WISCONSIN STANDARDS for

Technology and Engineering

Wisconsin Department of Public Instruction
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Madison, Wisconsin

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Foreword

Career and Technical Education (CTE) has significant value for all students – from introducing them to the world of work to providing specific technical skills. CTE helps students to find relevance, application and understanding of the core subjects.

Career and Technical Education needs to be recognized for the numerous ways it adds value to our students' education and success. As we strive to prepare every Wisconsin student to be college and career ready, it is CTE that provides our greatest opportunity for creating a skilled, knowledgeable and productive future workforce. CTE programs are critical for a student to develop contemporary knowledge and skills for the world of work or for postsecondary coursework. In many schools, CTE also provides articulated courses and work-based learning opportunities, as well as Career and Technical Student Organization connections for students.

To clearly identify what students should know and be able to demonstrate as productive workers, the Wisconsin Department of Public Instruction created the **Wisconsin Standards for Technology and Engineering**. This resource provides a framework for aligning technology and engineering curriculum, instruction and assessment.

The standards within this resource will strengthen CTE's multiple pathways for students to become college and career ready while still in high school. We need to ensure students are exposed to a variety of career development experiences from kindergarten through 12th grade. By adopting the standards within this resource, technology and engineering programs will continue offering relevant, rigorous and authentic learning experiences that meet the students' needs and future ambitions. Career and Technical Education should be part of any comprehensive effort to improve student achievement and success while preparing college and career ready graduates. This continued commitment has great economic implications for our future!

Tony Evers, PhD
State Superintendent

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Purpose of the Document

Career and Technical Education (CTE) programs include planned courses of high-quality academic content and technical competencies and skills which focus on programs of study and prepare students for successful college and career readiness.

The aim of this guide is to improve CTE for students and for communities. To assist Wisconsin educators and stakeholders in understanding and implementing the **Wisconsin Standards for Career and Technical Education**, the Wisconsin Department of Public Instruction (DPI) has developed standards in the areas of Agriculture, Food and Natural Resources; Business and Information Technology; Family and Consumer Sciences; Health Science; Marketing, Management and Entrepreneurship; and Technology and Engineering. These materials are intended to provide direction in the development of course offerings and curriculum in school districts across Wisconsin.

This publication provides a vision for student success and guiding principles for teaching and learning. Program leaders will find the guide valuable for making decisions about:

- program structure and integration;
- curriculum redesign;
- staffing and staff development;
- scheduling and student grouping;
- facility organization;
- learning spaces and materials development;
- resource allocation and accountability; and
- collaborative work with other units of the school, district and community.

A Guide to Wisconsin Career and Technical Education & Technology and Engineering Education

Wisconsin Career and Technical Education (CTE) programs (Agriculture, Food and Natural Resources; Business and Information Technology; Family and Consumer Sciences; Health Sciences; Marketing, Management and Entrepreneurship; and Technology and Engineering) have a rich history and foundation of preparing young adults for the next steps in their lives—postsecondary education and the world of work. Through ties to business, industry and community, CTE programs provide perspectives and partnerships necessary to educate the entire student. Along with CTE's relationships, the standards outlined in this document set a new direction for the knowledge and skills necessary for successful transition to postsecondary programs leading to and/or direct entry into high-wage, high-demand and highly skilled careers. When paired with the Common Core State Standards, Wisconsin students now have access to increasingly rigorous and relevant content to ensure college and career readiness.

Each set of Career and Technical Education standards contains two distinct sections:

1. **Wisconsin Common Career Technical Standards**
2. Standards for the specific discipline

The Shift from Model Academic Standards (1998) to State Standards (2013)

The Model Academic Standards published in 1998 were developed in such a way as to highlight what every student should know and be able to do in a particular content area by the end of grade 4, 8 or 12. In focusing on every student, these standards did not necessarily lend themselves to providing a proficiency level or mastery of industry expectations in a specific career pathway particularly for the purpose of career and technical education.

This new set of standards provides CTE programs an opportunity to develop a single course for exploring a career pathway; as well as developing programs and pathways which include a sequence of courses that have an expectation of proficiency and mastery of skills for students who concentrate in CTE. These standards also serve as a framework to align existing course content to identify gaps and inform curricular decisions. However, the full scope of a set of standards should not be used as a measure of a course or program's completeness. Rather, distinctive conversations and informed decisions with involvement of multiple stakeholders, including business/industry and postsecondary representation, should be made regarding what is and what is not covered in a course, a sequence of courses or a program. Where one district may focus, due to local and community needs or other influences, on a single pathway, another may fully develop multiple pathways. These standards provide a foundation for a variety of applications in each of Wisconsin's districts.

The standards also shift from looking at knowledge and skills acquired by the end of certain grade levels to grade bands of knowledge and skills that should be acquired during a student's route through each level of their education. 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. Licensed 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.

Wisconsin Common Career Technical Standards

In working with business, industry and education professionals from around the state in the development of standards for each of the individual CTE areas, discussions around common elements, skills, knowledge and dispositions led to the identification of a set of **Wisconsin Common Career Technical Standards**. At relatively the same time, national level conversations were also taking place. As part of the Common Career and Technical Core outlined by the National Association of State Directors of Career and Technical Education Consortium (NASDCTEc), a set of Career Ready Practices emerged. These Career Ready Practices can easily be seen within the **Wisconsin Common Career Technical Standards**.

Standards for Technology and Engineering

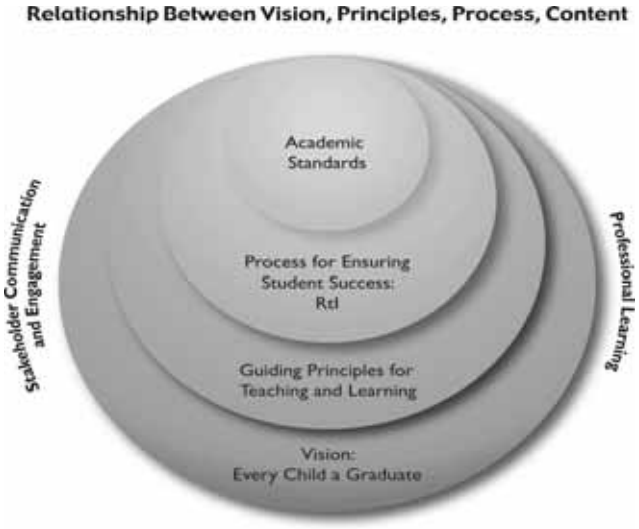
The learning priorities and performance indicators contained within each set of discipline standards consists of knowledge and skills specific to the respective disciplines and their related jobs and careers. These are, of course, critical as students develop and pursue their career goals.

The educators and stakeholders writing the **Wisconsin Standards for Technology and Engineering** took direction from many resources including, but not limited to:

- Career Clusters Knowledge and Skill Statements
- International Technology and Engineering Education Association Standards for Technological Literacy
- Electronics Technicians Association Standards
- Florida Department of Education Curriculum Framework
- Renewable Energy in Building Science Conceptual Framework
- KEEP Energy Education Conceptual Framework
- National Automotive Technicians Educational Foundation (NATEF)
- Woodwork Career Alliance
- SkillsUSA Competencies and Skills

Aligning for Student Success

To build and sustain schools that support every student in achieving success, educators must work together with families, community members and business partners to connect the most promising practices in the most meaningful contexts. Currently, statewide initiatives focus on high school graduation, Response to Intervention (RtI) and the *Common Core State Standards for English Language Arts, Disciplinary Literacy and Mathematics*. Now the release of the **Wisconsin Standards for Career and Technical Education** brings to light another set of important academic standards for school districts to implement. While these initiatives are often viewed as separate efforts, each of them is connected to a larger vision of every child graduating college and career ready. The graphic below illustrates how these initiatives function together for a common purpose. Here, the vision and set of guiding principles form the foundation for building a supportive process for teaching and learning rigorous and relevant content. The following sections articulate this integrated approach to increasing student success in Wisconsin schools and communities.



A Vision: Every Child a Graduate

In Wisconsin, we are committed to ensuring every child is a graduate who has successfully completed a rigorous, meaningful, 21st century education that will prepare him or her for careers, college and citizenship. Though the public education system continues to earn nation-leading graduation rates, a fact we can be proud of, one in ten students drop out of school, achievement gaps are too large and overall achievement could be even higher. This vision for every child a graduate guides our beliefs and approaches to education in Wisconsin.

Guided By Principles

All educational initiatives are guided and impacted by important and often unstated attitudes or principles for teaching and learning. *The Guiding Principles for Teaching and Learning* emerge from research and provide the touchstone for practices that truly affect the vision of every child a graduate prepared for college and career. When made transparent, these principles inform what happens in the classroom, direct the implementation and evaluation of programs and most importantly, remind us of our own beliefs and expectations for students.

Ensuring a Process for Student Success

To ensure that every child in Wisconsin graduates prepared for college and career, schools need to provide high quality instruction, balanced assessment and collaboration reflective of culturally responsive practices. The Wisconsin Response to Intervention (RtI) framework helps to organize the components of a system designed to support student learning. Below, the three essential elements of high quality instruction, balanced assessment and collaboration interact within a multi-level system of support to ensure each student receives what he or she needs to access higher levels of academic and behavioral success.

At the school or district level, programs, initiatives and practices related to high quality instruction, balanced assessment and collaboration can be more powerful when organized or braided to function systemically to support all students. The focus must be on a comprehensive approach to student learning.

Connecting to Content: The Common Core State Standards

Within this vision for increased student success, rigorous, internationally benchmarked academic standards provide the content for high quality curriculum and instruction and for a balanced assessment system aligned to those standards. With the adoption of the CCSS, Wisconsin has the tools to build world-class curriculum, instruction and assessments for greater student learning. The CCSS articulate what we teach so that educators can focus on how instruction can best meet the needs of each student. When implemented within a multi-level system of support, the CCSS can help to ensure that every child will graduate prepared for college, work and a meaningful life.

Wisconsin's Vision for RtI

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Section II

Wisconsin's Approach to Career and Technical Education and Technology and Engineering Education

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What is Contemporary Career and Technical Education?

There are multiple components to consider when developing contemporary Career and Technical Education (CTE) programs. The standards outlined in this document provide an important foundation to prepare individuals for a wide range of careers. Effective CTE programs are dynamic and require utilization of varied resources and involvement from multiple stakeholders. The discussion that follows highlights the multi-faceted nature of CTE and outlines the critical components that drive the development of effective CTE programs.

A National Vision for CTE

The National Association of State Directors of Career and Technical Education Consortium (NASDCTEc) has identified five guiding principles that should drive the development of quality CTE programs. Wisconsin supports these principles as spelled out in the NASDCTEc's *Reflect, Transform, Lead: A New Vision for Career and Technical Education*. These principles provide that Career and Technical Education is:

- critical to ensuring that the United States leads in global competitiveness;
- actively partnering with employers to design and provide high-quality, dynamic programs;
- preparing students to succeed in further education and careers;
- delivered through comprehensive programs of study aligned to The National Career Clusters framework; and
- a results-driven system that demonstrates a positive return on investment.

CTE in Wisconsin

Career and Technical Education is both a collection of educational programs or content areas as well as a system of preparing students to be career and college ready. Contemporary CTE programs are delivered primarily through six specific content areas; these include:

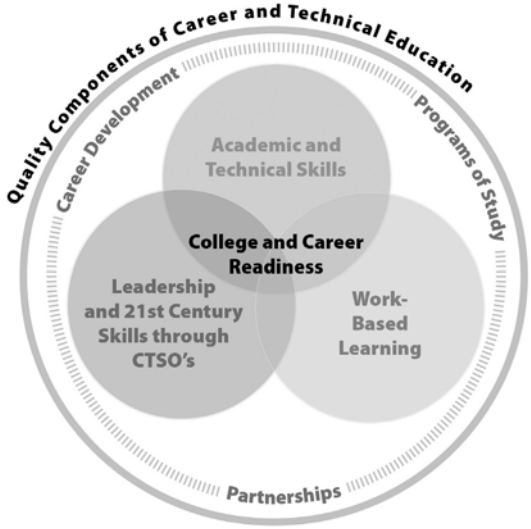
- Agriculture, Food and Natural Resources
- Business and Information Technology
- Family and Consumer Sciences
- Health Science
- Marketing, Management and Entrepreneurship
- Technology and Engineering

Not all Wisconsin school districts offer programs in all of these content areas, but all should be offering CTE through a systemic approach that prepares students to be college and career ready.

At the elementary level, CTE content and concepts should be integrated throughout the curriculum. Teachers can effectively use CTE concepts in instruction and activities to develop foundational skills and also create a connection to the world of work. At the middle and high school levels, all students should have access to CTE courses and programs while also participating in activities prescribed by the Wisconsin Comprehensive School Counseling Model. High quality CTE programs incorporate rigorous academic and technical standards, as well as critical workplace skills – such as problem solving, communication and teamwork – to ensure career and college success for its students. The Programs of Study components provide a framework for building and maintaining a high quality, contemporary CTE program, but one can also recognize such quality programs by the presence of three distinct and crucial elements – rigorous academics and technical skill attainment, work-based learning and Career and Technical Student Organizations (CTSOs). The diagram and description that follows on the next page illustrates the quality components of Career and Technical Education programs.

Rigorous Academics and Technical Skill Attainment

CTE programs prepare students for high-skill, family-sustaining jobs that typically require high levels of core academic skills as well as various technical skills. Consequently, CTE students must be held to high academic standards; often this includes course and performance expectations exceeding typical graduation requirements. CTE students benefit from a source of relevance for their academic instruction. They see the connection between their academic knowledge and skill instruction and their future occupational and career goals.



Of course, at the heart of CTE is the attainment of technical skills that are required for potential high-skill, high-wage jobs. Where circumstances and resources allow, CTE programs provide opportunities for high school students to attain the highest level of skills possible within their desired career pathway. This is done through courses taught by high school CTE teachers and/or through partnerships with neighboring districts, employers, technical colleges and postsecondary institutions or other organizations.

Some of the specific means of achieving rigorous academics and technical skill attainment include:

- *Partnerships/Advisory Committees* – These typically include representatives of area businesses within the given program's career area as well as representatives from related postsecondary training and education programs. They may also include parents, students and program alumni. They can provide recommendations on program changes and improvements, as well as serve as advocates for the program.
- *Transcripted or Dual Enrollment Options* – Opportunities such as these allow students to earn both high school and college credit concurrently. Various options are available for CTE students include advanced standing and transcripted coursework taught at the student's high school, as well as Youth Options and Advanced Placement (AP) courses.
- *Equivalency Credit Options* – These provide opportunities for students to earn credits required for high school graduation through CTE courses proven to have sufficient academic content.
- *Work-Based Learning* – See separate section below
- *Career and Technical Student Organizations* – See separate section below

Work-Based Learning

A vital part of comprehensive career and technical education programs is a structured work-based learning experience. One goal of education is preparing students to successfully enter the workforce. The best way to achieve this goal is for students to spend time in a work setting. Many factors will influence the work-based learning options that can be offered.

Work Place Visits, Employer/Employee Dialogues and Job Shadowing – At the very least, students should participate in work place visits and tours as well as hear presentations and have a dialogue with employers and employees to see how their school-based learning is relevant to the work place. Job shadowing – during which students spend several hours observing one or more employees at a work place – is an even better way to expose students to the work place.

Paid Work Experience – Ideally, students will have opportunities for paid work experience in a job related to their program of study and connected with one or more courses in which the student is currently enrolled. Such experiences should include a training agreement that spells out the expectations for everyone involved including the student, employer, teacher and parents. One of the critical elements of the training agreement is a

list of the skills and knowledge the student is expected to develop through their paid work experience. Examples of structured, existing work experience programs in Wisconsin are the Employability Skills Certificate, State Certified Skills Coop programs and Youth Apprenticeship.

Leadership Certificate – An option for many students includes the Wisconsin Youth Leadership Certificate. This certificate is comprised of leadership skills and attitudes that are honed through community and school volunteer or service experiences, leadership positions and volunteer or unpaid workplace encounters.

The more time students spend in the workplace and the broader the experiences, the better prepared they will be. These students will also be better prepared to plan and make decisions about their futures. Work-based learning allows students to put into action the knowledge and skills learned at school.

Career and Technical Student Organizations

Career and Technical Student Organizations (CTSOs) are the third critical element found in the best contemporary CTE programs. Through CTSOs, students match their skill level against those of other students and established industry standards. In addition, CTSOs allow students to develop civic responsibility, leadership and 21st century skills.

Wisconsin has six state and nationally recognized CTSOs that are intra-curricular in that they are connected directly to the classroom through curriculum, activities and community resources. All CTSOs include leadership development elements and competitive events where students demonstrate technical and leadership skills. CTSOs prepare young people to become productive citizens and leaders in their communities and their careers. This is done through school activities as well as regional, state and national leadership conferences and competitions. Students grow and develop through these events and receive recognition for the work they have done and the skills they have developed. CTSOs provide an exceptional extension of CTE instruction. Wisconsin's recognized CTSOs include:

An Association of Marketing Students	An Association of Technology and Engineering Students	An Association of Business and Information Technology Students	An Association of Health Science Students	An Association of Family and Consumer Students	An Association of Agricultural Education Students

The Powerful Outcomes of Quality CTE

Beyond the technical knowledge and skills developed by CTE students, the overall outcomes of students who have enrolled in a CTE course – and in particular students who have taken a sequence of courses in a CTE program of study (called CTE concentrators) – are exceptionally positive. Approximately two-thirds of Wisconsin students have taken at least one CTE course. These students have a higher graduation rate (84.2%) than students who have not taken a CTE course (81.8%). CTE concentrators have an even higher graduation rate (95.7%). In addition, within a year after graduation, CTE concentrators report overwhelming positive outcomes with approximately 95% either working, attending postsecondary education or engaged in training programs.*

CTE and Programs of Study – Expanding Student Opportunities

Such positive outcomes as those noted show how CTE programs expand student opportunities. To support quality CTE programs, it is critical to foster partnerships, implement Programs of Study and promote career development through academic and career planning. CTE students develop a strong base of academic knowledge and skills that better prepare them to enter nearly any postsecondary program and pursue any career pathway compared to students who have not taken CTE courses. The relevance created by CTE and programs of study opens up additional opportunities and prepares students to pursue those opportunities when they graduate from high school. Students who select and pursue a program of study through CTE, based on identified career goals, will be in the best position for all job and career opportunities that arise in their future, including those they have never considered or those not yet in existence. ***Quality CTE programs are at the forefront of preparing college and career ready graduates.***

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*Statistics from 2011 Wisconsin Career and Technical Education Enrollment Report (CTEERS) data.

Delivering Career and Technical Education through Career Clusters and Pathways

Career Clusters Framework

One of the keys to improving student achievement is providing students with relevant contexts for studying and learning. Career Clusters do exactly this by linking school-based learning with the knowledge and skills required for success in the workplace. The National Career Clusters Framework was developed by the National Association of State Directors for Career and Technical Education Consortium (NASDCTEc). This framework is comprised of 16 Career Clusters and related 79 Career Pathways to help students of all ages explore different career options and better prepare for further education and career. Each Career Cluster represents a distinct grouping of occupations and industries based on the knowledge and skills they require. They provide an important organizing tool for schools to develop more effective programs of study (POS) and curriculum.

> **CTE is delivered through comprehensive programs of study aligned to the National Career Clusters framework**
> *"Programs of Study aligned to the National Career Clusters framework…should be the method of delivery of all CTE. A rigorous and comprehensive program of study delivered by qualified instructors is a structured sequence of academic and CTE courses that leads to a postsecondary credential. We must be willing to take bold steps necessary to jumpstart dramatic change in our nation's education and workforce preparation systems. The dichotomous silos of academics versus CTE must be eliminated and their supporting infrastructures must be re-imagined to meet the needs of the economy. As the lines of economies blur, so too must the lines that currently separate CTE and academic education."*
> ***~Reflect, Transform, Lead: A New Vision for Career and Technical Education, NASDCTEc***

In Wisconsin, the Career Clusters and Pathways have been embraced by CTE programs to provide a context for learning the skills specific to a career. Furthermore, the nationally recognized 10 components framework (see the Wisconsin Program of Study Implementation Guide for details) delineates promising practices necessary to fully implement programs of study. Programs of Study are designed to produce higher levels of achievement in a number of measurable arenas, including academic and technical attainment, high school completion, postsecondary transitions to career and education and attainment of a formal postsecondary credential. They also contribute to increased student proficiency in vital areas such as creativity and innovation, critical thinking and problem solving.

Delivering CTE through Career Clusters

Delivering CTE through Career Clusters and Pathways means acknowledging three sets of standards (nationally-developed **Common Career Technical Core, Wisconsin Common Career Technical Standards and the Wisconsin Standards for Career and Technical Education**), their relationship to each other and how they can be used collectively to deliver quality instruction. It means shifting the way we approach curriculum and instruction to allow for a strategic approach for implementing these standards in a school or district. This section will outline the relationship that exists between these standards.

In our ever-changing society, many CTE programs are transitioning from helping students prepare for an entry-level job to helping students prepare for a career. As part of that transition, national organizations, such as the NASDCTEc, individual states and even industry-based organizations, have created different sets of standards for student learning in CTE programs. The result is an assortment of standards that vary in quality and specificity from one state to the next. In response, Wisconsin has made a concerted effort to outline these standards and their use for educators as they develop curriculum and programs of study.

Educating students is about the preparation for postsecondary options along with transferable skills that balance current business and industry needs and future career trends. CTE brings students, educators and employers together to develop and strengthen the relationship between what is being taught in the classroom and its application in the workplace. Having a skilled workforce and a vibrant economy depends on CTE programs that can deliver high quality

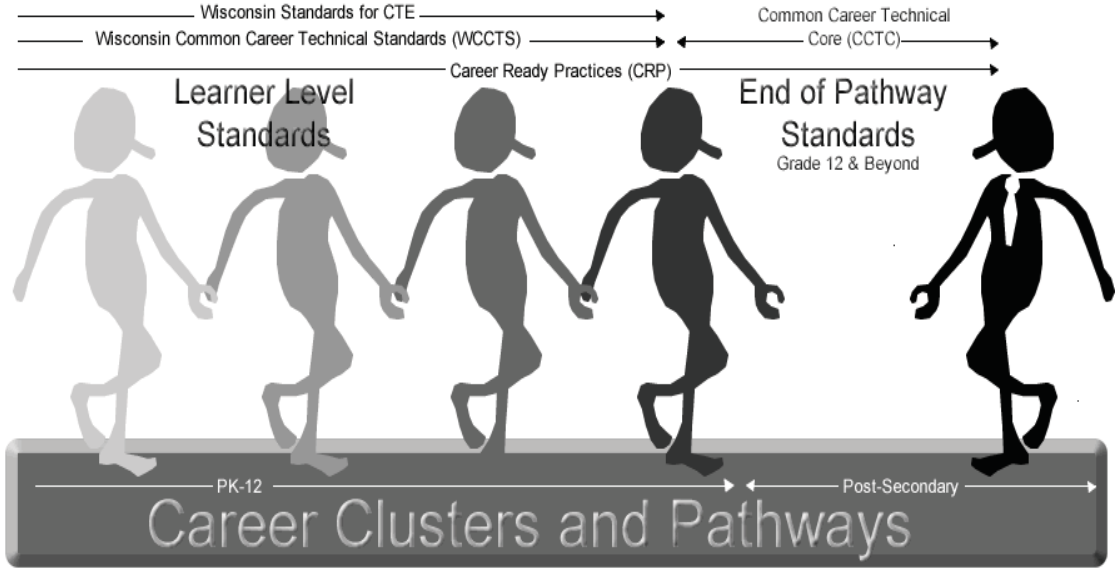
education and training. Because of this, understanding each of the following sets of standards and how they can impact classroom instruction is imperative and will need to be a priority for Wisconsin's CTE educators.

Common Career Technical Core

Recognizing the need for more consistency in today's global marketplace, in the spring of 2010, NASDCTEc united around a vision to develop a shared set of standards that meet a quality benchmark for students in CTE programs, regardless of where they live or which delivery system they use. The **Common Career Technical Core (CCTC)** has been developed to align with other college and career ready standards efforts, such as the Common Core State Standards in English Language Arts and Mathematics, while also articulating industry expectations for each of the 16 Career Clusters. The CCTC begins with a set of overarching **Career Ready Practices (CRP)** that apply to all programs of study. The **Career Ready Practices** include 12 statements that address the knowledge, skills and dispositions that are important to becoming career ready.

While the Common Core State Standards for English Language Arts and Mathematics define the academic knowledge and skills students need to succeed, there are additional standards that individuals must achieve if they are to be truly career ready. For example, employability skills such as team work and time management, as well as the career specific skills, have not been referenced in the Common Core State Standards. These are skills that individuals must possess in order to be successful in the workplace. These skills make up the **Career Ready Practices** outlined in the CCTC.

The nationally-developed **Common Career Technical Core** contains standards developed for each cluster and pathway. These standards are meant to showcase the knowledge and skills students should have at the **end of the pathway.** These standards provide a mechanism for districts and states to collaborate to provide seamless educational opportunities for students across a **program of study** beginning at the secondary level. Most programs of study will require postsecondary or industry-developed skills beyond what is provided at the secondary level.



*As depicted in this graphic, there is a continuum or progression that students travel in their PK-12 career. The path begins with learner-level standards such as the **Wisconsin Common Career Technical Standards** and the **Wisconsin Standards for CTE**. As students graduate from high school and move seamlessly into postsecondary options, the focus moves to the end-of-pathway standards such as the Common Career Technical Core (CCTC-national). The Career Ready Practices (CRP-national) act as overarching concepts that students need to know and be able to do throughout their educational experiences.*

Wisconsin Common Career Technical Standards

The development of the **Wisconsin Common Career Technical Standards (WCCTS)** occurred at the state level at the same time as the national **Common Career Technical Core (CCTC)**. The Wisconsin standards writing teams identified six areas that have been further developed into standards that should be addressed across all six CTE content areas. These standard areas are Career Development; Creativity, Critical Thinking, Communication and Collaboration; Environment, Health and Safety; Global and Cultural Awareness; Information, Media and Technology; and Leadership. The intended outcome of the WCCTS revolves around creating a set of standards that transcend CTE across the state and across all CTE content areas. To read more about the WCCTS, see Wisconsin's Approach to Common Career Technical Standards in Section III of this document. The WCCTS, along with the **Wisconsin Standards for CTE** form a strong foundation by which students move toward the completion of a program of study. The WCCTS and the Career Ready Practices in the CCTC correlate as shown below:

6 Wisconsin Common Career Technical Standards*					
Career Development Has a focus on personal and social, academic, career content and employability skills	**Creativity, Critical Thinking, Communication and Collaboration** Has a focus on creativity and innovative problem solving, critical thinking used to formulate and defend judgments, to communicate and collaborate to accomplish tasks and develop solutions	**Environment, Health & Safety** Has a focus on interrelationships of health, safety and environmental systems and the impacts of these systems on organizational performance for continuous improvement	**Global & Cultural Awareness** Has a focus on solutions and initiatives related to global issues and the benefits of working in diverse settings on diverse teams	**Information, Media and Technology** Has a focus on information and media literacy to improve productivity, solve problems and create opportunities	**Leadership** Has a focus on applying leadership skills in real-world, family, community and business and industry applications
12 Career Ready Practices**					
Attend to personal health and financial well-being	Apply appropriate academic and technical skills	Consider environmental, social and economic impacts of decisions	Work productively in teams while using cultural global competence	Employ valid and reliable research strategies	Act as a responsible and contributing citizen and employee
Plan education and career paths aligned to personal goals	Communicate clearly and effectively with reason			Use technology to enhance productivity	Model integrity, ethical leadership and effective management
	Demonstrate creativity and innovation				
	Utilize critical thinking to make sense of problems and preserve in solving them				

***See Section III**

****See** http://www.careertech.org/career technical-education/cctc/

Wisconsin Standards for Career and Technical Education (CTE)

The **Wisconsin Standards for Career and Technical Education** are sets of standards in each of the six content areas of Agriculture, Food and Natural Resources; Business and Information Technology; Family and Consumer Sciences; Health Science; Marketing, Management and Entrepreneurship; and Technology and Engineering. The **Wisconsin Standards for CTE** are written at the **learner level** and provide instruction and assessment at the PK-12 level,

that, when coupled with postsecondary education and training, leads to the mastery of end-of-pathway standards. Therefore, the **Wisconsin Standards for CTE** align to **Career Clusters and Pathways** and provide an excellent foundation for students **toward meeting the end-of-pathway** expectations.

In Summary

Career Clusters and Pathways provide an organizational structure for developing Programs of Study while building connections to current labor market information and future workforce demands. As noted previously, Programs of Study used within CTE help to create relevance for students in all subject areas. This relevance translates into improved student engagement in the learning process and more in-depth comprehension and skill development. Further, the **Wisconsin Common Career Technical Standards (WCCTS**) and the **Career Ready Practices** serve as the foundation for career readiness that ensures students have flexibility to change career paths as their interests, passions and circumstances change while considering changes in the current and projected job market. In our dynamic and unpredictable world, Career Clusters and Pathways, along with **Wisconsin Standards for CTE** to include the WCCTS, provide a measure of stability and certainty on which to build a successful future.

The Importance of Career and Technical Education

By meeting the current needs and anticipating the future demands of the economy, CTE is critical to our nation's economic success.† Quality CTE programs have planned course sequences of high-quality academic core content and technical skills that provide students with skills necessary for successful transition to postsecondary education or work in addition to a desire for life-long learning in global society.

CTE has grown and evolved to become a focus in schools, workforce and government. The importance and need for career and technical education in our society should be at the forefront of career decision making for the following reasons:

- CTE organizes both academics and career education into a practical program for workforce preparation, elevating the level of rigorous, challenging and applicable coursework leading to more informed preparation.
- CTE in schools promotes the wide variety of postsecondary options to help individuals choose and recognize pathways that will provide the most successful level and type of training for their future goals in postsecondary education, military or work, while understanding the need for lifelong learning and career development.
- CTE provides opportunities to develop 21st century and employability skills, exposure to work and mentoring from employers and connections with postsecondary education.
- CTE creates a positive, thoughtful learning environment for self-discovery, innovation and leadership to more lifelong career satisfaction and success.
- CTE recognizes the diverse needs, behaviors, backgrounds, environments and preferences of students by creating an approach for individual guidance and preparation for goals, plans and dreams.
- CTE is dynamic, flexible and responsive to the changes and advances of technology, education, the workforce and the economy by incorporating methods, ideas and resources to keep CTE relevant and contemporary.

CTE has a positive impact on student achievement and transitions. Programs help students find their passion, boost their confidence and empower them to succeed. Because CTE demonstrates a positive return on investment, CTE is a trusted, long-standing partner with the employer community.†

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† "Reflect, Transform, Lead: A New Vision for Career Technical Education." National Association of State Directors of Career Technical Education Consortium (NASDCTEc), 2010.

The Importance of Technology and Engineering in Wisconsin and Our Communities

With the growing importance of technology and engineering in our world, it is critical that our students receive education that emphasizes technological literacy. For generations, Wisconsin's technology and engineering education programs have made a significant contribution in the development of a world class work force.

Technology and Engineering is relevant and engaging

Technology and engineering education is at the heart of today's high-skilled, high-tech global economy. Many of workforce conversations involve manufacturing, construction, communications, transportation and STEM and easily relate to the content of technology and engineering courses. From engineering to manufacturing, electronics to graphics and sustainability, technology and engineering classes are at the forefront of today's work force and economic issues. Technology and engineering classrooms go beyond the construction of physical objects. Technology and engineering courses, which are applied classes, engage students in design, building, problem-solving, repair or service; are collaborative in nature and prepare students to be college and career ready.

Technology and Engineering is important to the economy

Technology and engineering education mostly encompasses five career cluster areas: Architecture and Construction, Arts A/V and Communication, Manufacturing, STEM and Transportation, Distribution and Logistics. Together, these large cluster areas provide opportunities for students in career exploration and career development. Manufacturing cluster courses such as welding are helping to solve the workforce skills shortage. According to the Bureau of Labor Statistics, welding and welding related fields are some of the most steady growth career fields students can choose. † STEM teaching and learning is another innovative approach for all learners that will contribute to Wisconsin being globally competitive. Providing career pathways for young people to acquire the knowledge and skills is essential to the future of America.

Technology and Engineering prepares for college and careers

As part of Career and Technology Education, postsecondary preparation is an inherent part of technology and engineering education. It is the mission of all technology and engineering educators to help students identify their own personal career ambitions and to determine which postsecondary institution will best meet the students' own needs for whatever career path they choose. Without technology and engineering education, students would lose a key opportunity to prepare themselves for the challenging world that awaits them after high school.

Technology and Engineering goes beyond the classroom

Technology and engineering education is able to reach beyond the four walls of a classroom through work-based learning options built on active participation with business and industry. Engaging students in high-quality technology and engineering classrooms can be found in a variety of capstone type work-based learning options in State Certified Skill Certificates and Youth Apprenticeship programs.

Through a proven system of developing leadership and technical skills, the student organization SkillsUSA should be part of every technology and engineering program. SkillsUSA is another significant way of taking technology and engineering education beyond the classroom. SkillsUSA prepares students for future careers by introducing them to the business culture. It emphasizes respect for the dignity of work, high standards, ethics and technical skills. SkillsUSA is an extremely effective instructional tool that connects our technology and engineering classrooms with college and careers.

SkillsUSA is:

- an extension of our classroom program;
- an instructional strategy used to develop, improve and expand occupational competencies;
- an avenue for students to gain personal and leadership skills; and
- an avenue to increase student motivation and support curricular integration.

Technology and Engineering is interdisciplinary and collaborative

Technology and engineering education provides specific connections between all content areas in secondary schools. Technology and Engineering lessons are heaped in technical concepts, design, science and math. Technology and engineering also has the technology education/science and math equivalent credit process. This process allows students to take a technology and engineering course and earn an equivalent math or science credit which counts for graduation. As part of career preparation and through involvement in the SkillsUSA organization, students in technology and engineering education develop strong abilities to work with others through collaboration and leadership. For a student to succeed after high school, they must have the ability to use their knowledge and skills in collaboration with the knowledge and skills of others in an interdependent manner. Technology and engineering education consistently provides specific and regular opportunities for students to become more productive citizens and employees through regular collaboration.

Technology and Engineering creates students who care

Technology and engineering education and SkillsUSA provides an educational experience that plays an important role in the development of citizens and the future workforce. Technology and engineering students are committed to serving their communities, with an eye toward solving problems that help those less fortunate. These activities emphasize ethics, high moral standards, communication and teamwork.

In summary

Technology and engineering education is an interdisciplinary STEM subject that provides multifaceted opportunities for students to become prepared for careers and for postsecondary education through theory and hands-on lessons in the classroom and industry-based opportunities outside of schools. The major force driving technology and engineering education is change. Contemporary technology and engineering programs are essential to Wisconsin and the nation's global competitiveness. Technology education, along with SkillsUSA, has the potential to elevate students to ensure the United States has a highly skilled workforce for generations to come.

†U.S. Department of Labor, Bureau of Labor Statistics. (2010). Occupational Outlook Handbook 2010-2011. Retrieved from http://www.bls.gov/oco

Work-Based Learning in Technology and Engineering Education Programs

One of the goals of technology and engineering programs is to prepare all students to be college and career ready. Providing work-based learning opportunities is an important step to becoming career ready. Engaging work-based learning experiences allow students to apply knowledge and technical skills to real-world projects and problems alongside professionals. Technology and engineering students who participate in programs such as the State Certified Construction Cooperative program and Youth Apprenticeship Manufacturing program makes a significant contribution to student's success in life.

Technology and engineering students seek a clear connection between their future career(s) and their class work. The opportunity to explore and experience the world of work is beneficial to career decision-making. These experiences provide students with a firsthand look at what skills and knowledge are needed to be successful in their chosen industry. Work-based learning is a key to a successful economy.

Some work-based education programs provide an opportunity for students to earn postsecondary credits concurrently while earning high school credit. This may occur through local agreements between a high school and college (such as a technical college or university) or through a more comprehensive agreement at the state or national level.

Today, most career pathways require some form of postsecondary education, whether it is an entry-level job, a management position for a mid-career professional or perhaps even a shift from practicing a profession to teaching others. A particular job might require a certificate, a two-year degree, a four-year degree, a doctorate or even a handful of courses to hone in on a particular piece of knowledge or a skill.†

Wisconsin SkillsUSA and Work-Based Learning

Recognized as integral to the success of work-based learning programs, the SkillsUSA organization is an important part in the success of our technology and engineering students. Through a proven system of developing leadership skills, positive attitudes and a sense of community pride, SkillsUSA serves a vehicle to transition students into careers. SkillsUSA prepares students for future careers by introducing them to the world of work. SkillsUSA emphasizes respect for the dignity of work, high standards, ethics and high quality skills. It is an extremely effective instructional tool that connects our technology and engineering classrooms with college and careers.

Work-Based Learning Options and Implementation in Technology and Engineering

Job Shadowing

Job shadowing is a career exploration strategy. As such, it is most appropriate at the middle school level. Middle school is the time for students to explore the broad range of occupations so that later on they will be able to narrow their career interests. High school students who have not narrowed their career interests by tenth grade may also find job shadowing to be a useful activity.

Service Learning

Service-learning is a teaching method that engages students in solving problems within their schools and communities as part of academic studies. In Wisconsin, service-learning is defined as "a teaching and learning method which fosters civic responsibility and links classroom learning and applied learning in communities." The strongest service-learning experiences occur when the service is intentionally immersed in ongoing learning and is a natural part of the curriculum that extends into the community.

Local Cooperative Education Program
Local Co-op involves paid work for a local credential that adds value for programs. Students can earn a high school credit for co-op experience and possible postsecondary credit. The number of required work hours is determined by the local school district and the program is administered by the local school district. Typically a local co-op is one year in length and can include all Career and Technical Education content areas.

School Based Enterprise
School-based enterprises (SBE) are effective educational tools in helping to prepare students for the transition from school to work or college. For many students, they provide the first work experience; for others, they provide an opportunity to build management, supervision and leadership skills. SBE activities help students increase their skills in management, problem solving, business operations, time management and working in teams.

Youth Leadership Skill Standards Program
The Youth Leadership Certificate is a set of competencies to recognize a student's mastery and exhibition of leadership skills valued by employers, communities and organizations. The certificate earned by the student will be issued by the State of Wisconsin and becomes a part of the student's portfolio and resume.

Employability Skills Certificate Program
The Employability Skills Certificate Program is a set of competencies developed for all students in order to recognize a student's mastery of employability skills valued by employers, to help students explore career interests and to provide a state credential of student mastery.

State Certified Cooperative Education Skill Standards Program
Wisconsin's Cooperative Education Skill Standards Certificate Program is designed in partnership with business, industry and labor representatives and educators around the integration of school-based and work-based learning and appropriate career development experiences. The program is designed to provide paid work experience for junior and senior high school students which contribute substantially to their educational and occupational development. Students learn technical tasks and employability skills validated by business and industry representatives in cooperation with high school, technical college and university instructors.

Technology and engineering students can choose from the electronics or construction skill standards program.

Wisconsin Youth Apprenticeship
Wisconsin's Youth Apprenticeship program is a part of a statewide School-to-Work initiative supported by the Wisconsin Department of Workforce Development (DWD). It is designed for high school students who want hands on learning in an occupational area at a worksite along with classroom instruction. The program is for high school juniors and seniors requiring a minimum of 900 hours (450 each year) of paid experience. In mentored on-the-job training, the mentor serves as a guide and sponsor of the Youth Apprentice and encourages the student's progress in the workplace. The DWD issues a Certificate of Occupational Proficiency to students who successfully complete the program.

The Youth Apprenticeship area has several choices for technology and engineering students to choose from including; Architecture and Construction, Arts, A/V Technology and Communications, Information Technology, Manufacturing, STEM and Transportation, Distribution and Logistics.

In Closing

Career and Technical Education programs use contemporary concepts and strategies to prepare students who are college and career ready. Today's 21st century workplace requires people with the leadership, teamwork and communication skills to perform effectively. Work-based learning programs have proven successful in developing these skills in students of all ages and backgrounds.

† http://careerreadynow.org/docs/CRPC_4pagerB.pdf

Career and Technical Student Organizations in Technology and Engineering Education Programs

SkillsUSA is the student organization for middle and high school technology and engineering education programs as recognized by the Wisconsin Department of Public Instruction. SkillsUSA was introduced in 1973 when schools involved with the Wisconsin Industrial Education Association voted to affiliate with a strong national organization. Wisconsin SkillsUSA began its history during the fall of 1973 with 282 members in thirteen schools. Wisconsin SkillsUSA has mentored students for over 40 years. SkillsUSA enhances the preparation for college and careers by providing an intra-curricular program that is integrated into technology and engineering classrooms. SkillsUSA is an applied method of instruction for preparing America's high performance workers in public career and technical programs. It provides quality educational experiences for students in leadership, teamwork, citizenship and character development. It builds and reinforces self-confidence, work attitudes and communications skills. SkillsUSA believes; in the dignity of work, in the American way of life, in education, in fair play, that satisfaction is achieved by good work and in high moral and spiritual standards. SkillsUSA also promotes understanding of the free-enterprise system and involvement in community service.

SkillsUSA Mission
SkillsUSA's mission is to help its members become world-class workers, leaders and responsible American citizens.

SkillsUSA Motto
Preparing for Leadership in the World of Work

Program of Work
The heart of SkillsUSA is the program of work or what chapters do annually. It is the activities and projects—the plan of action—that chapters carry out during the school year. The program of work sets the pace for SkillsUSA in Wisconsin and the nation. The expectation is that each chapter will carry out this program of work. All SkillsUSA programs are in some way related to the following seven major goals.

- **Professional Development**
  To prepare each SkillsUSA member to be college and career ready and ultimately ready for entry into the workforce and provide a foundation for success in a career pathway. Becoming a professional does not stop with acquiring a skill, but involves an increased awareness of the meaning of good citizenship and the importance of labor and management in the world of work.
- **Community Service**
  To promote and improve good will and understanding among all segments of the community through services donated by SkillsUSA chapters and to instill a lifetime commitment to community service.
- **Employment**
  To increase student awareness of quality job practices and attitudes and to increase the opportunities for employer contact and eventual employment.
- **Ways and Means**
  To plan and participate in fundraising activities to allow all members to carry out the chapter's projects.
- **SkillsUSA Competitive Events and Championships**
  To offer students the opportunity to demonstrate their skills and be recognized for them through competitive activities in occupational areas and leadership. SkillsUSA members have the opportunity to experience competitive events at a variety of different levels. Many local middle and high school chapters will attend one of six district events in the state. The next level is to compete in a regional event, then on to the SkillsUSA State

Leadership Conference. Students who are awarded gold medal at the State Leadership Conference advance to the SkillsUSA National Leadership and Skills Competition, where over 15,000 students, advisors, business and industry gather to compete, network, attend educational and leadership sessions and more. And through additional qualifying, some national gold medal winners have the opportunity to compete at the biennial World Skills Competition.

- **Public Relations**
  To make the general public aware of the good work that students in career and technical education are doing to better themselves and their community, state, nation and world.
- **Social Activities**
  To increase cooperation in the school and community through activities that allow SkillsUSA members to get to know each other in something other than a business or classroom setting.

In Summary

Career and Technical Student Organizations, like SkillsUSA, are valuable opportunities for students to develop technical and leadership skills, presents chances to get involved in communities and give back and showcases students' skills and abilities through competition. These opportunities, along with related classroom instruction, support young men and women in preparing for their future endeavors.

Section III

Wisconsin Common Career Technical Standards

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Wisconsin's Approach to Common Career Technical Standards

With the release of the Wisconsin Standards for Career and Technical Education (CTE), Wisconsin CTE teachers have access to the foundational knowledge and skills needed to educate students for successful entry into hundreds of high-wage, high-demand occupations and careers. Vetted by business, industry and education professionals, these standards guide Wisconsin schools, teachers and community partners toward development and continuous improvement of world class CTE courses and programs.

The learning priorities and performance indicators contained within each set of CTE standards consists of knowledge and skills specific to the respective disciplines and its related jobs and careers. These are, of course, critical as students develop and pursue their career goals. In addition, knowledge and skills exist that are common to the pursuit of jobs and careers in any field. It is this set of common career knowledge and skills that are contained in the **Wisconsin Common Career Technical Standards**.

The Wisconsin Common Career Technical Standards (WCCTS) include the CTE related knowledge and skills that all students should have to be college and career ready and they provide a foundation on which the discipline-specific CTE standards are built. In some cases, discipline-specific standards will be similar to the WCCTS, but those discipline-specific standards will have a depth or nature that is specific to that discipline and its related jobs and careers.

These WCCTS, which are included as an additional section in each of the discipline-specific CTE standards documents, have been developed from a broad collection of potential standards using a "workplace" lens. In other words, when determining common standards for all CTE areas, their relevance to being successful and valued as an employee in a wide range of career clusters and pathways has been considered. From this perspective, six areas for the WCCTS emerged: **Creativity, Critical Thinking, Communication and Collaboration; Career Development; Environment, Health and Safety; Global and Cultural Awareness; Information, Media and Technology**; and **Leadership**.

Numerous existing sets of standards and standards-related documents have been used in developing the Wisconsin Common Career Technical Standards. These include:

- 21st Century Skills
- Career Cluster Essential Knowledge and Skills Statements
- Wisconsin Employability Skills Certificate
- Wisconsin Youth Leadership Skill Certificate
- National Career Development Association Career Development Standards
- Wisconsin Comprehensive School Counseling Model
- NASDCTEc Common Career Technical Core Initiative

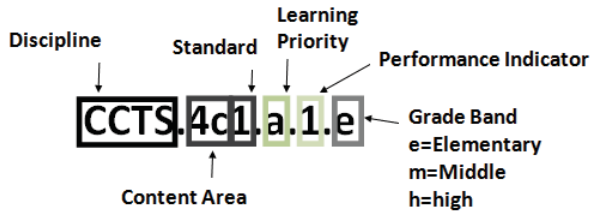
In addition to the Wisconsin Common Career Technical Standards, personal financial literacy and entrepreneurial knowledge and skills are an important part of a student's education. These areas were not included as part of the WCCTS since Wisconsin educators and schools use the Model Academic Standards for Personal Financial Literacy and *Wisconsin's Vision for Entrepreneurial Education* which adapts the *National Content Standards for Entrepreneurs*. Educators should reference these two sets of standards for inclusion in CTE curriculum where appropriate.

As with all the standards, the Wisconsin Common Career Technical Standards may be taught and integrated through a variety of classes and experiences. Each district, school and program area should determine the means by which students meet these standards. Through the collaboration of multiple stakeholders, these foundational standards will set the stage for high-quality, successful, contemporary CTE courses and programs throughout Wisconsin's PK-12 systems.

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

Wisconsin Common Career Technical Standards (WCCTS)			
Content Area: 4C/Creativity, Critical Thinking, Communication and Collaboration			
Standard: 4C1: Students will think and work creatively to develop innovative solutions to problems and opportunities.			
	Performance Indicators (By Grade Band)		
Learning Priority	**PK-5**	**6-8**	**9-12**
4C1.a: Develop original solutions, products, and services to meet a given need.	**4C1.a.1.e:** Recognize that there can be multiple ways to solve a problem.	**4C1.a.4.m:** Analyze elements of a problem to develop creative solutions.	**4C1.a.7.h:** Develop original ways to solve a given problem.
	4C1.a.2.e: Explain how human needs and desires drive innovation.	**4C1.a.5.m:** Explain how a recently developed product or service fulfills a human need or desire.	**4C1.a.8.h:** Design a product or service that could fulfill a human need or desire.
	4C1.a.3.e: Explain how a solution to one problem may or may not work for a related problem or situation.	**4C1.a.6.m:** Describe how past experiences can inform current problem solving.	**4C1.a.9.h:** Apply past experiences to current problems in developing innovative solutions.

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 can be 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.

Wisconsin Common Career Technical Standards (WCCTS)

Content Area: 4C/Creativity, Critical Thinking, Communication and Collaboration

Standard: 4C1: Students will think and work creatively to develop innovative solutions to problems and opportunities.

	Performance Indicators (By Grade Band)		
Learning Priority	**PK-5**	**6-8**	**9-12**
4C1.a: Develop original solutions, products and services to meet a given need.	**4C1.a.1.e:** Recognize that there can be multiple ways to solve a problem.	**4C1.a.4.m:** Analyze elements of a problem to develop creative solutions.	**4C1.a.7.h:** Develop original ways to solve a given problem.
	4C1.a.2.e: Explain how human needs and desires drive innovation.	**4C1.a.5.m:** Explain how a recently developed product or service fulfills a human need or desire.	**4C1.a.8.h:** Design a product or service that could fulfill a human need or desire.
	4C1.a.3.e: Explain how a solution to one problem may or may not work for a related problem or situation.	**4C1.a.6.m:** Describe how past experiences can inform current problem solving.	**4C1.a.9.h:** Apply past experiences to current problems in developing innovative solutions.
4C1.b: Work creatively with others to develop solutions, products and services.	**4C1.b.1.e:** Recognize that an individual's background and experiences influence their perspective of problems and solutions.	**4C1.b.4.m:** Explain how multiple people can develop better solutions than an individual.	**4C1.b.7.h:** Incorporate the skills and experiences of others to develop a new solution to a problem.
	4C1.b.2.e: Participate with a group to develop new ideas.	**4C1.b.5.m:** Explain how multiple people and perspectives can develop better ideas than an individual.	**4C1.b.8.h:** Work as part of a team to design a product or service that could fulfill a human need or desire.
	4C1.b.3.e: Explain the value of multiple perspectives in solving problems and recognizing opportunities.	**4C1.b.6.m:** Explain how multiple people and perspectives can improve an existing product or process better than an individual.	**4C1.b.9.h:** Work as part of a team to improve an existing product or process.

Standard: 4C2: Students will formulate and defend judgments and decisions by employing critical thinking skills.			
	Performance Indicators (By Grade Band)		
Learning Priority	**PK-5**	**6-8**	**9-12**
4C2.a: Develop effective resolutions for a given problem, decision or opportunity using available information.	**4C2.a.1.e:** Differentiate between problems and symptoms.	**4C2.a.5.m:** Analyze symptoms to identify the root cause of a problem.	**4C2.a.11.h:** Determine the information needed to address an identified problem.
	4C2.a.2.e: Explain problems, decisions and opportunities faced by individuals and communities.	**4C2.a.6.m:** Develop multiple resolutions for a given problem, decision or opportunity.	**4C2.a.12.h:** Contrast the benefits and drawbacks of various proposed resolutions to a given situation.
	4C2.a.3.e: Explain the negative aspects of making decisions without adequate information and/or thought.	**4C2.a.7.m:** Identify problems that became worse due to poorly thought out or poorly informed solutions.	**4C2.a.13.h:** Predict how an action could result in unintended consequences, both positive and negative.
	4C2.a.4.e: Describe the concept of systems thinking.	**4C2.a.8.m:** Explain how implementation of a solution or action may affect one or more corresponding systems.	**4C2.a.14.h:** Analyze the impact of a decision using a systems thinking model.
		4C2.a.9.m: Explain how different resolutions may be appropriate under different circumstances.	**4C2.a.15.h:** Determine the best resolution for a problem, decision or opportunity based on given criteria.
		4C2.a.10.m: Explain the process for choosing an action or making a decision.	**4C2.a.16.h:** Defend an action taken or a decision implemented.
4C2.b: Develop and implement a resolution for a new situation using personal knowledge and experience.	**4C2.b.1.e:** Describe how past experience relates to new situations.	**4C2.b.3.m:** Analyze problems to determine what past experiences might be related and relevant.	**4C2.b.5.h:** Apply past experience to develop a course of action for a new situation.
	4C2.b.2.e: Describe how knowledge learned in one class can be used in other classes and situations.	**4C2.b.4.m:** Analyze a problem to determine how it relates to existing knowledge.	**4C2.b.6.h:** Use existing knowledge to develop a resolution for a new situation, problem or opportunity.

Standard: 4C3: Students will communicate and collaborate with others to accomplish tasks and develop solutions to problems and opportunities.			
	Performance Indicators (By Grade Band)		
Learning Priority	**PK-5**	**6-8**	**9-12**
4C3.a: Communicate thoughts and feelings with others using verbal and non-verbal language.	**4C3.a.1.e:** Discuss a shared experience with others.	**4C3.a.5.m:** Conduct a shared dialogue with others on a common problem or task.	**4C3.a.9.h:** Develop a mutually acceptable response to a question or problem.
	4C3.a.2.e: Identify a person's emotions based on expressions and body language.	**4C3.a.6.m:** Predict how a person's emotions may influence his/her communication.	**4C3.a.10.h:** Distinguish between what a person says and what their expressions and body language indicate.
	4C3.a.3.e: Describe various ways people communicate with each other without using words.	**4C3.a.7.m:** Explore non-verbal and non-written means of communication.	**4C3.a.11.h:** Communicate effectively in the presence of a language barrier.
	4C3.a.4.e: Demonstrate effective listening skills.	**4C3.a.8.m:** Implement effective listening skills in resolving a situation.	**4C3.a.12.h:** Utilize effective listening skills in creating consensus in a group.
4C3.b: Work collaboratively with others.	**4C3.b.1.e:** Describe various ways of generating ideas in a group setting.	**4C3.b.4.m:** Use idea generating practices as part of a group.	**4C3.b.7.h:** Participate in group processes to generate consensus.
	4C3.b.2.e: Complete an assignment as part of a group.	**4C3.b.5.m:** Describe ways to facilitate group collaboration.	**4C3.b.8.h:** Lead group processes to generate consensus.
	4C3.b.3.e: Compare the impact of face-to-face discussion with the use of technology for communication.	**4C3.b.6.m:** Demonstrate the use of various tools to communicate effectively with an individual or a group.	**4C3.b.9.h:** Incorporate the use of technology to productively plan, implement and evaluate a solution, process or procedure.
4C3.c: Use interpersonal skills to resolve conflicts with others in an ethical manner.	**4C3.c.1.e:** Compare and contrast ways of resolving conflicts with another person.	**4C3.c.4.m:** Resolve a conflict with another person with assistance.	**4C3.c.7.h:** Resolve conflicts productively with individuals as they arise.
	4C3.c.2.e: Describe ways of resolving conflicts within a team or group.	**4C3.c.5.m:** Contribute to resolving conflicts that occur within a team or group.	**4C3.c.8.h:** Lead a team or group through a conflict resolution process to reach a productive outcome.
	4C3.c.3.e: Explain ways in which an act might be considered ethical or unethical.	**4C3.c.6.m:** Explore the ethical considerations of a current or historical action or decision.	**4C3.c.9.h:** Defend personal ethics applied to common conflicts that arise during group interactions and team activities.

Wisconsin Common Career Technical Standards (WCCTS)

Content Area: CD/Career Development

Standard: CD1: Students will consider, analyze and apply an awareness of self, identity and culture to identify skills and talents.

	Performance Indicators (By Grade Band)		
Learning Priority	**PK-5**	**6-8**	**9-12**
CD1.a: Identify person strengths, aptitudes and passions.	**CD1.a.1.e:** Identify individual likes and dislikes related to utilizing skills and abilities.	**CD1.a.2.m:** Assess personal strengths, aptitudes and passions related to potential future careers.	**CD1.a.3.h:** Evaluate various occupations and career pathways to identify personal, academic and career goals based on personal strengths, aptitudes and passions.
CD1.b: Demonstrate effective decision-making, problem solving and goal setting.	**CD1.b.1.e:** Recognize consequences of decisions and choices.	**CD1.b.3.m:** Develop effective coping skills for dealing with problems.	**CD1.b.5.h:** Use a decision-making and problem-solving model.
	CD1.b.2.e: Define a goal and describe why it is important to have goals.	**CD1.b.4.m:** Identify long and short-term goals.	**CD1.b.6.h:** Develop an action plan to set and achieve realistic goals.
CD1.c: Interact effectively with others in similar and diverse teams.	**CD1.c.1.e:** Identify when it is appropriate to listen and when it is appropriate to speak.	**CD1.c.5.m:** Distinguish between appropriate and inappropriate behavior in a team setting.	**CD1.c.9.h:** Assess cultural differences and work effectively with people from a range of social and cultural backgrounds.
	CD1.c.2.e: Recognize personal boundaries, rights and privacy needs.	**CD1.c.6.m:** Conduct oneself in a respectable manner which acknowledges the personal boundaries, rights and privacy of others.	**CD1.c.10.h:** Critique different ideas and values while leveraging social and cultural differences to increase innovation, new ideas and quality of work.
	CD1.c.3.e: Demonstrate cooperative behavior in groups.	**CD1.c.7.m:** Display cooperative behavior and identify personal strengths and assets in groups.	**CD1.c.11.h:** Evaluate how the personal strengths and assets of others contribute to a cooperative group atmosphere.
	CD1.c.4.e: Describe what it means to show respect and appreciation for individual and cultural differences.	**CD1.c.8.m:** Show respect and appreciation for individual and cultural differences in groups.	**CD1.c.12.h:** Assess how respect and appreciation for individual and cultural differences impacts group processes.
CD1.d: Apply a range of relevant decision-making strategies.	**CD1.d.1.e:** Define what a decision is and how decisions can be made.	**CD1.d.3.m:** Evaluate the positive and negative implications of personal decisions.	**CD1.d.5.h:** Predict the outcome of various decisions on personal, social and career success.
	CD1.d.2.e: Demonstrate when, where and how to seek help with solving problems and making decisions.	**CD1.d.4.m:** Apply decision-making strategies to personal and team interactions.	**CD1.d.6.h:** Evaluate the impact of personal decision-making strategies on specific outcomes.

Standard: CD2: Students will identify the connection between educational achievement and work opportunities in order to reach personal and career goals.			
	Performance Indicators (By Grade Band)		
Learning Priority	**PK-5**	**6-8**	**9-12**
CD2.a: Apply academic experiences to the world of work, inter-relationships and the community.		**CD2.a.1.m:** Practice balancing school, studies, co-curricular activities, leisure time and family life.	**CD2.a.3.h:** Evaluate how performance and connections within the learning community enhance future opportunities.
		CD2.a.2.m: Describe a diverse range of opportunities available beyond high school.	**CD2.a.4.h:** Determine those opportunities that best support attainment of a specific career goal.
CD2.b: Assess attitudes and skills that contribute to successful learning in school and across the life span.	**CD2.b.1.e:** Set realistic expectations for work and achievement.	**CD2.b.4.m:** Assess changes due to influences and shifts in regional, national and global economies related to career opportunities.	**CD2.b.7.h:** Interpret and analyze the impact of current education, training and work trends on life, learning and career plans.
	CD2.b.2.e: Establish challenging academic goals.	**CD2.b.5.m:** Apply academic information from a variety of sources to enhance career preparedness and lifelong learning.	**CD2.b.8.h:** Assess education and training opportunities to acquire new skills necessary for career advancement.
	CD2.b.3.e: Explore local and regional labor market and job growth information.	**CD2.b.6.m:** Research local and regional labor market and job growth information to analyze career opportunities.	**CD2.b.9.h:** Analyze local and regional labor market and job growth information to select a career pathway for potential advancement.

Standard: CD3: Students will create and manage a flexible and responsive individualized learning plan to meet their career goals.			
	Performance Indicators (By Grade Band)		
Learning Priority	**PK-5**	**6-8**	**9-12**
CD3.a: Investigate the world of work in order to gain knowledge of self in order to make informed career decisions.	**CD3.a.1.e:** Locate, evaluate and interpret career information.	**CD3.a.5.m:** Demonstrate the ability to use technology to retrieve and manage career information that inspires educational achievement.	**CD3.a.10.h:** Analyze how career plans may be affected by personal growth, external events and changes in motivations and aspirations.
	CD3.a.2.e: Discuss and explain behaviors and decisions that reflect interests, likes and dislikes.	**CD3.a.6.m:** Build an ongoing awareness of personal abilities, skills, interests and motivation and determine how these fit with chosen career pathway.	**CD3.a.11.h:** Apply academic and employment readiness skills in work-based learning situations such as internships, shadowing and/or mentoring experiences.
	CD3.a.3.e: Give examples of positive personal characteristics (e.g., honesty, dependability, responsibility, integrity and loyalty).	**CD3.a.7.m:** Develop an individual learning plan to enhance educational achievement and attain career goals based on a career pathway.	**CD3.a.12.h:** Evaluate changes in local, national and global employment trends, societal needs and economic conditions related to career planning.
	CD3.a.4.e: Identify career opportunities of interest; match personal interests and aptitudes.	**CD3.a.8.m:** Choose career opportunities that appeal to personal career goals.	**CD3.a.13.h:** Recognize how chance opportunities integrate with learning and career goals.
		CD3.a.9.m: Use assessment results in educational planning including career awareness.	**CD3.a.14.h:** Implement an individual learning plan to maximize academic ability and achievement.
CD3.b: Examine and evaluate opportunities that could enhance life and career plans and articulate plan to guide decisions and actions.	**CD3.b.1.e:** Describe why people work and how aspects of the work environment affect lifestyle.	**CD3.b.2.m:** Describe educational levels (e.g., work-based learning, certificate, two-year, four-year and professional degrees) and performance skills needed to attain personal and career goals.	**CD3.b.4.h:** Implement strategies for responding to transition and change with flexibility and adaptability.
		CD3.b.3.m: Demonstrate openness to exploring a wide range of occupations and career pathways.	**CD3.b.5.h:** Evaluate the relationship between educational achievement and career development.

	Performance Indicators (By Grade Band)		
Learning Priority	**PK-5**	**6-8**	**9-12**
CD3.c: Employ career management strategies to achieve future career success and satisfaction.	**CD3.c.1.e:** Explain how good nutrition, adequate rest and physical activity affect energy levels and productivity in school and at work.	**CD3.c.3.m:** Identify work values and needs.	**CD3.c.5.h:** Determine how principles of equal opportunity, equity, respect, inclusiveness and fairness, affect career planning and management.
	CD3.c.2.e: Demonstrate the ability to seek assistance (e.g., with problems at school or work) from appropriate resources, including other people.	**CD3.c.4.m:** Define adaptability and flexibility in the world of work.	**CD3.c.6.h:** Discuss how adaptability and flexibility, especially when initiating or responding to change, contributes to career success.
Standard: CD4: Students will identify and apply employability skills.			
CD4.a: Identify and demonstrate positive work behaviors and personal qualities needed to be employable.	**CD4.a.1.e:** Identify behaviors that demonstrate self-discipline, self-worth, positive attitude and integrity.	**CD4.a.3.m:** Demonstrate self-discipline, self-worth, positive attitude and integrity.	**CD4.a.6.h:** Evaluate how self-discipline, self-worth, positive attitude and integrity displayed in a work situation affect employment status.
		CD4.a.4.m: Demonstrate flexibility and willingness to learn new knowledge and skills.	**CD4.a.7.h:** Assess how flexibility and willingness to learn new knowledge and skills affect employment status.
			CD4.a.8.h: Apply communication strategies when adapting to a culturally diverse environment.
	CD4.a.2.e: Describe positive work-qualities typically desired in each of the career cluster's pathways.	**CD4.a.5.m:** Identify positive work-qualities typically desired in each of the career cluster's pathways.	**CD4.a.9.h:** Use positive work-qualities typically desired in each of the career cluster's pathways.
			CD4.a.10.h: Manage work roles and responsibilities to balance them with other life roles and responsibilities.
CD4.b: Demonstrate skills related to seeking and applying for employment to find and obtain a desired job.	**CD4.b.1.e:** Identify the qualities employers may seek in a candidate.	**CD4.b.2.m:** Identify the components of a job description.	**CD4.b.5.h:** Use multiple resources to locate job opportunities.
		CD4.b.3.m: Use technology to assist in career exploration and job-seeking activities.	**CD4.b.6.h:** Prepare a resume, cover letter, employment application.

	Performance Indicators (By Grade Band)		
Learning Priority	**PK-5**	**6-8**	**9-12**
		CD4.b.4.m: Compare and contrast personal attributes with employment needs and trends.	**CD4.b.7.h:** Employ critical thinking and decision-making skills to exhibit qualifications to a potential employer in an interview.
CD4.c: Identify and exhibit traits for retaining employment.	**CD4.c.1.e:** Recognize the appropriate behavior and communication skills necessary in adult interactions.	**CD4.c.2.m:** Demonstrate the behavior and etiquette appropriate to interactions with adults.	**CD4.c.4.h:** Model behaviors that demonstrate reliability and dependability.
		CD4.c.3.m: Distinguish between appropriate behaviors in a social vs. professional setting.	**CD4.c.5.h:** Maintain appropriate dress and behavior for the job to contribute to a safe and effective workplace/jobsite.
			CD4.c.6.h: Complete required employment forms and documentation.
			CD4.c.7.h: Summarize key activities necessary to retain a job in an industry.
CD4.d: Develop positive relationships with others.	**CD4.d.1.e:** Define what it means to be respectful and non-judgmental.	**CD4.d.3.m:** Interact with others in a respectful and non-judgmental manner.	**CD4.d.5.h:** Participate in co-curricular and community activities to enhance the school experience.
	CD4.d.2.e: Define cooperation.	**CD4.d.4.m:** Use cooperative behavior in helping peers accomplish goals and tasks.	**CD4.d.6.h:** Evaluate the best method to assist co-workers in accomplishing goals and tasks.
			CD4.d.7.h: Examine the skills required to enable students to successfully transition to post-secondary opportunities.
			CD4.d.8.h: Use a systematic approach to academic and career planning for students to achieve their learning, socio-cultural and work goals.

Wisconsin Common Career Technical Standards (WCCTS)

Content Area: EHS/Environment, Health and Safety

Standard: EHS1: Students will identify the importance and interrelationships of health, safety and environmental systems and evaluate the impacts of these systems on organizational performance for continuous improvement.

	Performance Indicators (By Grade Band)		
Learning Priority	**PK-5**	**6-8**	**9-12**
EHS1.a: Assess the interdependency among natural and human-built systems, including social, ecological and economic health.	**EHS1.a.1.e:** Recognize and describe various types of natural and human-built systems.	**EHS1.a.5.m:** Describe the process of change, flow of energy and the importance of diversity in natural and human-built systems.	**EHS1.a.9.h:** Assess systems dynamics, including constant change and carrying capacity within social, ecological and economic systems.
	EHS1.a.2.e: Describe how social, ecological and economic systems have benefits and consequences.	**EHS1.a.6.m:** Compare ways in which social, ecological and economic systems have been managed.	**EHS1.a.10.h:** Evaluate the societal, ecological and economic costs and benefits of allocating resources in various ways.
			EHS1.a.11.h: Identify strategies to maintain societal, ecological and environmental health.
	EHS1.a.3.e: Describe how personal choices impact natural and human-built systems.	**EHS1.a.7.m:** Analyze the impact of personal choices regarding natural and human-built systems on future actions.	**EHS1.a.12.h:** Evaluate the impact of personal choices on the interactions or interdependency between natural and human-built systems.
	EHS1.a.4.e: Identify and give examples of short-term and long-term solutions to a problem.	**EHS1.a.8.m:** Evaluate the advantages and disadvantages of short-term and long-term solutions and the impacts on social, ecological and economic environments.	**EHS1.a.13.h:** Assess how the human-built environment can be designed or modified to promote ecological and economic health and provide a better quality of life.
EHS1.b: Engage in systems thinking and inquiry processes that identify problems while analyzing the impacts of decisions made now and in the future.	**EHS1.b.1.e:** Engage in a decision-making process that includes selecting and using data, suggesting possible alternatives, predicting consequences and defending the decision.	**EHS1.b.3.m:** Evaluate consequences of a variety of approaches on social, ecological and environmental systems.	**EHS1.b.5.h:** Formulate a plan of action that addresses a current issue that considers the impact on social, economic and ecological systems now and in the future.
	EHS1.b.2.e: Identify questions that require skilled investigation to solve current social, economic and ecological problems.	**EHS1.b.4.m:** Plan investigations to collect information, make predictions and offer explanations about the social, economic, and ecological questions asked.	**EHS1.b.6.h:** Communicate the results of an investigation of current issues' effects on social, economic and ecological systems.

	Performance Indicators (By Grade Band)		
Learning Priority	**PK-5**	**6-8**	**9-12**
EHS1.c: Develop solutions to social, economic and ecological problems without compromising the ability of future generations to meet their needs.	**EHS1.c.1.e:** Identify examples of how personal actions can influence social, economic and ecological systems.	**EHS1.c.4.m:** Give examples of education, economic and governmental institutions' and individuals' influence on social, economic and ecological systems.	**EHS1.c.7.h:** Analyze political, educational, economic and governmental influences on systems and identify the roles individuals play within the systems.
	EHS1.c.2.e: Identify local or regional social, economic and ecological issues.	**EHS1.c.5.m:** Explain the political, legal or economic reasons for resolving local, state and national social, economic or ecological issues.	**EHS1.c.8.h:** Explain the factors that contribute to the development of social, economic and ecological systems issues and policies.
	EHS1.c.3.e: Identify short-term and long-term solutions to a problem.	**EHS1.c.6.m:** Develop a plan for personal contribution toward improving or maintaining some part of the social, economic or ecological system.	**EHS1.c.9.h:** Formulate a plan to maintain or improve some part of the local or regional social, economic or ecological system.
EHS1.d: Implement personal and jobsite safety rules and regulations to maintain and improve safe and healthful working conditions and environments.	**EHS1.d.1.e:** Identify health and safety considerations in the classroom along with individual responsibility for maintaining conditions.	**EHS1.d.4.m:** Identify the relationships between school and community conditions with regard to personal and environmental health and safety.	**EHS1.d.7.h:** Assess workplace conditions with regard to personal and environmental health and safety.
	EHS1.d.2.e: Identify different types of jobs and how safety and health systems operate.	**EHS1.d.5.m:** Recognize and use systems in school and in the community that protect and enhance personal, environmental health and safety.	**EHS1.d.8.h:** Identify different workplace systems that protect and enhance personal and environmental health and safety.
	EHS1.d.3.e: Explain the origin of rules and laws to promote health and safety in school and work.	**EHS1.d.6.m:** Discuss employee rights and responsibilities and how to apply them in a workplace setting.	**EHS1.d.9.h:** Describe employee rights and responsibilities to maintain workplace health and safety, including compliance with rules and laws.

Wisconsin Common Career Technical Standards (WCCTS)

Content Area: GCA/Global and Cultural Awareness

Standard: GCA1: Students will propose solutions and initiatives related to global issues.

	Performance Indicators (By Grade Band)		
Learning Priority	**PK-5**	**6-8**	**9-12**
GCA1.a: Evaluate the effects of diversity encountered through interactions with people in or from other parts of the community, state, nation and world.	**GCA1.a.1.e:** List ways in which people are different from one another.	**GCA1.a.4.m:** Explain reasons people are different based on where in the world they live.	**GCA1.a.7.h:** Interpret how differences will affect people's interactions in their own communities and when traveling to other regions and countries.
	GCA1.a.2.e: List ways in which communities are different from one another.	**GCA1.a.5.m:** Describe reasons why communities develop differently.	**GCA1.a.8.h:** Explain the differences between communities located near one another as well as between nations.
	GCA1.a.3.e: Identify historical examples of large ethnic groups emigrating to a new country or community.	**GCA1.a.6.m:** Describe the effects of diverse groups moving into the same community.	**GCA1.a.9.h:** Predict the effects of a new group of people moving into an existing community.
GCA1.b: Explain how events in one part of the world affect nations, communities and individuals in other parts of the world.	**GCA1.b.1.e:** Summarize events taking place in various parts of the world.	**GCA1.b.4m:** Explain how an event in one part of the world caused an effect in another part of the world.	**GCA1.b.7.h:** Predict how a recent global event could affect community and self.
	GCA1.b.2.e: Discuss how personal differences can contribute to conflict between individuals.	**GCA1.b.5.m:** Describe how personal conflicts can lead to larger scale conflicts between groups of people.	**GCA1.b.8.h:** Describe events where conflicts escalated to become national or global conflicts.
	GCA1.b.3.e: Summarize challenges and crises taking place in various parts of the world.	**GCA1.b.6.m:** Explain how diversity can affect challenges and crises.	**GCA1.b.9.h:** Describe how diversity has impacted local, national or global challenges.
GCA1.c: Explain how diverse groups of people can work together to overcome local, national, regional and global crises.	**GCA1.c.1.e:** Identify ways in which diversity has led to innovation and opportunity.	**GCA1.c.4.m:** Discuss examples of diverse groups working together to make the world better.	**GCA1.c.7.h:** Explain how diverse groups could work collectively to resolve a local problem or challenge.
	GCA1.c.2.e: Give examples of nations collaborating.	**GCA1.c.5.m:** Discuss examples of diverse nations collaborating to make the world better.	**GCA1.c.8.h:** Analyze how diversity has contributed to successful resolution of global challenges.
	GCA1.c.3.e: Describe how diverse groups of people can work together.	**GCA1.c.6.m:** Explain how diverse nations can accomplish tasks a single nation could not.	**GCA1.c.9.h:** Predict how diverse nations may work together in addressing current global challenges and issues.

Standard: GCA2: Students will assess the benefits and challenges of working in diverse settings and on diverse teams.			
	Performance Indicators (By Grade Band)		
Learning Priority	**PK-5**	**6-8**	**9-12**
GCA2.a: Work effectively with diverse individuals in a variety of settings and contexts.	**GCA2.a.1.e:** Identify different ways people learn.	**GCA2.a.3.m:** Explain how people differ in the way they see the world and their experiences.	
	GCA2.a.2.e: List ways in which people are different from one another.	**GCA2.a.4.m:** Describe ways to collaborate in the presence of language, personality and cultural differences.	**GCA2.a.6.h:** Collaborate with others in the presence of language, personality and cultural differences.
		GCA2.a.5.m: Demonstrate mutual respect and open dialogue with individuals representing diverse cultures, beliefs and lifestyles.	**GCA2.a.7.h:** Collaborate with diverse individuals to accomplish tasks in personal, school, work and community contexts.
GCA2.b: Develop innovative solutions and initiatives as part of a diverse team.	**GCA2.b.1.e:** List differences between self and others on a team.	**GCA2.b.4.m:** Describe the value of traits, beliefs and experiences of others that differ from self.	**GCA2.b.7.h:** Develop ideas for using awareness of diversity to create new opportunities.
	GCA2.b.2.e: Identify benefits of working with someone with a diverse background or set of experiences.	**GCA2.b.5.m:** Demonstrate ability to learn from and work collaboratively with individuals representing diverse cultures, beliefs and lifestyles.	**GCA2.b.8.h:** Synthesize the experiences of a diverse group to develop innovative solutions to a given problem.
	GCA2.b.3.e: Identify how groups comprised of individuals from diverse backgrounds may approach situations differently than those of similar backgrounds.	**GCA2.b.6.m:** Contrast the capabilities of diverse teams with those of homogeneous teams.	

Wisconsin Common Career Technical Standards (WCCTS)

Content Area: IMT/Information, Media and Technology Skills

Standard: IMT1: Students will access, interpret and evaluate information from a variety of sources in order to inform and support premises, arguments, decisions, ideas and initiatives.

	Performance Indicators (By Grade Band)		
Learning Priority	**PK-5**	**6-8**	**9-12**
IMT1.a: Choose appropriate sources of data and information for a given purpose.	**IMT1.a.1.e:** Give examples of various sources of data and information.	**IMT1.a.3.m:** Compare and contrast the benefits and drawbacks of various information sources.	**IMT1.a.6.h:** Justify the selection of various information sources for a given purpose.
	IMT1.a.2.e: Discuss how individual and group biases can affect how information is portrayed.	**IMT1.a.4.m:** Explain how information can be portrayed differently by groups with varying purposes and perspectives.	**IMT1.a.7.h:** Explain the level of objectivity for a given source of information.
		IMT1.a.5.m: Use information sources to support an argument, idea or initiative.	**IMT1.a.8.h:** Model how raw data can be applied differently to support opposing arguments or premises.
IMT1.b: Determine the relevance, validity and timeliness of data and information.	**IMT1.b.1.e:** Describe the concepts of raw data and information.	**IMT1.b.4.m:** Distinguish the differences between raw data and information.	**IMT1.b.7.h:** Use raw data and information appropriately to support an argument, idea or initiative.
	IMT1.b.2.e: Discuss various electronic and non-electronic sources of data and information.	**IMT1.b.5.m:** Demonstrate ability to gather information from electronic and non-electronic sources.	**IMT1.b.8.h:** Compare and contrast validity of information from electronic and non-electronic sources.
	IMT1.b.3.e: Describe the concepts of relevance, validity and timeliness as they relate to data and information.	**IMT1.b.6.m:** Analyze various sources of data and information for relevance, validity and timeliness.	**IMT1.b.9.h:** Defend a position or decision using relevant, valid and timely data and information.
IMT1.c: Select relevant information necessary for making decisions and solving problems.	**IMT1.c.1.e:** Explain the concepts of relevance and reliability as they relate to data and information.	**IMT1.c.3.m:** Evaluate the relevance and reliability of various sources of information.	**IMT1.c.5.h:** Defend a solution or conclusion using appropriate data and information.
	IMT1.c.2.e: Identify various sources of information.	**IMT1.c.4.m:** Contrast the appropriateness of data and information from different sources for different purposes.	**IMT1.c.6.h:** Interpret and select appropriate information to develop a resolution for a given situation.

	Performance Indicators (By Grade Band)		
Learning Priority	**PK-5**	**6-8**	**9-12**
IMT1.d: Apply data and information to communicate ideas and create new opportunities.	**IMT1.d.1.e:** Identify different ways to communicate data and information.	**IMT1.d.3.m:** Demonstrate how information analysis can be used to identify entrepreneurial opportunities.	**IMT1.d.6.h:** Defend a proposal for a new product or service based on data and information analysis.
		IMT1.d.4.m: Incorporate information from multiple sources to communicate a new idea or support an argument.	**IMT1.d.7.h:** Synthesize data and information from multiple sources to identify new trends.
	IMT1.d.2.e: Collect and review data and information from multiple sources.	**IMT1.d.5.m:** Apply a system for tracking and accessing data and information from multiple sources.	**IMT1.d.8.h:** Manage and share stored data and information for a specific purpose.
Standard: IMT2: Students will apply information literacy skills to access and evaluate media to design and produce media products.			
IMT2.a: Analyze media messages to determine biases and objectivity.	**IMT2.a.1.e:** Identify various types of media.	**IMT2.a.4.m:** Explain the benefits and drawbacks of various forms of media.	**IMT2.a.7.h:** Defend the selection of various media formats for a given purpose.
	IMT2.a.2.e: Discuss how individual and group biases can affect how information is portrayed.	**IMT2.a.5.m:** Explain how media content is portrayed differently by groups with varying purposes and perspectives.	**IMT2.a.8.h:** Compare and contrast the level of objectivity for given media sources.
	IMT2.a.3.e: Discuss how individual and group biases can affect how information is received.	**IMT2.a.6.m:** Explain how information is manipulated in media depending on the intended audience.	**IMT2.a.9.h:** Portray information in different ways to account for different audiences.
IMT2.b: Prepare media products in order to communicate a specific message.	**IMT2.b.1.e:** Identify common principles of graphic design and advertising.	**IMT2.b.2.m:** Create media products using common principles of graphic design.	**IMT2.b.4.h:** Create media products to communicate a given message to different audiences.
		IMT2.b.3.m: Explain how various elements of media combine to deliver a desired message.	**IMT2.b.5.h:** Compare and contrast the elements of media products and how each helps deliver a desired message.

Standard: IMT3: Students will use available information and communication technology to improve productivity, solve problems and create opportunities.			
	Performance Indicators (By Grade Band)		
Learning Priority	**PK-5**	**6-8**	**9-12**
IMT3.a: Adopt new technological tools to increase personal and organizational productivity.	**IMT3.a.1.e:** Explore and use data management tools.	**IMT3.a.5.m:** Apply the use of data management tools in daily activities.	**IMT3.a.9.h:** Adapt and refine technology to continuously improve management of data in daily activity.
	IMT3.a.2.e: Explore and use communication tools.	**IMT3.a.6.m:** Demonstrate the ability to use electronic communication technology.	**IMT3.a.10.h:** Integrate technological tools to efficiently create and manage correspondence in daily activity.
	IMT3.a.3.e: Explore and use productivity tools.	**IMT3.a.7.m:** Apply the use of technological tools for managing calendars, schedules and work flow.	**IMT3.a.11.h:** Adapt and refine technology to continuously improve personal and organizational productivity.
	IMT3.a.4.e: Discuss how technology can serve as a positive and negative distraction.	**IMT3.a.8.m:** Explain how technology can detract from personal and organizational productivity.	**IMT3.a.12.h:** Manage use of technology to reduce negative impacts on productivity.
IMT3.b: Select and use communication and information technology to help solve problems and provide opportunities.	**IMT3.b.1.e:** Describe the nature of problems and how they can have multiple elements.	**IMT3.b.4.m:** Apply communication and information technology to the various elements of a problem.	**IMT3.b.7.h:** Use communication and information technology to effectively solve a given problem.
	IMT3.b.2.e: Discuss the impact of communication and information technology.	**IMT3.b.5.m:** Explain how communication and information technology have helped address national and global problems.	**IMT3.b.8.h:** Explain how communication and information technology could help address a current national or global problem.
	IMT3.b.3.e: Describe the nature of opportunities.	**IMT3.b.6.m:** Use communication and information technology to pursue a new opportunity.	**IMT3.b.9.h:** Assess the use of communication and information technology to create new opportunities.

Wisconsin Common Career Technical Standards (WCCTS)

Content Area: LE/Leadership

Standard: LE1: Students will apply leadership skills in real-world, family, community and business and industry applications.

	Performance Indicators (By Grade Band)		
Learning Priority	**PK-5**	**6-8**	**9-12**
LE1.a: Implement leadership skills to accomplish team goals and objectives.	**LE1.a.1.e:** Identify the various roles of leaders within organizations and give examples of positive leadership skills.	**LE1.a.5.m:** Exhibit skills such as empowerment, risk-talking, communication, focusing on results, decision-making, problem solving and investment in individuals when leading a group in solving a problem.	**LE1.a.10.h:** Exhibit skills such as compassion, service, listening, coaching, developing others, team development.
	LE1.a.2.e: Create a community of trust, giving space for different opinions and ideas to help students develop plans and prioritize tasks.	**LE1.a.6.m:** Consider issues related to self, team, community, diversity, environment and global awareness when leading others.	**LE1.a.11.h:** Demonstrate skills such as enthusiasm, creativity, conviction, mission, courage, concept, focus, principle-centered living and change when interacting with others in general.
	LE1.a.3.e: Describe effective leadership and teamwork skills and identify ways to participate in civic activities in school, family or the community.	**LE1.a.7.m:** Participate in civic and community leadership and teamwork opportunities to enhance skills to develop leadership potential.	**LE1.a.12.h:** Exhibit skills such as innovation, intuition, adaptation, life-long learning and coach-ability to develop leadership potential over time.
	LE1.a.4.e: Describe leadership in relation to trust, positive attitude, integrity, willingness and commitment to accept key responsibilities in a group project.	**LE1.a.8.m:** Explain leadership in relation to trust, positive attitude, integrity, willingness and commitment to accept key responsibilities in a group project.	**LE1.a.13.h:** Create a sense of trust, positive attitude, integrity, willingness and commitment in order to accept key responsibilities in a group project.
		LE1.a.9.m: Build interest, guide and influence decisions organize efforts and involve members of a group.	**LE1.a.14.h:** Apply parliamentary procedure to an appropriate situation.
LE1.b: Employ teamwork skills to achieve collective goals and use team members/ talents effectively.	**LE1.b.1.e:** Work with a group to meet objectives while including all members.	**LE1.b.4.m:** Involve of all members during group discussions.	**LE1.b.7.h:** Capitalize on team members' individual talents and skills in a project.
			LE1.b.8.h: Apply conflict management skills to help facilitate solutions.

	Performance Indicators (By Grade Band)		
Learning Priority	**PK-5**	**6-8**	**9-12**
	LE1.b.2.e: Demonstrate commitment and a positive attitude toward team goals.	**LE1.b.5.m:** Demonstrate teamwork skills through working cooperatively with group members, group leader and others, both in the school and in the community, to achieve group objective.	**LE1.b.9.h:** Evaluate and apply teamwork processes that provide team building, consensus, continuous improvement, respect for the opinions of others, cooperation, adaptability and conflict resolution.
	LE1.b.3.e: Outline plans to improve teamwork.	**LE1.b.6.m:** Demonstrate a positive attitude and a commitment toward achieving team goals.	**LE1.b.10.h:** Demonstrate the ability to negotiate and adapt effectively to changes in projects and work activities to meet timelines.
LE1.c: Identify the role of community service and service learning in family, community and business and industry.	**LE1.c.1.e:** Identify the roles and responsibilities of citizenship.	**LE1.c.3.m:** Analyze the roles and responsibilities of citizenship.	**LE1.c.6.h:** Assess the roles and responsibilities of citizenship and formulate an activity or event to showcase community service.
	LE1.c.2.e: Describe involvement in a civic activity.	**LE1.c.4.m:** Select and develop a community service activity/event.	**LE1.c.7.h:** Plan a community service event, participate in the event and evaluate its impact.
		LE1.c.5.m: Show organizational skills necessary to be a successful leader and citizen and practice those skills in real-life situations.	**LE1.c.8.h:** Plan and participate in activities that rate skills necessary to be a successful leader and citizen.
			LE1.c.9.h: Advocate for issues on the local, state and international level.
			LE1.c.10.h: Identify components and structure of community-based organizations.
			LE1.c.11.h: Participate in the development of a program of work/strategic plan and work to implement the organization's goals.

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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.

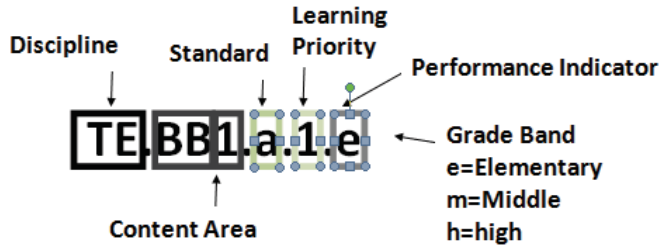
- Face-to-Face Classroom and Lab Instruction
- Digital Learning (models may include blended, hybrid and online distance learning at multiple grade levels)
- Transcripted Credit (partnering with local Technical College or University should be strongly considered)
- Youth Options
- Work-Based Learning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

Connecting Career and Technical Education to the Common Core State Standards

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Connecting Career and Technical Education to the Common Core State Standards

Introduction

In Wisconsin, the education vision is for every child to graduate ready for postsecondary education and the workforce—to be college and career ready. To achieve this vision, students must develop the skills to think, read, communicate and perform in many academic contexts. Since students must develop these specific skills, every educator must consider how students learn in their discipline.

In 2010, State Superintendent Tony Evers officially adopted the Common Core State Standards (CCSS) in English Language Arts, Mathematics and Literacy in All Subject Areas. The CCSS in Mathematics and English Language Arts are designed to be focused and coherent. Each is anchored in college and career readiness; as well as evidence and research-based. The CCSS signify the need to change practice in at least three areas: content, instruction and assessments. Building on the strength of the Common Core State Standards and the **Wisconsin Standards for Career and Technical Education**, educators in CTE must be knowledgeable in how both CTE and CCSS standards are addressed in their classrooms. Connections between the CCSS and CTE come in two forms.

Making the Connection: CCSS and CTE Content

1. **Integration with Disciplinary Literacy (Literacy in All Subjects) and Standards for Mathematical Practice**

   - **Standards and Instruction**- The knowledge and skills students learn in conjunction with content standards to assist students in reading, writing, speaking, listening and computing while using the specific knowledge and skills of the content area.
   - **Assessment** - Standards should be measured through multiple assessments including performance-based assessments, like those used in CTE to measure technical skill attainment.

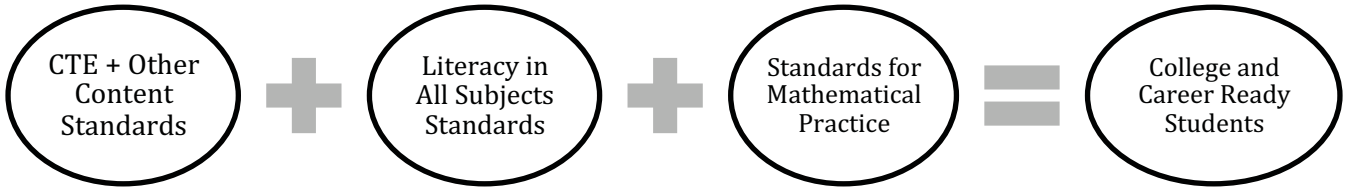
2. **Direct "return on investment" within course content where standards from other content areas are embedded:**

   - **Standards and Instruction** -- The use of multiple sets of standards to create relevance of content for students; both CTE **AND** content/standards from other subjects.
   - **Assessment** -- Standards should be measured through multiple assessments including performance-based assessments, like those used in CTE to measure technical skill attainment.
   - **Equivalency –** Equivalency *shows a one-to-one correlation between CCSS or other content areas such as science and social studies* ***and*** *CTE standards t*hrough a state approved equivalency process in conformity with the Wisconsin State Statute for equivalency credit (§ 118.33, Wis. Stats.). This is an option for CTE courses that prove to have sufficient academic content and are taught in a technical and applied setting.

When district administrators and teachers alike ask for "an alignment of CTE to the CCSS" there is uncertainty about what that means or looks like. It will take time for CTE and core teachers to review their standards before beginning to work collaboratively to see connections between sets of standards. The reality is that there is no easy "one-to-one" match between CTE and CCSS and other content standards—it is about changing the role of the teacher to not only be experts in their content area, but to engage in deep conversations with colleagues across all content areas to make strong connections for students.

The Connection

This visual shows the relationship of the CCSS and CTE Content that, when combined together and adding the standards from other content areas, ensures that students are college and career ready for further education in their chosen pathway.

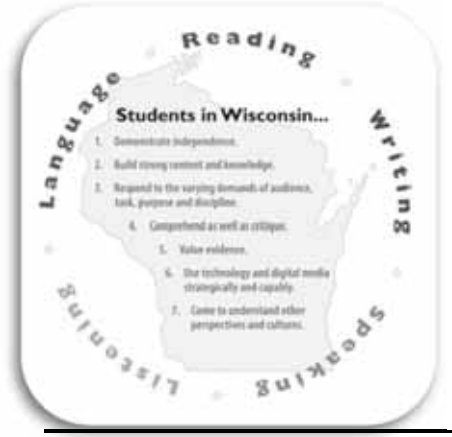


Literacy in All Subjects: The Shift

The shift in English language arts means a shared responsibility across all grade levels for all students. Extensive research establishes the need for college and career ready students to be proficient in reading both complex literary text and informational texts independently across a variety of content areas. Literacy, the ability to read, write, listen, speak, think critically and perform in different ways and for different purposes, begins to develop early and becomes increasingly important as students pursue specialized fields of study in high school and beyond. The Common Core State Standards (CCSS) for Literacy in All Subjects† are connected to college and career readiness standards that guide educators as they strive to help students meet the literacy challenges within each particular field of study. This national effort is referred to as "disciplinary literacy" that prepares students for college and career readiness.

In Wisconsin, disciplinary literacy is defined as the confluence of content knowledge, experiences, and skills merged with the ability to read, write, listen, speak, think critically and perform in a way that is meaningful within the context of a given field.
~ Taken from "Literacy in All Subjects."

Disciplinary Literacy will look different in every classroom based upon the nature of the academic standards addressed within the course and the types of reading and writing required to convey knowledge. Students are reading texts to gain knowledge about the discipline; teachers are engaging students with questions and performance tasks; students are writing/composing/creating.



For the first time ever, the Common Core State Standards identify the specific literacy skills that should be a part of the Career and Technical Education (CTE) and other disciplines. The task, as experts, is to expose students to the authentic literacy activities of the discipline and teach students how to interact with content effectively. It is often taken for granted that by high school, students should be able to read what is given to them, but research now shows otherwise. The standards make it clear: Literacy must be taught—not assigned—within every classroom, every day.

"Literacy is a prerequisite to learning in all other subjects, especially as students are exposed to increasingly diverse and intricate texts from which they need to glean knowledge. Unfortunately, too many adolescents lack the literacy skills necessary to navigate the reading and writing requirements of high school and the future world in which they will work and live…While educators around the country are seeking ways to address this [literacy] challenge, career and technical education (CTE) programs are

stepping up to offer students a rigorous and relevant education rich in literacy content and strategies. CTE courses, often overlooked in academic discussions, can have a tremendous impact on students' literacy engagement and achievement and must be considered as part of the adolescent literacy solution."

~CTE's Role in Adolescent Literacy. Issue Brief, November 2009, Association for Career and Technical Education

Mathematical Practices: The Shift

"When today's students become adults, they will face new demands for mathematical proficiency that school mathematics should attempt to anticipate. Moreover, mathematics is a realm no longer restricted to a select few. All young Americans must learn to think mathematically and they must think mathematically to learn."

~Adding It Up, National Research Council, 2001

The shift in mathematics processes means students are able to transfer math skills and understanding across concepts and grades. Focus allows each student to think, practice and integrate new ideas into a growing knowledge structure. Mathematical proficiency is necessary for every student. Therefore, understanding concepts and being fluent are both important.

This means teaching more than ***"how to get the answer"*** and instead ***support students' ability to access concepts*** from a number of perspectives while demonstrating conceptual understanding of core math concepts by applying them to new situations. Teachers in content areas outside of math, particularly science and CTE, ensure students are using math at all grade levels to make meaning of and access content. Educators must intentionally engage students at all levels, so they are readily able to apply mathematics in their ever-changing world.

By combining the mathematical practices and CTE standards, it allows the teacher to build on students' prior learning from multiple content areas. Students are able to see the relevance of their learning in their chosen career pathway and deepen their learning by transferring skills and concepts.

Connecting to Other Content Area Standards

Career and Technical Education courses and programs are the quintessential convergence of standards from numerous content areas. Not only do students learn the knowledge and skills necessary for successful transition to college and careers, they also practice and apply their learning in real-life instructional situations that prepare them for specific entry-level careers and postsecondary studies. Along with CTE specific standards, students are also applying and reinforcing the standards learned in many other areas of study; such as, science, arts and creativity, social studies and mathematics. Educators should be considering how standards from other content areas are incorporated into instruction and assessments within CTE courses and units.

Other standards, such as the Wisconsin Model Academic Standards for Personal Financial Literacy, National Content Standards for Entrepreneurship and the Career Cluster's Green/Sustainability Standards, can easily be embedded into CTE coursework curriculum and activities to reinforce the knowledge and skills that are important for every future employee and citizen.

Showcasing the connections made through CTE courses and programs serves to illustrate student mastery of all of these areas that make them truly ready for the next stage of their lives.

Performance Tasks

Wisconsin is a Smarter Balanced Assessment Consortium (SBAC) state, so the Theory of Action outlined by SBAC for creating performance tasks have been adapted for Wisconsin's classrooms. Performance tasks challenge students to apply their knowledge and skills to respond to real-world problems. They can best be described as collections of questions and activities that are coherently connected to a single theme or scenario. These activities are meant to measure capacities such as depth of understanding, research skills and complex analysis, which cannot be adequately assessed with selected- or constructed-response items.

When determining performance tasks, teachers need to determine ***the purpose*** of the performance task: Is the performance task going to plan, support, monitor or verify learning? Teachers need to determine ***the type*** of assessment the performance task is going to be: Is the performance task going to be a formative, benchmark or summative assessment?

Once that is decided, then teachers can design the performance task. A performance task presents students with a complex, real-world challenge in which the scenario, role, process and product are authentic; students must then demonstrate that they have the skills and knowledge to complete the task.

Elements of a performance task:

- Integrate knowledge and skills across multiple content standards or strands within a content area.
- Measure capacities such as depth of understanding, research skills, complex analysis and identification/providing of relevant evidence.
- Require student-initiated planning, management of information and ideas, interaction with other materials.
- Require production of extended responses, such as oral presentations, exhibitions and other scorable products, including more extended written responses, which might be revised and edited.
- Reflect a real-world task and/or scenario-based problem.
- Allow for multiple approaches.
- Represent content that is relevant and meaningful to students.

- Allow for demonstration of important knowledge and skills, including those that address 21st-century skills such as critically analyzing and synthesizing information presented in a variety of formats, media, etc.
- Require scoring that focuses on the essence of the task.
- Be feasible for the school/classroom environment.

In the next section there are examples of implementing CCSS into specific content areas through the use of performance tasks using sentence frames like the one shown below.

After reading/listening/viewing/researching _____ (texts), write/create/present _____ (product) for _____ (audience) that provides an/a explanation/argument/narrative _____ (content) so that _____ (purpose/so what).

† Transformed in Wisconsin from the Common Core State Standards for Literacy in Science, Social Studies, History and Technical Subjects.

Connecting Technology and Engineering to the Common Core State Standards

Connecting To Academic Standards through Performance Tasks

Once the purpose and type of performance task is decided, teachers can then design the performance task. A performance task presents students with a complex, real-world challenge in which the scenario, role, process and product are authentic; students must then demonstrate that they have the skills and knowledge to complete the task.

Displayed below is an example of a tool known as a sentence frame that may be used to develop a performance task in a Technology and Engineering course. Implementing CCSS may look different for every teacher, every program, every course and potentially every unit. Once a performance task has been identified, then an instructor may connect the task to academic standards associated with the respective content area within Technology and Engineering, as well as within other academic areas.

(Example 1: grade 9-10 performance task in an Introduction to Engineering Course)

After reading/researching/listening/viewing stairway construction and local building codes, write/create/present an economical stairway design plan for a custom home that conforms to local building codes (product) for the home owners (audience) that provides a/an explanation/argument/narrative that mathematically the stairway is engineered safely (content) so the owners can make a decision based on function, safety and cost. (purpose/so what).

The following academic standard(s) are addressed through the performance task displayed above:

Technology and Engineering Standards

AC1.b.11.h: Identify design solutions for residential construction problems**.**

ENG1.a.8.h: The design process includes defining a problem, brainstorming, researching and generating ideas, identifying criteria and specifying constraints, exploring possibilities, selecting an approach, developing a design proposal, making a model or prototype, testing and evaluating the design using specifications, refining the design, creating or making it and communicating the process and results.

Literacy Standards

Anchor Standard for Reading 1: Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.

Anchor Standard for Reading 2: Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon or concept; provide an accurate summary of the text.

Anchor Standard for Reading 4: Determine the meaning of symbols, key terms and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.

Anchor Standard for Writing 4: Produce clear and coherent writing in which the development organization and style are appropriate to task, purpose and audience.

Anchor Standard for Writing 7: Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

Mathematical Practices

Make sense of problems and persevere in solving them.

Reason abstractly and quantitatively.

Construct viable arguments and critique the reasoning of others.

Standards for Scientific and Engineering Practice

Asking questions and defining problems.
Planning and carrying our investigations.
Using mathematics and computational thinking.
Constructing explanations and designing solutions.
Engaging in argument from evidence.
Obtaining, evaluating and communication evidence

Other Content Standards Alignment

Social Studies/Economics
Mathematics
Personal Financial Literacy

(Example 2: grade 11-12 performance task in a Residential Construction course)

The Residential Construction class wants to take an extended field trip (audience). After reading/researching/listening/viewing storage shed costs, a student team will write/create/present their finding for building yard storage sheds (product) and provide a/an explanation/argument/narrative of each building option and includes a forecast of estimated revenues and expenses (content) so the class may debate options and make an official request seeking approval for at least one option to the school/district administration. (purpose/so what).

The following academic standard(s) are addressed through the performance task displayed above:

Technology and Engineering Standards

AC1.b.12.h: Calculate required materials for residential construction applications.
AC1.e.14.h: Understand how to estimate materials from blueprints and specifications.

Literacy Standards

Anchor Standard for Reading 2: Determine the central ideas or conclusions of a text; summarize complex concepts, processes or information presented in a text by paraphrasing them in simpler but still accurate terms.
Anchor Standard for Writing 2: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments or technical processes.
Anchor Standard for Writing 4: Produce clear and coherent writing in which the development organization and style are appropriate to task, purpose and audience.

Mathematical Practices

Reason abstractly and quantitatively.
Construct viable arguments and critique the reasoning of others.
Use appropriate tools strategically.
Attend to precision.

Standards for Scientific and Engineering Practice

Asking questions and defining problems.
Planning and carrying our investigations.
Using mathematics and computational thinking.
Constructing explanations and designing solutions.
Obtaining, evaluating and communication evidence

Other Content Standards Alignment

Mathematics

English Language Arts

The Value of Technology and Engineering

Through an example of a common performance task, the documentation above identifies that the connection to academic standards extends far beyond the Technology and Engineering classroom. Critical knowledge and skills are developed through performance tasks which challenge a student to apply prior knowledge emphasized in other academic areas when combined with discipline specific content in Technology and Engineering. Additionally, the discipline specific performance task can play a critical role in providing an opportunity for student growth in other core academic areas when this connection to an elective program of study is clearly made through classroom instruction. This reflective practice of combining Technology and Engineering Content Standards plus Literacy in All Subject Standards and Standards for Mathematical Practices plus standards for other content areas equals a greater assurance that students are college and career ready.

Reaching Every Student; Reaching Every Discipline

Reaching Every Student

The CCSS set high, clear and consistent expectations for all students. In order to ensure that all students can meet and exceed those expectations, Wisconsin educators provide flexible and fluid support based on student need. Each student brings a complex system of strengths and experiences to learning. One student may have gifts and talents in mathematics and need additional support to reach grade-level standards in reading. A student may be learning English as a second language while remaining identified for gifted services in science. The following statements provide guidance for how to ensure that the CCSS provide the foundation for learning for every student in Wisconsin, regardless of their unique learning needs.

Application of Common Core State Standards for English Language Learners

The National Governors Association Center for Best Practices and the Council of Chief State School Officers strongly believe that all students should be held to the same high expectations outlined in the Common Core State Standards. This includes students who are English language learners (ELLs). However, these students may require additional time, appropriate instructional support and aligned assessments as they acquire both English language proficiency and content area knowledge.

ELLs are a heterogeneous group with differences in ethnic background, first language, socioeconomic status, quality of prior schooling and levels of English language proficiency. Effectively educating these students requires pre-assessing each student instructionally, adjusting instruction accordingly and closely monitoring student progress. For example, ELLs who are literate in a first language that shares cognates with English can apply first-language vocabulary knowledge when reading in English; likewise ELLs with high levels of schooling can often bring to bear conceptual knowledge developed in their first language when reading in English. However, ELLs with limited or interrupted schooling will need to acquire background knowledge prerequisite to educational tasks at hand. Additionally, the development of native-like proficiency in English takes many years and may not be achieved by all ELLs especially if they start schooling in the US in the later grades. Teachers should recognize that it is possible to achieve the standards for reading and literature, writing and research, language development and speaking and listening without manifesting native-like control of conventions and vocabulary.

English Language Arts

The Common Core State Standards for English Language Arts (ELA) articulate rigorous grade-level expectations in the areas of reading, writing, speaking, listening to prepare all students to be college and career ready, including English language learners. Second-language learners also will benefit from instruction about how to negotiate situations outside of those settings so they are able to participate on equal footing with native speakers in all aspects of social, economic and civic endeavors.

ELLs bring with them many resources that enhance their education and can serve as resources for schools and society. Many ELLs have first language and literacy knowledge and skills that boost their acquisition of language and literacy in a second language; additionally, they bring an array of talents and cultural practices and perspectives that enrich our schools and society. Teachers must build on this enormous reservoir of talent and provide those students who need it with additional time and appropriate instructional support. This includes language proficiency standards that teachers can use in conjunction with the ELA standards to assist ELLs in becoming proficient and literate in English. To help ELLs meet high academic standards in language arts it is essential that they have access to:

- Teachers and personnel at the school and district levels who are well prepared and qualified to support ELLs while taking advantage of the many strengths and skills they bring to the classroom;
- Literacy-rich school environments where students are immersed in a variety of language experiences;
- Instruction that develops foundational skills in English and enables ELLs to participate fully in grade-level coursework;
- Coursework that prepares ELLs for postsecondary education or the workplace, yet is made comprehensible for students learning content in a second language (through specific pedagogical techniques and additional resources);
- Opportunities for classroom discourse and interaction that are well-designed to enable ELLs to develop communicative strengths in language arts;
- Ongoing assessment and feedback to guide learning; and

- Speakers of English who know the language well enough to provide ELLs with models and support.

Application to Students with Disabilities

The Common Core State Standards articulate rigorous grade-level expectations in the areas of mathematics and English language arts. These standards identify the knowledge and skills students need in order to be successful in college and careers.

Students with disabilities, students eligible under the Individuals with Disabilities Education Act (IDEA), must be challenged to excel within the general curriculum and be prepared for success in their post-school lives, including college and/or careers. These common standards provide an historic opportunity to improve access to rigorous academic content standards for students with disabilities. The continued development of understanding about research-based instructional practices and a focus on their effective implementation will help improve access to mathematics and English language arts (ELA) standards for all students, including those with disabilities. Students with disabilities are a heterogeneous group with one common characteristic: the presence of disabling conditions that significantly hinder their abilities to benefit from general education (IDEA 34 CFR §300.39, 2004).Therefore, how these high standards are taught and assessed is of the utmost importance in reaching this diverse group of students.

In order for students with disabilities to meet high academic standards and to fully demonstrate their conceptual and procedural knowledge and skills in mathematics, reading, writing, speaking and listening (English language arts), their instruction must incorporate supports and accommodations, including:

- Supports and related services designed to meet the unique needs of these students and to enable their access to the general education curriculum (IDEA 34 CFR §300.34, 2004).
- An Individualized Education Program (IEP)[1] which includes annual goals aligned with and chosen to facilitate their attainment of grade-level academic standards.
- Teachers and specialized instructional support personnel who are prepared and qualified to deliver high-quality, evidence-based, individualized instruction and support services.

Promoting a culture of high expectations for all students is a fundamental goal of the Common Core State Standards. In order to participate with success in the general curriculum, students with disabilities, as appropriate, may be provided additional supports and services, such as:

- Instructional supports for learning, based on the principles of Universal Design for Learning (UDL),[2] which foster student engagement by presenting information in multiple ways and allowing for diverse avenues of action and expression.
- Instructional accommodations (Thompson, Morse, Sharpe & Hall, 2005), changes in materials or procedures, which do not change the standards but allow students to learn within the framework of the Common Core.
- Assistive technology devices and services to ensure access to the general education curriculum and the Common Core State Standards.

Some students with the most significant cognitive disabilities will require substantial supports and accommodations to have meaningful access to certain standards in both instruction and assessment, based on their communication and academic needs. These supports and accommodations should ensure that students receive access to multiple means of learning and opportunities to demonstrate knowledge, but retain the rigor and high expectations of the Common Core State Standards.

Implications for the Common Core State Standards for Students with Gifts and Talents

The CCSS provide a roadmap for what students need to learn by benchmarking expectations across grade levels. They include rigorous content and application of knowledge through higher-order skills. As such, they can serve as a foundation for a robust core curriculum, however, students with gifts and talents may need additional challenges or curricular options. In order to recognize what adaptations need to be made or what interventions need to be employed, we must understand who these students are.

According to the National Association for Gifted Children (2011), "Giftedness, intelligence and talent are fluid concepts and may look different in different contexts and cultures" (para. 1). This means that there are students that demonstrate high performance or have the potential to do so in academics, creativity, leadership and/or the visual

and performing arts. Despite this diversity there are common characteristics that are important to note.

Students with gifts and talents:

- Learn at a fast pace.
- Are stimulated by depth and complexity of content.
- Make connections.

These traits have implications for how the Common Core State Standards are used. They reveal that as curriculum is designed and instruction is planned there must be:

- Differentiation based on student readiness, interest and learning style:
  Pre-assessing in order to know where a student stands in relation to the content that will be taught (readiness), then teach those standards that the student has not mastered and enrich, compact and/or accelerate when standards have been mastered. This might mean using standards that are beyond the grade level of the student.
  Knowledge of our students so we are familiar with their strengths, background knowledge, experiences, interests and learning styles.
  Flexible grouping to provide opportunities for students to interact with peers that have similar abilities, similar interests and similar learning styles (homogenous grouping), as well as different abilities, different interests and different learning styles (heterogeneous grouping).

- Differentiation of content, process and product.
  Use of a variety of materials (differentiating content) to provide challenge. Students may be studying the same concept using different text and resources.
  Variety of tasks (differentiating process). For example in a science lesson about the relationship between temperature and rate of melting, some students may use computer-enhanced thermometers to record and graph temperature so they can concentrate on detecting patterns while other students may graph temperature at one-minute intervals, then examine the graph for patterns.
  Variety of ways to demonstrate their learning (differentiating product).These choices can provide opportunities for students with varying abilities, interests and learning styles to show what they have discovered.

- Adjustment to the level, depth and pace of curriculum.
  Compact the curriculum to intensify the pace.
  Vary questioning and use creative and critical thinking strategies to provide depth.
  Use standards beyond the grade level of the students. Since the CCSS provide a PK-12 learning progression, this is easily done.
  Accelerate subject areas or whole grades when appropriate.

- Match the intensity of the intervention with the student's needs. This means that we must be prepared to adapt the core curriculum and plan for a continuum of services to meet the needs of all students, including those with gifts and talents.

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What is Disciplinary Literacy?

Literacy, the ability to read, write, listen, speak, think critically and perform in different ways and for different purposes, begins to develop early and becomes increasingly important as students pursue specialized fields of study in high school and beyond. The Common Core State Standards (CCSS) for Literacy in Science, Social Studies, History and the Technical Subjects are connected to College and Career Readiness Standards that guide educators as they strive to help students meet the literacy challenges within each particular field of study. This national effort is referred to as disciplinary literacy.

In Wisconsin, disciplinary literacy is defined as the confluence of content knowledge, experiences, and skills merged with the ability to read, write, listen, speak, think critically and perform in a way that is meaningful within the context of a given field.

These abilities are important in ALL courses and subjects. While the Common Core State Standards (CCSS) for Literacy in Science, Social Studies, History and the Technical Subjects provide standards for cross-discipline reading and writing in grades 6-12, Wisconsin recognizes the need to broaden this effort and include **all disciplines and every educator in every grade level K-12.** This literacy focus must begin as soon as children have access to formal education and continue intentionally as college and career readiness goals advance for all children in Wisconsin.

To address this expanded definition and approach to disciplinary literacy, excerpts from the K-5 Common Core State Standards for English Language Arts are included in this document. Elementary classroom teachers build the foundational literacy skills necessary for students to access all learning. Additionally, they develop content specific to deep literary study oratory tradition and linguistic analysis; skills specific to English language arts. Literacy reaches beyond this knowledge in one content area to include reading, writing, listening, speaking and thinking critically in each discipline beginning at an early age. The applicable K-5 standards help educators in Wisconsin build a ladder of skills and dispositions that lead to accelerated achievement across disciplines and will be included in every content-specific standards document into the future.

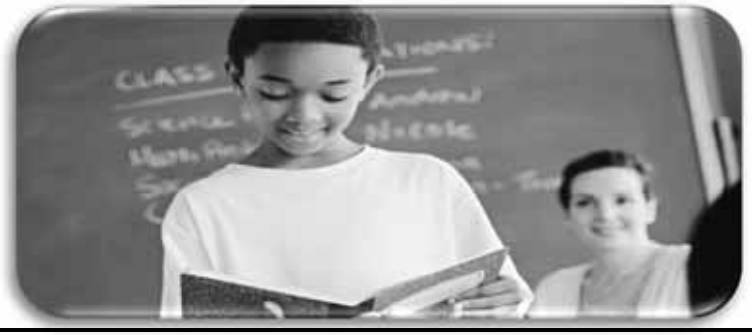
Why is disciplinary literacy important?

The modern global society, of which our students are a part, requires postsecondary learning. An analysis of workforce trends by Georgetown University economist Anthony Carnevale and his colleagues found that nearly 60 percent of all job openings in 2007 required some postsecondary education; postsecondary success depends on students' ability to comprehend and produce the kinds of complex texts found in all disciplines. Therefore, the economic future of our state, as well as our students and their success as productive citizens and critical thinkers link to disciplinary literacy.

Textbooks, articles, manuals and historical primary source documents create specialized challenges for learners. These texts often include abstracts, figures, tables, diagrams and specialized vocabulary. The ideas are complex and build across a number of paragraphs requiring focus and strategic processing. To comprehend and produce this type of text, students must be immersed in the language and thinking processes of that discipline and they must be supported by an expert guide, their teacher (Carnegie Report, 2010).

A focus at the elementary level on foundational reading, when expanded to include engaging experiences connected to informational texts, vocabulary and writing for content-specific purposes builds background knowledge and skills in each discipline. This increases opportunities for success as students approach more rigorous content in those disciplines (Alliance for Excellent Education, 2011).

Reading, writing, speaking, listening and critical thinking must be integrated into each discipline across all grades so that all students gradually build knowledge and skills toward college and career readiness. Collaboration among institutes of higher education, CESA Statewide Network, districts, schools, teachers and family and community will guide the implementation of the Common Core State Standards in Wisconsin.



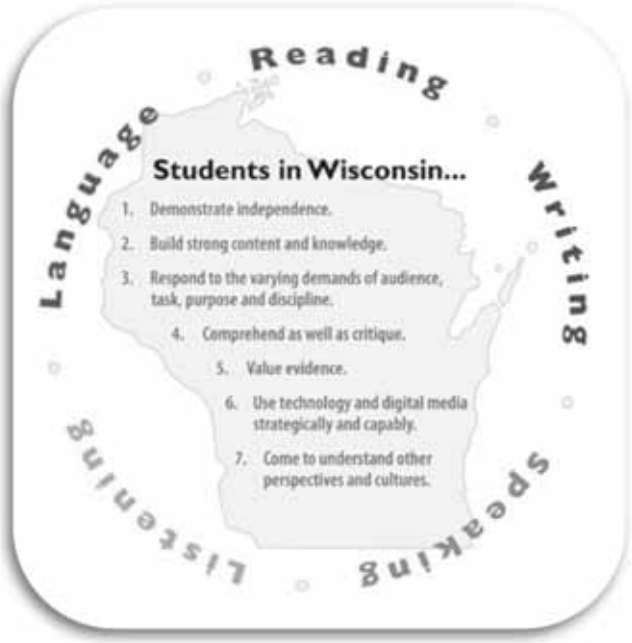
The message is that literacy is integral to attainment of content knowledge and content is essential background knowledge for literacy development. This interdependent relationship exists in all disciplines.

The Common Core State Standards require educators to support literacy in each classroom across the state. Since the impact of this effort is significant, it is essential that resources and supports be accessible to all educators. To build consistent understanding, DPI convened a statewide Disciplinary Literacy Leadership Team in 2011 comprised of educators from many content areas and educational backgrounds. This team was charged with examining the CCSS for Disciplinary Literacy, identifying the needs in the field for support and gathering materials and resources to address those needs.

Wisconsin Foundations for Disciplinary Literacy

To guide understanding and professional learning, a set of foundations, developed in concert with Wisconsin's *Guiding Principles for Teaching and Learning,* directs Wisconsin's approach to disciplinary literacy.

Academic learning begins in early childhood and develops across all disciplines.
Each discipline has its own specific vocabulary, text types and ways of communicating. Children begin learning these context- and content-specific differences early in life and continue through high school and beyond. While gardening, small children observe and the form and function of a root, stem, leaf and soil; or measure, mix and blend while baking a cake. School offers all students opportunities to develop the ability to, for example, think like a scientist, write like a historian, critique like an artist, problem-solve like an auto mechanic or analyze technological advances like a health care technician. As literacy skills develop, educators gradually shift the responsibility for reading, writing, listening, speaking and critical thinking to students through guided supports in both individual and collaborative learning experiences.



Content knowledge is strengthened when educators integrate discipline-specific literacy into teaching and learning.
Educators help students recognize and understand the nuances of a discipline by using strategies that "make their thinking visible." They promote classroom reading, writing, listening, speaking and critical thinking using authentic materials that support the development of content-specific knowledge. They guide students through these complex texts by using strategies that develop conceptual understanding of language and set expectations for relevant application of skills. These literacy practices deepen students' content knowledge, strategies and skills so that their learning transfers to real world situations.

The literacy skills of reading, writing, listening, speaking and critical thinking improve when content-rich learning experiences motivate and engage students.

Educators who foster disciplinary literacy develop experiences that integrate rigorous content with relevant collaborative and creative literacy processes to motivate and engage students. Setting high expectations, they structure routines and supports that empower students to take charge of their own learning. When students work in teams to research science and mathematics concepts in the development of an invention or a graphic arts design; when they collaboratively build a blog that contains their recent marketing venture, they use specific literacy skills and strategies to solidify learning. Students need these opportunities over time to develop the precise and complex reading, writing, listening, speaking and critical thinking skills demanded in today's careers.

Students demonstrate their content knowledge through reading, writing, listening, and speaking as part of a content-literate community.

Students who are literate in a particular discipline are able to successfully read, write and speak about that discipline and can listen to and think critically as others communicate in that community. Performance tasks that allow students to present the complexity of a content area in a way that is meaningful to the field become authentic approaches to assessing mastery within a discipline. Such tasks empower students to discover the real world connections across disciplines and to actively participate in communities of discipline-literate peers. As Wisconsin moves to the SMARTER Balanced Assessment System these performance tasks will be integral to assessment of student learning.

What research and resources are available to support educators' use of the Common Core State Standards for Literacy in All Subjects?

The Common Core State Standards for Literacy in All Subjects reflect the importance of literacy in both the oral and written language and in both productive (speaking and writing) and receptive (listening and reading) discourse. Clearly, critical and precise thinking are required to develop all of these specific strategies and skills. The standards also address the learning and functioning of language in a technological, media-driven world because the language that we use is selective depending upon the context of the conversation.

The following section will offer relevant research and resources to support professional learning in reading, writing, speaking, listening and language across disciplines. Collegial conversation and learning, both cross-discipline and within-discipline will help make the Common Core State Standards more applicable to schools and districts and will address the needs of unique programs within those contexts. A collection of online resources will continue to develop as support materials emerge.

Reading Connections

While early reading focuses on learning that letters make sounds and that words carry meaning, reading quickly develops to a point where the message taken from text depends on what the reader brings to it. The Carnegie Report, *Reading in the Disciplines* (2010) describes this phenomenon:

"The ability to comprehend written texts is not a static or fixed ability, but rather one that involves a dynamic relationship between the demands of texts and prior knowledge and goals of the reader."

Therefore, a musician reading a journal article that describes concepts in music theory will take more information away from the text than a music novice because of their knowledge and experience in music. As well, an individual who spends a significant amount of time reading automotive manuals will more easily navigate a cell phone manual because of familiarity with that type of text.

A chart excerpted from the Carnegie Report (2010) details a few of the generic and more discipline-specific strategies that support students as they attempt to comprehend complex text. While the generic strategies pertain across content areas, discipline-specific ones must be tailored to match the demands of the content area.

Both generic and discipline focused strategies and knowledge must be applied to the comprehension and evaluation of:

- Textbooks
- Journal and magazine articles
- Historically situated primary documents
- Full Length Books
- Newspaper Articles
- Book Chapters
- Multimedia and Digital Texts

Generic Reading Strategies	Discipline-Specific Reading Strategies
Monitor comprehension Pre-read Set goals Think about what one already knows Ask questions Make predictions Test predictions against the text Re-read Summarize	Build prior knowledge Build specialized vocabulary Learn to deconstruct complex sentences Use knowledge of text structures and genres to predict main and subordinate ideas Map graphic (and mathematical) representations against explanations in the text Pose discipline relevant questions Compare claims and propositions across texts Use norms for reasoning within the discipline (i.e. what counts as evidence) to evaluate claims

Source: Carnegie Report, (2010)

Additional resources that support reading in specific subjects include *Content Counts! Developing Disciplinary Literacy Skills, K–6* by Jennifer L. Altieri (2011).This guide for discipline-specific literacy at the elementary level offers strategies to balance the demands of literacy while continuing to make content count and help students meet the reading, writing, speaking and listening demands of the content areas as they advance in school.

A resource by Doug Buehl (2011) entitled *Developing Readers in the Academic Disciplines* describes what it means to read, write and think through a disciplinary lens in the adolescent years. This teacher-friendly guide helps connect literacy with disciplinary understandings to bridge academic knowledge gaps, frontload instruction and build critical thinking through questioning.

Note on range and content of student reading

To become college and career ready, students must grapple with works of exceptional craft and thought whose range extends across genres, cultures and centuries. Such works offer profound insights into the human condition and serve as models for students' own thinking and writing. Along with high-quality contemporary works, these texts should be chosen from seminal U.S. documents, the classics of American literature and the timeless dramas of Shakespeare. Through wide and deep reading of literature and literary nonfiction of steadily increasing sophistication, students gain a reservoir of literary and cultural knowledge, references and images; the ability to evaluate intricate arguments; and the capacity to surmount the challenges posed by complex texts. (*CCSS p. 35 http://www.corestandards.org/assets/CCSSI_ELA%20Standards.pdf*)

The Common Core State Standards require that all students "be able to comprehend texts of steadily increasing complexity as they progress through school" (Appendix A: Research Supporting Key Elements of the Standards, p. 2). More detailed definitions of complex text and examples of complex texts across disciplines are available in Appendix B of the English Language Arts CCSS.

Writing Connections

The Common Core State Standards call for emphasis on three types of writing: narrative, informational and logical argument. Writing that presents a logical argument is especially appropriate to discipline-specific work since credible evidence differs across content areas. The ability to consider multiple perspectives, assess the validity of claims and present a point of view is required in argumentative writing. These thinking and communication skills are "critical to college and career readiness".

A 2007 report entitled *Writing Next: Effective Strategies to Improve Writing of Adolescents in Middle and High Schools* detailed research on writing to learn, rather than only for assessment, as having a significant impact on content learning.

The study found writing to learn was equally effective for all content areas in the study (social studies, math and science) and at every grade (4-12).

Note on range and content of student writing

For students, writing is a key means of asserting and defending claims, showing what they know about a subject and conveying what they have experienced, imagined, thought and felt. To be college and career ready writers, students must take task, purpose and audience into careful consideration, choosing words, information, structures and formats deliberately. They need to know how to combine elements of different kinds of writing—for example, to use narrative strategies within an argument and explanation within narrative—to produce complex and nuanced writing. They need to be able to use technology strategically when creating, refining and collaborating on writing. They have to become adept at gathering information, evaluating sources and citing material accurately, reporting findings from their research and analysis of sources in a clear and cogent manner. They must have flexibility, concentration and fluency to produce high quality first draft text under a tight deadline as well as the capacity to revisit and make improvements to a piece of writing over multiple drafts when circumstances encourage or require it. *(CCSS p.41 http://www.corestandards.org/assets/CCSSI_ELA%20Standards.pdf*)

When a social studies teacher guides students in taking on the perspective of a person from a specific historical era, she might ask students to write a first person narrative from that perspective. Research into that era leads students to discover personal beliefs of that historical person. They may dig into the personal experiences, ideas and events involved in the era to visualize life in that period. They then develop a rich understanding of the era and embed language from that era into the texts that they create. (Samples of discipline-specific writing across grades and content areas are available in Appendix C of the English Language Arts CCSS.

Speaking, Listening and Language Connections

The ability to share ideas and orally communicate with credibility in a specific academic discourse empowers students and allows access to specialized groups. In *Situated Language and Learning: A Critique of Traditional Schooling*, James Paul Gee (2004) describes the need to prioritize these skills so that students are at ease as they enter situations connected to a specific content area and are more likely to continue their learning in that discipline.

As expertise develops, students feel more and more comfortable applying knowledge and skills while speaking and listening in a specific discipline.

- A media course may teach students appropriate expression, tone and rate of speech when addressing a large audience.
- Listening carefully to questions posed is a specialized skill that debate facilitators develop.
- Scientists learn to listen for bias in the perspectives presented by peers to determine the reliability of scientific outcomes.
- Artists have very specialized and specific ways of speaking about the many aspects of a piece.

A policy brief from the Alliance for Excellent Education called, *Engineering Solutions to the National Crisis in Literacy: How to Make Good on the Promise of the Common Core State Standards* describes "a staircase of literacy demands" and emphasizes the importance of a progressive development of language and literacy over time.

The conceptual understanding of "functions" in mathematics may begin to develop in elementary school in its simplest form. As the concept develops over the years, students will use the word "function" in a meaningful way when speaking and writing to describe the mathematical concept they apply. When educators explicitly connect a mathematical term to its application and repeatedly expose students to the concept connected to the term, a specialized language becomes second nature to the mathematics classroom.

Students must have extensive vocabularies, built through reading and explicit instruction embedded in the context of content learning. This enables them to comprehend complex texts, engage in purposeful writing and communicate effectively within a discipline.

Skills in determining or clarifying the meaning of words and phrases encountered, choosing flexibly from an array of strategies and seeing an individual word as part of a network of other words that, for example, have similar denotations but different connotations allow students to access information and support their own learning.

Literacy in Multiple Languages

Increasing economic, security, cross-cultural and global demands underscore the value of literacy in more than one language. Students who think, read, write and communicate in multiple languages are an asset to our own country and can more easily interact and compete in the world at large.

English language learners (ELL) in our classrooms face significant challenges as they add a new language and work to grasp content at the same rate as their English-speaking peers. In a report to the Carnegie Corporation entitled *Double the Work: Challenges and Solutions to Acquiring Academic Literacy for Adolescent English Language Learners (2007)* researchers found that a focus on academic literacy is crucial for ELL's success in school. In their description of academic literacy they include reading, writing and oral discourse that:

- Varies from subject to subject.
- Requires knowledge of multiple genres of text, purposes for text use and text media.
- Is influenced by students' literacies in context outside of school.
- Is influenced by students' personal, social and cultural experiences.

The needs of our English language learners are addressed when we embed disciplinary literacy strategies into our subject area teaching. These high impact strategies and skills allow English language learners and all students to more readily access content knowledge and connect it to the prior knowledge they bring to the classroom. When educators take the initiative to understand and embed these strategies and skills, they offer additional opportunities for success to all of our students.

Who Should Use the Common Core State Standards for Literacy in All Subjects?

The term "disciplinary literacy" may be new to many Wisconsin teachers. The Common Core State Standards for Literacy in All Subjects, as excerpted from the Common Core Standards for English Language Arts, are intended for all PK-12 educators. Each standard is written broadly in content-neutral language, breaking down the complex skills that comprise reading, writing, speaking, listening and language. These standards serve as a complement to the specific content-related standards of each individual discipline. Administrators and communities may also find the disciplinary literacy standards helpful in charting a clear and consistent school or district-wide approach to literacy that moves Wisconsin forward toward the goal of every student career and college ready.

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Common Core State Standards for Literacy in All Subjects

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Key Design Considerations

CCR and grade-specific standards

The CCR standards anchor the document and define general, cross-disciplinary literacy expectations that must be met for students to be prepared to enter college and workforce training programs ready to succeed. The K–12 grade-specific standards define end-of-year expectations and a cumulative progression designed to enable students to meet college and career readiness expectations no later than the end of high school. The CCR and high school (grades 9–12) standards work in tandem to define the college and career readiness line—the former providing broad standards, the latter providing additional specificity. Hence, both should be considered when developing college and career readiness assessments.

Students advancing through the grades are expected to meet each year's grade-specific standards, retain or further develop skills and understandings mastered in preceding grades, and work steadily toward meeting the more general expectations described by the CCR standards.

Grade levels for K–8; grade bands for 9–10 and 11–12

The Standards use individual grade levels in kindergarten through grade 8 to provide useful specificity; the Standards use two-year bands in grades 9–12 to allow schools, districts, and states flexibility in high school course design.

A focus on results rather than means

By emphasizing required achievements, the Standards leave room for teachers, curriculum developers, and states to determine how those goals should be reached and what additional topics should be addressed. Thus, the Standards do not mandate such things as a particular writing process or the full range of metacognitive strategies that students may need to monitor and direct their thinking and learning. Teachers are thus free to provide students with whatever tools and knowledge their professional judgment and experience identify as most helpful for meeting the goals set out in the Standards.

An integrated model of literacy

Although the Standards are divided into Reading, Writing, Speaking and Listening, and Language strands for conceptual clarity, the processes of communication are closely connected, as reflected throughout this document. For example, Writing standard 9 requires that students be able to write about what they read. Likewise, Speaking and Listening standard 4 sets the expectation that students will share findings from their research.

Research and media skills blended into the Standards as a whole

To be ready for college, workforce training, and life in a technological society, students need the ability to gather, comprehend, evaluate, synthesize, and report on information and ideas, to conduct original research in order to answer questions or solve problems, and to analyze and create a high volume and extensive range of print and nonprint texts in media forms old and new. The need to conduct research and to produce and consume media is embedded into every aspect of today's curriculum. In like fashion, research and media skills and understandings are embedded throughout the Standards rather than treated in a separate section.

Shared responsibility for students' literacy development

The Standards insist that instruction in reading, writing, speaking, listening, and language be a shared responsibility within the school. The K–5 standards include expectations for reading, writing, speaking, listening, and language applicable to a range of subjects, including but not limited to ELA. The grades 6–12 standards are divided into two sections, one for ELA and the other for history/social studies, science, and technical subjects. This division reflects the unique, time-honored place of ELA teachers in developing students' literacy skills while at the same time recognizing that teachers in other areas must have a role in this development as well.

Part of the motivation behind the interdisciplinary approach to literacy promulgated by the Standards is extensive research establishing the need for college and career ready students to be proficient in reading complex informational text independently in a variety of content areas. Most of the required reading in college and workforce training programs is informational in structure and challenging in content; postsecondary education programs typically provide students with both a higher volume of such reading than is generally required in K–12 schools and comparatively little scaffolding.

The Standards are not alone in calling for a special emphasis on informational text. The 2009 reading framework of the National Assessment of Educational Progress (NAEP) requires a high and increasing proportion of informational text on its assessment as students advance through the grades.

Distribution of Literary and Informational Passages by Grade in the 2009 NAEP Reading Framework

Grade	Literary	Informational
4	50%	50%
8	45%	55%
12	30%	70%

Source: National Assessment Governing Board. (2008). *Reading framework for the 2009 National Assessment of Educational Progress.* Washington, DC: U.S. Government Printing Office.

The Standards aim to align instruction with this framework so that many more students than at present can meet the requirements of college and career readiness. In K–5, the Standards follow NAEP's lead in balancing the reading of literature with the reading of informational texts, including texts in history/social studies, science, and technical subjects. In accord with NAEP's growing emphasis on informational texts in the higher grades, the Standards demand that a significant amount of reading of informational texts take place in and outside the ELA classroom. Fulfilling the Standards for 6–12 ELA requires much greater attention to a specific category of informational text—literary nonfiction—than has been traditional. Because the ELA classroom must focus on literature (stories, drama, and poetry) as well as literary nonfiction, a great deal of informational reading in grades 6–12 must take place in other classes if the NAEP assessment framework is to be matched instructionally.[1] To measure students' growth toward college and career readiness, assessments aligned with the Standards should adhere to the distribution of texts across grades cited in the NAEP framework.

NAEP likewise outlines a distribution across the grades of the core purposes and types of student writing. The 2011 NAEP framework, like the Standards, cultivates the development of three mutually reinforcing writing capacities: writing to persuade, to explain, and to convey real or imagined experience. Evidence concerning the demands of college and career readiness gathered during development of the Standards concurs with NAEP's shifting emphases: standards for grades 9–12 describe writing in all three forms, but, consistent with NAEP, the overwhelming focus of writing throughout high school should be on arguments and informative/explanatory texts.[2]

Distribution of Communicative Purposes by Grade in the 2011 NAEP Writing Framework

Grade	To Persuade	To Explain	To Convey Experience
4	30%	35%	35%
8	35%	35%	30%
12	40%	40%	20%

Source: National Assessment Governing Board. (2007). *Writing framework for the 2011 National Assessment of Educational Progress, pre-publication edition.* Iowa City, IA: ACT, Inc.

It follows that writing assessments aligned with the Standards should adhere to the distribution of writing purposes across grades outlined by NAEP.

Focus and coherence in instruction and assessment

While the Standards delineate specific expectations in reading, writing, speaking, listening, and language, each standard need not be a separate focus for instruction and assessment. Often, several standards can be addressed by a single rich task. For example, when editing writing, students address Writing standard 5 ("Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach") as well as Language standards 1–3 (which deal with conventions of standard English and knowledge of language). When drawing evidence from literary and informational texts per Writing standard 9, students are also demonstrating their comprehension skill in relation to specific standards in Reading. When discussing something they have read or written, students are also demonstrating their speaking and listening skills. The CCR anchor standards themselves provide another source of focus and coherence.

The same ten CCR anchor standards for Reading apply to both literary and informational texts, including texts in history/social studies, science, and technical subjects. The ten CCR anchor standards for Writing cover numerous text types and subject areas. This means that students can develop mutually reinforcing skills and exhibit mastery of standards for reading and writing across a range of texts and classrooms.

[1]The percentages on the table reflect the sum of student reading, not just reading in ELA settings. Teachers of senior English classes, for example, are not required to devote 70 percent of reading to informational texts. Rather, 70 percent of student reading across the grade should be informational.
[2]As with reading, the percentages in the table reflect the sum of student writing, not just writing in ELA settings.

What is Not Covered by the Standards

The Standards should be recognized for what they are not as well as what they are. The most important intentional design limitations are as follows:

1. The Standards define what all students are expected to know and be able to do, not how teachers should teach. For instance, the use of play with young children is not specified by the Standards, but it is welcome as a valuable activity in its own right and as a way to help students meet the expectations in this document. Furthermore, while the Standards make references to some particular forms of content, including mythology, foundational U.S. documents, and Shakespeare, they do not—indeed, cannot—enumerate all or even most of the content that students should learn. The Standards must therefore be complemented by a well-developed, content-rich curriculum consistent with the expectations laid out in this document.

2. While the Standards focus on what is most essential, they do not describe all that can or should be taught. A great deal is left to the discretion of teachers and curriculum developers. The aim of the Standards is to articulate the fundamentals, not to set out an exhaustive list or a set of restrictions that limits what can be taught beyond what is specified herein.

3. The Standards do not define the nature of advanced work for students who meet the Standards prior to the end of high school. For those students, advanced work in such areas as literature, composition, language, and journalism should be available. This work should provide the next logical step up from the college and career readiness baseline established here.

4. The Standards set grade-specific standards but do not define the intervention methods or materials necessary to support students who are well below or well above grade-level expectations. No set of grade-specific standards can fully reflect the great variety in abilities, needs, learning rates, and achievement levels of students in any given classroom. However, the Standards do provide clear signposts along the way to the goal of college and career readiness for all students.

5. It is also beyond the scope of the Standards to define the full range of supports appropriate for English language learners and for students with special needs. At the same time, all students must have the opportunity to learn and meet the same high standards if they are to access the knowledge and skills necessary in their post–high school lives.

   Each grade will include students who are still acquiring English. For those students, it is possible to meet the standards in reading, writing, speaking, and listening without displaying native-like control of conventions and vocabulary.

   The Standards should also be read as allowing for the widest possible range of students to participate fully from the outset and as permitting appropriate accommodations to ensure maximum participation of students with special education needs. For example, for students with disabilities *reading* should allow for the use of Braille, screen-reader technology, or other assistive devices, while *writing* should include the use of a scribe, computer, or speech-to-text technology. In a similar vein, *speaking* and *listening* should be interpreted broadly to include sign language.

6. While the ELA and content area literacy components described herein are critical to college and career readiness, they do not define the whole of such readiness. Students require a wide-ranging, rigorous academic preparation and, particularly in the early grades, attention to such matters as social, emotional, and physical development and approaches to learning. Similarly, the Standards define literacy expectations in history/social studies, science, and technical subjects, but literacy standards in other areas, such as mathematics and health education, modeled on those in this document are strongly encouraged to facilitate a comprehensive, schoolwide literacy program.

Students Who are College and Career Ready in Reading, Writing, Speaking, Listening, and Language

The descriptions that follow are not standards themselves but instead offer a portrait of students who meet the standards set out in this document. As students advance through the grades and master the standards in reading, writing, speaking, listening, and language, they are able to exhibit with increasing fullness and regularity these capacities of the literate individual.

They demonstrate independence.

Students can, without significant scaffolding, comprehend and evaluate complex texts across a range of types and disciplines, and they can construct effective arguments and convey intricate or multifaceted information. Likewise, students are able independently to discern a speaker's key points, request clarification, and ask relevant questions. They build on others' ideas, articulate their own ideas, and confirm they have been understood. Without prompting, they demonstrate command of standard English and acquire and use a wide-ranging vocabulary. More broadly, they become self-directed learners, effectively seeking out and using resources to assist them, including teachers, peers, and print and digital reference materials.

They build strong content knowledge.

Students establish a base of knowledge across a wide range of subject matter by engaging with works of quality and substance. They become proficient in new areas through research and study. They read purposefully and listen attentively to gain both general knowledge and discipline-specific expertise. They refine and share their knowledge through writing and speaking.

They respond to the varying demands of audience, task, purpose, and discipline.

Students adapt their communication in relation to audience, task, purpose, and discipline. They set and adjust purpose for reading, writing, speaking, listening, and language use as warranted by the task. They appreciate nuances, such as how the composition of an audience should affect tone when speaking and how the connotations of words affect meaning. They also know that different disciplines call for different types of evidence (e.g., documentary evidence in history, experimental evidence in science).

They comprehend as well as critique.

Students are engaged and open-minded—but discerning—readers and listeners. They work diligently to understand precisely what an author or speaker is saying, but they also question an author's or speaker's assumptions and premises and assess the veracity of claims and the soundness of reasoning.

They value evidence.

Students cite specific evidence when offering an oral or written interpretation of a text. They use relevant evidence when supporting their own points in writing and speaking, making their reasoning clear to the reader or listener, and they constructively evaluate others' use of evidence.

They use technology and digital media strategically and capably.

Students employ technology thoughtfully to enhance their reading, writing, speaking, listening, and language use. They tailor their searches online to acquire useful information efficiently, and they integrate what they learn using technology with what they learn offline. They are familiar with the strengths and limitations of various technological tools and mediums and can select and use those best suited to their communication goals.

They come to understand other perspectives and cultures.

Students appreciate that the twenty-first-century classroom and workplace are settings in which people from often widely divergent cultures and who represent diverse experiences and perspectives must learn and work together. Students actively seek to understand other perspectives and cultures through reading and listening, and they are able to communicate effectively with people of varied backgrounds. They evaluate other points of view critically and constructively. Through reading great classic and contemporary works of literature representative of a variety of periods, cultures, and worldviews, students can vicariously inhabit worlds and have experiences much different than their own.

How to Read This Document

Overall Document Organization

The Standards comprise three main sections: a comprehensive K–5 section and two content area–specific sections for grades 6–12, one for ELA and one for history/social studies, science, and technical subjects. Three appendices accompany the main document.

Each section is divided into strands. K–5 and 6–12 ELA have Reading, Writing, Speaking and Listening, and Language strands; the 6–12 history/ social studies, science, and technical subjects section focuses on Reading and Writing. Each strand is headed by a strand-specific set of College and Career Readiness Anchor Standards that is identical across all grades and content areas.

Standards for each grade within K–8 and for grades 9–10 and 11–12 follow the CCR anchor standards in each strand. Each grade-specific standard (as these standards are collectively referred to) corresponds to the same-numbered CCR anchor standard. Put another way, each CCR anchor standard has an accompanying grade-specific standard translating the broader CCR statement into grade-appropriate end-of-year expectations.

Individual CCR anchor standards can be identified by their strand, CCR status, and number (R.CCR.6, for example). Individual grade-specific standards can be identified by their strand, grade, and number (or number and letter, where applicable), so that RI.4.3, for example, stands for Reading, Informational Text, grade 4, standard 3 and W.5.1a stands for Writing, grade 5, standard 1a. Strand designations can be found in brackets alongside the full strand title.

Who is responsible for which portion of the Standards

A single K–5 section lists standards for reading, writing, speaking, listening, and language across the curriculum, reflecting the fact that most or all of the instruction students in these grades receive comes from one teacher. Grades 6–12 are covered in two content area–specific sections, the first for the English language arts teacher and the second for teachers of history/social studies, science, and technical subjects. Each section uses the same CCR anchor standards but also includes grade-specific standards tuned to the literacy requirements of the particular discipline(s).

Key Features of the Standards

Reading: Text complexity and the growth of comprehension

The Reading standards place equal emphasis on the sophistication of what students read and the skill with which they read. Standard 10 defines a grade-by-grade "staircase" of increasing text complexity that rises from beginning reading to the college and career readiness level. Whatever they are reading, students must also show a steadily growing ability to discern more from and make fuller use of text, including making an increasing number of connections among ideas and between texts, considering a wider range of textual evidence, and becoming more sensitive to inconsistencies, ambiguities, and poor reasoning in texts.

Writing: Text types, responding to reading, and research

The Standards acknowledge the fact that whereas some writing skills, such as the ability to plan, revise, edit, and publish, are applicable to many types of writing, other skills are more properly defined in terms of specific writing types: arguments, informative/explanatory texts, and narratives. Standard 9 stresses the importance of the writing-reading connection by requiring students to draw upon and write about evidence from literary and informational texts. Because of the centrality of writing to most forms of inquiry, research standards are prominently included in this strand, though skills important to research are infused throughout the document.

Speaking and Listening: Flexible communication and collaboration

Including but not limited to skills necessary for formal presentations, the Speaking and Listening standards require students to develop a range of broadly useful oral communication and interpersonal skills. Students must learn to work together, express and listen carefully to ideas, integrate information from oral, visual, quantitative, and media sources, evaluate what they hear, use media and visual displays strategically to help achieve communicative purposes, and adapt speech to context and task.

Language: Conventions, effective use, and vocabulary

The Language standards include the essential "rules" of standard written and spoken English, but they also approach language as a matter of craft and informed choice among alternatives. The vocabulary standards focus on understanding words and phrases, their relationships, and their nuances and on acquiring new vocabulary, particularly general academic and domain-specific words and phrases.

STANDARDS FOR

Literacy in All Subjects

6-12

College and Career Readiness Anchor Standards for Reading

The grades 6–12 standards on the following pages define what students should understand and be able to do by the end of each grade span. They correspond to the College and Career Readiness (CCR) anchor standards below by number. The CCR and grade-specific standards are necessary complements—the former providing broad standards, the latter providing additional specificity—that together define the skills and understandings that all students must demonstrate.

Key Ideas and Details

1. Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.
2. Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.
3. Analyze how and why individuals, events, or ideas develop and interact over the course of a text.

Craft and Structure

4. Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.
5. Analyze the structure of texts, including how specific sentences, paragraphs, and larger portions of the text (e.g., a section, chapter, scene, or stanza) relate to each other and the whole.
6. Assess how point of view or purpose shapes the content and style of a text.

Integration of Knowledge and Ideas

7. Integrate and evaluate content presented in diverse formats and media, including visually and quantitatively, as well as in words.*
8. Delineate and evaluate the argument and specific claims in a text, including the validity of the reasoning as well as the relevance and sufficiency of the evidence.
9. Analyze how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches the authors take.

Range of Reading and Level of Text Complexity

10. Read and comprehend complex literary and informational texts independently and proficiently.

*Please see "Research to Build and Present Knowledge" in Writing for additional standards relevant to gathering, assessing, and applying information from print and digital sources.

Note on range and content of student reading

Reading is critical to building knowledge in history/social studies as well as in science and technical subjects. College and career ready reading in these fields requires an appreciation of the norms and conventions of each discipline, such as the kinds of evidence used in history and science; an understanding of domain-specific words and phrases; an attention to precise details; and the capacity to evaluate intricate arguments, synthesize complex information, and follow detailed descriptions of events and concepts. In history/social studies, for example, students need to be able to analyze, evaluate, and differentiate primary and secondary sources. When reading scientific and technical texts, students need to be able to gain knowledge from challenging texts that often make extensive use of elaborate diagrams and data to convey information and illustrate concepts. Students must be able to read complex informational texts in these fields with independence and confidence because the vast majority of reading in college and workforce training programs will be sophisticated nonfiction. It is important to note that these Reading standards are meant to complement the specific content demands of the disciplines, not replace them.

Reading Standards for Literacy in All Subjects

RH

The standards below begin at grade 6; standards for K–5 reading in history/social studies, science, and technical subjects are integrated into the K–5 Reading standards. The CCR anchor standards and high school standards in literacy work in tandem to define college and career readiness expectations—the former providing broad standards, the latter providing additional specificity.

Grades 6–8 students:	Grades 9–10 students:	Grades 11–12 students:
Key Ideas and Details		
1. Cite specific textual evidence to support analysis of primary and secondary sources.	1. Cite specific textual evidence to support analysis of primary and secondary sources, attending to such features as the date and origin of the information.	1. Cite specific textual evidence to support analysis of primary and secondary sources, connecting insights gained from specific details to an understanding of the text as a whole.
2. Determine the central ideas or information of a primary or secondary source; provide an accurate summary of the source distinct from prior knowledge or opinions.	2. Determine the central ideas or information of a primary or secondary source; provide an accurate summary of how key events or ideas develop over the course of the text.	2. Determine the central ideas or information of a primary or secondary source; provide an accurate summary that makes clear the relationships among the key details and ideas.
3. Identify key steps in a text's description of a process related to history/social studies (e.g., how a bill becomes law, how interest rates are raised or lowered).	3. Analyze in detail a series of events described in a text; determine whether earlier events caused later ones or simply preceded them.	3. Evaluate various explanations for actions or events and determine which explanation best accords with textual evidence, acknowledging where the text leaves matters uncertain.
Craft and Structure		
4. Determine the meaning of words and phrases as they are used in a text, including vocabulary specific to domains related to history/social studies.	4. Determine the meaning of words and phrases as they are used in a text, including vocabulary describing political, social, or economic aspects of history/social studies.	4. Determine the meaning of words and phrases as they are used in a text, including analyzing how an author uses and refines the meaning of a key term over the course of a text (e.g., how Madison defines *faction* in *Federalist* No. 10).
5. Describe how a text presents information (e.g., sequentially, comparatively, causally).	5. Analyze how a text uses structure to emphasize key points or advance an explanation or analysis.	5. Analyze in detail how a complex primary source is structured, including how key sentences, paragraphs, and larger portions of the text contribute to the whole.
6. Identify aspects of a text that reveal an author's point of view or purpose (e.g., loaded language, inclusion or avoidance of particular facts).	6. Compare the point of view of two or more authors for how they treat the same or similar topics, including which details they include and emphasize in their respective accounts.	6. Evaluate authors' differing points of view on the same historical event or issue by assessing the authors' claims, reasoning, and evidence.
Integration of Knowledge and Ideas		
7. Integrate visual information (e.g., in charts, graphs, photographs, videos, or maps) with other information in print and digital texts.	7. Integrate quantitative or technical analysis (e.g., charts, research data) with qualitative analysis in print or digital text.	7. Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, as well as in words) in order to address a question or solve a problem.
8. Distinguish among fact, opinion, and reasoned judgment in a text.	8. Assess the extent to which the reasoning and evidence in a text support the author's claims.	8. Evaluate an author's premises, claims, and evidence by corroborating or challenging them with other information.
9. Analyze the relationship between a primary and secondary source on the same topic.	9. Compare and contrast treatments of the same topic in several primary and secondary sources.	9. Integrate information from diverse sources, both primary and secondary, into a coherent understanding of an idea or event, noting discrepancies among sources.
Range of Reading and Level of Text Complexity		
10. By the end of grade 8, read and comprehend history/social studies texts in the grades 6–8 text complexity band independently and proficiently.	10. By the end of grade 10, read and comprehend history/social studies texts in the grades 9–10 text complexity band independently and proficiently.	10. By the end of grade 12, read and comprehend history/social studies texts in the grades 11–CCR text complexity band independently and proficiently.

Reading Standards for Literacy in All Subjects

RST

Grades 6–8 students:	Grades 9–10 students:	Grades 11–12 students:
Key Ideas and Details		
1. Cite specific textual evidence to support analysis of science and technical texts.	1. Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.	1. Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.
2. Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.	2. Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.	2. Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
3. Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.	3. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.	3. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
Craft and Structure		
4. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 6–8 texts and topics.*	4. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 9–10 texts and topics*.	4. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 11–12 texts and topics*.
5. Analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to an understanding of the topic.	5. Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., *force, friction, reaction force, energy*).	5. Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.
6. Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text.	6. Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address.	6. Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.
Integration of Knowledge and Ideas		
7. Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).	7. Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.	7. Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
8. Distinguish among facts, reasoned judgment based on research findings, and speculation in a text.	8. Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem.	8. Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.
9. Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.	9. Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.	9. Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.
Range of Reading and Level of Text Complexity		
10. By the end of grade 8, read and comprehend science/technical texts in the grades 6–8 text complexity band independently and proficiently.	10. By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently.	10. By the end of grade 12, read and comprehend science/technical texts in the grades 11–CCR text complexity band independently and proficiently.

College and Career Readiness Anchor Standards for Writing

The grades 6–12 standards on the following pages define what students should understand and be able to do by the end of each grade span. They correspond to the College and Career Readiness (CCR) anchor standards below by number. The CCR and grade-specific standards are necessary complements—the former providing broad standards, the latter providing additional specificity—that together define the skills and understandings that all students must demonstrate.

Text Types and Purposes*

1. Write arguments to support claims in an analysis of substantive topics or texts using valid reasoning and relevant and sufficient evidence.
2. Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content.
3. Write narratives to develop real or imagined experiences or events using effective technique, well-chosen details and well-structured event sequences.

Production and Distribution of Writing

4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
5. Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach.
6. Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.

Research to Build and Present Knowledge

7. Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation.
8. Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism.
9. Draw evidence from literary or informational texts to support analysis, reflection, and research.

Range of Writing

10. Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.

*These broad types of writing include many subgenres.

Note on range and content of student writing

For students, writing is a key means of asserting and defending claims, showing what they know about a subject, and conveying what they have experienced, imagined, thought, and felt. To be college and career ready writers, students must take task, purpose, and audience into careful consideration, choosing words, information, structures, and formats deliberately. They need to be able to use technology strategically when creating, refining, and collaborating on writing. They have to become adept at gathering information, evaluating sources, and citing material accurately, reporting findings from their research and analysis of sources in a clear and cogent manner. They must have the flexibility, concentration, and fluency to produce high-quality first-draft text under a tight deadline and the capacity to revisit and make improvements to a piece of writing over multiple drafts when circumstances encourage or require it. To meet these goals, students must devote significant time and effort to writing, producing numerous pieces over short and long time frames throughout the year.

Writing Standards for Literacy in All Subjects

WHST

The standards below begin at grade 6; standards for K–5 writing in history/social studies, science, and technical subjects are integrated into the K–5 Writing standards. The CCR anchor standards and high school standards in literacy work in tandem to define college and career readiness expectations—the former providing broad standards, the latter providing additional specificity.

Grades 6–8 students:	Grades 9–10 students:	Grades 11–12 students:
Text Types and Purposes		
1. Write arguments focused on *discipline-specific content*. a. Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically. b. Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources. c. Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence. d. Establish and maintain a formal style. e. Provide a concluding statement or section that follows from and supports the argument presented.	1. Write arguments focused on *discipline-specific content.* a. Introduce precise claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that establishes clear relationships among the claim(s), counterclaims, reasons, and evidence. b. Develop claim(s) and counterclaims fairly, supplying data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form and in a manner that anticipates the audience's knowledge level and concerns. c. Use words, phrases, and clauses to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims. d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. e. Provide a concluding statement or section that follows from or supports the argument presented.	1. Write arguments focused on *discipline-specific content.* a. Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons, and evidence. b. Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form that anticipates the audience's knowledge level, concerns, values, and possible biases. c. Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims. d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. e. Provide a concluding statement or section that follows from or supports the argument presented.

Writing Standards for Literacy in All Subjects

WHST

Grades 6–8 students:	Grades 9–10 students:	Grades 11–12 students:
Text Types and Purposes (continued)		
2. Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. a. Introduce a topic clearly, previewing what is to follow; organize ideas, concepts, and information into broader categories as appropriate to achieving purpose; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension. b. Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples. c. Use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts. d. Use precise language and domain-specific vocabulary to inform about or explain the topic. e. Establish and maintain a formal style and objective tone. f. Provide a concluding statement or section that follows from and supports the information or explanation presented.	2. Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. a. Introduce a topic and organize ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension. b. Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic. c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among ideas and concepts. d. Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers. e. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. f. Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic).	2. Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. a. Introduce a topic and organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension. b. Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic. c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts. d. Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers. e. Provide a concluding statement or section that follows from and supports the information or explanation provided (e.g., articulating implications or the significance of the topic).
3. (See note; not applicable as a separate requirement)	3. (See note; not applicable as a separate requirement)	3. (See note; not applicable as a separate requirement)

Note: Students' narrative skills continue to grow in these grades. The Standards require that students be able to incorporate narrative elements effectively into arguments and informative/explanatory texts. In history/social studies, students must be able to incorporate narrative accounts into their analyses of individuals or events of historical import. In science and technical subjects, students must be able to write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results.

Writing Standards for Literacy in All Subjects

WHST

Grades 6–8 students:	Grades 9–10 students:	Grades 11–12 students:
Production and Distribution of Writing		
4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.	4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.	4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
5. With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed.	5. Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.	5. Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
6. Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently.	6. Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.	6. Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.
Research to Build and Present Knowledge		
7. Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.	7. Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.	7. Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
8. Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.	8. Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.	8. Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
9. Draw evidence from informational texts to support analysis reflection, and research.	9. Draw evidence from informational texts to support analysis, reflection, and research.	9. Draw evidence from informational texts to support analysis, reflection, and research.
Range of Writing		
10. Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.	10. Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.	10. Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

College and Career Readiness Anchor Standards for Speaking and Listening

The grades 6–12 standards on the following pages define what students should understand and be able to do by the end of each grade. They correspond to the College and Career Readiness (CCR) anchor standards below by number. The CCR and grade-specific standards are necessary complements—the former providing broad standards, the latter providing additional specificity—that together define the skills and understandings that all students must demonstrate.

Comprehension and Collaboration

1. Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.
2. Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally.
3. Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric.

Presentation of Knowledge and Ideas

4. Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience.
5. Make strategic use of digital media and visual displays of data to express information and enhance understanding of presentations.
6. Adapt speech to a variety of contexts and communicative tasks, demonstrating command of formal English when indicated or appropriate.

Note on range and content of student speaking and listening

To become college and career ready, students must have ample opportunities to take part in a variety of rich, structured conversations—as part of a whole class, in small groups, and with a partner—built around important content in various domains. They must be able to contribute appropriately to these conversations, to make comparisons and contrasts, and to analyze and synthesize a multitude of ideas in accordance with the standards of evidence appropriate to a particular discipline. Whatever their intended major or profession, high school graduates will depend heavily on their ability to listen attentively to others so that they are able to build on others' meritorious ideas while expressing their own clearly and persuasively.

New technologies have broadened and expanded the role that speaking and listening play in acquiring and sharing knowledge and have tightened their link to other forms of communication. The Internet has accelerated the speed at which connections between speaking, listening, reading, and writing can be made, requiring that students be ready to use these modalities nearly simultaneously. Technology itself is changing quickly, creating a new urgency for students to be adaptable in response to change.

Speaking and Listening Standards for Literacy in All Subjects

SL

The following standards for grades 6–12 offer a focus for instruction in each year to help ensure that students gain adequate mastery of a range of skills and applications. *Students advancing through the grades are expected to meet each year's grade-specific standards and retain or further develop skills and understandings mastered in preceding grades.*

Grade 6 students:	Grade 7 students:	Grade 8 students:
Comprehension and Collaboration		
1. Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grade 6 topics, texts, and issues*, building on others' ideas and expressing their own clearly. a. Come to discussions prepared, having read or studied required material; explicitly draw on that preparation by referring to evidence on the topic, text, or issue to probe and reflect on ideas under discussion. b. Follow rules for collegial discussions, set specific goals and deadlines, and define individual roles as needed. c. Pose and respond to specific questions with elaboration and detail by making comments that contribute to the topic, text, or issue under discussion. d. Review the key ideas expressed and demonstrate understanding of multiple perspectives through reflection and paraphrasing.	1. Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grade 7 topics, texts, and issues,* building on others' ideas and expressing their own clearly. a. Come to discussions prepared, having read or researched material under study; explicitly draw on that preparation by referring to evidence on the topic, text, or issue to probe and reflect on ideas under discussion. b. Follow rules for collegial discussions, track progress toward specific goals and deadlines, and define individual roles as needed. c. Pose questions that elicit elaboration and respond to others' questions and comments with relevant observations and ideas that bring the discussion back on topic as needed. d. Acknowledge new information expressed by others and, when warranted, modify their own views.	1. Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grade 8 topics, texts, and issues,* building on others' ideas and expressing their own clearly. a. Come to discussions prepared, having read or researched material under study; explicitly draw on that preparation by referring to evidence on the topic, text, or issue to probe and reflect on ideas under discussion. b. Follow rules for collegial discussions and decision-making, track progress toward specific goals and deadlines, and define individual roles as needed. c. Pose questions that connect the ideas of several speakers and respond to others' questions and comments with relevant evidence, observations, and ideas. d. Acknowledge new information expressed by others, and, when warranted, qualify or justify their own views in light of the evidence presented.
2. Interpret information presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how it contributes to a topic, text, or issue under study.	2. Analyze the main ideas and supporting details presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how the ideas clarify a topic, text, or issue under study.	2. Analyze the purpose of information presented in diverse media and formats (e.g., visually, quantitatively, orally) and evaluate the motives (e.g., social, commercial, political) behind its presentation.
3. Delineate a speaker's argument and specific claims, distinguishing claims that are supported by reasons and evidence from claims that are not.	3. Delineate a speaker's argument and specific claims, evaluating the soundness of the reasoning and the relevance and sufficiency of the evidence.	3. Delineate a speaker's argument and specific claims, evaluating the soundness of the reasoning and relevance and sufficiency of the evidence and identifying when irrelevant evidence is introduced.
Presentation of Knowledge and Ideas		
4. Present claims and findings, sequencing ideas logically and using pertinent descriptions, facts, and details to accentuate main ideas or themes; use appropriate eye contact, adequate volume, and clear pronunciation.	4. Present claims and findings, emphasizing salient points in a focused, coherent manner with pertinent descriptions, facts, details, and examples; use appropriate eye contact, adequate volume, and clear pronunciation.	4. Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation.
5. Include multimedia components (e.g., graphics, images, music, sound) and visual displays in presentations to clarify information.	5. Include multimedia components and visual displays in presentations to clarify claims and findings and emphasize salient points.	5. Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest.
6. Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate.	6. Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate.	6. Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate.

Speaking and Listening Standards for Literacy in All Subjects

SL

The CCR anchor standards and high school grade-specific standards work in tandem to define college and career readiness expectations—the former providing broad standards, the latter providing additional specificity.

Grades 9–10 students:	Grades 11–12 students:
Comprehension and Collaboration	
1. Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grades 9–10 topics, texts, and issues,* building on others' ideas and expressing their own clearly and persuasively. a. Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas. b. Work with peers to set rules for collegial discussions and decision-making (e.g., informal consensus, taking votes on key issues, presentation of alternate views), clear goals and deadlines, and individual roles as needed. c. Propel conversations by posing and responding to questions that relate the current discussion to broader themes or larger ideas; actively incorporate others into the discussion; and clarify, verify, or challenge ideas and conclusions. d. Respond thoughtfully to diverse perspectives, summarize points of agreement and disagreement, and, when warranted, qualify or justify their own views and understanding and make new connections in light of the evidence and reasoning presented.	1. Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grades 11–12 topics, texts, and issues,* building on others' ideas and expressing their own clearly and persuasively. a. Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas. b. Work with peers to promote civil, democratic discussions and decision-making, set clear goals and deadlines, and establish individual roles as needed. c. Propel conversations by posing and responding to questions that probe reasoning and evidence; ensure a hearing for a full range of positions on a topic or issue; clarify, verify, or challenge ideas and conclusions; and promote divergent and creative perspectives. d. Respond thoughtfully to diverse perspectives; synthesize comments, claims, and evidence made on all sides of an issue; resolve contradictions when possible; and determine what additional information or research is required to deepen the investigation or complete the task.
2. Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source.	2. Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.
3. Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, identifying any fallacious reasoning or exaggerated or distorted evidence.	3. Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used.
Presentation of Knowledge and Ideas	
4. Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task.	4. Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.
5. Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.	5. Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.
6. Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate.	6. Adapt speech to a variety of contexts and tasks, demonstrating a command of formal English when indicated or appropriate.

College and Career Readiness Anchor Standards for Language

The grades 6–12 standards on the following pages define what students should understand and be able to do by the end of each grade. They correspond to the College and Career Readiness (CCR) anchor standards below by number. The CCR and grade-specific standards are necessary complements—the former providing broad standards, the latter providing additional specificity—that together define the skills and understandings that all students must demonstrate.

Conventions of Standard English

1. Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.
2. Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.

Knowledge of Language

3. Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening.

Vocabulary Acquisition and Use

4. Determine or clarify the meaning of unknown and multiple-meaning words and phrases by using context clues, analyzing meaningful word parts, and consulting general and specialized reference materials, as appropriate.
5. Demonstrate understanding of figurative language, word relationships, and nuances in word meanings.
6. Acquire and use accurately a range of general academic and domain-specific words and phrases sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.

Note on range and content of student language use

To be college and career ready in language, students must have firm control over the conventions of standard English. At the same time, they must come to appreciate that language is as at least as much a matter of craft as of rules and be able to choose words, syntax, and punctuation to express themselves and achieve particular functions and rhetorical effects. They must also have extensive vocabularies, built through reading and study, enabling them to comprehend complex texts and engage in purposeful writing about and conversations around content. They need to become skilled in determining or clarifying the meaning of words and phrases they encounter, choosing flexibly from an array of strategies to aid them. They must learn to see an individual word as part of a network of other words—words, for example, that have similar denotations but different connotations. The inclusion of Language standards in their own strand should not be taken as an indication that skills related to conventions, effective language use, and vocabulary are unimportant to reading, writing, speaking, and listening; indeed, they are inseparable from such contexts.

Language Standards for Literacy in All Subjects

The following standards for grades 6–12 offer a focus for instruction each year to help ensure that students gain adequate mastery of a range of skills and applications. *Students advancing through the grades are expected to meet each year's grade-specific standards and retain or further develop skills and understandings mastered in preceding grades.* Beginning in grade 3, skills and understandings that are particularly likely to require continued attention in higher grades as they are applied to increasingly sophisticated writing and speaking are marked with an asterisk (*).

Grade 6 students:	Grade 7 students:	Grade 8 students:
Conventions of Standard English		
1. Demonstrate command of the conventions of standard English grammar and usage when writing or speaking. a. Ensure that pronouns are in the proper case (subjective, objective, possessive). b. Use intensive pronouns (e.g., *myself, ourselves*). c. Recognize and correct inappropriate shifts in pronoun number and person.* d. Recognize and correct vague pronouns (i.e., ones with unclear or ambiguous antecedents).* e. Recognize variations from standard English in their own and others' writing and speaking, and identify and use strategies to improve expression in conventional language.*	1. Demonstrate command of the conventions of standard English grammar and usage when writing or speaking. a. Explain the function of phrases and clauses in general and their function in specific sentences. b. Choose among simple, compound, complex, and compound-complex sentences to signal differing relationships among ideas. c. Place phrases and clauses within a sentence, recognizing and correcting misplaced and dangling modifiers.*	1. Demonstrate command of the conventions of standard English grammar and usage when writing or speaking. a. Explain the function of verbals (gerunds, participles, infinitives) in general and their function in particular sentences. b. Form and use verbs in the active and passive voice. c. Form and use verbs in the indicative, imperative, interrogative, conditional, and subjunctive mood. d. Recognize and correct inappropriate shifts in verb voice and mood.*
2. Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing. a. Use punctuation (commas, parentheses, dashes) to set off nonrestrictive/parenthetical elements.* b. Spell correctly.	2. Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing. a. Use a comma to separate coordinate adjectives (e.g., *It was a fascinating, enjoyable movie* but not *He wore an old[,] green shirt*). b. Spell correctly.	2. Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing. a. Use punctuation (comma, ellipsis, dash) to indicate a pause or break. b. Use an ellipsis to indicate an omission. c. Spell correctly.
Knowledge of Language		
3. Use knowledge of language and its conventions when writing, speaking, reading, or listening. a. Vary sentence patterns for meaning, reader/listener interest, and style.* b. Maintain consistency in style and tone.*	3. Use knowledge of language and its conventions when writing, speaking, reading, or listening. a. Choose language that expresses ideas precisely and concisely, recognizing and eliminating wordiness and redundancy.*	3. Use knowledge of language and its conventions when writing, speaking, reading, or listening. a. Use verbs in the active and passive voice and in the conditional and subjunctive mood to achieve particular effects (e.g., emphasizing the actor or the action; expressing uncertainty or describing a state contrary to fact).

Language Standards for Literacy in All Subjects

Grade 6 students:	Grade 7 students:	Grade 8 students:
Vocabulary Acquisition and Use		
4. Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on *grade 6 reading and content*, choosing flexibly from a range of strategies. a. Use context (e.g., the overall meaning of a sentence or paragraph; a word's position or function in a sentence) as a clue to the meaning of a word or phrase. b. Use common, grade-appropriate Greek or Latin affixes and roots as clues to the meaning of a word (e.g., *audience, auditory, audible*). c. Consult reference materials (e.g., dictionaries, glossaries, thesauruses), both print and digital, to find the pronunciation of a word or determine or clarify its precise meaning or its part of speech. d. Verify the preliminary determination of the meaning of a word or phrase (e.g., by checking the inferred meaning in context or in a dictionary).	4. Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on *grade 7 reading and content*, choosing flexibly from a range of strategies. a. Use context (e.g., the overall meaning of a sentence or paragraph; a word's position or function in a sentence) as a clue to the meaning of a word or phrase. b. Use common, grade-appropriate Greek or Latin affixes and roots as clues to the meaning of a word (e.g., *belligerent, bellicose, rebel*). c. Consult general and specialized reference materials (e.g., dictionaries, glossaries, thesauruses), both print and digital, to find the pronunciation of a word or determine or clarify its precise meaning or its part of speech. d. Verify the preliminary determination of the meaning of a word or phrase (e.g., by checking the inferred meaning in context or in a dictionary).	4. Determine or clarify the meaning of unknown and multiple-meaning words or phrases based on *grade 8 reading and content*, choosing flexibly from a range of strategies. a. Use context (e.g., the overall meaning of a sentence or paragraph; a word's position or function in a sentence) as a clue to the meaning of a word or phrase. b. Use common, grade-appropriate Greek or Latin affixes and roots as clues to the meaning of a word (e.g., *precede, recede, secede*). c. Consult general and specialized reference materials (e.g., dictionaries, glossaries, thesauruses), both print and digital, to find the pronunciation of a word or determine or clarify its precise meaning or its part of speech. d. Verify the preliminary determination of the meaning of a word or phrase (e.g., by checking the inferred meaning in context or in a dictionary).
5. Demonstrate understanding of figurative language, word relationships, and nuances in word meanings. a. Interpret figures of speech (e.g., personification) in context. b. Use the relationship between particular words (e.g., cause/effect, part/whole, item/category) to better understand each of the words. c. Distinguish among the connotations (associations) of words with similar denotations (definitions) (e.g., *stingy, scrimping, economical, unwasteful, thrifty*).	5. Demonstrate understanding of figurative language, word relationships, and nuances in word meanings. a. Interpret figures of speech (e.g., literary, biblical, and mythological allusions) in context. b. Use the relationship between particular words (e.g., synonym/antonym, analogy) to better understand each of the words. c. Distinguish among the connotations (associations) of words with similar denotations (definitions) (e.g., *refined, respectful, polite, diplomatic, condescending*).	5. Demonstrate understanding of figurative language, word relationships, and nuances in word meanings. a. Interpret figures of speech (e.g. verbal irony, puns) in context. b. Use the relationship between particular words to better understand each of the words. c. Distinguish among the connotations (associations) of words with similar denotations (definitions) (e.g., *bullheaded, willful, firm, persistent, resolute*).
6. Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases; gather vocabulary knowledge when considering a word or phrase important to comprehension or expression.	6. Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases; gather vocabulary knowledge when considering a word or phrase important to comprehension or expression.	6. Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases; gather vocabulary knowledge when considering a word or phrase important to comprehension or expression.

Language Standards for Literacy in All Subjects

Grades 9–10 students:	Grades 11–12 students:
Vocabulary Acquisition and Use	
4. Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on *grades 9–10 reading and content*, choosing flexibly from a range of strategies. a. Use context (e.g., the overall meaning of a sentence, paragraph, or text; a word's position or function in a sentence) as a clue to the meaning of a word or phrase. b. Identify and correctly use patterns of word changes that indicate different meanings or parts of speech (e.g., *analyze, analysis, analytical; advocate, advocacy*). c. Consult general and specialized reference materials (e.g., dictionaries, glossaries, thesauruses), both print and digital, to find the pronunciation of a word or determine or clarify its precise meaning, its part of speech, or its etymology. d. Verify the preliminary determination of the meaning of a word or phrase (e.g., by checking the inferred meaning in context or in a dictionary).	4. Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on *grades 11–12 reading and content*, choosing flexibly from a range of strategies. a. Use context (e.g., the overall meaning of a sentence, paragraph, or text; a word's position or function in a sentence) as a clue to the meaning of a word or phrase. b. Identify and correctly use patterns of word changes that indicate different meanings or parts of speech (e.g., *conceive, conception, conceivable*). c. Consult general and specialized reference materials (e.g., dictionaries, glossaries, thesauruses), both print and digital, to find the pronunciation of a word or determine or clarify its precise meaning, its part of speech, its etymology, or its standard usage. d. Verify the preliminary determination of the meaning of a word or phrase (e.g., by checking the inferred meaning in context or in a dictionary).
5. Demonstrate understanding of figurative language, word relationships, and nuances in word meanings. a. Interpret figures of speech (e.g., euphemism, oxymoron) in context and analyze their role in the text. b. Analyze nuances in the meaning of words with similar denotations.	5. Demonstrate understanding of figurative language, word relationships, and nuances in word meanings. a. Interpret figures of speech (e.g., hyperbole, paradox) in context and analyze their role in the text. b. Analyze nuances in the meaning of words with similar denotations.
6. Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.	6. Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.

Language Progressive Skills, by Grade

The following skills, marked with an asterisk (*) in Language standards 1–3, are particularly likely to require continued attention in higher grades as they are applied to increasingly sophisticated writing and speaking.

Standard	Grade(s)							
	3	4	5	6	7	8	9–10	11–12
L.3.1f. Ensure subject-verb and pronoun-antecedent agreement.								
L.3.3a. Choose words and phrases for effect.								
L.4.1f. Produce complete sentences, recognizing and correcting inappropriate fragments and run-ons.								
L.4.1g. Correctly use frequently confused words (e.g., *to/too/two; there/their*).								
L.4.3a. Choose words and phrases to convey ideas precisely.*								
L.4.3b. Choose punctuation for effect.								
L.5.1d. Recognize and correct inappropriate shifts in verb tense.								
L.5.2a. Use punctuation to separate items in a series.†								
L.6.1c. Recognize and correct inappropriate shifts in pronoun number and person.								
L.6.1d. Recognize and correct vague pronouns (i.e., ones with unclear or ambiguous antecedents).								
L.6.1e. Recognize variations from standard English in their own and others' writing and speaking, and identify and use strategies to improve expression in conventional language.								
L.6.2a. Use punctuation (commas, parentheses, dashes) to set off nonrestrictive/parenthetical elements.								
L.6.3a. Vary sentence patterns for meaning, reader/listener interest, and style.‡								
L.6.3b. Maintain consistency in style and tone.								
L.7.1c. Place phrases and clauses within a sentence, recognizing and correcting misplaced and dangling modifiers.								
L.7.3a. Choose language that expresses ideas precisely and concisely, recognizing and eliminating wordiness and redundancy.								
L.8.1d. Recognize and correct inappropriate shifts in verb voice and mood.								
L.9–10.1a. Use parallel structure.								

* Subsumed by L.7.3a
† Subsumed by L.9–10.1a
‡ Subsumed by L.11–12.3a

Standards for Mathematical Practice

Mathematical proficiency is necessary for every student; therefore, understanding concepts and being fluent with procedural skills are both important. This means that educators must intentionally engage students at all levels so they are readily able to understand important concepts, use skills effectively and apply mathematics to make sense of their changing world.

Adding it Up (National Research Council, 2001), a major research report that informed the development of the Common Core State Standards for Mathematics, emphasizes the five strands of mathematical proficiency: conceptual understanding, procedural fluency, adaptive reasoning, strategic competence and productive disposition. These strands are not sequential, but intertwined and form the basis for the *Standards for Mathematical Content* and the *Standards for Mathematical Practice*. Together, these two sets of mathematics standards define what students should understand and be able to do in their study of PK-12 mathematics.

Standards for Mathematical Practice	Characteristics of Mathematically Proficient Students
Make sense of problems and persevere in solving them.	**Mathematically proficient students can:** Explain the meaning of a problem and restate it in their words. Analyze given information to develop possible strategies for solving the problem. Identify and execute appropriate strategies to solve the problem. Evaluate progress toward the solution and make revisions if necessary. Explain the connections among various representations of a problem or concept. Check for accuracy and reasonableness of work, strategy and solution. Understand and connect strategies used by others to solve problems.
Reason abstractly and quantitatively.	**Mathematically proficient students can:** Translate given information to create a mathematical representation for a concept. Manipulate the mathematical representation by showing the process considering the meaning of the quantities involved. Recognize the relationships between numbers/quantities within the process to evaluate a problem. Review the process for reasonableness within the original context.
Construct viable arguments and critique the reasoning of others.	**Mathematically proficient students can:** Use observations and prior knowledge (stated assumptions, definitions and previous established results) to make conjectures and construct arguments. Compare and contrast logical arguments and identify which one makes the most sense. Justify (orally and in written form) the approach used, including how it fits in the context from which the data arose. Listen, understand, analyze and respond to the arguments of others. Identify and explain both correct and flawed logic. Recognize and use counterexamples to refine assumptions or definitions and dispute or disprove an argument.

Standards for Mathematical Practice	Characteristics of Mathematically Proficient Students
Model with mathematics.	**Mathematically proficient students can:** Use a variety of methods to model, represent and solve real-world problems. Simplify a complicated problem by making assumptions and approximations. Interpret results in the context of the problem and revise the model if necessary. Choose a model that is both appropriate and efficient to arrive at one or more desired solutions.
Use appropriate tools strategically.	**Mathematically proficient students can:** Identify mathematical tools and recognize their strengths and weaknesses. Select and use appropriate tools to best model/solve problems. Use estimation to predict reasonable solutions and/or detect errors. Identify and successfully use external mathematical resources to pose or solve problems. Use a variety of technologies, including digital content, to explore, confirm and deepen conceptual understanding.
Attend to precision.	**Mathematically proficient students can:** Understand symbols and use them consistently within the context of a problem. Calculate answers efficiently and accurately and label them appropriately. Formulate precise explanations (orally and in written form) using both mathematical representations and words. Communicate using clear mathematical definitions, vocabulary and symbols.
Look for and make use of structure.	**Mathematically proficient students can:** Look for, identify and accept patterns or structure within relationships. Use patterns or structure to make sense of mathematics and connect prior knowledge to similar situations and extend to novel situations. Analyze a complex problem by breaking it down into smaller parts. Reflect on the problem as a whole and shift perspective as needed.
Look for and express regularity in repeated reasoning.	**Mathematically proficient students can:** Recognize similarities and patterns in repeated trials with a process. Generalize the process to create a shortcut which may lead to developing rules or creating a formula. Evaluate the reasonableness of results throughout the mathematical process while attending to the details.

* Collaborative project with Cedarburg, Franklin, Fox Point-Bayside, Grafton, Greendale, Kettle Moraine, Menomonee Falls, Oconomowoc, Pewaukee, Waukesha and Whitefish Bay School Districts and CESA 1.

Section VI

Wisconsin's Guiding Principles for Teaching and Learning

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Guiding Principles for Teaching and Learning

These guiding principles are the underpinnings of effective teaching and learning for every Wisconsin teacher and every Wisconsin student. They are larger than any one initiative, process or set of standards. Rather, they are the lens we look through as we identify teaching and learning standards, design assessments and determine what good instruction looks like. These principles recognize that every student has the right to learn and are built upon three essential elements: high quality instruction, balanced assessment and collaboration. They are meant to align with academic excellence, rigorous instruction and college and career readiness for every Wisconsin student. For additional research, resources and probing questions to support professional learning on the six principles, please see the Wisconsin Research and Resources section of this document.

Every student has the right to learn.
It is our collective responsibility as an education community to make certain each child receives a high-quality, challenging education designed to maximize potential, an education that reflects and stretches his or her abilities and interests. This belief in the right of every child to learn forms the basis of equitable teaching and learning. The five principles that follow cannot exist without this commitment guiding our work.

Instruction must be rigorous and relevant.
To understand the world in which we live, there are certain things we all must learn. Each school subject is made up of a core of essential knowledge that is deep, rich and vital. Every student, regardless of age or ability, must be taught this essential knowledge. What students learn is fundamentally connected to how they learn and successful instruction blends the content of a discipline with processes of an engaging learning environment that changes to meet the dynamic needs of all students.

Purposeful assessment drives instruction and affects learning.
Assessment is an integral part of teaching and learning. Purposeful assessment practices help teachers and students understand where they have been, where they are and where they might go next. No one assessment can provide sufficient information to plan teaching and learning. Using different types of assessments as part of instruction results in useful information about student understanding and progress. Educators should use this information to guide their own practice and in partnership with students and their families to reflect on learning and set future goals.

Learning is a collaborative responsibility.
Teaching and learning are both collaborative processes. Collaboration benefits teaching and learning when it occurs on several levels: when students, teachers, family members and the community collectively prioritize education and engage in activities that support local schools, educators and students; when educators collaborate with their colleagues to support innovative classroom practices and set high expectations for themselves and their students; and when students are given opportunities to work together toward academic goals in ways that enhance learning.

Students bring strengths and experiences to learning.
Every student learns. Although no two students come to school with the same culture, learning strengths, background knowledge or experiences and no two students learn in exactly the same way, every student's unique personal history enriches classrooms, schools and the community. This diversity is our greatest education asset.

Responsive environments engage learners.
Meaningful learning happens in environments where creativity, awareness, inquiry and critical thinking are part of instruction. Responsive learning environments adapt to the individual needs of each student and encourage learning by promoting collaboration rather than isolation of learners. Learning environments, whether classrooms, schools or other systems, should be structured to promote engaged teaching and learning.

Every student has the right to learn.

It is our collective responsibility as an education community to make certain each child receives a high-quality, challenging education designed to maximize potential, an education that reflects and stretches his or her abilities and interests. This belief in the right of every child to learn forms the basis of equitable teaching and learning. The five principles that follow cannot exist without this commitment guiding our work.

Every student's right to learn provides the overarching vision for Wisconsin's Guiding Principles for education. To be successful, education must be committed to serving the learning needs of students from various social, economic, cultural, linguistic and developmental backgrounds. For all students to have a guaranteed right to learn, schooling must be equitable.

Research Summary

Focusing on Equity

The belief that each student has the right to learn despite differences in educational needs and backgrounds has important implications for ensuring an equitable education for all students. In the education research literature, the term *educational equality* refers to the notion that all students should have access to an education of similar quality—the proxy for which is frequently educational *inputs* such as funding, facilities, resources and quality teaching and learning. In contrast, the term *educational equity* connotes the requirement that all students receive an education that allows them to achieve at a standard level or attain standard educational *outcomes* (Brighouse & Swift, 2008). Importantly, equality in terms of educational resources or inputs may not guarantee equity in educational outcomes because not all students reach the same level of achievement with the same access to resources (Brighouse & Swift, 2008).To serve students of varying economic, social, developmental or linguistic backgrounds, achieving equity in education may require more resources to meet the greater educational needs of certain students (Berne & Stiefel, 1994).

The research literature offers several components that provide a framework for understanding what an equitable education for all students looks like at the classroom level. These components include a call for all students to be provided with the following:

- Access to resources and facilities
- Instruction in all areas tailored to their needs
- Curriculum that is rigorous and relevant
- Educators who are culturally sensitive and respectful
- Interactions with staff and other students that are positive and encouraging in an atmosphere of learning
- Assessment that is varied to give each student the opportunity to demonstrate learning (Education Northwest, 2011)

Access

Access to resources and facilities largely refers to various legal mandates that all children have the right to attend school and participate in all school activities. Since the landmark ruling *Brown v. Board of Education of Topeka* (1954), court decisions and federal regulations have mandated equality of access to all educational opportunities for students regardless of race, ethnicity or gender (Civil Rights Act, 1964), disability (Education for All Handicapped Children Act, 1975) or language (*Lau v. Nichols, 1974*). Equity in the provision of educational resources and funding was improved with the passage of Title I of the Elementary and Secondary Education Act (ESEA; 1965), which provided additional resources for economically disadvantaged students to meet their learning needs. Since Title I, research on equity in education has grown and with the reauthorization of ESEA in the No Child Left Behind Act in 2001, equity in educational outcomes for all students was emphasized in the law. Access to an equitable education is a legal right for all children and the quality of that access in classroom instruction is a moral and ethical right.

Instruction

Instruction that is tailored to meet all students' needs goes beyond simply providing equal access to education. High-quality instruction has increasingly been defined in the literature as a key factor in student achievement. High-quality instruction includes differentiated instructional strategies, teaching to students' learning styles and provision of instructional support for students who are educationally, socially or linguistically challenged. Differentiated instruction involves utilizing unique instructional strategies for meeting individual student needs as well as modifying curriculum for both high- and low-performing students. Assessing and teaching to student learning styles is one form of differentiation. Research has shown the value of adapting instructional strategies to different student learning styles (Gardner, 1999) and supports the practice of classroom differentiation (Mulroy & Eddinger, 2003; Tomlinson, 2005).

Curriculum

Designing curriculum that is rigorous and relevant provides an important foundation for a high-quality learning environment by helping make standards-based content accessible to all students. A relevant, rigorous curriculum has been found to be important for all students. Although

advanced and rigorous curriculum is generally viewed to be an important factor of academic success for high-achieving students, research also indicates that using challenging, interesting and varied curriculum for students of all achievement levels improves student achievement (Daggett, 2005). Rigorous curriculum can be adapted for low-performing students in a way that challenges them and helps them meet learning standards. For example, the universal design for learning (UDL) offers strategies for making the general curriculum accessible to special education students (Rose, Hasselbring, Stahl, & Zabala, 2009). Similarly, research on lesson scaffolding emphasizes strategies for providing a rigorous content curriculum to student who are culturally or linguistically diverse or who need additional context to understand certain concepts (Gibbons, 2002).

Climate

Interactions with staff and students that are positive and focused on learning are part of an emotionally safe school climate, but the literature also supports the need for a climate of high academic expectations (Haycock, 2001). Schools with large numbers of high-poverty and racially diverse students have shown significant academic growth when teachers and staff members create an environment of high expectations for achievement (Reeves, 2010). In addition, research on school climate has asserted the need for students to feel emotionally safe and respected as well as physically safe in school (Gronna & Chin-Chance, 1999).

A positive, respectful learning environment with high expectations and curricular and instructional supports for all students offers an avenue to genuine educational equity.

Probing Questions

- What are some of the needs and challenges your school faces in moving toward a fully equitable education for all students?
- How could you provide leadership in your school to work to ensure an equitable education for all students?

Resources

A variety of resources are available for teachers and leaders on educational equity for all students. A few websites and links are highlighted below:

The School Improvement Center developed activities to help districts develop an equity framework. These resources can be found at Actualizing Equity: The Equity Framework: http://www.gapsc.com/EducatorPreparation/NoChildLeftBehind/Admin/Files/ conference_032010/Actualizing_Equity.pdf.

The Education Equality Project developed a website with useful resources for educators. It can be found at http://www.edequality.org.

The Equity Center has a website with a variety of resources. The resources can be found at http://educationnorthwest.org/project/Equity%20Program/resource/.

The Midwest Equity Assistance Center has a website with many resources. It can be found at http://www.meac.org/Publications.html.

The Office for Civil Rights has a useful website for educators. It can be found at http://www2.ed.gov/about/offices/list/ocr/index.html.

Southern Poverty Law Center, Teaching Tolerance Program. Resources can be found at http://www.splcenter.org/what-we-do/teaching-tolerance.

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Guiding Principle 2:
Instruction must be rigorous and relevant.

To understand the world in which we live, there are certain things we all must learn. Each school subject is made up of a core of essential knowledge that is deep, rich and vital. Every student, regardless of age or ability, must be taught this essential knowledge. What students learn is fundamentally connected to how they learn and successful instruction blends the content of a discipline with processes of an engaging learning environment that changes to meet the dynamic needs of all students.

Research Summary

Instruction should connect directly to students' lives and must deeply engage them with the content in order for students to be better prepared for college and careers. To succeed in postsecondary education and in a 21st century economy, students must be afforded opportunities to practice higher-order thinking skills, such as how to analyze an argument, weigh evidence, recognize bias (their own and others' bias), distinguish fact from opinion, balance competing principles, work collaboratively with others and be able to communicate clearly what they understand (Wagner, 2006). In order to accomplish these goals, instruction must be rigorous and meaningful.

The definition of rigor varies greatly in both research and practice. Bower and Powers (2009) conducted a study to determine the essential components of rigor. They defined rigor through their research as "how the standard curriculum is delivered within the classroom to ensure students are not only successful on standardized assessments but also able to apply this knowledge to new situations both within the classroom and in the real world." They also identified higher-order thinking and real-world application as two critical aspects of rigor, suggesting that it is not enough for students to know how to memorize information and perform on multiple-choice and short-answer tests. Students must have deep and rich content knowledge, but rigor also includes the ability to apply that knowledge in authentic ways.

Teaching and learning approaches that involve students collaborating on projects that culminate with a product or presentation are a way to bring rigor into the classroom. Students can take on real problems, use what they know and research to come up with real solutions to real problems. They must engage with their subject and with their peers.

In August 2010, the Institutes of Education Sciences reported the results of a randomized control trial showing that a problem-based curriculum boosted high school students' knowledge of economics. This research suggests that students using this learning system and its variants score similarly on standardized tests as students who follow more traditional classroom practices. The research also suggests that students learning through problem-solving and projects are more adept at applying what they know and are more deeply engaged.

The notion of a meaningful curriculum is not a new one. John Dewey (1990), writing in 1902, called for a curriculum that involves a critical but balanced understanding of the culture and the prior knowledge of each child in order to extend learning. According to Spillane (2000), presenting content in more authentic ways—disciplinary and other real-world contexts—has become a central theme of current reform movements. Schools should be places where "the work students are asked to do [is] work worth doing" (Darling-Hammond, 2006, p. 21). Research collected by the International Center for Leadership in Education shows that "students understand and retain knowledge best when they have applied it in a practical, relevant setting" (Daggett, 2005, p. 2).A skilled 21st century educator helps students master learning targets and standards using purposefully crafted lessons and teaches with appropriate instructional strategies incorporated. The students understand why they are learning particular skills and content and are engaged in learning opportunities that allow them to use their inquiry skills, creativity and critical thinking to solve problems.

According to Brown, Collins and Duguid (1989), instruction connected to individual contexts has been found to have a significant impact on learning. Research conducted by Sanbonmatsu, Shavitt and Sherman (1991) and Petty and Cacioppo (1984) also contends that student learning is directly influenced by how well it is connected to a context. Much of this research began with the analysis of how people learn when they find the ideas significant to their own world. It begins to show the importance

of connecting content and instruction to the world of the students. Weaver and Cottrell (1988) point out that how content is presented can affect how students retain it. They state instruction that connects the content to the students' lives and experiences helps students to internalize meaning. Sass (1989) and Keller (1987) suggest that if teachers can make the content familiar to the students and link it to what they are familiar with, students' learning will increase. Shulman and Luechauer (1993) contend that these connections must be done by engaging students with rigorous content in interactive learning environments.

Higher-Order Thinking

Higher-order thinking, according to Newmann (1990),"challenges the student to interpret, analyze or manipulate information" (p. 45).This definition suggests that instruction must be designed to engage students through multiple levels in order for them to gain a better understanding of the content. An analysis of the research by Lewis and Smith (1993) led to their definition of higher-order thinking: "when a person takes new information and information stored in memory and interrelates and/ or rearranges and extends this information to achieve a purpose or find possible answers in perplexing situations" (p. 44).This definition emphasizes the level of complexity necessary to help students reach a deeper and higher level of understanding of the content. Shulman (1987) points out teachers will need an in-depth knowledge of their content to be able to fit these types of strategies to their instruction.

Real-World Application

VanOers and Wardekker (1999) indicate that connecting instruction to real-world applications gives meaning to learning, makes it practical and can help to develop connections with the greater community. Incorporating real-world examples becomes more authentic to students because they will be able to connect the learning to the bigger picture rather than just the classroom. Newmann and Wehlage (1993) describe the three criteria developed by Archbald and Newmann (1988) for this type of authentic learning:"Students construct meaning and produce knowledge, students use disciplined inquiry to construct meaning and students aim their work toward production of discourse, products and performances that have value or meaning beyond success in school" (p. 8) These criteria, when reflected upon by teachers, can be a useful tool to ensure that instruction is authentic and engaging for all students.

Authentic Learning

Authentic learning builds on the concept of "learning by doing" to increase a student's engagement. To succeed, this method needs to have meaning or value to the student, embody in-depth learning in the subject and allow the student to use what he or she learned to produce something new and innovative (Lemke & Coughlin, 2009). For example, in project-based learning, students collaborate to create their own projects that demonstrate their knowledge (Bell, 2010). Students start by developing a question that will guide their work. The teacher acts as the supervisor. The goal is greater understanding of the topic, deeper learning, higher-level reading and increased motivation (Bell, 2010). Research has shown that students who engage in project-based learning outscore their traditionally educated peers in standardized testing (Bell, 2010).

Constructivist learning is also a way to bring authenticity to the classroom. Richard Mayer (2004) defines constructivist learning as an "active process in which learners are active sense makers who seek to build coherent and organized knowledge." Students co-construct their learning, with the teacher serving as a guide or facilitator (oftentimes using technology as a facilitating tool).The teacher doesn't function in a purely didactic manner. Neo and Neo (2009) state that constructivism helps students develop problem-solving skills, critical thinking and creative skills and apply them in meaningful ways. Inquiry-based instruction, a type of constructivist learning, has students identify real world problems and then pose and find answers to their own questions. A study by Minner, Levy and Century (2010) has shown this method can improve student performance. They found inquiry-based instruction has a larger impact (approximately 25-30% higher) on a student's initial understanding and retention of content than any other variable.

Another form of authentic learning involves video simulated learning or gaming. Research has shown that video games can provide a rich learning context by fostering creative thinking. The games can show players how to manage complex problems and how their decisions can affect the outcome (Sharritt, 2008). This form of learning also can engage students in collaboration and interaction with peers.

Multimodal Instruction

Multimodal teaching leverages various presentation formats—such as printed material, videos, PowerPoints and computers—to appeal to

different learning styles (Birch, 2009; Moreno & Mayer, 2007). It accommodates a more diverse curriculum and can provide a more engaging and interactive learning environment (Birch, 2009).According to research, an effective way of learning is by utilizing different modalities within the classroom, which can help students understand difficult concepts—therefore improving how they learn (Moreno & Mayer, 2007).

An example of multimodal learning that incorporates technology is digital storytelling. Digital storytelling is the practice of telling stories by using technology tools (e.g., digital cameras, authoring tools, computers) to create multimedia stories (Sadik, 2008). Researchers have found that using this form of learning facilitates student engagement, deep learning, project-based learning and effective integration of technology into instruction (Sadik, 2008).

Probing Questions

Research emphasizes the need for higher-order thinking embedded in instructional practice. How might you learn to incorporate higher-order thinking strategies into your practice?

The research also suggests the need to connect learning experiences to the real world of the students. How can you use real-world examples in your practice to better engage students in their learning?

Resources

The Rigor/Relevance Framework created by Daggett (2005) is a useful tool to create units, lessons and assessments that ask students to engage with content at a higher, deeper level. The model and examples are available on the following website: http://www.leadered.com/rrr.html.

Newmann's Authentic Intellectual Work Framework (Newmann, Secada & Wehlage, 1995) gives teachers the tools to analyze instructional practices and student work in regard to indicators of rigor. The research and tools are available at the Center for Authentic Intellectual Work website: http://centerforaiw.com/.

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Guiding Principle 3:
Purposeful assessment drives instruction and affects learning.

Assessment is an integral part of teaching and learning. Purposeful assessment practices help teachers and students understand where they have been, where they are and where they might go next. No one assessment can provide sufficient information to plan teaching and learning. Using different types of assessments as part of instruction results in useful information about student understanding and progress. Educators should use this information to guide their own practice and in partnership with students and their families to reflect on learning and set future goals.

Research Summary

Assessment informs teachers, administrators, parents and other stakeholders about student achievement. It provides valuable information for designing instruction; acts as an evaluation for students, classrooms and schools; and informs policy decisions. Instruments of assessment can provide formative or summative data and they can use traditional or authentic designs. Research on assessment emphasizes that the difference between formative and summative assessment has to do with how the data from the assessment is used.

Dunn and Mulvenon (2009) define summative assessment as assessment "data for the purposes of assessing academic progress at the end of a specified time period (i.e., a unit of material or an entire school year) and for the purposes of establishing a student's academic standing relative to some established criterion" (p. 3).

The Council of Chief State School Officers (CCSSO) (2008) define formative assessment as a process "used by teachers and students during instruction that provides feedback to adjust ongoing teaching and learning to improve students' achievement of intended instructional outcomes" (p. 3).

Wisconsin's approach to balanced assessment www.dpi.wi.gov/oea/balanced emphasizes the importance of identifying the purposes for administering an assessment. Identifying the purpose or data needed establishes whether a particular assessment is being used formatively or summatively. There can be multiple purposes for giving a particular assessment, but identifying how the data will be used helps to ensure that the assessment is collecting the data that is needed for educators, students and their families.

Assessments, whether formative or summative, can be designed as traditional or authentic tools. Traditional assessment uses tools such as paper and pencil tests, while authentic assessment focuses on evaluating student learning in a more "real life" situation. The bulk of the research on assessment design focuses on authentic assessment.

Formative Assessment

Using formative assessment as a regular part of instruction has been shown to improve student learning from early childhood to university education. It has been shown to increase learning for both low-performing and high-performing students. Black and Wiliam's (1998) seminal study found that the use of formative assessment produces significant learning gains for low-achieving students. Other researchers have shown similar results for students with special learning needs. (McCurdy & Shapiro, 1992; Fuchs & Fuchs, 1986). Research also supports the use of formative assessment in kindergarten classes (Bergan, Sladeczek, Schwarz, & Smith, 1991) and university students (Martinez & Martinez, 1992).

Formative assessment provides students with information on the gaps that exist between their current knowledge and the stated learning goals (Ramaprasad, 1983). By providing feedback on specific errors it helps students understand that their low performance can be improved and is not a result of lack of ability (Vispoel & Austin, 1995). Studies emphasize that formative assessment is most effective when teachers use it to provide specific and timely feedback on errors and suggestions for improvement (Wininger, 2005), when students understand the learning objectives and assessment criteria and when students have the opportunity to reflect on their work (Ross, 2006; Ruiz-Primo & Furtak, 2006). Recent research supports the use of web-based formative assessment for improving student achievement (Wang, 2007).
A number of studies emphasize the importance of teacher professional development on formative assessment in order to gain maximum student

achievement benefits (Atkins, Black & Coffey, 2001; Black & Wiliam, 1998).A 2009 article in *Educational Measurement* asserts that teachers are better at analyzing formative assessment data than at using it to design instruction. Research calls for more professional development on assessment for teachers (Heritage, Kim, Vendlinski, & Herman, 2009).

Authentic Assessment

Generating rich assessment data can be accomplished through the use of an authentic assessment design as well as through traditional tests. Authentic assessments require students to "use prior knowledge, recent learning and relevant skills to solve realistic, complex problems" (DiMartino & Castaneda, 2007, p. 39). Research on authentic assessment often explores one particular form, such as portfolios (Berryman & Russell, 2001; Tierney et al., 1998); however, several studies examined more than one form of authentic assessment: portfolios, project-based assessment, use of rubrics, teacher observation and student demonstration (Darling-Hammond, Rustique-Forrester, & Pecheone, 2005; Herman, 1997; Wiggins, 1990). Authentic assessment tools can be used to collect both formative and summative data. These data can provide a more complete picture of student learning.

Balanced Assessment

Wisconsin's Next Generation Assessment Task Force (2009) defines the purpose and characteristics of a balanced assessment system:

> Purpose: to provide students, educators, parents and the public with a range of information about academic achievement and to determine the best practices and policies that will result in improvements to student learning.
>
> Characteristics: includes a continuum of strategies and tools that are designed specifically to meet discrete needs–daily classroom instruction, periodic checkpoints during the year and annual snapshots of achievement. (p. 6)

A balanced assessment system is an important component of quality teaching and learning. Stiggins (2007) points out that a variety of quality assessments must be available to teachers in order to form a clearer picture of student achievement of the standards. Popham (2008) believes that when an assessment is of high quality, it can accurately detect changes in student achievement and can contribute to continuous improvement of the educational system.

Probing Questions

- How might you use questioning and discussion in your classroom in a way that gives you formative assessment information on all students?
- How can you use assignments and tests as effective formative assessment?
- How could you design and implement a balanced assessment system that includes pre- and post-assessments for learning?

Resources

Rick Stiggins, founder and director of the Assessment Training Institute, provides resources on the practice of assessment at http://www.assessmentinst.com/author/rick-stiggins/.

Margaret Heritage's books Formative Assessment for Literacy and Academic Language (2008, coauthored with Alison Bailey) and Formative Assessment: Making It Happen in the Classroom (2010) provides resources and practices. These books are available through bookstores.

ASCD has publications on assessment at http://www.ascd.org/SearchResults.aspx?s=assessment&c=1&n=10&p=0.

The National Middle Schools Association provides assessment information through a search for "assessment" at http://www.nmsa.org/.
Boston (2002) recommends the following resources for assessment:

A Practical Guide to Alternative Assessment, by J. R. Herman, P. L. Aschbacher and L.Winters. Available at a variety of booksellers.

Improving Classroom Assessment: A Toolkit for Professional Developers
http://educationnorthwest.org/resource/700
Classroom Assessment and the National Science Education Standards
http:www.nap.edu/catalog/9847.html

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Guiding Principle 4:
Learning is a collaborative responsibility.

Teaching and learning are both collaborative processes. Collaboration benefits teaching and learning when it occurs on several levels: when students, teachers, family members and the community collectively prioritize education and engage in activities that support local schools, educators and students; when educators collaborate with their colleagues to support innovative classroom practices and set high expectations for themselves and their students; and when students are given opportunities to work together toward academic goals in ways that enhance learning.

Research Summary

Collaborative learning is an approach to teaching and learning that requires learners to work together to deliberate, discuss and create meaning. Smith and MacGregor (1992) define the term as follows:

> "Collaborative learning" is an umbrella term for a variety of educational approaches involving joint intellectual effort by students or students and teachers together. Usually, students are working in groups of two or more, mutually searching for understanding, solutions or meanings or creating a product. Collaborative learning activities vary widely, but most center on students' exploration or application of the course material, not simply the teacher's presentation or explication of it. (p. 1)

Collaborative learning has been practiced and studied since the early 1900s.The principles are based on the theories of John Dewey (2009), Lev Vygotsky (1980) and Benjamin Bloom (1956).Their collective work focusing on how students learn has led educators to develop more student-focused learning environments that put students at the center of instruction. Vygotsky specifically stated that learning is a social act and must not be done in isolation. This principle is the foundation of collaborative learning.

The research of Vygotsky (1980) and Jerome Bruner (1985) indicates that collaborative learning environments are one of the necessities for learning. Slavin's (1989) research also suggests that students and teachers learn more, are more engaged and feel like they get more out of their classes when working in a collaborative environment. Totten, Sills, Digby and Russ (1991) found that those involved in collaborative learning understand content at deeper levels and have higher rates of achievement and retention than learners who work alone. They suggest that collaborative learning gives students opportunities to internalize their learning.

A meta-analysis from the Cooperative Learning Center at the University of Minnesota concluded that having students work collaboratively has significantly more impact on learning than having students work alone (Johnson, Maruyama, Johnson, Nelson, & Skon, 1981).An analysis of 122 studies on cooperative learning revealed:

- More students learn more material when they work together—talking through the material with each other and making sure that all group members understand—than when students compete with one another or work alone individualistically.
- More students are motivated to learn the material when they work together than when students compete or work alone individualistically (and the motivation tends to be more intrinsic).
- Students have more positive attitudes when they work together than when they compete or work alone individualistically.
- Students are more positive about the subject being studied, the teacher and themselves as learners in that class and are more accepting of each other (male or female, handicapped or not, bright or struggling or from different ethnic backgrounds) when they work together.

Collaboration can be between teachers, between students and between teacher and student.

Teacher-Teacher Collaboration

It is critical for teachers to have the time to collaborate. Professional learning communities, which provide teachers with established time to collaborate with other teachers, have become a more common practice in recent years. Louis and Kruse (1995) conducted a case study analysis that highlighted some of the positive outcomes associated with professional learning communities, including a reduction in teacher isolation, increases in teacher commitment and sense of shared responsibility and a better understanding of effective instructional practices. Professional learning communities encourage collaborative problem solving and allow teachers

to gain new strategies and skills to improve and energize their teaching and classrooms.

Another example of teacher-to-teacher collaboration is lesson study. This professional development process began in Japan. Lesson study is a collaborative approach to designing and studying classroom lessons and practice. The most critical components of lesson study are observation of the lesson, collection of data about teaching and learning and a collaborative analysis of the data to further impact instruction (Lewis, 2002; Lewis & Tsuchida, 1998; Wang-Iverson & Yoshida, 2005). Some of these characteristics are similar to other forms of professional development—analyzing student work, cognitive coaching and action research, to name a few—but the fact that it focuses on teachers observing a live lesson that was collaboratively developed is different than any other form of professional development. Lesson study is a way for teachers to work together, collect data and analyze data to reflect on teaching and learning (Lewis, 2002).

Student-Student Collaboration
Collaborative learning not only allows students to engage deeply with content but also helps students build the interpersonal skills needed to be successful in college and careers. Johnson, Johnson and Holubec (1993) state that collaborative learning provides students with the opportunity to develop social skills. They found that many of the outcomes expected as part of a collaborative learning activity corresponded with goals for student content understanding and skill attainment. The strategies associated with collaborative learning—such as role assignments, collaborative problem solving and task and group processing—all build the social skills that students need to be successful when working with others. Additionally, these skills are important in preparing students for the world of work, where collaborative writing and problem-solving are key elements of many careers.

There is a plethora of instructional and learning strategies that encourage student collaboration, including peer teaching, peer learning, reciprocal learning, team learning, study circles, study groups and work groups, to name just a few (Johnson & Johnson, 1986). Collaborative inquiry, which combines many of the elements of student collaboration just mentioned, is a research-based strategy in which learners work together through various phases "of planning, reflection and action as they explore an issue or question of importance to the group" (Goodnough, 2005 88). Collaborative inquiry brings together many perspectives to solve a problem, engaging students in relevant learning around an authentic question. It allows students to work together toward a common purpose to explore, make meaning and understand the world around them (Lee & Smagorinsky, 2000).

Teacher-Student Collaboration
The purpose for collaboration in an educational setting is to learn and unpack content together to develop a shared understanding. Harding-Smith (1993) points out that collaborative learning approach is based on the idea that learning must be a social act. It is through interaction that learning occurs. Johnson and Johnson (1986) similarly emphasize that when students and teachers talk and listen to each other; they gain a deeper understanding of the content and can develop the skills necessary to negotiate meaning throughout their lives.

Collaboration requires a shift from teacher-led instruction to instruction and learning that is designed by both teachers and students. Collaboration between student and teacher plays a critical role in helping students reflect and engage in their own learning experiences. The constructivist learning movement is one current example of efforts to increase the amount of collaboration between student and teacher occurring in the classroom. Mayer (2004) defines constructivist learning as an "active process in which learners are active sense makers who seek to build coherent and organized knowledge" (p. 14). Students co-construct their learning, with the teacher serving as a guide or facilitator. The teacher does not function in a purely didactic (i.e., lecturing) role. Neo and Neo (2009) found that constructivism helps students develop problem-solving skills, critical thinking and creative skills and apply them in meaningful ways.

Probing Questions

- How can you use collaborative learning processes to engage students in their learning?
- How might you create space for teacher-teacher collaboration within your context?

Resources

All Things PLC website provides a number of resources on professional learning communities. Links to these resources can be found at http:// www.allthingsplc.info/.

The Wisconsin Center for Education Research hosts a website with many resources for collaborative and small group learning. It can be found at http://www.wcer.wisc.edu/archive/cl1/cl/.

The Texas Collaborative for Teaching Excellence has created a professional development module about collaborative learning, which provides readings, research and resources. It can be found at http://www. texascollaborative.org/Collaborative_Learning_Module.htm.

A review of research on professional learning communities, presented at the National School Reform Faculty research forum in 2006, contains findings that outline what is known about professional learning communities and how they should be structured. This paper is available at http://www.nsrfharmony.org/research.vescio_ross_adams.pdf.

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Guiding Principle 5:
Students bring strengths and experiences to learning.

Every student learns. Although no two students come to school with the same culture, learning strengths, background knowledge or experiences and no two students learn in exactly the same way, every student's unique personal history enriches classrooms, schools and the community. This diversity is our greatest education asset.

Research Summary

The authors of the groundbreaking work How People Learn: Brain, Mind, Experience and School (Bransford, Brown, & Cocking, 2000) found that students' preconceptions may clash with new concepts and information they learn in school. If those preconceptions are not addressed, students may fail to grasp what is being taught or may learn only to pass a test. In other words, a student might enter kindergarten believing the world is flat because he or she has seen a flat map. Despite the presentation of geographic names and principles, the student still maintains the fundamental preconception about the shape of the world. Developing competence—or in this case, a knowledge of the shape of the world—requires that students have a deep foundation of factual knowledge, a context or conceptual framework to place it in and the opportunity to explore how it connects to the real world. Ultimately, a metacognitive approach—one that pushes students to think about their own thought processes—can help them take control of their own learning.

As educational research on how people learn advances, so does our approach to teaching and learning. Strategies to advance teaching and learning are constantly evolving into new and innovative ways to reach learners. When a teacher uses students' interests, curiosity and areas of confidence as starting points in planning instruction, learning is more productive. Teachers who are cognizant of these issues—and reflect on how to use them as strengths upon which they can build—ensure that all students have access to the content. Areas to consider are student strengths, gender, background knowledge and connections to the home environment.

Building on Student Strengths

Teaching to students' strengths can improve student engagement (Sternberg, 2000, Sternberg & Grigorenko, 2000). Many students have strengths that are unrecognized and neglected in traditional schooling. Students in underrepresented minority groups have culturally relevant knowledge that teachers can use to promote learning. Sternberg et al. (2000) found that conventional instruction in school systematically discriminates against students with creative and practical strengths and tends to favor students with strong memory and analytical abilities. This research, combined with Sternberg's earlier (1988) research showing that teaching for diverse styles of learning produces superior results, suggests that capitalizing on the various strengths that all students bring to the classroom can positively affect students' learning. When students are taught in a way that fits how they think, they do better in school (Sternberg, 2000; Sternberg & Grigorenko, 2000). Sternberg and O'Hara (2000) found that when students were taught in a way that incorporated analytical thinking, creative thinking (creating, imagining and inventing) and practical thinking (applying, implementing and putting into practice)—students achieved at higher levels than when taught using conventional instructional methods.

Gender Considerations

Changing instruction might help alleviate the gender gap in literacy achievement. Research conducted by Sax (2005) reveals that boys fall behind girls in reading and writing early on and never catch up. Sax (2007) found that this dynamic plays a role in higher high school dropout rates for males, particularly black males. The college graduation rate for females approaches twice that of males in Hispanic and black populations. Many classrooms are a better fit for the verbal-emotive, sit-still, take-notes, listen-carefully, multitasking girl (Sax, 2005).The characteristics that boys bring to learning—impulsivity, single-task focus, spatial-kinesthetic learning and physical aggression—often are viewed as problems.

Researchers such as Blum (1997) have identified more than 100 structural differences between the male and female brains. Altering strategies to accommodate more typically male assets—for example, the use of multimodal teaching (discussed on pages 10-11 of this report); the use of various display formats, such as printed material, videos, presentations and computers; and an interactive learning environment to appeal to different learning styles—can help bridge the gap between what students

are thinking and what they are able to put down on paper. Sadik's (2008) research suggests that using multimodal instructional strategies like digital storytelling—allowing students to incorporate digital cameras, creative and editing tools, computers and other technology to design multimedia presentations—deepens students' learning.

Background Knowledge Bransford et al. (2000) note in How People Learn, learning depends on how prior knowledge is incorporated into building new knowledge and thus teachers must take into account students' prior knowledge. Jensen's (2008) research on the brain and learning demonstrates that expertise cannot be developed merely through exposure to information. Students must connect the information to their prior knowledge to internalize and deepen their understanding. Teachers can connect academic learning with real-life experiences. Service learning, project-based learning, school-based enterprises and student leadership courses are some examples of how schools are trying to make the curriculum relevant. The key to making the curriculum relevant is asking the students to help connect the academics to their lives; this approach gets students actively engaged in their learning, which builds a stronger connection and commitment to school. Bell (2010) suggests that strategies such as project-based approaches to learning can help ensure that content and skills are taught together and connected to prior knowledge, which helps students understand how to develop and apply new skills in various contexts.

Connections to the Home Environment

Cochran-Smith (2004) emphasizes family histories, traditions and stories as an important part of education. Often, children enter school and find themselves in a place that does not recognize or value the knowledge or experience they bring from their homes or communities. This situation can create a feeling of disconnect for students—a dissonance obliging them to live in and navigate between two different worlds, each preventing them from full participation or success in the other. Districts and schools can alleviate this dissonance by valuing and taking advantage of the unique experiences that each student brings to the classroom. Emphasizing connections to parents and community, recognizing and utilizing student strengths and experiences and incorporating varied opportunities within the curriculum can help alleviate this dissonance.

Ferguson (2001) points out that it is particularly important to establish connections that not only bring the parents into the school environment but also encourage school understanding and participation within the community. Social distinctions often grow out of differences in attitudes, values, behaviors and family and community practices (Ferguson, 2001). Students need to feel their unique knowledge and experience is valued by the school and parents and community members need to feel they are respected and welcome within the school.

Although much attention has been paid to No Child Left Behind (NCLB) requirements for annual achievement tests and high-quality teachers, the law also includes important requirements for schools, districts and states to organize programs of parental involvement and to communicate with parents and the public about student achievement and the quality of schools. Epstein (2005) offers perspectives on the NCLB requirements for family involvement; provides a few examples from the field; suggests modifications that are needed in the law; and encourages sociologists of education to take new directions in research on school, family and community partnerships.

Probing Questions

- What are some ways that you currently use students' background knowledge to inform instruction?
- Does your experience teaching boys to read and write concur with the research? What ideas do you have to address the achievement gaps related to gender?
- What are ways you can uncover, acknowledge and use students' backgrounds and strengths to enhance learning?
- What are some strategies for valuing and taking advantage of the unique experiences that each student brings to the classroom?

Resources

A good resource still valid today is Making Assessment Work for Everyone: How to Build on Student Strengths. See the SEDL website to download this resource: http://www.sedl.org/pubs/tl05/.

A short, easy-to-digest article from Carnegie Mellon University is titled Theory and Research-Based Principles of Learning. The article and full bibliography are at http://www.cmu.edu/teaching/principles/learning.html.

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Guiding Principle 6:
Responsive environments engage learners.

Meaningful learning happens in environments where creativity, awareness, inquiry and critical thinking are part of instruction. Responsive learning environments adapt to the individual needs of each student and encourage learning by promoting collaboration rather than isolation of learners. Learning environments, whether classrooms, schools or other systems, should be structured to promote engaged teaching and learning.

Research Summary

To be effective for all students, classroom learning environments must be responsive to a broad range of needs among a diverse student population. These diverse needs include cultural and linguistic differences as well as developmental levels, academic readiness and learning styles. A responsive learning environment engages all students by providing a respectful climate where instruction and curriculum are designed to respond to the backgrounds and needs of every student.

Culturally Responsive Teaching

Research on culturally responsive teaching emphasizes the importance of teachers' understanding the cultural characteristics and contributions of various ethnic groups (Smith, 1998) and showing respect toward these students and their culture (Ladson-Billings, 1995; Pewewardy & Cahape, 2003). Culturally responsive teaching is defined by Gay (2002) as "using the cultural characteristics, experiences and perspectives of ethnically diverse students as conduits for teaching them more effectively" (p. 106).

Research on culturally responsive teaching has found that students both are more engaged in learning and learn more effectively when the knowledge and skills taught are presented within a context of their experience and cultural frames of references (Au & Kawakami, 1994; Gay, 2000; Ladson-Billings, 1995).Areas considered part of creating a culturally responsive learning environments are (1) understanding the cultural lifestyles of their students, such as which ethnic groups give priority to communal living and problem solving; (2) knowing differences in the modes of interaction between children and adults in different ethnic groups; and (3) becoming aware of cultural implications of gender role socialization among different groups (Banks & Banks, 2001).To provide a culturally responsive learning environment teachers need to:

- Communicate high expectations for all students (Gay, 2000; Hollins & Oliver, 1999; Ladson-Billings, 1994, Nieto, 1999).
- Use active teaching methods and act as learning facilitators (Banks & Banks, 2001; Gay, 2000).
- Maintain positive perspectives on families of diverse students (Delgado-Gaitin & Trueba, 1991).
- Gain knowledge of cultures of the students in their classrooms (Banks & Banks, 2001; Nieto, 1999).
- Reshape the curriculum to include culturally diverse topics (Banks & Banks, 2001; Gay, 2000; Hilliard, 1991).
- Use culturally sensitive instruction that includes student-controlled discussion and small-group work (Banks & Banks, 2001; Nieto, 1999).

Further research asserts that culturally responsive teachers help students understand that knowledge is not absolute and neutral but has moral and political elements. This knowledge can help students from diverse groups view learning as empowering (Ladson-Billings, 1995; Tharp & Gallimore, 1988).

Strategies for designing curriculum and instruction for culturally diverse students are similar to the strategies for differentiating curriculum and instruction. In fact, Mulroy and Eddinger (2003) point out that the research on differentiation emerged, in part, because of the demand on schools to serve an increasingly diverse student population. Heacox (2002) asserts that classrooms are diverse in cognitive abilities, learning styles, socioeconomic factors, readiness, learning pace and gender and cultural influences.

Differentiation

Research on differentiation includes meeting the learning needs of all students through modifying instruction and curriculum to consider developmental level, academic readiness and socioeconomic backgrounds, as well as cultural and linguistic differences. Tomlinson (2005) defines differentiated instruction as a philosophy of teaching based on the premise that students learn best when their teachers

accommodate the difference in their readiness levels, interests and learning profiles. In a differentiated learning environment, each student is valued for his or her unique strengths while being offered opportunities to learn and demonstrate learning through a variety of strategies (Mulroy & Eddinger, 2003). Hall (2002) states, "To differentiate instruction is to recognize students' varying backgrounds, readiness, language, learning preferences and interests and to react responsively" (p. 1).

According to Tomlinson (2005), who has written extensively on differentiation, three elements guide differentiated instruction: content, process and product. Content means that all students are given access to the same content but are allowed to master it in different ways. Process refers to the ways in which the content is taught. Product refers to how students demonstrate understanding. Corley (2005) provides three questions that drive differentiation: (1) What do you want the student to know? (2) How can each student best learn this? and (3) How can each student most effectively demonstrate learning? Maker (1986) offers a framework through which differentiation can occur in the classroom:

- Create an encouraging and engaging learning environment through student-centered activities, encouraging independent learning, accepting student contributions, using a rich variety of resources and providing mobility and flexibility in grouping.
- Modify the content according to abstractness and complexity. Provide a variety of content and particularly content focused on people.
- Modify the learning process through use of inquiry, higher-order thinking activities, group interactions, variable pacing, creativity and student risk-taking and freedom of choice in learning activities.
- Modify the product through facilitating different ways for students to demonstrate learning, such as the use of authentic assessments.

In addition, researchers have found that the use of flexible grouping and tiered instruction for differentiation increases student achievement (Corley, 2005; Tomlinson & Eidson, 2003). Heacox (2002) describes differentiation as follows:

> The focus is not on the adjustment of the students, but rather the adjustment of teaching and instructional strategies making it about learning, not teaching. The teacher is the facilitator who…puts students at the center of teaching and learning and lets his or her students' learning needs direct instructional planning (p. 1).

Several studies conducted in elementary and middle school classroom have found that student achievement is increased in differentiated classrooms (Connor, Morrison, & Katch 2004; McAdamis, 2001). Tomlinson and Eidson (2003) emphasize the need to include the components of student readiness, student interest and student learning profile in differentiating instruction. Students' interests and learning profiles are often tied to their learning styles.

Learning Styles

The body of research on learning styles has coalesced around the work of Howard Gardner, who introduced the theory of multiple intelligences in 1983. Gardner's work suggests that the concept of a pure intelligence that can be measured by a single I.Q. score is flawed and he has identified nine intelligences that people possess to various degrees. His theory asserts that a person's type of intelligence determines how he or she learns best (Gardner, 1999).

Learning style refers to how a student learns and the concept takes into account cultural background and social and economic factors as well as multiple intelligences. Beishuizen and Stoutjesdjik (1999) define learning style as a consistent mode of acquiring knowledge through study or experience. Research has shown that the quality of learning at all levels of education (primary, secondary and higher education) is enhanced when instruction and curriculum take into account individual learning styles (Dunn, Griggs, Olsen, Beasley & Gorman, 1995).Another study found that student learning improved when the learning environment was modified to allow students to construct personally relevant knowledge and to engage in the materials at different levels and from different points of view (Dearing, 1997).

A responsive classroom environment considers the individual learning needs of all students. These learning needs include a variety of factors that influence how students learn: culture, language, developmental level, readiness, social and economic background and learning style.

Creativity
Creativity is an essential component for creating an engaging and accessible classroom environment. The Wisconsin Task Force on Arts and Creativity in Education (2009) defines creativity as a process that combines "imagination, creativity and innovation to produce something novel that has value" (p. 14). Sir Ken Robinson (2011) and Daniel Pink (2006) both support the need for schools to focus on creating classroom that foster this type of creativity in students. According to Robinson (2011), classrooms that foster creativity and allow students to question assumptions, look at content through various lenses and create new understandings can help students be more successful in postsecondary education and the workplace.

Probing Questions

- Describe two or three ways you might differentiate the instruction in your classroom. How might you share this with a new teacher?
- How might you implement a simple strategy for assessing your students' learning styles?

Resources
ASCD offers a number of resources on differentiated instruction, including work by Carol Ann Tomlinson, at http://www.ascd.org.
For resources on culturally responsive teaching, the Center for Culturally Responsive Teaching and Learning can be accessed at http://www.culturallyresponsive.org/.

The website of the National Center for Culturally Responsive Education Systems (NCCRESt) can be accessed at http://www.nccrest.org.
For learning styles and resources on multiple intelligences, Thomas Armstrong hosts a website with information on Gardner's Theory of Multiple Intelligences and related teaching resources at http://www.thomasarmstrong.com/multiple_intelligences.php.

Creativity: Its Place in Education is a report that offers suggestions for creative classrooms and teaching. This report can be found at http://www.jpb.com/creative/Creativity_in_Education.pdf.

The report of the Wisconsin Task Force on Arts and Creativity in Education offers recommendations for policy and practice. This report can be found at ftp://doaftp04.doa.state.wi.us/doadocs/taskforce_report_final2009pdf.

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