT1.e.16.h: Predict how networking will change in the future.
ICT1.f: Analyze, select various technologies, design and develop websites.	**ICT1.f.1.e:** Discuss key events in the history of the internet.	**ICT1.f.3.m:** Analyze the effects of the internet on society.	**ICT1.f.7.h:** Plan and develop a website using HTML.
	ICT1.f.2.e: Discuss different information that can be accessed through the internet.	**ICT1.f.4.m:** Define internet terminology.	**ICT1.f.8.h:** Create links, use graphics and multimedia.
		ICT1.f.5.m: Demonstrate proper folder and file naming conventions.	**ICT1.f.9.h:** Create and format a table.

	Performance Indicators (By Grade Band)		
Learning Priority	**PK-5**	**6-8**	**9-12**
		ICT1.f.6.m: Develop a plan for a website.	**ICT1.f.10.h:** Demonstrate the principles of design utilizing commercial software.
			ICT1.f.11.h: Contrast designer and developer website development and additional website file types (i.e., swf, java, asp, xml, php, css).
			ICT1.f.12.h: Demonstrate the management of a website.
			ICT1.f.13.h: Presentation on legal issues and ethics in websites and digital media.
			ICT1.f.14.h: Use commercial web design software to create web pages.
			ICT1.f.15.h: Demonstrate content management and knowledge (i.e., testing site integrity, testing site on different browsers, timely updates, etc.).
ICT1.g: Analyze and use various technologies to produce graphic communication products.	**ICT1.g.1.e:** Identify printed materials we come into contact with daily.	**ICT1.g.3.m:** Design a printed product.	**ICT1.g.5.h:** Identify what type of printing produced a specific product.
	ICT1.g.2.e: Create a poster to be printed.	**ICT1.g.4.m:** Discuss how a poster can be produced.	**ICT1.g.6.h:** Refine a poster which has been produced which could be improved.
			ICT1.g.7.h: Predict how printing will change in the future.
ICT1.h: Analyze and use various technologies in the telecommunication area.	**ICT1.h.1.e:** Identify how a message can be broadcasted over long distances.	**ICT1.h.5.m:** Describe how messages can be broadcast over long distances.	**ICT1.h.9.h:** Create a broadcast program to send over a long distance.
	ICT1.h.2.e: Identify different types of messages which should be broadcasted.	**ICT1.h.6.m:** Predict how telecommunications will be used in the future.	**ICT1.h.10.h:** Create a presentation which proposes what the future could look like in the telecommunications field.

	Performance Indicators (By Grade Band)		
Learning Priority	**PK-5**	**6-8**	**9-12**
	ICT1.h.3.e: Discuss how people can be manipulated by telecommunications.	**ICT1.h.7.m:** Predict how telecommunications will be broadcast in the future.	**ICT1.h.11.h:** Create a quality digital animation which could be used in various types of communications.
	ICT1.h.4.e: Describe an animation.	**ICT1.h.8.m:** Create a basic animation.	
ICT1.i: Analyze and use various technologies related to photographic media.	**ICT1.i.1.e:** Describe what a picture is.	**ICT1.i.5.m:** Explain how a photograph can be different from a picture.	**ICT1.i.9.h:** Create a photographic illustration.
	ICT1.i.2.e: Describe the difference between a photograph and an illustration.	**ICT1.i.6.m:** Describe the difference between a photograph and a photo illustration.	**ICT1.i.10.h:** Create examples of good photographic composition.
	ICT1.i.3.e: Identify the types of photographic composition.	**ICT1.i.7.m:** Differentiate good photographic composition from poor.	**ICT1.i.11.h:** Create a manipulated photograph.
	ICT1.i.4.e: Discuss how photographs can be manipulated.	**ICT1.i.8.m:** Demonstrate how photographs can be manipulated.	
ICT1.j: Use various technologies to produce multimedia products and presentations.	**ICT1.j.1.e:** Describe what multimedia means.	**ICT1.j.3.m:** Describe how multimedia affects how we see things.	**ICT1.j.5.h:** Create a presentation which uses at least three types of media.
	ICT1.j.2.e: Identify different types of media.	**ICT1.j.4.m:** Identify devices or programs which you can create different media types.	**ICT1.j.6.h:** Combine different media types to create a final product which can be presented on different devices.
ICT1.k: Analyze and use various technologies to produce printed products.	**ICT1.k.1.e:** Identify a screen printed product.	**ICT1.k.5.m:** Discuss the different products which can be screen printed on.	**ICT1.k.9.h:** Create screen printed product.
	ICT1.k.2.e: Identify a flexographic printed product.	**ICT1.k.6.m:** Discuss why flexography is used on some surfaces.	**ICT1.k.10.h:** Create a product using flexography.
	ICT1.k.3.e: Identify an offset printed product.	**ICT1.k.7.m:** Explain the difference between offset and Gravure printing.	**ICT1.k.11.h:** Create a product using offset printing.
	ICT1.k.4.e: Identify printing colors.	**ICT1.k.8.m:** Identify how many colors a given design would need to print.	**ICT1.k.12.h:** Create a multicolored product in various production processes.

Wisconsin Standards for Technology and Engineering (TE)

Content Area: MNF/Manufacturing

Standard: MNF1: Students will be able to select and use manufacturing technologies.

	Performance Indicators (By Grade Band)		
Learning Priority	**PK-5**	**6-8**	**9-12**
MNF1.a: Identify, select and safely use tools, machines, products and systems for specific tasks.	**MNF1.a.1.e:** Discuss health safety in the workplace.	**MNF1.a.4.m:** Discuss health and safety procedures in the workplace that keep workers safe.	**MNF1.a.7.h:** Identify safety and health protections and procedures that are critical to worker well-being.
	MNF1.a.2.e: Recognize tools, machines and materials along with their applications and failures.	**MNF1.a.5.m:** Use tools, materials and machines safely to diagnose, adjust and repair systems.	**MNF1.a.8.h:** Use appropriate tools, materials, and machines to repair a malfunctioning system.
	MNF1.a.3.e: Recognize the characteristics of length, volume, weight, area and time.	**MNF1.a.6.m:** Explore both customary and metric systems of measurement and conversions.	**MNF1.a.9.h:** Select and apply the appropriate units and scales for situations involving measurement.
MFN1.b: Create and communicate alternative solutions.	**MNF.1.b.1.e:** Introduce critical thinking skills to make educated decisions and solve problems.	**MNF.1.b.3.m:** Practice appropriate problem-solving approaches and critical thinking skills to on-the-job issues and tasks.	**MNF.1.b.5.h:** Apply methodical problem-solving models which include input, process, outcome and feedback components.
	MNF.1.b.2.e: Learn basic methods of verbal, written and graphical communication as it relates to manufacturing.	**MNF.1.b.4.m:** Comprehend and engage in communication methods to convey ideas, concepts and requirements to other individuals and teams.	**MNF.1.b.6.h:** Design and publish documents using advanced publishing software and graphic programs to defend and promote results.
MNF1.c: Demonstrate cooperation with others in ways to exhibit respect for individual and cultural differences and for the attitudes and feelings of others.	**MNF1.c.1.e:** Learn how to cooperate with others in ways to exhibit respect for individual and cultural differences and for the attitudes and feelings of others.	**MNF1.c.3.m:** Learn how to cooperate with others in ways to exhibit respect for individual and cultural differences and for the attitudes and feelings of others.	**MNF1.c.6.h:** Learn how to cooperate with others in ways to exhibit respect for individual and cultural differences and for the attitudes and feelings of others.
	MNF1.c.2.e: Recognize characteristics and benefits of teamwork, leadership and citizenship in the school, community and manufacturing settings.	**MNF1.c.4.m:** Recognize characteristics and benefits of teamwork, leadership and citizenship in the school, community and manufacturing settings.	**MNF1.c.7.h:** Recognize characteristics and benefits of teamwork, leadership and citizenship in the school, community and manufacturing settings.

	Performance Indicators (By Grade Band)		
Learning Priority	**PK-5**	**6-8**	**9-12**
		MNF1.c.5.m: Participate in the student organization SkillsUSA competitive career development events to enrich academic skills, encourage career choices and contribute to employability.	**MNF1.c.8.h:** Participate in the student organization SkillsUSA competitive career development events to enrich academic skills, encourage career choices and contribute to employability.
			MNF1.c.9.h: Identifying various strategies to conflict resolution and their importance for a variety of situations.
			MNF1.c.10.h: Recognizing how to bring together projects individually and in teams for effective performance and the achievement of objectives.
MNF1.d: Select, use and identify manufacturing processes, such as casting, forming, machining, joining, rapid manufacturing (CNC) and treating/coating.	**MNF1.d.1.e:** Learn processing systems convert natural materials into products.	**MNF1.d.3.m:** Identify manufactured goods as durable and nondurable.	**MNF1.d.5.h:** Recognize durable goods are designed to operate for a long period of time, while nondurable goods are designed to operate for a short period of time.
	MNF1.d.2.e: Manufacturing processes include designing products, gathering resources and using tools to separate, form and combine materials in order to produce products.	**MNF1.d.4.m:** Identify the manufacturing process; including the designing, development, making and servicing of products and systems.	**MNF1.d.6.h:** Demonstrate the interchangeability of parts increases the effectiveness of manufacturing processes.
MNF1.e: Select, use and identify manufacturing systems.	**MNF1.e.1.e:** Explore manufacturing systems that produce products in quantity.	**MNF1.e.3.m:** Identify that manufacturing systems use mechanical processes that change the form of materials through the processes of separating, forming, combining and conditioning.	**MNF1.e.6.h:** Recognize manufacturing systems may be classified into types, such as customized production, batch production and continuous production.

	Performance Indicators (By Grade Band)		
Learning Priority	**PK-5**	**6-8**	**9-12**
	MNF1.e.2.e: Discuss essential components of a manufacturing system.	**MNF1.e.4.m:** Define the purposes of marketing.	**MNF1.e.7.h:** Use marketing to establish a product's identity, conduct research on its potential, advertise it, distribute it and sell it.
		MNF1.e.5.m: Identify the sub-components of a manufacturing system.	**MNF1.e.8.h:** Use a manufacturing system to produce a product.
MNF1.f: Select and use manufacturing technologies.	**MNF1.f.1.e:** Learn manufacturing enterprises exist because of a consumption of goods.	**MNF1.f.4.m:** Define harvesting, drilling and mining processes.	**MNF1.f.7.h:** Recognize servicing keeps products in good operating condition.
	MNF1.f.2.e: Learn that manufactured products are designed.	**MNF1.f.5.m:** Discuss how technologies are used to modify or alter chemical substances.	**MNF1.f.8.h:** Recognize technologies provide a means for humans to alter or modify materials and to produce products.
	MNF1.f.3.e: Products are produced of materials to benefit our lives (e.g., safer, easier and more enjoyable).	**MNF1.f.6.m:** Describe the relationship between materials and manufacturing.	**MNF1.f.9.h:** Identify materials have different qualities and may be classified as natural, synthetic or mixed and their effects on our world.
MNF1.g: Analyze and use GMAW, GTAW, SMAW and oxy-acetylene welding.	**MNF1.j.1.e:** Discuss how metal is joined together.	**MNF1.g.3.m:** Analyze the different processes needed to fuse metal together (i.e., MIG, TIG, oxy-acetylene, Arc, etc.).	**MNF1.g.8.h:** Demonstrate the ability to choose proper welding supplies given the process.
	MNF1.g.2.e: Discuss dangerous situations and the importance of safety in welding processes.	**MNF1.g.4.m:** Identify various types of metal, both ferrous and non-ferrous.	**MNF1.g.9.h:** Identify different types of welding machines.

	Performance Indicators (By Grade Band)		
Learning Priority	**PK-5**	**6-8**	**9-12**
		MNF1.g.5.m: Identify the importance of safety and different types of safety equipment needed for different welding processes.	**MNF1.g.10.h:** Demonstrate appropriate use of welding blueprint symbols and codes used in industry.
		MNF1.g.6.m: Demonstrate basic welding joints and processes used to weld them.	**MNF1.g.11.h:** Demonstrate safety and chose the proper safety equipment given the process being used (i.e., oxy-acetylene, GMAW, SMAW, GTAW, etc.).
		MNF1.g.7.m: Discuss how robotics and automation play a role in manufacturing.	**MNF1.g.12.h:** Identify different types of welding joints and be able to demonstrate the ability perform the welds (i.e., butt, corner, edge, lap, tee).
			MNF1.g.13.h: Identify the different type of welding positions and be able to demonstrate the ability to perform the welds (i.e., flat, horizontal, vertical and overhead).
MNF1.h: Analyze and use metal and manufacturing cutting operations.	**MNF1.h.1.e:** Discuss dangerous situations and the importance of safety with manufacturing cutting processes.	**MNF1.h.2.m:** Identify the importance of safety and different types of safety equipment needed for different metal and manufacturing cutting processes.	**MNF1.h.6.h:** Demonstrate the proper use and proper way to set-up and close down oxy-acetylene equipment and check for leaking gases.
		MNF1.h.3.m: Compare and contrast different metal and manufacturing cutting operations.	**MNF1.h.7.h:** Demonstrate the proper safety and use with plasma cutting equipment.

	Performance Indicators (By Grade Band)		
Learning Priority	**PK-5**	**6-8**	**9-12**
		MNF1.h.4.m: Demonstrate different metal and manufacturing cutting operations.	**MNF1.h.8.h:** Demonstrate how to use oxy-acetylene and plasma cutting.
		MNF1.h.5.m: Discuss how robotics and automation play a role in manufacturing cutting operations.	**MNF1.h.9.h:** Compare the pros and cons with plasma cutting and oxy-acetylene cutting manufacturing operations and analyze other cutting operations used in industry.
			MNF1.h.10.h: Analyze the metallurgical effects heat has on metal during a cutting process or in forming and heat treating.

Wisconsin Standards for Technology and Engineering (TE)

Content Area: PE/Power and Energy

Standard: PE1: Students will be able to select and use energy and power technologies.

	Performance Indicators (By Grade Band)		
Learning Priority	**PK-5**	**6-8**	**9-12**
PE1.a: Discuss, analyze and use energy systems.	**PE1.a.1.e:** Discuss that energy comes in many forms.	**PE1.a.6.m:** Define how energy is the ability to do work.	**PE1.a.11.h:** Analyze how energy cannot be created nor destroyed; however, it can be converted from one form to another.
	PE1.a.2.e: Discuss that renewable and nonrenewable energy should not be wasted.	**PE1.a.7.m:** Discuss how energy can be used to do work, using various processes.	**PE1.a.12.h:** Categorize how energy can be grouped into major forms: thermal, radiant, electrical, mechanical, chemical, nuclear and others.
	PE1.a.3.e: Identify types of green energy systems used in our world.	**PE1.a.8.m:** Analyze how power is the rate at which energy is converted from one form to another or transferred from one place to another or the rate at which work is done.	**PE1.a.13.h:** Identify and research developing future trends of energy systems including trends that are environmentally responsible.
	PE1.a.4.e: Identify renewable and nonrenewable energy systems.	**PE1.a.9.m:** Examine how power systems are used to drive and provide propulsion to other technological products and systems.	**PE1.a.14.h:** Identify trends in energy impacting the world's renewable and nonrenewable energy systems.
	PE1.a.5.e: Identify types of Energy systems used in our world.	**PE1.a.10.m:** Discuss that much of the energy used in our environment is not used efficiently.	**PE1.a.15.h:** Assess how power systems must have a source of energy, a process and loads.
PE1.b: Analyze, use and discuss machine and tool use relating to energy and power systems.	**PE1.b.1.e:** Identify tools used in energy systems.	**PE1.b.5.m:** Explain the machines and systems used in energy systems to do work.	**PE1.b.9.h:** Describe how future trends in new and developing tools used in power and energy systems use innovative design and techniques.
	PE1.b.2.e: Identify new machines used in power and energy systems.	**PE1.b.6.m:** Explain the emerging machine technology trends in developing power systems are needed for the future.	**PE1.b.10.h:** Demonstrate how the uses of new technology, tools and machines are necessary for future trends in power and energy systems.

	Performance Indicators (By Grade Band)		
Learning Priority	**PK-5**	**6-8**	**9-12**
	PE1.b.3.e: Recognize the need for safety in the use of new tools and machines.	**PE1.b.7.m:** Follow safe procedures when using tools and equipment related to power and energy systems.	**PE1.b.11.h:** Demonstrate and follow proper safety procedures for tools and machines used in power and energy systems.
	PE1.b.4.e: Recognize terms related to Power and Energy systems.	**PE1.b.8.m:** Define and use specific tools and technology related to power and energy systems. (Such as: multi-meter and computer software programs).	**PE1.b.12.h:** Demonstrate the practical and theoretical applications of test equipment to identify voltage, current and resistance in energy systems.
PE1.c: Identify and analyze responsible and efficient management of energy resources.	**PE1.c.1.e:** Identify efficient use of an energy system.	**PE1.c.6.m:** Explain how efficient use in energy systems save time and resources.	**PE1.c.11.h:** Demonstrate efficient use of energy in a related project or lab.
	PE1.c.2.e: Identify renewable energy sources.	**PE1.c.7.m:** Explain how the efficient use of renewable energy sources is necessary for society.	**PE1.c.12.h:** Develop and perform tasks related to responsible use of energy systems and/or resources.
	PE1.c.3.e: Identify non-renewable energy sources.	**PE1.c.8.m:** Explain why the need for efficient use of non-renewable energy sources is vital for the future.	**PE1.c.13.h:** Demonstrate efficient use of energy resources related to power and energy technology.
	PE1.c.4.e: Identify how quickly energy resources are consumed.	**PE1.c.9.m:** Explain how tools and machines can be designed to be more efficiently used in energy systems.	**PE1.c.14.h:** Research and demonstrate how new and emerging technology will be developed for efficient use of energy resources.
	PE1.c.5.e: Give examples of careers related to work in power and energy systems.	**PE1.c.10.m:** Identify new trends in careers related to the power and energy fields.	**PE1.c.15.h:** Research and explain new and emerging careers in (green) energy management and power systems.

	Performance Indicators (By Grade Band)		
Learning Priority	**PK-5**	**6-8**	**9-12**
PE1.d: Develop necessary skills in problem solving for future energy systems.	**PE1.d.1.e:** Identify problem solving steps used to solve real world problems.	**PE1.d.5.m:** Describe Problem solving as the application of math and science to solve a problem through invention or innovation.	**PE1.d.9.h:** Demonstrate the application of the Design Process to solve a problem related to technology, power and energy systems.
	PE1.d.2.e: Identify older technology used in energy systems.	**PE1.d.6.m:** Define new techniques used to solve problems in energy systems.	**PE1.d.10.h:** Explain and apply skills using new technology and tools to solve energy problems.
	PE1.d.3.e: Discuss power and energy problems.	**PE1.d.7.m:** Maintain a journal of problem solving steps used in solving a real-world problem for energy and power.	**PE1.d.11.h:** Write a technical report on a researched energy problem and the steps used to solve the problem.
	PE1.d.4.e: Identify a job skill and tools for use in a green energy system.	**PE1.d.8.m:** Identify and select specific tools required to safely measure, test and analyze traditional and green energy problems.	**PE1.d.12.h:** Apply/Demonstrate the safe use of test equipment and tools required to properly diagnose problems for (green) energy systems.

Wisconsin Standards for Technology & Engineering

Content Area: TR/Transportation Standards

Standard: TR1: Students will be able to select and use transportation technologies.

	Performance Indicators (By Grade Band)		
Learning Priority	**PK-5**	**6-8**	**9-12**
TR1.a: Analyze and explain transportation systems.	**TR1.a.1.e:** Identify that transportation systems allow people and goods to be moved from place to place.	**TR1.a.3.m:** Explain how transporting people and goods involve a combination of individuals and vehicles.	**TR1.a.6.h:** Summarize how transportation plays a vital role in the operation of other technologies, such as manufacturing, construction, communication, health and safety and agriculture.
	TR1.a.2.e: Identify the transportation modes used to move people or goods from one place to another in water, air or space and on land.	**TR1.a.4.m:** Explain intermodal transportation - the use of different modes of transportation, such as highways, railways and waterways, as part of an interconnected system that can move people and goods easily from one mode to another.	**TR1.a.7.h:** Identify how governmental regulations and technological trade-offs might influence the transportation modes used to move people and goods from one place to another.
		TR1.a.5.m: Recognize that production and management processes (i.e., logistics) are necessary for the entire transportation system to operate efficiently.	**TR1.a.8.h:** Relate how the current and future design of advanced transportation systems depends on many innovative materials and processes.
TR1.b: Analyze and explain how transportation vehicles and transportation vehicle systems work.	**TR1.b.1.e:** Recognize that transportation vehicles need to be cared for in order to prolong their useful life.	**TR1.b.4.m:** Predict how a lack of maintenance can lead to degradation and premature failure.	**TR1.b.7.h:** Interpret preventive maintenance schedules and recommended service intervals for vehicles.
	TR1.b.2.e: Explain that transportation vehicles have multiple components with different functions.	**TR1.b.5.m:** Explain that transportation vehicles are made up of subsystems, such as structural, propulsion, suspension, guidance, control and support that must function together to make them work effectively.	**TR1.b.8.h:** Define the interdependency of individual systems within a vehicle.

	Performance Indicators (By Grade Band)		
Learning Priority	**PK-5**	**6-8**	**9-12**
	TR1.b.3.e: Explain that malfunctioning components must be repaired or replaced to restore intended operation.	**TR1.b.6.m:** Identify that a transportation system may lose efficiency or fail if one part is missing or malfunctioning or if a subsystem is not properly working.	**TR1.b.9.h:** Explain that all systems demand specific repair procedures in order to achieve highest performance and efficiency.
TR1.c: Develop the skill set necessary to diagnose, problem solve and repair transportation vehicles.	**TR1.c.1.e:** Give examples of other content areas (math & science) that directly applicable to the transportation field.	**TR1.c.5.m:** Use STEM – Science, Technology, Engineering and Math to solve problems related to the transportation field.	**TR1.c.9.h:** Develop measurement skills in electrical/electronic, mechanical and hydraulic applications that are necessary to efficiently repair vehicles.
	TR1.c.2.e: Recognize the 6 simple machines in common products.	**TR1.c.6.m:** Use simple machines to construct transportation-related devices.	**TR1.c.10.h:** Students will perform tasks related directly to current national standards per transportation area (i.e., NATEF).
	TR1.c.3.e: Identify examples of safety related to the use of simple tools and equipment.	**TR1.c.7.m:** Operate transportation-related tools and equipment in a safe manner.	**TR1.c.11.h:** Demonstrate safe and proficient use of specialty tools and equipment related to servicing transportation vehicles.
	TR1.c.4.e: List careers related to the transportation field.	**TR1.c.8.m:** Perform career research related to the transportation field.	**TR1.c.12.h:** Explain career preparation, career pathways and the importance of on-the-job training as well as further education with regard to the transportation field.

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