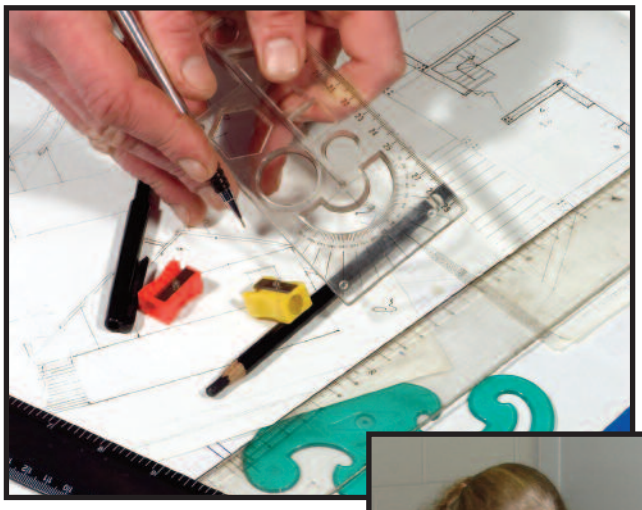
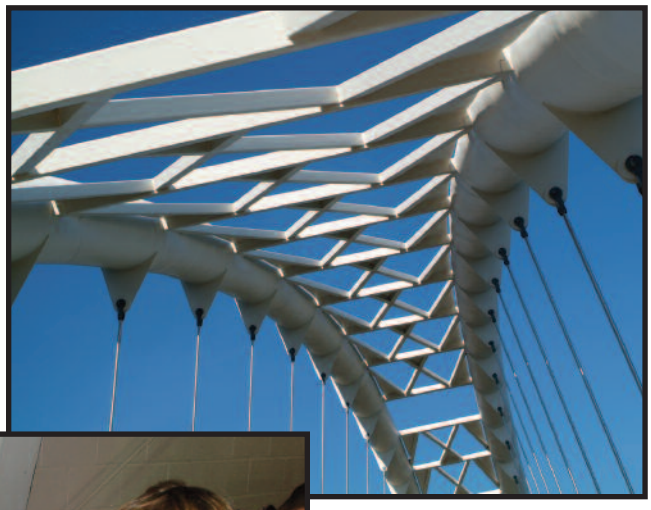
Delaware
Technology Education
Standards





DELAWARE TSA TECHNOLOGY STUDENT ASSOCIATION

ITEA

Delaware Department of Education

Teacher Resource Guide
for
Recommended Curriculum Development

June 2007

Delaware
Technology Education
Standards

Teacher Resource Guide for Recommended Curriculum Development

This material is also available on the Delaware Department of Education's website: www.doe.k12.de.us/programs/ci/ as a downloadable document.

June 2007

Delaware Department of Education
Adult Education and Work Force Development Branch
Career and Technical Education and School Climate Workgroup

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Thanks to Anna Sumner, Standards Specialist for ITEA and the Standards for Technological Literacy (STL). Her review of our Delaware Technology Education Standards and the STL project were very beneficial at the start of the project.

This project was made possible though the Workforce Investment Act (WIA) Incentive Grant. Grateful acknowledgment is extended to those persons at the Department of Education who were part of this effort: Valerie Woodruff, Secretary of Education; Michael Owens, Ed.D., Associate Secretary, Adult Education and Workforce Development; and Robin Case, Director Career and Technical Education and School Climate. The formatting and editing efforts of the University of Delaware's Center for Disabilities Studies staff, Debbie Amsden, Stephanie Ferrell, and Stephen Scheib, are also greatly appreciated.

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Introduction

The goal of Technology Education is to introduce, to provide an understanding, to provide a place to apply, and to transfer the methodology of technology and the technical and practical application of technology.

The Technology Education Standards Project is part of an initiative at the Department of Education. One of the main goals was to review and update the current Technology Education content standards. A focus was placed on high school standards and the development of structured 3-credit Career Pathways.

As the committee began to work we looked at the Delaware Technology Education Standards, current courses approved in Technology Education and the International Technology Education Association (ITEA) Standards for Technological Literacy. The committee made a philosophical choice to update all Technology Education standards, Kindergarten through grade 12, and to align with the ITEA Standards for Technological Literacy. It was clear that all components were in place to move forward and produce a working document for Technology Education teachers and other stakeholders to utilize as a guide to provide quality Technology Education Programs in Delaware. The program's need to produce students, who upon leaving high school, are ready to work or for post secondary programs that address the need for high skill, high wage, and high demand jobs.

Technology Education is a natural and effective means to curricular integration. In addition to the standards as part of this project, a crosswalk of Technology Education performance indicators to each of the academic standards has been completed and provided for your use. Teams from each academic area worked with a Technology Education sub-committee to insure a quality crosswalk.

The intent is for this project to be an ongoing interactive web-based system to continue to evolve as needed to serve our students.

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Delaware Technology Education
Definitions

Technology is the use of accumulated knowledge, skills and tools to meet a human need or want.

Technology – 1. Human innovation in action that involves the generation of knowledge and processes to develop systems that solve problems and extend human capabilities. 2. The innovation, change, or modification of the natural environment to satisfy perceived human needs and wants.

Technology Education – a study of technology, which provides an opportunity for students to learn about the processes and knowledge related to technology that are needed to solve problems and extend human capabilities.

Design Process – a systematic problem-solving strategy, with criteria and constraints, used to develop many possible solutions to solve a problem or satisfy a human need or want.

Resource – the things needed to get a job done. In a technological system, the basic technological resources are: energy, capital, information, machines and tools, materials, people and time.

Systems Model –a universal combination of steps that insures that the output meets or exceeds the established criteria. The System Model is a unifying element of technology. A system is a group of integrated components that collectively achieve a goal.

Design Brief – a written plan that identifies a problem to be solved, its criteria, and its constraints. The design brief is used to encourage thinking of all aspects of a problem before attempting a solution.

Problem Solving – the process of understanding a problem, devising a plan, carrying out the plan, and evaluating the plan in order to solve a problem or meet a need or want.

Career Pathway – three planned and sequential courses.

Program of Study – a career pathway and the required academic and supporting courses to prepare a student for high skill, high wage and high demand employment.

Technological Literacy – the ability to use, manage, understand, and assess technology.

Engineering Design – the systematic and creative application of scientific and mathematical principles to practical ends such as the design, manufacture, and operation of efficient and economical structures, machines, processes, and systems.

Delaware
Technology Education

Coming Soon:

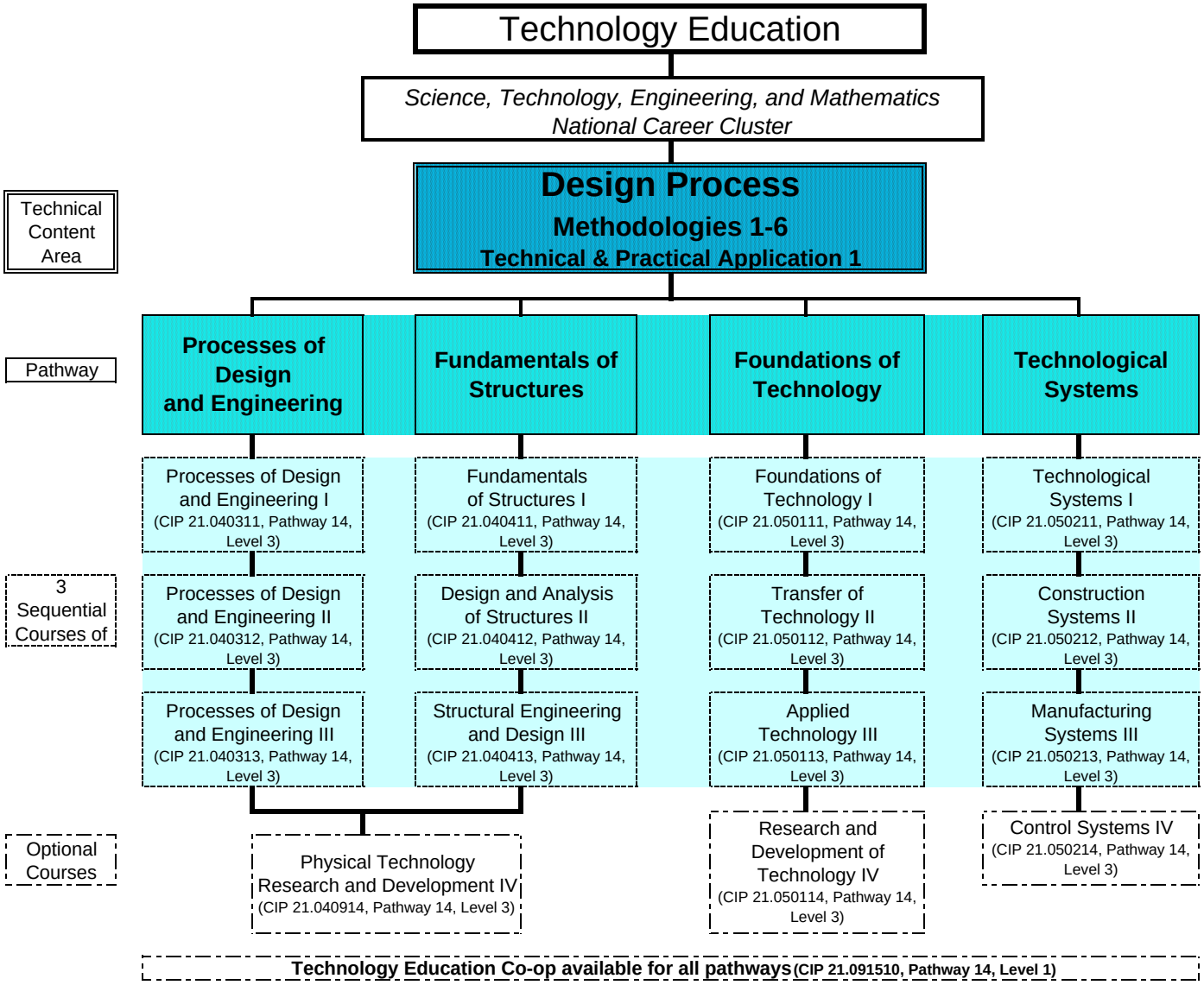
Big Ideas

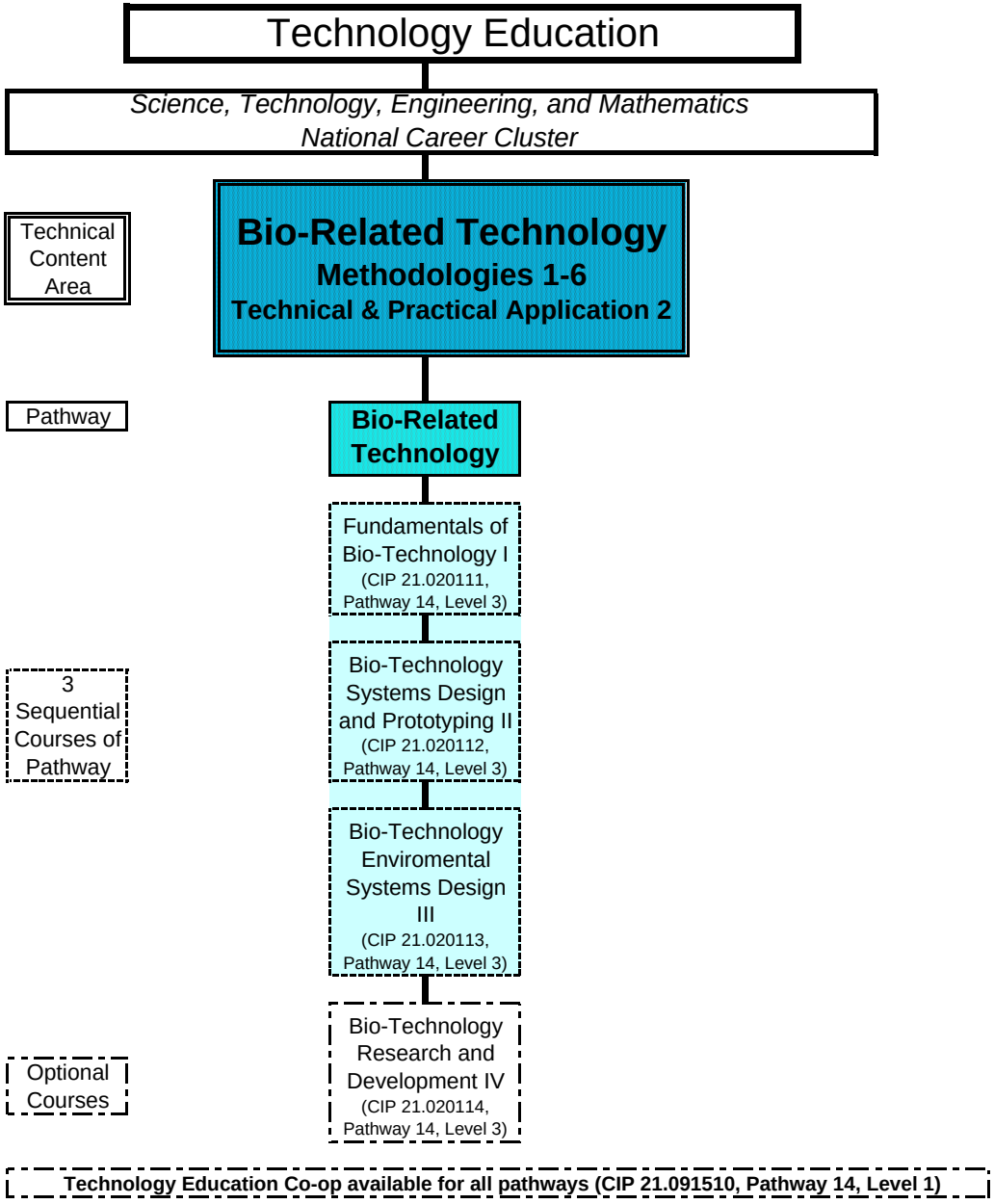
Overarching Enduring Understandings

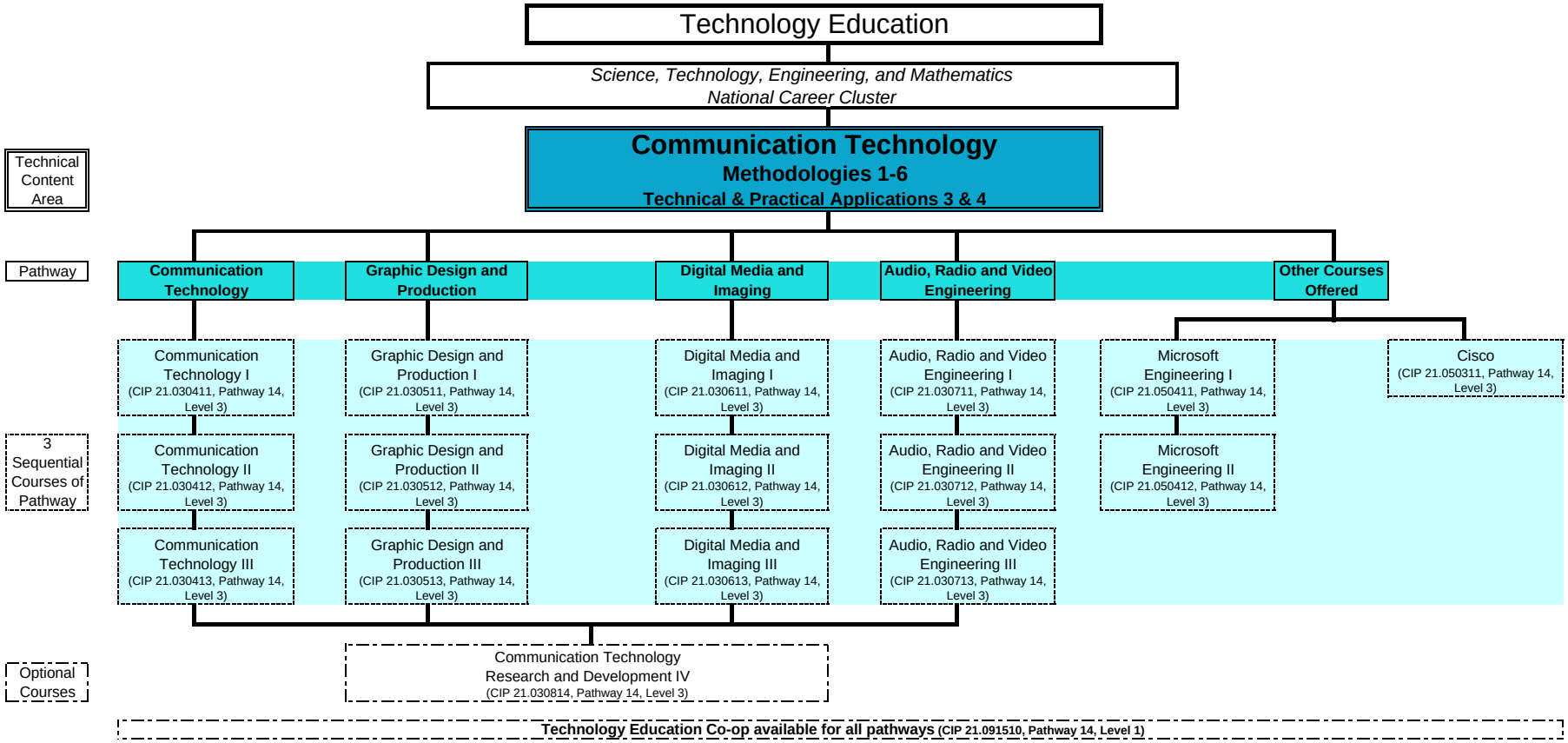
Overarching Essential Questions

Three-Credit Technology Education Career Pathways

The *Delaware Technology Education Teacher Resource Guide* describes the three-credit pathway programs in Design Process, Bio-Related Technology, Communication Technology, and Physical Technology. On the following pages are diagrams that display each pathway and the courses that will be associated with each of the pathways. For each course, the CIP number (Classification of Instructional Program) is identified.


Technology Education
Science, Technology, Engineering, and Mathematics
National Career Cluster
Design Process
Methodologies 1-6
Technical & Practical Application 1
Technical Content Area
Pathway
Processes of Design and Engineering
Fundamentals of Structures
Foundations of Technology
Technological Systems
3 Sequential Courses of
Processes of Design and Engineering I (CIP 21.040311, Pathway 14, Level 3)
Fundamentals of Structures I (CIP 21.040411, Pathway 14, Level 3)
Foundations of Technology I (CIP 21.050111, Pathway 14, Level 3)
Technological Systems I (CIP 21.050211, Pathway 14, Level 3)
Processes of Design and Engineering II (CIP 21.040312, Pathway 14, Level 3)
Design and Analysis of Structures II (CIP 21.040412, Pathway 14, Level 3)
Transfer of Technology II (CIP 21.050112, Pathway 14, Level 3)
Construction Systems II (CIP 21.050212, Pathway 14, Level 3)
Processes of Design and Engineering III (CIP 21.040313, Pathway 14, Level 3)
Structural Engineering and Design III (CIP 21.040413, Pathway 14, Level 3)
Applied Technology III (CIP 21.050113, Pathway 14, Level 3)
Manufacturing Systems III (CIP 21.050213, Pathway 14, Level 3)
Optional Courses
Physical Technology Research and Development IV (CIP 21.040914, Pathway 14, Level 3)
Research and Development of Technology IV (CIP 21.050114, Pathway 14, Level 3)
Control Systems IV (CIP 21.050214, Pathway 14, Level 3)
Technology Education Co-op available for all pathways (CIP 21.091510, Pathway 14, Level 1)


Technology Education
Science, Technology, Engineering, and Mathematics
National Career Cluster
Technical Content Area
Bio-Related Technology
Methodologies 1-6
Technical & Practical Application 2
Pathway
Bio-Related Technology
3 Sequential Courses of Pathway
Fundamentals of Bio-Technology I
(CIP 21.020111, Pathway 14, Level 3)
Bio-Technology Systems Design and Prototyping II
(CIP 21.020112, Pathway 14, Level 3)
Bio-Technology Enviromental Systems Design III
(CIP 21.020113, Pathway 14, Level 3)
Optional Courses
Bio-Technology Research and Development IV
(CIP 21.020114, Pathway 14, Level 3)
Technology Education Co-op available for all pathways (CIP 21.091510, Pathway 14, Level 1)


Technology Education
Science, Technology, Engineering, and Mathematics
National Career Cluster
Communication Technology
Methodologies 1-6
Technical & Practical Applications 3 & 4
Technical Content Area
Pathway
Communication Technology
Graphic Design and Production
Digital Media and Imaging
Audio, Radio and Video Engineering
Other Courses Offered
3 Sequential Courses of Pathway
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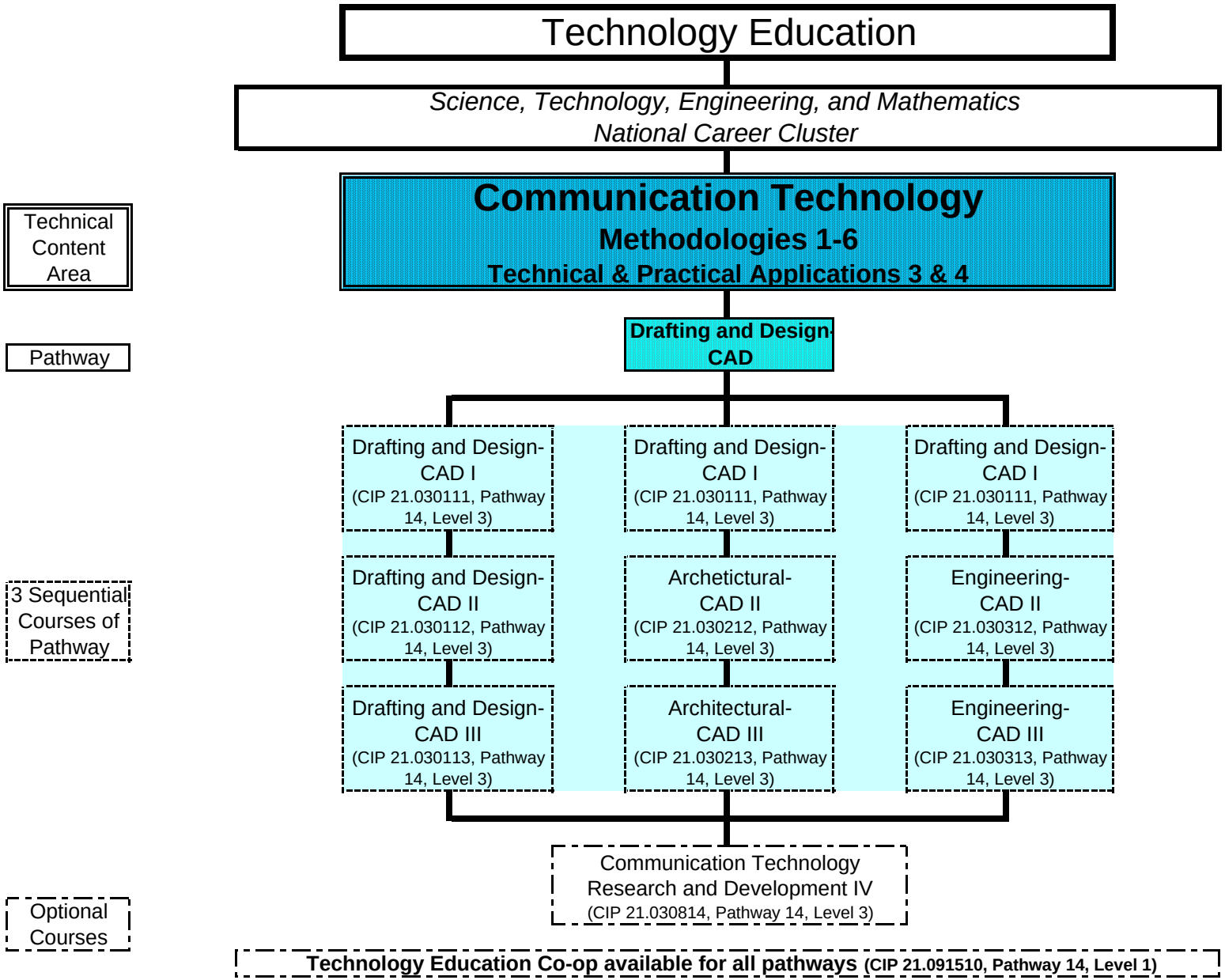
Communication Technology II (CIP 21.030412, Pathway 14, Level 3)
Communication Technology III (CIP 21.030413, Pathway 14, Level 3)
Graphic Design and Production I (CIP 21.030511, Pathway 14, Level 3)
Graphic Design and Production II (CIP 21.030512, Pathway 14, Level 3)
Graphic Design and Production III (CIP 21.030513, Pathway 14, Level 3)
Digital Media and Imaging I (CIP 21.030611, Pathway 14, Level 3)
Digital Media and Imaging II (CIP 21.030612, Pathway 14, Level 3)
Digital Media and Imaging III (CIP 21.030613, Pathway 14, Level 3)
Audio, Radio and Video Engineering I (CIP 21.030711, Pathway 14, Level 3)
Audio, Radio and Video Engineering II (CIP 21.030712, Pathway 14, Level 3)
Audio, Radio and Video Engineering III (CIP 21.030713, Pathway 14, Level 3)
Microsoft Engineering I (CIP 21.050411, Pathway 14, Level 3)
Microsoft Engineering II (CIP 21.050412, Pathway 14, Level 3)
Cisco (CIP 21.050311, Pathway 14, Level 3)
Optional Courses
Communication Technology Research and Development IV (CIP 21.030814, Pathway 14, Level 3)
Technology Education Co-op available for all pathways (CIP 21.091510, Pathway 14, Level 1)


Technology Education
Science, Technology, Engineering, and Mathematics
National Career Cluster
Communication Technology
Methodologies 1-6
Technical & Practical Applications 3 & 4
Technical Content Area
Drafting and Design-CAD
Pathway
Drafting and Design-CAD I (CIP 21.030111, Pathway 14, Level 3)
Drafting and Design-CAD I (CIP 21.030111, Pathway 14, Level 3)
Drafting and Design-CAD I (CIP 21.030111, Pathway 14, Level 3)
Drafting and Design-CAD II (CIP 21.030112, Pathway 14, Level 3)
Archetictural-CAD II (CIP 21.030212, Pathway 14, Level 3)
Engineering-CAD II (CIP 21.030312, Pathway 14, Level 3)
3 Sequential Courses of Pathway
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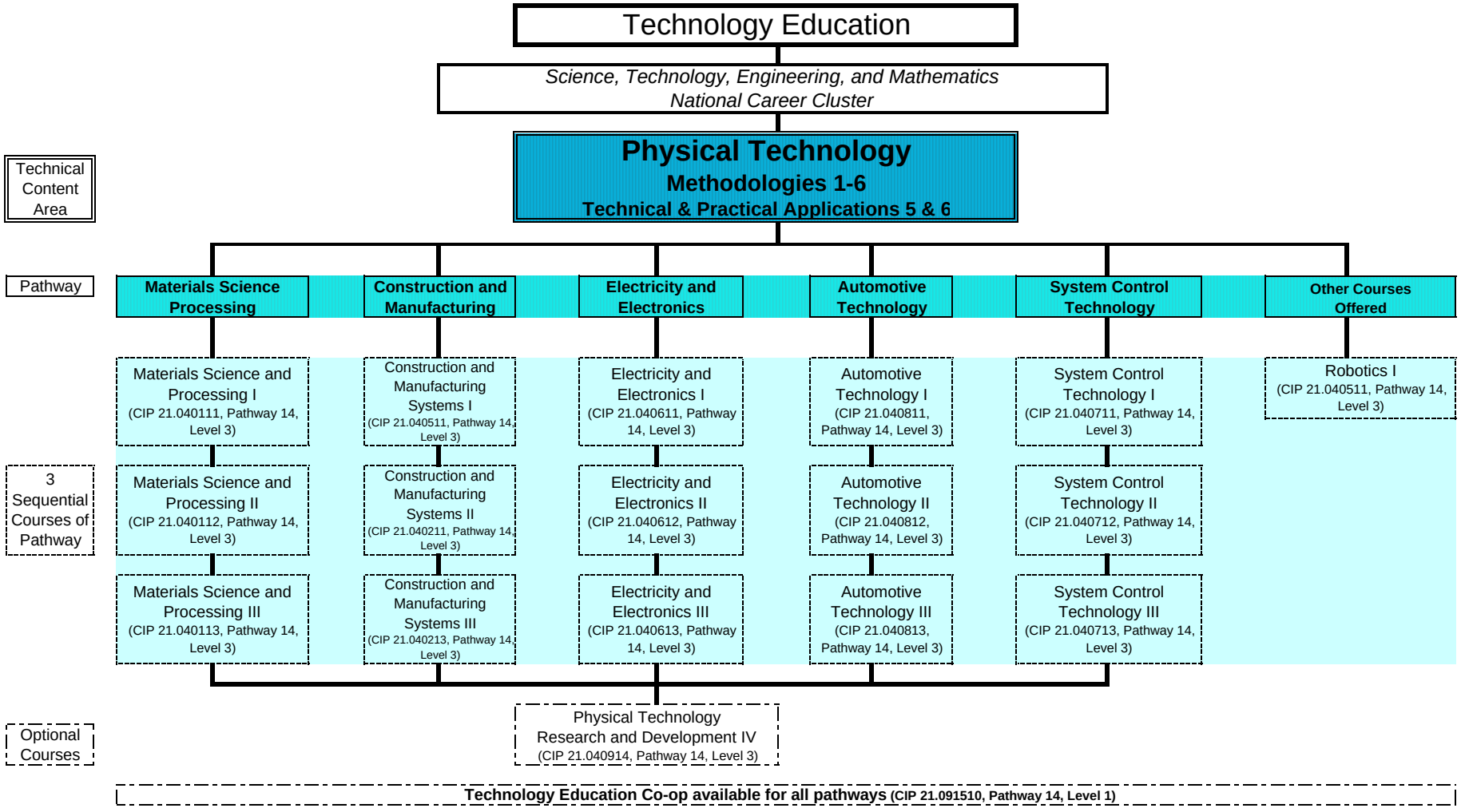
Architectural-CAD III (CIP 21.030213, Pathway 14, Level 3)
Engineering-CAD III (CIP 21.030313, Pathway 14, Level 3)
Communication Technology Research and Development IV (CIP 21.030814, Pathway 14, Level 3)
Optional Courses
Technology Education Co-op available for all pathways (CIP 21.091510, Pathway 14, Level 1)


Technology Education
Science, Technology, Engineering, and Mathematics
National Career Cluster
Physical Technology
Methodologies 1-6
Technical & Practical Applications 5 & 6
Technical Content Area
Pathway
Materials Science Processing
Construction and Manufacturing
Electricity and Electronics
Automotive Technology
System Control Technology
Other Courses Offered
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Construction and Manufacturing Systems I (CIP 21.040511, Pathway 14, Level 3)
Electricity and Electronics I (CIP 21.040611, Pathway 14, Level 3)
Automotive Technology I (CIP 21.040811, Pathway 14, Level 3)
System Control Technology I (CIP 21.040711, Pathway 14, Level 3)
Robotics I (CIP 21.040511, Pathway 14, Level 3)
3 Sequential Courses of Pathway
Materials Science and Processing II (CIP 21.040112, Pathway 14, Level 3)
Construction and Manufacturing Systems II (CIP 21.040211, Pathway 14, Level 3)
Electricity and Electronics II (CIP 21.040612, Pathway 14, Level 3)
Automotive Technology II (CIP 21.040812, Pathway 14, Level 3)
System Control Technology II (CIP 21.040712, Pathway 14, Level 3)
Materials Science and Processing III (CIP 21.040113, Pathway 14, Level 3)
Construction and Manufacturing Systems III (CIP 21.040213, Pathway 14, Level 3)
Electricity and Electronics III (CIP 21.040613, Pathway 14, Level 3)
Automotive Technology III (CIP 21.040813, Pathway 14, Level 3)
System Control Technology III (CIP 21.040713, Pathway 14, Level 3)
Optional Courses
Physical Technology Research and Development IV (CIP 21.040914, Pathway 14, Level 3)
Technology Education Co-op available for all pathways (CIP 21.091510, Pathway 14, Level 1)

Meeting Requirements for Federal and State Funding

The *Delaware Career and Technical Education Teacher Resource Guide for Recommended Curriculum Development* is designed to support school districts in meeting federal and state requirements to receive funding for the career and technical courses offered. The federal funding available to school districts for career and technical education is from the Carl D. Perkins Career and Technical Act. The state funds career and technical education courses approved by the Delaware Department of Education.

Federal Funding

One of the purposes set forth in the most recent Carl D. Perkins Career and Technical Act of 2006 is to develop more fully the academic, career and technical skills of secondary students who elect to enroll in career and technical education programs by developing challenging academic and technical standards, and to assist students in meeting the standards, including preparation for high-skill, high-wage or high-demand occupations in current or emerging professions. This Perkins Act promotes the development of services and activities that integrate rigorous and challenging academic and career and technical instruction, and that link secondary and post-secondary education for participating career and technical education students. The new Perkins Act has added responsibilities for local accountability, requiring school districts to set specific performance targets on each performance indicator and be responsible for meeting those requirements.

State Funding

Local school districts and publicly funded schools that wish to receive state career and technical education funds (509 funds) to support career and technical courses in grades seven through twelve must have these courses approved by the Delaware Department of Education.

Course Approval Process

The course approval process begins with the local school district. As a local education agency initiates courses or reviews their offerings periodically, the course purpose, outline, and statement of objectives that satisfy or exceed approved state content standards are required to be submitted to the Delaware Department of Education. With the publication of this document, career and technical education courses approved by the Delaware Department of Education will meet or exceed the Standards, Performance Elements, and Performance Indicators as outlined in the *Delaware Teacher Resource Guide for Recommended Curriculum Development*.
In addition to the course information, the local education agency needs to show documentation justifying the need for the course, Labor Department projections, and student interest survey results in order to receive approval for the course to receive state career and technical education funding.

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Department of Education Regulations Regarding Career and Technical Education

For more information regarding Delaware Department of Education regulations that affect career and technical education, consult the Delaware Department of Education website at www.doe.k12.de.us.

High School Graduation Requirements and Diplomas
Current high school graduation requirements include a career pathway. See the definition of "Career Pathway" and the entire regulation in Delaware Administrative Code in Title 14: Education, Section 505. The requirements can be found at http://regulations.delaware.gov/AdminCode/title14/500/505.shtml#TopOfPage.

Career and Technical Education Program Requirements
The requirements for Career Technical Education Programs are outlined in Delaware Administrative Code in Title 14: Education, Section 525 related to Curriculum and Instruction. This section outlines the requirements for local districts and charter schools to meet when career and technical programs are offered. The requirements can be found at http://regulations.delaware.gov/AdminCode/title14/500/525.shtml#TopOfPage.

Components of Technology Education

The Technology Education Standards consist of the Methodology of Technology Education and the Technical and Practical Application of Technology. As stated earlier the standards committee made a philosophical decision to maintain the integrity of our current standards and to continue to align with the Standards for Technological Literacy addressing all grade levels Kindergarten through grade 12. In using the document you will find the K-12 progression for each standard. Each standard has a standard statement, performance element, and any performance indicators needed.

The Methodology of Technology Education standards are to be embedded in each Technology Education course offered. The Technical and Practical Application (TPA) standards are to define the specific technology area you are working with whether it is for a class or for a project. The Technical and Practical Application standards also correlate to the Technology Education approved Career Pathways in Delaware.

The performance elements for grades 9 through 12 refer to the understanding, application and transfer of the particular technology. The "understanding" will define and guide what a first course would be evaluated on, the "application" will define and guide what a second course would be evaluated on, and the "transfer" will define and guide what a third course would be evaluated on. The course level one, two, and three are the planned and sequential courses of a 3-credit career pathway.

The standards provide the guidance for the curriculum content, the career pathways will provide the structure. A complete academic crosswalk has been included to assist in your effort with the academic achievement of each of your students.

This document is the start of an ongoing process that will evolve to meet our needs in the future. The project will be accessible on the website and we will have the opportunity to add materials to assist our efforts in Technology Education.

The following table was extracted from the Methodology Five section:

Grade Levels:	**K-2**	**3-5**	**6-8**	**9-12**
Performance Elements:				
M5.01	Begin to identify technological concepts.	Begin to understand technological concepts and their relationships to the design of solutions.	Recognize how technological concepts are applied to the various systems of a technological solution.	Synthesize and apply discrete technological concepts to arrive at innovative solutions.
Performance Indicators:				
M5.01.01	Build an awareness of technological concepts through hands-on exploration.	Investigate the applications of technological concepts.	Recognize, investigate, and document how technological concepts are used in various technological systems.	Research and identify technological concepts.

Technology Student Association

Mission Statement

The Technology Student Association fosters personal growth, leadership, and opportunities in technology, innovation, design, and engineering. Members apply and integrate science, technology, engineering and mathematics concepts through co-curricular activities, competitive events and related programs.

Goals of Technology Education as it relates to TSA

Because technology is an integral part of the American culture, it is necessary for schools to provide students with an appreciation and understanding of the role and dynamics of technology in our society.

Technology springs from the human abilities to reason, solve problems, create, construct, and use materials imaginatively. The study of technology, integrated into the school curricula, promotes the development of these abilities and prepares students for a fulfilled and responsible adulthood.

Technology education goals at the elementary, middle, and high school levels, focus on students acquiring specific abilities and perspectives.

1. Through the use of tools, materials, and the design and technology process, student learning at the elementary level will be enhanced and contribute to overall personal development and technological awareness.
2. Students at the middle school level will gain a greater understanding of technology's role in contemporary society, including future career opportunities and related programs of study.
3. Technological skills and knowledge attained by students at the high school level will yield occupational readiness, consumer awareness, and personal enrichment.
4. Student members of the Technology Student Association (TSA) will develop leadership skills, pride in work well done, and high standards of technical ability, scholarship, and safety.

What is TSA?

Purposes
The Technology Student Association's constitution identifies the general and specific purposes of TSA.

TSA provides opportunities for **LEADERSHIP** development and training. Through individual and group action, members develop the ability to plan, organize, and carry out worthy activities and projects together. Emphasis is placed on social development, civic consciousness, scholastic motivation, and community involvement.

TSA promotes **TECHNOLOGY EDUCATION** in the school, community, state, and nation. Members help technology education become ever more viable and effective as an integral part of the total education system.

TSA increases the **KNOWLEDGE** and broadens the understanding of its members. Members better understand the technical society in which we live by becoming aware and informed of new developments in technology.
TSA inspires students to **RESPECT** the dignity of technology in our society. Members learn to cooperate in order to obtain quality results in individual and chapter activities and projects.

TSA encourages scholastic **MOTIVATION** in its members. By providing opportunities to integrate and use the knowledge and skills of other educational disciplines, members become interested in learning.

TSA assists members in making informed and meaningful career **CHOICES**. Members receive career information and instruction pertaining to a broad range of occupations through general program activities and local guidance and counseling. Career awareness is accomplished through exploratory experiences in classrooms, laboratories, and observations in business and industry.

TSA and the School

TSA chapter activities are an integral part of the school technology education program and provide added dimension to school/community activities. TSA activities enhance the instructor's means of creating technology related challenges that benefit the student. TSA increases the opportunity for individual student growth and participation in an educational environment. Some benefits to the school are that TSA
• promotes, expands, and improves the total technology education program.
• creates additional means of developing student interest in broad-based learning.
• promotes the school, with visibility provided through school and community projects.
• provides opportunities for students to integrate learning experiences from other instructional areas.

TSA and the Student

TSA students have common objectives and interests. Each is learning about his or her role in our technological society. TSA activities can have a tremendous effect upon the attitudes, growth, and development of each member. Some of the benefits that each student derives from TSA are

• learning from leadership training.
• developing and increasing individual civic pride, responsibility, and involvement.
• participating in service activities and projects for the benefit of others.
• the opportunity for individual growth, development, and maturation according to one's own interests and abilities.
• involvement in projects for one's chapter, school, community, and self.
• meeting and working with leaders from business, industry, and the community to gain additional career information and exposure.
• participating in local, state, and national conferences.
• learning how to share with others--by leading, following, and making decisions that affect oneself and other members.
• sharing in all the benefits and membership services provided through local, state, and national membership affiliation.

Methodology One

Standard Statement M1*: Students will recognize **The Nature, Impacts, and Evolution of Technology** as they relate to the chronological human presence on Earth, as well as recognize the consequential influence of inventions and innovations that extend human capabilities.

Defining Statement: Students will recognize that technology can and does extend human capabilities, but students must also learn that technology can have negative impacts. Through historical context, students will evaluate present-day technology to make decisions regarding the future impact of technology; the political, social and economic effects of technology; and the ethical dilemmas and environmental concerns related to technology use. Students will further recognize technological contributions made by multicultural and gender-diverse groups.

*Correlates with content standards 1, 4, 6, 7, and 13 from the International Technology Education Association's *Standards for Technological Literacy.* See appendices for more information about International Technology Association (ITEA).

Methodology One

Grade Levels:	K-2	3-5	6-8	9-12
Performance Elements:				
M1.01	Develop a nascent awareness of the technological world in which they live.	Begin to realize that technology can have both negative and positive impacts and effects.	Understand the evolution of technology and society and apply this understanding to predict impacts of current and future technology.	Evaluate the impacts that technological solutions can have upon the environments in which they are applied.
Performance Indicators:				
M1.01.01	Share ideas with peers and reflect on how technology affects their view of the world in which they live.	Recognize and identify technological trade-offs and the impact of technology on individuals, families, communities, geographic areas, Earth, and more.	Explain and predict the impacts of current and future technology, addressing ethical, cultural, social, economic, and political ramifications.	Analyze the impact, including the ethical, cultural, social, economic, and political ramifications, of a past or present technological trend on today's individuals and society.
M1.01.02				Evaluate the safety aspects of a student-generated product or system.
M1.01.03			Research and document technological inventions and their subsequent uses, recognizing that individuals, business and industry, or society often create the demand for a particular technological product.	Perform a market analysis to ascertain a product's potential impact or real impact on individuals and communities.
M1.01.04			Design and use instruments to gather data, analyze and interpret technological trends to ascertain their positive and negative impacts, and finally, evaluate the accuracy of the gathered information to determine its usefulness.	Develop and implement a performance-testing plan for a selected product or process.
M1.01.05		Create models or pictorial representations of simple technological inventions.	Understand that most inventions evolve through a slow and methodical process, with the specialization of function at the center of many technological improvements.	Design a model, prototype, or process that improves or enhances the form or function of a product.

M1.01.06		Compare, contrast, and classify collected information in order to identify patterns.	Identify and describe the difference between the positive and negative impacts of past, present, and future technology.	Understand that the evolutionary nature of technology is a function of setting and that technological development, which may be profit driven, is a result of specific goal-directed research.
M1.01.07	Understand the difference between a world with technology and a world without technology.	Produce a written explanation of how various technological inventions work.	Recognize and demonstrate an understanding of the cultural and gender diversity reflected in technological inventions and innovations.	Identify how cultures develop specific technologies to meet their own needs and understand that technological development is influenced by societal opinions and demands.
M1.01.08	Develop a nascent awareness of technology existing as part of the past, present, and future.	Describe the evolution of technological concepts, including changes in the provision of food, clothing, and protection.	Demonstrate, through varied media, an understanding of the nature, impacts, and evolution of technology.	Understand the impacts of and relationships between the technological ages (i.e., Stone Age, Bronze Age, Iron Age, Pre-Industrial Revolution, Industrial Revolution, and Information Age) relative to advances in inventions, processes, and the use of available resources.
M1.01.09			Identify the scientific knowledge on which a technological invention or innovation is typically predicated.	Collect and evaluate information, synthesize data, analyze trends, and draw conclusions; use assessment techniques to make decisions about future technologies; and design forecasting techniques to evaluate the results of altering natural systems.

Methodology Two

Standard Statement M2*: Students will effectively communicate technological solutions by using **Technology Education as an Interdisciplinary and Technological Link.**

Defining Statement: Students will participate in a technology educational program that integrates itself with other school curricula. Students will therefore make connections and effectively communicate technological solutions that reflect cross-curricular integration. Though technological content will form the core of student solutions, these solutions will be enhanced by this integration of knowledge. Further, students will learn to appreciate the relationships between technology and other fields of study.

*Correlates with content standards 3, 4, 10, and 12 from the International Technology Education Association's *Standards for Technological Literacy.* See appendices for more information about International Technology Association (ITEA).

Methodology Two

Grade Levels:	K-2	3-5	6-8	9-12
Performance Elements:				
M2.01	Begin to use skills and knowledge from various content areas to solve problems.	Recognize academic content areas as resources that can be used to help solve challenges within formal design briefs.	Use knowledge from and interactions with other curricular areas as resources that can be used to help solve technological challenges.	Arrive at solutions to technological challenges by synthesizing and using knowledge from and interactions with applicable curricular areas.
Performance Indicators:				
M2.01.01	Demonstrate an awareness that various content areas can be used during the design process.	Use academic content areas as resources to help solve challenges.	Integrate other curricular skills (e.g., writing or measurement skills) with technological activities.	Consult and collaborate with instructors from other disciplines to successfully complete a design challenge.
M2.01.02		Show how technologies are combined.	Illustrate the interactions between technological systems; the effects that other fields of study have on the technological development of products and systems; and how a product or system developed for one setting can be applied to another.	Generate a portfolio for the design challenge that contains evidence of cross-curricular information.
M2.01.03	Begin to integrate the problem-solving process with areas of daily life.	Show evidence of the Design Process in academic content-area work.	Apply problem-solving skills to enhance learning in other curricular areas.	Identify cross-curricular concepts of technology, including technology transfer, the relationship of science and math to technology, and progress that results from technology.
M2.01.04		Identify the relationships between technology and other fields of study.	Present technological solutions in an effective manner using skills and knowledge from other curricular areas as resources.	Deliver a presentation and complete a technical document in the final stage of the design challenge.
M2.01.05				Demonstrate knowledge of the patent process and how it protects technological ideas.

Methodology Three

Standard Statement M3[*]: Students will develop and apply a practical understanding of **The Use and Management of Technological Resources and Systems.**

Defining Statement: Students will develop an understanding of wide-ranging technological resources and systems. To begin, students will learn to identify, explore, manage, responsibly evaluate, and use technological resources (e.g., people, information, materials, tools and machines, energy, capital, and time). Students will further develop the ability to use and maintain technological systems and assess the impacts of these systems. For instance, students will gain practical knowledge regarding the effects of technology on the environment.

[*]Correlates with content standards 8, 9, 10, and 11 from the International Technology Association's *Standards for Technological Literacy.* See appendices for more information about International Technology Association (ITEA).

Methodology Three

Grade Levels:	K-2	3-5	6-8	9-12
Performance Elements:				
M3.01	Begin to identify the resources and systems available to solve technological problems.	Begin to investigate, design, test, and evaluate creative solutions to technological problems.	Investigate, design, model, and analyze creative solutions to increasingly complex technological challenges.	Solve complex technological challenges and model working solutions by employing the design process and the systems model.
Performance Indicators:				
M3.01.01	Recognize that a variety of technological resources (e.g., people, information, materials, tools and machines, energy, capital, and time) are used to solve problems.	Recognize that technological resources vary with geographic location and with such things as the industrialization, economic strength, and import activity of a community or nation.	Differentiate between types of technological resources (e.g., available or scarce, renewable or nonrenewable, and natural or synthetic) and examine resources that place environmental and economic concerns in direct competition.	Demonstrate the appropriate use and management of technological resources.
M3.01.02	Explore the use of appropriate materials for a specific challenge.	Employ technological resources while generating solutions to a specific challenge.	Describe the possible applications of technological resources to specific problem-solving activities (e.g., illustrate how to use technological resources to repair damage from natural disasters).	Identify criteria for evaluating the appropriateness of resources, processes, and products used to achieve an end goal.
M3.01.03	Understand that people plan in order to accomplish tasks.	Recognize that requirements act as limits on the design of a product or system.	Demonstrate responsible decision making in the use of resources and in the operation and maintenance of systems.	Develop an evaluation plan for testing according to pre-established criteria.
M3.01.04		Follow step-by-step directions to assemble a product.	Use a variety of technological resources to create solutions and systems for different environments.	Make decisions that result in optimal resource use and align technological processes with natural processes.
M3.01.05	Begin to realize the ways things work and that different materials are used to manufacture things.			Compare a past technological process or product with a current technological process or product.

Methodology Three

M3.01.06	Identify differences between natural and man-made resources, renewable and nonrenewable resources, and natural and man-made systems.	Demonstrate, through oral and visual presentations, an understanding of how technological resources, systems, and subsystems affect the world in which they live.	Recognize and identify existing technological resources (e.g., people, information, materials, tools and machines, energy, capital, and time).	Contrast the technological resources used for and the environmental impacts of each selected example.
M3.01.07		Understand that technology affects the environment in good and bad ways and that waste must be appropriately recycled or disposed to prevent unnecessary environmental harm.	Recognize that waste management as related to technological systems is an important social issue.	Identify new technologies used to reduce the environmental impact of other technologies and ways in which these new technologies can monitor the environment to guide optimal decisions.
M3.01.08	Begin to name hand tools and use them correctly and safely.	Design and test multiple solutions to stated challenges using available resources, and select and safely use tools, products and systems in the process of constructing and assessing their solutions.	Demonstrate the effective management of resources in the process of developing, creating and evaluating solutions.	Understand that complex systems have layers of controls and feedback loops and learn to diagnose, troubleshoot, analyze, operate, and maintain these systems.
M3.01.09	Recognize and use everyday symbols.	Use computers to access and organize information and common symbols to communicate key ideas.	Understand the concept of system maintenance and how people use controls as mechanisms to cause system change.	Use electronic media to access, retrieve, organize, process, maintain, interpret, and evaluate data and information.
M3.01.10			Discuss the difference between open- and closed-loop systems, as well as how systems can be connected and how malfunctions within a system can affect system quality.	Demonstrate knowledge of systems relative to logic and creativity, stability, optimization, quality control, and management.

Methodology Four

Standard Statement M4[*]: Students will demonstrate technological problem solving by applying **The Design Process and The Systems Model.**

Defining Statement: Students will learn that creative technological problem solving (i.e., engineering) involves identifying, analyzing, designing, developing, creating, and evaluating solutions. Students will refine increasingly complex solutions by employing the Design Process and the Systems Model.

[*]Correlates with content standards 8, 9, 10, and 11 from the International Technology Education Association's *Standards for Technological Literacy*. See appendices for more information about International Technology Association (ITEA).

Methodology Four

Grade Levels:	K-2	3-5	6-8	9-12
Performance Elements:				
M4.01	Begin to solve technological challenges using available resources.	Begin to investigate, design, test and evaluate creative solutions to technological challenges.	Investigate, design, model, and analyze creative solutions to increasingly complex technological challenges.	Solve complex technological challenges and model working solutions by employing the Design Process and the Systems Model.
Performance Indicators:				
M4.01.01	Use pictures, symbols, models, and words to communicate ideas.	Evaluate creative models and solutions according to established design criteria.	Evaluate and describe creative strategies that are appropriate to use when solving technological challenges.	Demonstrate a working knowledge of the Design Process, understanding that design requirements, such as criteria, constraints, and efficiency, sometimes compete with each other.
M4.01.02	Brainstorm, build, test, and evaluate their models against specific criteria, understanding that all products and systems are subject to failure.	Identify and collect information and test and evaluate the effectiveness of their solutions, and if necessary, the need for modification.	Investigate and brainstorm potential solutions to a specific technological challenge by employing the Design Process.	Achieve technological solutions by identifying problems, criteria, and constraints, then refining solutions to ensure quality, efficiency, and productivity.
M4.01.03	Begin to question and make observations and identify and research sources of information (e.g., peers, teachers and school staff, parents, literature, educational video, electronic media, the Internet, and the library media center).	Combine experience and knowledge to use the design process to generate sketches and models.	Demonstrate appropriate use of the design process, giving heed to desired elements and features, the limits placed on the design, and more.	Document revisions made during the design process by using verbal, graphic (including three-dimensional models), quantitative, virtual, and written means.
M4.01.04	Solve technological challenges by using simple design briefs.	Use tools and materials safely and effectively in order to build and modify their models.	Design, model, modify, evaluate, document and present two- and three-dimensional solutions to specific technological challenges.	Produce a prototype that exemplifies the safe and effective use of technological resources.
M4.01.05				Assume both a team approach and an individual approach to solve technological challenges.

M4.01.06			Recognize that not every problem is technological in nature and not every problem can be solved through technology.	Understand that design problems are seldom presented in a clearly defined form and a design needs to be continually checked, critiqued, refined, and improved.
M4.01.07		Investigate how things are made and the ways in which they can be improved.	Recognize that while there is no perfect design, the requirements for a design are made up of criteria and constraints.	Demonstrate that the engineering Design Process takes into account a range of factors and that design is influenced by personal characteristics.

Methodology Five

Standard Statement M5[*]: Students will develop an operational awareness of **Technological Concepts** through focused invention and subsequent innovation.

Defining Statement: Students will develop an operational awareness of various technological concepts in the world, acquiring the ability to identify, analyze, and apply these concepts. Students will further integrate specific concepts with the design of new solutions for different technological systems.

[*]Correlates with content standards 2 and 11 from the International Technology Education Association's *Standards for Technological Literacy.* See appendices for more information about International Technology Association (ITEA).

Methodology Five

Grade Levels:	K-2	3-5	6-8	9-12
Performance Elements:				
M5.01	Begin to identify technological concepts.	Begin to understand technological concepts and their relationships to the design of solutions.	Recognize how technological concepts are applied to the various systems of a technological solution.	Synthesize and apply discrete technological concepts to arrive at innovative solutions.
Performance Indicators:				
M5.01.01	Build an awareness of technological concepts through hands-on exploration.	Investigate the applications of technological concepts.	Recognize, investigate, and document how technological concepts are used in various technological systems.	Research and identify technological concepts.
M5.01.02	Demonstrate technological concepts through hands-on activities.	Understand technological concepts and apply these concepts through the use of appropriate presentation models.	Distinguish and describe the technological concepts that comprise the various systems of a solution.	Develop a successful product or prototype.
M5.01.03		Begin to identify simple technological systems and components.	Describe strategies to apply technological concepts to a design challenge.	Generate plans or graphic displays to construct a solution.
M5.01.04	Identify technological concepts present in daily life.	Apply and demonstrate technological concepts through the use of appropriate research methods and materials.	Apply and demonstrate technological concepts through the use of appropriate documentation.	Document the information resources used to solve a given problem.
M5.01.05			Describe the difference between invention and innovation.	Deliver a presentation to explain the rationale and operation of a product or prototype.

Methodology Six

Standard Statement M6[*]: Students will explore technology-related skills, leadership skills, personal growth, and careers through opportunities provided by **Active Participation in the Technology Student Association (TSA).**

Defining Statement: Students will have opportunities for personal growth by participating in TSA activities. These activities will include leadership and problem-solving training, competitive events related to the study of technology, parliamentary governance, philanthropic endeavors, and social gatherings.

[*]Correlates with content standards 1 and 20 from the International Technology Education Association's *Standards for Technological Literacy*. See appendices for more information about International Technology Association (ITEA).

Methodology Six

Grade Levels:	K-2	3-5	6-8	9-12
Performance Elements:				
M6.01	Begin to explore technology applications through TSA activities.	Begin to explore technology through TSA activities.	Begin to explore technology-related skills and applications through TSA activities.	Explore technology-related skills and careers through TSA activities.
Performance Indicators:				
M6.01.01	Engage in activities designed to show how modern technology makes it easier to accomplish everyday tasks.	Participate in class work designed according to TSA activities.	Participate in current competitive events and related programs at local, state, and national levels.	Participate in current competitive events and related programs at local, state, and national levels.
M6.01.02		Demonstrate leadership during small-group activities.	Participate in leadership training activities at local, state, and national levels.	Participate in leadership training activities at local, state, and national levels.
M6.01.03		Work in groups to solve basic design problems.	Interact with each other on current competitive events and related programs in class, during which time they will be encouraged to examine the related political, ethical, cultural, and social issues.	Interact with each other on current competitive events and related programs in class, during which time they will be encouraged to examine the related political, ethical, cultural, and social issues.
M6.01.04			Engage in, through competitive events and related programs, real-world simulations that incorporate technology, innovation, design, and engineering through competitive events and related programs.	Engage in, through competitive events and related programs, real-world simulations that incorporate technology, innovation, design, and engineering through competitive events and related programs.

Technical and Practical Application One

Standard Statement TPA1*: Students will develop an understanding of **The Design Process** and be able to apply and transfer the related knowledge and skills to solve technological problems.

Career Statement: TPA1 will introduce the appropriate career opportunity for The Design Process, concentrating on the labor market studies for the area.

*Correlates with or reflects content standards 8, 9, and 10 from the International Technology Education Association's *Standards for Technological Literacy*. See appendices for more information about International Technology Association (ITEA).

Technical and Practical Application One

Grade Levels:	K-2	3-5	6-8	9-12
Performance Elements:				
TPA1.01	Realize that everyone can design solutions to technological process.	Understand the design process as a purposeful method of planning practical solutions to technological problems.	Recognize design as a creative planning process that leads to useful products and systems.	Understand that the design process includes defining a problem; brainstorming, researching, and generating ideas; identifying criteria and specifying constraints; exploring possibilities and selecting an approach; developing a design proposal and making a model or prototype; testing and evaluating the design using specifications; refining the design and creating or making it; and communicating processes and results.
Performance Indicators:				
TPA1.01.01	Design is a creative process.	Requirements for a design include factors such as desired elements and features, the limits placed on the design, and more.	There is no perfect design.	Design problems are seldom presented in a clearly defined form.
TPA1.01.02			Criteria and constraints make up design requirements.	The design needs to be continually checked and critiqued, and the ideas of the design must be redefined and improved.
TPA1.01.03				Design requirements, such as criteria, constraints, and efficiency, sometimes compete with each other.
TPA1.01.04	The engineering design process includes identifying a problem, searching for ideas, and developing and sharing solutions.	The engineering design process involves defining a problem, generating ideas, selecting a solution, testing the solution, making and evaluating the product, and presenting the results.	Design involves a set of steps, which can be performed in different sequences and repeated as needed.	Established design principles are used to evaluate existing designs, collect data, and guide the design process.

Technical and Practical Application One

TPA1.01.05	Expressing ideas verbally and through sketches and models is an important part of the design process.	It is important to be creative and open to all ideas during the design process.	Brainstorming is a group problem-solving design process in which each person of the group presents his or her ideas in an open forum.	Engineering design is influenced by personal characteristics, such as creativity, resourcefulness, and an ability to visualize and think abstractly.
TPA1.01.06		Models are used to communicate ideas and test design processes.	Modeling, testing, evaluating, and modifying are used to transform ideas into practical solutions.	A prototype (or working model) helps an engineer test and observe a design in order to make necessary adjustments.
TPA1.01.07				The process of engineering design takes into account a number of factors.
TPA1.01.08	Asking questions and making observations helps a person to figure out how things work.	Troubleshooting is a way to find out the cause of problems in order to fix those problems.	Troubleshooting is a problem-solving method used to identify the cause of a malfunction in a technological system.	Research and development is a specific problem-solving approach that is intensively used in business and industry to prepare devices and systems for the marketplace.
TPA1.01.09	All products and systems are subject to failure but many can also be fixed.	Invention and innovation are creative methods to turn ideas into real things.	Invention is a process to turn ideas and imagination into products and systems, while innovation is a process to modify an existing product or system.	Technological problems must be researched before they can be solved.
TPA1.01.10		The process of experimentation, which is common in science, can be used to solve technological problems.	Some technological problems are best solved through experimentation.	Not every problem is technological in nature, and not every problem can be solved through technology.
TPA1.01.11				Many technological problems require a multidisciplinary approach.

Technical and Practical Application Two

Standard Statement TPA2[*]: Students will develop an understanding of **Agricultural, Bio-related, and Medical Technologies** and be able to apply and transfer the related knowledge and skills.

Career Statement: TPA2 will introduce the appropriate career opportunity for Agricultural, Bio-related, and Medical Technologies, concentrating on the labor market studies for the area.

[*]Correlates with or reflects content standards 14 and 15 from the International Technology Education Association's *Standards for Technological Literacy*. See appendices for more information about International Technology Association (ITEA).

Technical and Practical Application Two

Grade Levels:	K-2	3-5	6-8	9-12
Performance Elements:				
TPA2.01	Begin to identify and recognize the differences between agricultural, bio-related, and medical technologies.	Begin to explore agricultural, bio-related, and medical technologies.	Select, use, and understand agricultural, bio-related, and medical technologies.	Understand, apply, and transfer knowledge and skills related to agricultural, bio-related, and medical technologies.
Performance Indicators:				
TPA2.01.01	The use of agricultural technology makes it possible for food to be available year round.	Artificial ecosystems are man-made environments that are designed to function as a unit composed of humans, plants, and animals.	Agricultural innovation and advancement directly affects the time and personnel required to produce food for a large population.	Agriculture collaborates with related businesses that use a wide array of products and systems to process and distribute such things as food, fiber, fuel, and chemicals.
TPA2.01.02			Most agricultural waste water can be recycled, and therefore, the use of agricultural technology is important in the conservation of water and other resources.	Conservation, which is essential to the maintenance of the environment, is the process of controlling soil erosion, reducing sediment in waterways, conserving water, and improving water quality.
TPA2.01.03	Many different tools and materials are necessary to make up and control an ecosystem and its components.	Many processes used in agriculture require different procedures, products, or systems.	Artificial ecosystems are man-made environments that replicate many aspects of the natural world.	Engineering design and management of agricultural systems requires knowledge of artificial ecosystems and the effects of technological development on plant and animal sciences.
TPA2.01.04				A variety of specialized equipment, techniques, and practices are used to care for animals and to improve the production of food, fuel, and other commodities.

TPA2.01.05			Genetic engineering involves modifying the structure of DNA to produce novel genetic material.	Advances in biochemistry and molecular biology have made it possible to manipulate the genetic information of living creatures.
TPA2.01.06			Biotechnology applies the principles of biology to create commercial products or processes.	Biotechnology has applications in areas such as agriculture, pharmaceuticals, food and beverages, medicine, energy, genetic engineering, and the environment.
TPA2.01.07			Many tools and devices have been designed to help ascertain health information and provide a safe environment.	Processes used to manage, recycle, and dispose of hazardous materials help protect people from harmful organisms and disease and shape the ethics of environmental safety.
TPA2.01.08	Vaccinations protect people from contracting certain diseases, while medicines help people who are sick get better.	Vaccines are designed to prevent diseases from developing and spreading, while medicines are designed to relieve symptoms and stop the progression of diseases.	Medical advancements, innovation related to equipment, and the field of immunology are all critical to the improvement of the health care system.	Medical practices used to maintain and protect health include prevention and rehabilitation, vaccines and pharmaceuticals, medical and surgical procedures, and genetic engineering.
TPA2.01.09		There are many products specifically to help people care of themselves.	Technological advances have made it possible to create new devices, repair or replace certain body parts, and develop means of mobility.	The convergence of technological advances in a number of fields (e.g., medicine, telecommunications, virtual presence, computer engineering, informatics, artificial intelligence, robotics, materials science, and perceptual psychology) has created an emerging area called "telemedicine."

Technical and Practical Application Three

Standard Statement TPA3*: Students will develop an understanding of **Information and Communication Technologies** and be able to apply and transfer the related knowledge and skills.

Career Statement: TPA3 will introduce the appropriate career opportunity for Information and Communication Technologies, concentrating on the labor market studies for the area.

*Correlates with or reflects the content standard 17 from the International Technology Education Association's *Standards for Technological Literacy*. See appendices for more information about International Technology Association (ITEA).

Technical and Practical Application Three

Grade Levels:	K-2	3-5	6-8	9-12
Performance Elements:				
TPA3.01	Begin to identify and recognize the differences between information and communication technologies.	Begin to explore information and communication technologies.	Select, use, and understand information and communication technologies.	Understand, apply, and transfer knowledge and skills related to information and communication technologies.
Performance Indicators:				
TPA3.01.01	Data that has been organized is information.	Humans use technology to process information, make decisions, and solve problems.	Information and communication systems allow information to be transferred between humans or between humans and machines.	Information and communication systems allow information to be transferred between humans and machines.
TPA3.01.02	Information sent via technological systems can travel over a long distance.	Information is sent and received by electronic and print devices.	Information and communication technologies include the inputs and processes of information.	The components of a communication system are made up of symbols and drawings that include the source, encoder, transmitter, receiver, and decoder, and storage, retrieval, and destination.
TPA3.01.03	Symbols are a message of communication technology.	Human or machines can send messages over long distances by using communication technology.	Many factors can affect the design of a message, such as the intended audience, the delivery medium, and the purpose or nature of the message.	People use information and communication systems for many purposes, for instance, to inform, persuade, entertain, control, manage, and educate.
TPA3.01.04		Signs and symbols are used to communicate ideas and information.	Ideas are expressed through the use of a common language of symbols and drawings.	Technological knowledge and processes are communicated through symbols, measurement, conventions, icons, and graphic images, as well as through languages that incorporate a variety of visual, auditory, and tactile stimuli.

Technical and Practical Application Four

Standard Statement TPA4[*]: Students will develop an understanding of **Drafting, Design, and CADD** and be able to apply and transfer the related knowledge and skills.

Career Statement: TPA4 will introduce the appropriate career opportunity for Drafting, Design, and CADD, concentrating on the labor market studies for the area.

[*]Correlates with or reflects the content standard 17 from the International Technology Education Association's *Standards for Technological Literacy.* See appendices for more information about International Technology Association (ITEA).

Technical and Practical Application Four

Grade Levels:	K-2	3-5	6-8	9-12
Performance Elements:				
TPA4.01	Begin to identify and recognize the differences between Drafting, Design, and CADD.	Begin to explore Drafting, Design, and CADD.	Select, use, and understand Drafting, Design, and CADD.	Understand, apply, and transfer knowledge and skills related to Drafting, Design, and CADD.
Performance Indicators:				
TPA4.01.01	There is a set of primary design components.	It is possible to generate and convey two-dimensional solutions to technological challenges.	Drafting skills can be used to generate and convey solutions to technological challenges.	Drafting skills can be used to address design problems, accurately generating and conveying solutions to technological challenges.
TPA4.01.02	Geometric shapes can be put together to form various objects.	Shapes are the basic building blocks in the world of design.	Drafting techniques employ the use of tools and conventions in order to develop solutions to technological challenges.	Drafting and design conventions help to generate and communicate design ideas to appropriate stakeholders.
TPA4.01.03	There are size differences between objects.	Unit measurement relates to size differences.	The use of size description is essential to drafting and design conventions.	Precision measurements, accurate scale drawings, and proportion are essential to drafting and design conventions.
TPA4.01.04				A working knowledge of CADD systems and software helps to communicate solutions to design challenges.
TPA4.01.05				Applying the essential elements of design (i.e., research, design, development, and the integration of previous knowledge) is necessary to solve complex technological challenges.

Technical and Practical Application Five

Standard Statement TPA5[*]: Students will develop an understanding of **Energy, Power, and Transportation Technologies** and be able to apply and transfer the related knowledge and skills.

Career Statement: TPA5 will introduce the appropriate career opportunity for Energy, Power, and Transportation Technologies, concentrating on the labor market studies for the area.

[*]Correlates with or reflects content standards 16 and 18 from the International Technology Education Association's *Standards for Technological Literacy*. See appendices for more information about International Technology Association (ITEA).

Technical and Practical Application Five

Grade Levels:	K-2	3-5	6-8	9-12
Performance Elements:				
TPA5.01	Begin to identify and recognize the differences between Energy, Power, and Transportation Technologies.	Begin to explore Energy, Power, and Transportation Technologies.	Select, use, and understand Energy, Power, and Transportation Technologies.	Understand, apply, and transfer knowledge and skills related to Energy, Power, and Transportation Technologies.
Performance Indicators:				
TPA5.01.01	Energy comes in many forms.	Energy comes in different forms.	Energy is the capacity to do work.	Energy cannot be created or destroyed, yet it can be converted from one form to another.
TPA5.01.02	Energy should not be wasted.	Tools, machines, products, and systems use energy in order to perform work.	Energy, through a variety of processes, can be harnessed to help perform work.	Energy can be grouped into major forms, such as thermal, radiant, electrical, mechanical, chemical, and nuclear.
TPA5.01.03			Power is the rate at which energy is converted from one form to another; the rate at which energy is transferred from one place to another; or the rate at which work is done.	It is impossible to build an engine that does not release thermal energy.
TPA5.01.04			A great deal of the energy that comes from the environment is not used efficiently.	Energy resources can be renewable or nonrenewable.
TPA5.01.05			Power systems provide propulsion to and drive other technological products and systems.	Power systems must have a source of energy, a process, and loads.
TPA5.01.06	A transportation system has many parts, which work together to help people travel.	Transportation helps people and goods move from place to place.	Transporting either people or goods involves the combined use of individuals and vehicles.	Transportation plays a vital role in the operation of other technologies, such as manufacturing, construction, communication, agriculture, and health and safety.

Technical and Practical Application Five

TPA5.01.07	Vehicles move people and goods from place to place, for instance, across the land or water or through the air or space.	A transportation system may lose efficiency or fail if just one part is missing or if one part or subsystem malfunctions.	Transportation vehicles are made up of subsystems (e.g., structural, propulsion, suspension, guidance, control, and support) that must function together for a system to operate effectively.	Intermodalism is the use of different modes of transportation (e.g., highways, railways, and waterways) to form an interconnected system in which people and goods can easily shift between modes.
TPA5.01.08			Governmental regulations often influence the design and operation of transportation systems.	Transportation services and methods have led to a population that is regularly in transit.
TPA5.01.09			Various processes, such as receiving, holding, storing, loading, moving, unloading, delivering, evaluating, marketing, managing, communicating, and using conventions, are necessary for a transportation system to operate efficiently.	The design of intelligent and nonintelligent transportation systems depends on many processes and innovative techniques.

Technical and Practical Application Six

Standard Statement TPA6[*]: Students will develop an understanding of **Construction and Manufacturing Technologies** and be able to apply and transfer the related knowledge and skills.

Career Statement: TPA6 will introduce the appropriate career opportunity for Construction and Manufacturing Technologies, concentrating on the labor market studies for the area.

[*]Correlates with or reflects content standards 19 and 20 from the International Technology Education Association's *Standards for Technological Literacy*. See appendices for more information about International Technology Association (ITEA).

Technical and Practical Application Six

Grade Levels:	K-2	3-5	6-8	9-12
Performance Elements:				
TPA6.01	Begin to identify and recognize the differences between Construction and Manufacturing Technologies.	Begin to explore Construction and Manufacturing Technologies.	Select, use, and understand Construction and Manufacturing Technologies.	Understand, apply, and transfer knowledge and skills related to Construction and Manufacturing Technologies.
Performance Indicators:				
TPA6.01.01	Construction and manufacturing and construction systems change the form of natural materials in order to make those materials useful.	Construction and manufacturing systems convert natural materials to products.	Construction and manufacturing systems change the form of natural materials through the processes of separating, forming, combining, and conditioning.	Manufacturing and construction and manufacturing infrastructures form the basic framework of a system.
TPA6.01.02		Construction and manufacturing enterprises exist because of a consumption of goods.	Constructed and manufactured goods may be classified as durable (i.e., permanent) or nondurable (i.e., temporary).	Materials used in construction and manufacturing have different qualities and may be classified as natural, synthetic, or mixed.
TPA6.01.03	Constructed and manufactured products are designed.	Construction and manufacturing processes include many steps (all of which help to yield products), such as creating designs, gathering resources, and using tools to separate, form, and combine materials.	Construction and manufacturing processes include the design, development, assembly, and maintenance of products and systems.	Construction and manufacturing systems can be classified by type, such as customized or mass production.
TPA6.01.04			Products, whether constructed or manufactured, contain a variety of subsystems (i.e., subassemblies).	The interchangeability of parts increases the effectiveness of construction and manufacturing and processes.
TPA6.01.05			Natural (i.e., raw) materials are typically converted to standard stock items, which in turn become the resources that are used in construction and manufacturing.	Emerging technology helps humans alter or modify natural materials to create new products.

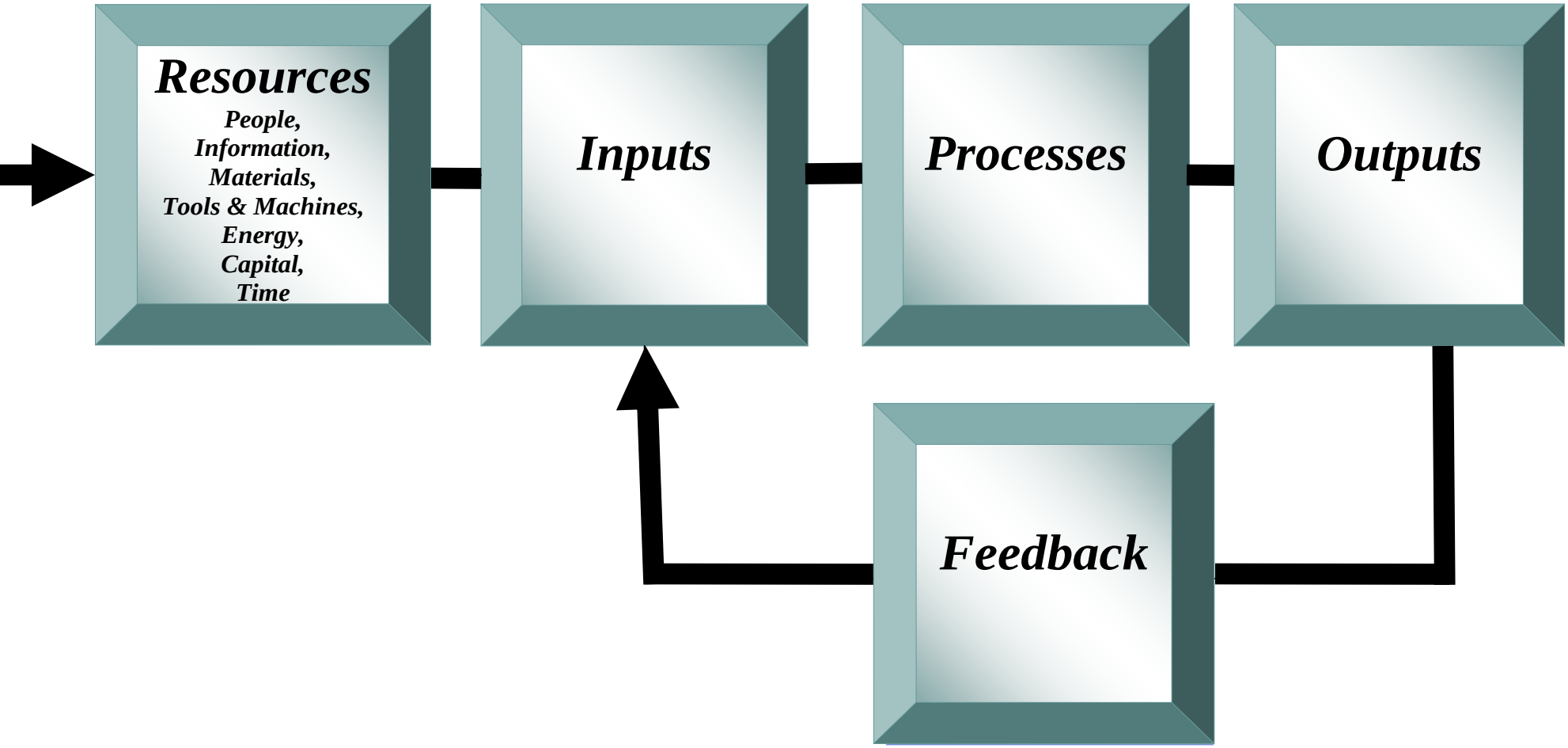
Technical and Practical Application Six

TPA6.01.06			Marketing involves informing the public of a product and assisting in product sales and distribution.	Marketing involves establishing a product identity; conducting research on product potential; and then advertising, distributing, and selling a product.
TPA6.01.07	People live, work, and attend school in different types of buildings.	Modern communities are usually planned according to specific guidelines.	The design of a structure must address a number of requirements.	The selection of design for structures is based on factors such as building laws and codes, style, convenience, cost, climate, and function.
TPA6.01.08	The type of structure determines how the parts of the structure are assembled.	It is necessary to maintain structures.	A structure rests on a foundation.	Structures are constructed through a variety of processes and procedures.
TPA6.01.09			Some structures can include prefabricated materials and be either temporary or permanent.	Constructed and manufactured products periodically undergo maintenance, alterations, or renovations to improve and prolong their functions.

Technology Education
Resources

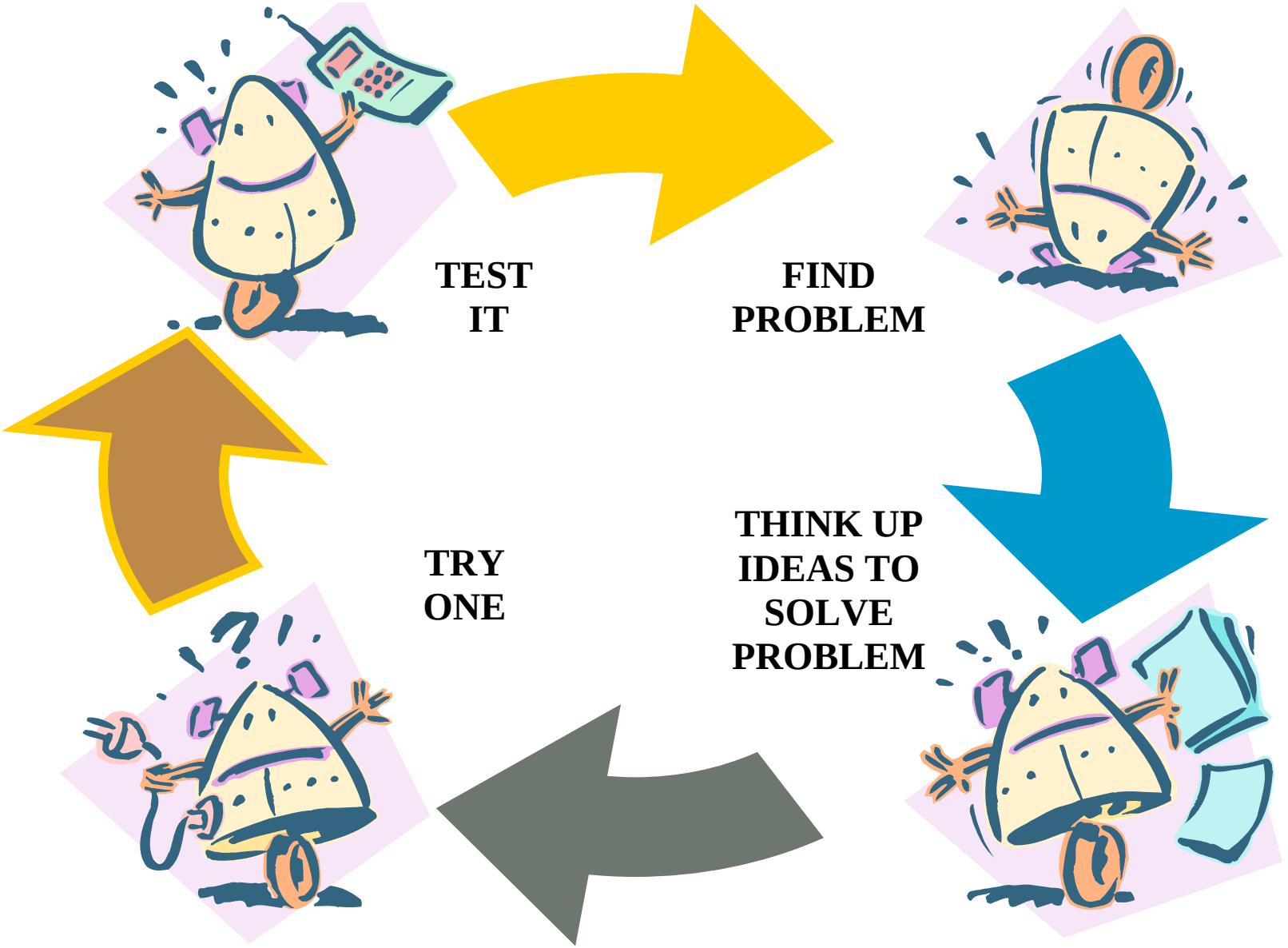
ITEA – International Technology Education Association	www.iteaconnect.org
DTEA – Delaware Technology Education Association	
TIDE – Technology, Innovation, Design, and Engineering	www.iteaconnect.org
EbD – Engineering by Design	www.iteaconnect.org
STEM – Science, Technology, Engineering, and Math	
TSA – Technology Student Association	www.tsaweb.org
National Career Clusters	www.careercluster.org
DEDOL – Delaware Department of Labor	www.delawareworks.com
Tech Prep of Delaware Department of Education	www.techprepdelaware.org
DACCTE – Delaware Advisory Council for Career & Technical Education	

Technology Systems Model Overview

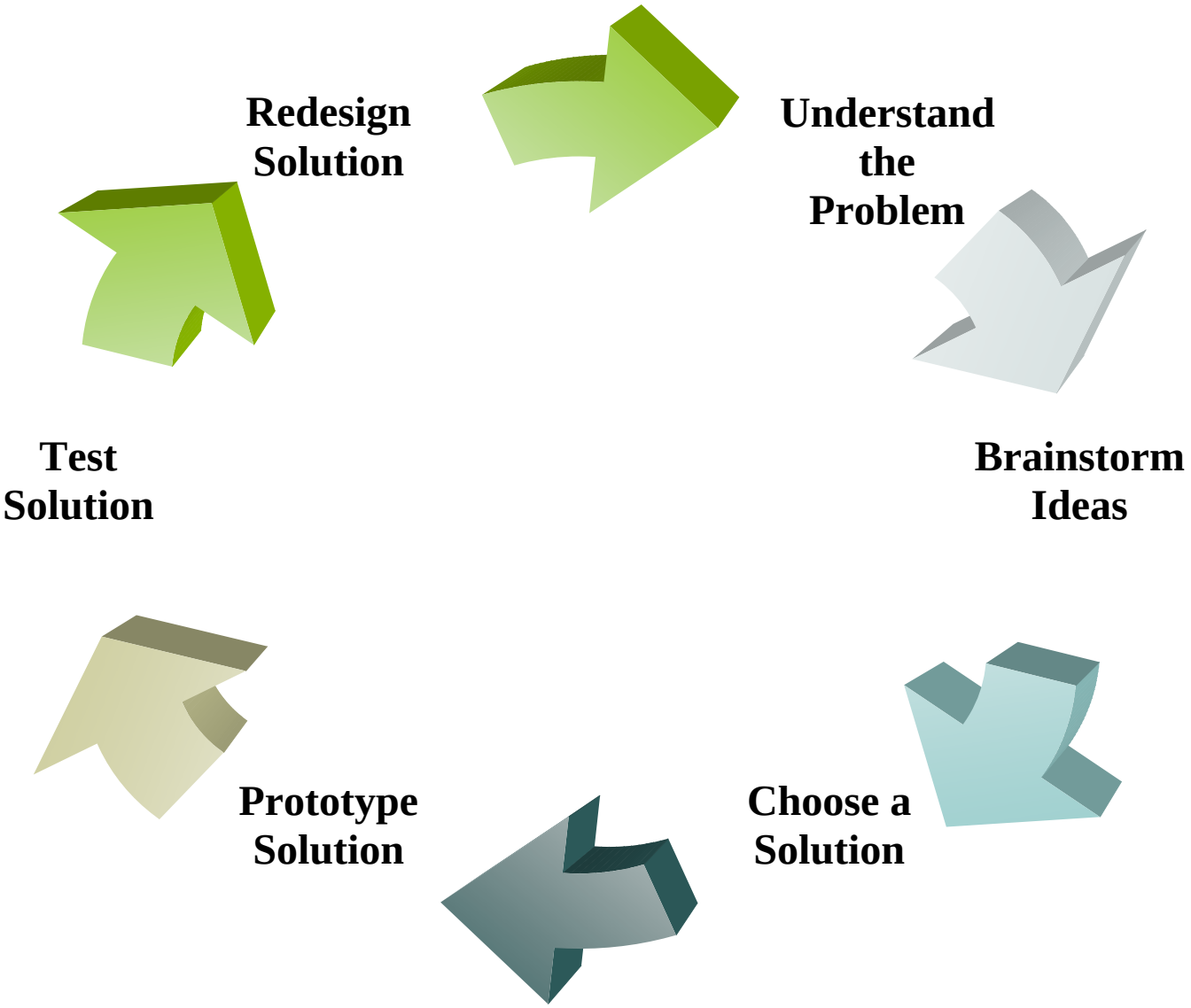


Elementary Design Process

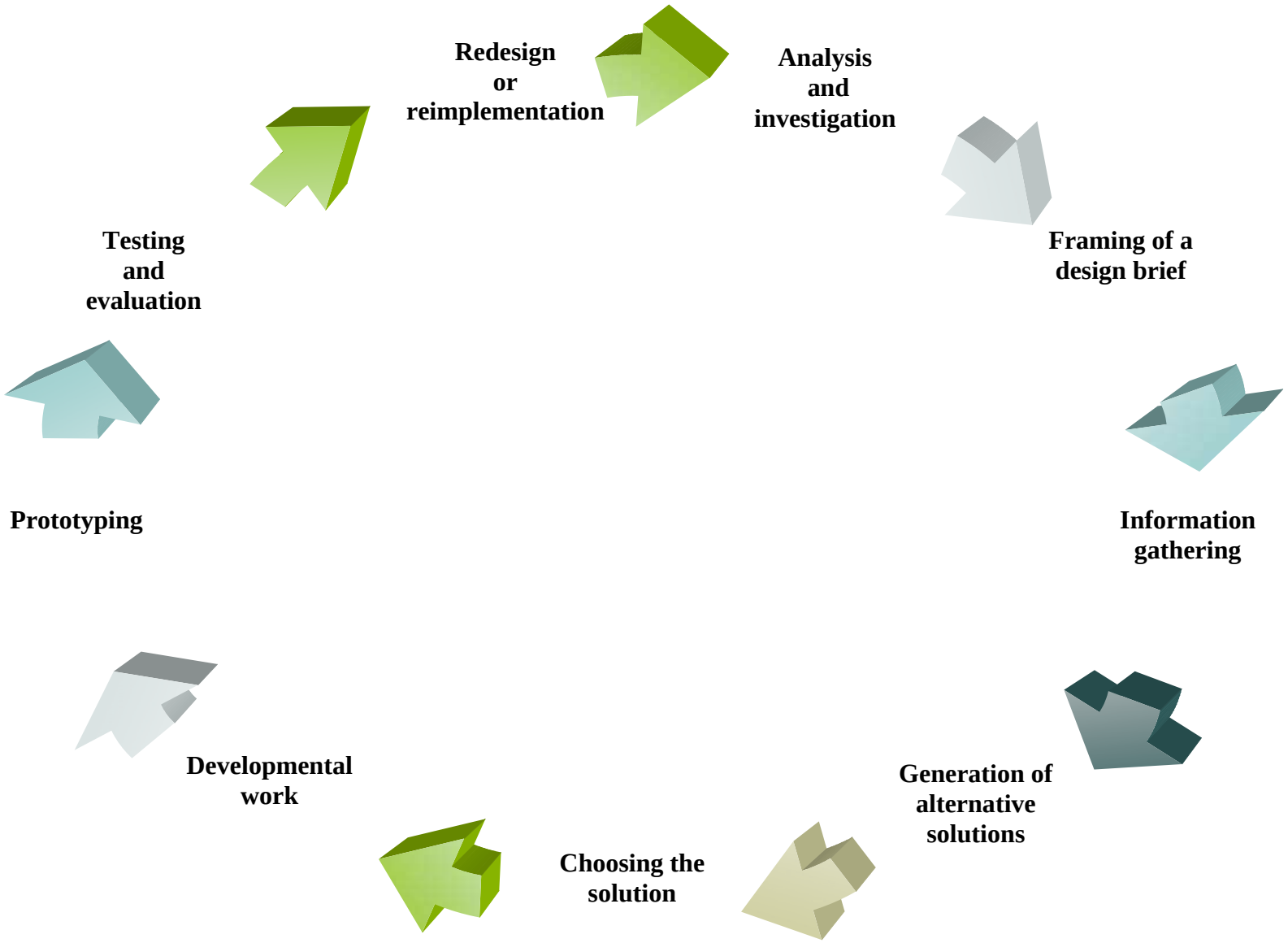
PROBLEM SOLVING!



Middle School Design Process



High School Design Process



Technology Education Acronyms

ACTE – Association for Career and Technical Education

ASCD – Association for Supervision and Curriculum Development

ASEE – American Society for Engineering Education

CTSO – Career and Technical Student Organization

EbD – Engineering by Design

FIRST – For Inspiration and Recognition of Science and Technology

JETS – Junior Engineering Technical Society

ITEA – International Technology Education Association

NAESP – National Association of Elementary School Principals

NASA – National Aeronautics and Space Administration

NASSP – National Association of Secondary School Principals

NCTM – National Council of the Teachers of Mathematics

NOCTI – National Occupational Competency Testing Institute

NSF – National Science Foundation

NSTA – National Science Teachers Association

PLTW – Project Lead the Way

STEM – Science, Technology, Engineering and Mathematics

STL – Standards for Technological Literacy

SWE – Society of Women Engineers

TIDE – Technology Innovation Design and Engineering

TSA – Technology Student Association

WIC – Women in Construction

WIT – Women in Technology

Technology Education Standards

Methodology of Technology Education

- Students will recognize **The Nature, Impacts, and Evolution of Technology** as they relate to the chronological human presence on Earth, as well as recognize the consequential influence of inventions and innovations that extend human capabilities.
- Students will effectively communicate technological solutions by using **Technology Education as an Interdisciplinary and Technological Link**.
- Students will develop and apply a practical understanding of **The Use and Management of Technological Resources and Systems.**
    - Technological resources: people, information, materials, tools and machines, energy, capital and time.
- Students will demonstrate technological problem solving by applying **The Design Process and The Systems Model.**
- Students will develop an operational awareness of **Technological Concepts** through focused invention and subsequent innovation.
- Students will explore technology-related skills, leadership skills, personal growth, and careers through opportunities provided by **Active Participation in the Technology Student Association (TSA).**

Technical & Practical Application of Technology Education

- Students will develop an understanding of **The Design Process** and be able to apply and transfer the related knowledge and skills to solve technological problems.
- Students will develop an understanding of **Agricultural, Bio-related, and Medical Technologies** and be able to apply and transfer the related knowledge and skills.
- Students will develop an understanding of **Information and Communication Technologies** and be able to apply and transfer the related knowledge and skills.
- Students will develop an understanding of **Drafting, Design, and CADD** and be able to apply and transfer the related knowledge and skills.
- Students will develop an understanding of **Energy, Power, and Transportation Technologies** and be able to apply and transfer the related knowledge and skills.
- Students will develop an understanding of **Construction and Manufacturing Technologies** and be able to apply and transfer the related knowledge and skills.

Appendix for Technology Education Standards:

Supporting Information for Methodologies and Technical and Practical Applications

Delaware Technology Education Practical Information to Support Standards

Standard Statement M1: Students will recognize **The Nature, Impacts, and Evolution of Technology** as they relate to the chronological human presence on Earth, as well as recognize the consequential influence of inventions and innovations that extend human capabilities.

	K-2	3-5	6-8	9-12
M1.01.01	Group discussions, cooperative group information sharing, pictures and/or models.	Cooperative group discussions to differentiate positive and negative impacts, e.g., students may identify ways in which humans pollute and restore the earth.		
M1.01.02				
M1.01.03				
M1.01 .04				
M1.01.05				
M1.01.06				
M1.01.07	What if there were no telephones or cars?			
M1.01.08	Fire, wood stove, oven gas grill, wheeled cart, horse drawn buggy, car, starship, cave, hut, log cabin, house, apartment, skyscraper.	Oral and written presentations, timelines and pictorial representations.		
M1.01.09				

Delaware Technology Education Practical Information to Support Standards

Standard Statement M2: Students will effectively communicate technological solutions by using **Technology Education as an Interdisciplinary and Technological Link.**

	K-2	3-5	6-8	9-12
M2.01.01	Language Arts: reading, oral presentation, labeling, writing of expressive and informative pieces using the writing process. Math: computation, graphing, measurement, geometry. Science: materials and their properties, energy, structures, tools and mechanisms. Social Studies: citizenship, economics, trade, mapping, natural resources and diversity in cultures. Visual and Performing Arts: sketching and music.	Language Arts: reading, oral presentation, labeling, writing of expressive and informative pieces using the writing process. Science: materials and properties, energy, structures, tools and mechanisms. Math: computation, graphing, measurement and geometry. Social Studies: citizenship, economics, trade, mapping, natural resources and diversity in cultures. Visual and Performing Arts. Sketching, music, painting, role-playing and sculpting.		
M2.01.02				
M2.01.03	Social situations, i.e., the playground, teams, family, math problems, science experiments.			
M2.01.04				
M2.01.05				

Delaware Technology Education Practical Information to Support Standards

<u>Standard Statement M3</u>: Students will develop and apply a practical understanding of **The Use and Management of Technological Resources and Systems.**

	K-2	3-5	6-8	9-12
M3.01.01				
M3.01.02	Does it sink or float? How might we join these materials? What could we use to cover this dome?			
M3.01.03				
M3.01.04				
M3.01.05				
M3.01.06				
M3.01.07				
M3.01.08				
M3.01.09				
M3.01.10				

Delaware Technology Education Practical Information to Support Standards

Standard Statement M4: Students will demonstrate technological problem solving by applying **The Design Process and The Systems Model.**

	K-2	3-5	6-8	9-12
M4.01.01	**N/A for Methodology 4**			
M4.01.02				
M4.01.03				
M4.01.04				
M4.01.05				
M4.01.06				
M4.01.07				

Delaware Technology Education Practical Information to Support Standards

Standard Statement M5: Students will develop an operational awareness of **Technological Concepts** through focused invention and subsequent innovation.

	K-2	3-5	6-8	9-12
M5.01.01	Sort and classify various materials; hard, soft, rough and/or smooth/ identify tools used in technology activities; scissors, ruler pencil, etc.			
M5.01.02	Construction and evaluation of the performance of wheeled vehicles to be used on a ramp that may be adjusted through a variety of angles. Design clothing to serve a variety of climate. Construction of transport vehicles for use on a specified surface, e.g., ice, rocks, sand, snow or asphalt.	Presentation; oral, written format graphics, charts and tables, model and prototypes.		
M5.01.03		Bicycle, toilet, garage door operating system.		
M5.01.04	An axle and wheel on a car, bike, skates, skateboard, tractor, or an inclined plane: used as ramps for skateboard, truck loading and Americans with Disabilities Act Requirements.	Research: books, internet, community resources.	Design briefs, Techno-logs.	
M5.01.05				

Delaware Technology Education Practical Information to Support Standards

M6. Standard Statement: Students will explore technology-related skills, leadership skills, personal growth, and careers through opportunities provided by **Active Participation in the Technology Student Association (TSA).**

	K-2	3-5	6-8	9-12
M6.01.01	**N/A for Methodology 6**			
M6.01.02				
M6.01.03				
M6.01.04				

Delaware Technology Education Practical Information to Support Standards

Standard Statement TPA 1: Students will develop an understanding of **The Design Process** and be able to apply and transfer the related knowledge and skills to solve technological problems.

	K-2	3-5	6-8	9-12
TPA1.01.01	**N/A for TPA 1**			
TPA1.01.02				
TPA1. 01.03				
TPA1. 01.04				
TPA1. 01.05				
TPA1. 01.06				
TPA1. 01.07				
TPA1. 01.08				
TPA1. 01.09				
TPA1. 01.10				
TPA1. 01.11				

Delaware Technology Education Practical Information to Support Standards

Standard Statement TPA2: Students will develop an understanding of **Agricultural, Bio-related, and Medical Technologies** and be able to apply and transfer the related knowledge and skills.

	K-2	3-5	6-8	9-12
TPA2.01.01	Students will investigate how the process of planting, growing, maintaining, harvesting, and preserving are important in providing food.	Students will investigate and summarize how a farm may be considered as an example of an artificial ecosystem where plants, animals and soil all work together in the production of a product. They will explore how a small pond, either man-made or natural, is designed to use plants to provide food and shelter for aquatic life, which in turn use their waste products to support plant life. For example, students can construct an artificial ecosystem, such as a terrarium, to demonstrate how an artificial ecosystem functions.	New tools and machinery are designed to make work easier and more productive. Today, fewer people are involved in producing food, while more are needed for processing, packaging, and distribution. Students will participate in learning activities using and simulating these techniques.	Agricultural products are bought and sold by individuals, corporations, and financial institutions. Local, state, and federal governments regulate the marketing and safety of agriculture products and systems.
TPA2.01.02			Students identify products which can be recycled and determine how composting is the process used to recycle waste. For example, bio-fuels, such as ethanol or methane, can be made from recycled waste.	Students will study landscaping techniques as well as ways to establish environmental control of watersheds and wetlands.
TPA2.01.03	Students will determine that an ecosystem is the collection of organisms, such as plants and animals, in a shared physical environment. They will investigate how plants, animals, and their wastes interact with their environment is important in	Students will identify the processes and machinery used to plant and harvest a crop and the function each performs For example, propagating and growing requires tractors, plows, planting equipment, and irrigation systems. In contrasts, harvesting requires combines, mowers, balers, and shears.	Students will study that an artificial ecosystem acts as an environment using all the systems of life, such as food, water, shelter, and space. System management involves gathering data to plan, organize, and control processes, products, and systems. Operating a hydroponics or aquaculture system within a closed or open environment requires	Management of agriculture requires the consideration of such topics as the amount, orientation, and distribution of crops and other plants, the effects of pests, and the management of land and animals.

	order to know how to use them as natural devices for maintaining the environment. For example, how trees and grasses remove carbon dioxide from the air and generate oxygen.		total control and cultivation. Temperature, nutrients, light, air circulation, and monitoring are required in order for the system to function properly.	
TPA2.01.04				Students will learn that farmers use lasers to level their fields and the global positioning system (GPS) for precision farming. Farmers use pollination techniques to improve crop management techniques.
TPA2.01.05			Generic engineering is done in a laboratory that allows researchers to make controlled changes in genetic information and structure. Students will examine applications of genetic engineering looking at basic cell structure, genetic code, and genome projects.	DNA has resulted in methods for screening and diagnosis of disease states and disease predisposition through diagnostics. The potential for misuse should compel society to establish ethical mandates for regulating its uses.
TPA2.01.06			Students will investigate advances in the areas of gene and molecular therapeutics that have been made in the pharmaceutical industry with improved therapeutic drugs, the agricultural industry has developed herbicide-resistant, pesticide resistant, and climate-adapted crops, as well as the development of plant based alternative fuels.	Biological processes are used in combination with physical technologies to alter or modify materials, products, and organisms.
TPA2.01.07			Student will identify and explain how tools, such as thermometers, blood	Students will understand proper handling and management of hazardous materials

			pressure machines, and heart monitors help determine if people are well and provide other health clues. For example, a heart monitor measures a person's heart rate. Many tools have been designed what is happening in the human body such as self-testing kits to determine glucose, sugar and pH levels are examples of such tools. This information helps determine if a person's health is stable or if they are developing an illness.	help to protect us from disease and unnecessary harm. The development of a risk-free environment is essential to long-term social impact.
TPA2.01.08	Students will investigate how vaccinations help build protection to disease and are often administered early in life and when given over a period of time have led to improved health and life. They will also investigate why some medicines require a long period of time before they become effective and require repeated doses, while others work in a short period of time and should only be used when needed.	Students will share how vaccines for such illnesses as polio, tetanus and mumps are used in the maintenance of good health, while medicines, such as those for the common cold, the flu, or pneumonia re used to help ease an illness and restore good health.	Students will investigate various developments and innovations in medical equipment are now used in the diagnosis and treatment of illnesses that previously were undiagnosed or untreatable. Immunology requires special technologies to develop and produce vaccines and biochemistry plays a role in analysis of a patient's diagnostics.	For example, the development of vaccines and drugs has helped to eradicate or cause remission of many serious illnesses. The development of various diagnostic tools allows for easier and more accurate diagnosis of illness. The use of specially designed equipment can also assist in maintaining daily health.
TPA2.01.09		Students will identify and describe how everyday products, such as toothbrushes, hairbrushes, and soap are used to promote healthy living (e.g., doctors, dentists, optometrists, and other health professionals use many technological tools to gather medical information about people's health.	Students will describe how products such as artificial limbs, wheel chairs, or crutches change to take advantage of new technologies and to improve upon previous designs.	Students will investigate how telemedicine represents a significant change in the delivery of medical care by increasing the number of doctors who can diagnose illness and offer treatment in unsafe and remote areas via computer, videoconference, or other technology.

Delaware Technology Education Practical Information to Support Standards

Standard Statement TPA3: Students will develop an understanding of **Information and Communication Technologies** and be able to apply and transfer the related knowledge and skills.

	K-2	3-5	6-8	9-12
TPA3.01.01	Data includes such things as numbers, amounts, words, symbols, sounds and images.	Computers are a tool that can be used to record, store, access, and manipulate data.	The transmission of information is accomplished using various systems. These systems involve sending signals using various forms including, but not limited to electromagnetic waves, electronic means, and fiber-optic cable.	Examples of these are: two people talking to each other using a wireless device; a person inputting information into a computer; an error message on an electronic device; or a computer-controlled milling machine.
TPA3.01.02	Electronic devices can be used to improve communication worldwide.	Information processing is a growing career field.	All of these components are necessary for the sender and receiver to understand each other. Communications systems include input, processes, outputs, and sometimes feedback. Information is encoded using symbols and graphics.	For a telephone communication system, the encoder and decoder would be the phone, and the transmitter would be the transmission lines or airwaves.
TPA3.01.03	For example, icons used on a computer desktop to represent programs and folders.	Electronic devices are used to improve the process of communication.	These factors should be taken into account when the message is created and transmitted to a particular audience. Communication-technology systems enhance the ability of disabled people to communicate. For example, communication systems have been designed to enhance the ability of hearing impaired.	Visual messages can be developed through graphic communication. Examples of graphic communication systems include printing and photochemical processes. Electronic systems include methods of communication such as MP3 players, radio, television, the Internet, telephones, etc. Multimedia systems combine both graphic and electronic methods of communication. Some examples of systems include the Internet, high-definition television, e-mail, podcasting, and computers.
TPA3.01.04		In mathematics "+" and "-" are used to represent addition and subtraction; an	The international sign of "do not" is a circle with a line through it.	

		arrow is used on a map to represent direction, Symbols, measurements, and sketches represent information.		

Delaware Technology Education Practical Information to Support Standards

Standard Statement TPA4: Students will develop an understanding of **Drafting, Design, and CADD** and be able to apply and transfer the related knowledge and skills.

	K-2	3-5	6-8	9-12
TPA4.01.01	**N/A for TPA 4**			
TPA4.01.02				
TPA4.01.03				
TPA4.01.04				
TPA4.01.05				

Delaware Technology Education Practical Information to Support Standards

Standard Statement TPA5: Students will develop an understanding of **Energy, Power, and Transportation Technologies** and be able to apply and transfer the related knowledge and skills.

	K-2	3-5	6-8	9-12
TPA5.01.01	It is used to do work. An early source of energy for machines was provided by human or animal muscle and was converted from food that was eaten. A car engine changes chemical energy (gasoline0 to mechanical energy (motion). Many appliances in the home and school use electrical energy.	Forms of energy include thermal, radian (light), chemical, mechanical, electrical, and others. Some energy sources cost less than others, and some give off less pollution. Electrical energy is used in an electric motor, and solar cells can be used to transform solar energy to electrical energy to operate a calculator.	Energy is required for a broad range of action s, from walking to running a diesel engine. Energy is an important input to many technological systems. Work is the product of force multiplied by the distance through which the force acted. Work is measure in Newton-meters, or joules, in the metric system and foot-pounds in the English system.	In scientific terms, this is called the law of conservation of energy, which can be stated as: "The total energy of an isolated system does not change." Understanding scientific concepts and laws concerning energy is necessary in order to develop technologies for utilizing energy. These concepts and laws describe the nature of energy. Energy can be classified as either kinetic or potential. Kinetic energy is the energy a body has associated with its motion. Potential energy is energy a body has because of its position (if it can be acted upon by a force) or condition; it is often referred to as stored energy.
TPA5.01.02	Toys and appliances should be turned off when they are not being used. Many energy resources, often called fuels, that are used to heat and light our homes, run our cars, and cook our food are non-renewable. There is a limited supply of these resources, and the supply is being used up.	A well-designed tool, machine, product, or system minimizes energy losses. For example, machines should be designed to apply energy efficiently to do a useful task. Energy is an important resource in technology.	For example, electricity can be generated by using geothermal energy to turn a turbine, which subsequently turns a generator to produce an electrical voltage. Another example involves an internal combustion engine; gasoline vapor is combined with air and ignited with a spark plug inside the cylinder, creating high pressure and temperature; the pressure acting on the piston pushes it down; the piston is connected to a piston rod that turns the crankshaft.	Some forms of energy cannot be transported easily. In transporting or transmitting energy, losses from the source of energy to the destination occur. Many times, technology systems that use a great deal of energy are located near the energy source. An example of this is an electric-generating plant located near a source of energy, such as a coal mine. The combustion of fossil fuels (e.g., coal, natural gas, and petroleum) provides one of the largest sources of energy today.

TPA5.01.03			Power is calculated by dividing the energy provided by the time taken to provide it. Common power measurements are kilowatt and horsepower. An example of the difference between the concept of energy (or work) and power can be seen in a student climbing a set of stairs. To climb from one floor of a building to another takes the same amount of energy to do the same work no matter how fast the student climbs. However, to climb twenty stairs in 10 seconds. Climbing faster requires the same amount of energy but more power – in the previous example three times more power.	This is one form of the second law of thermodynamics. No energy system can be 100 percent efficient. Large coal-fired, electric-generation systems strive for 40 percent efficiencies. That means that 60 percent of the energy from the coal is lost in the form of heating the environment rather than being turned into electrical energy. The law also has many wide-ranging consequences, such as the fact that there can be no perpetual motion machine.

TPA5.01.04			Conservation is the act of making better use of energy. Individuals can conserve energy by car pooling, driving the speed limit, and turning off lights. Builders can conserve energy by installing better insulation, and manufacturers can conserve energy by building more energy-efficient products. The rate at which energy is being used in the world is increasing. This rapid increase has created a concern that natural resources may be depleted in the future before other energy resources are available to replace them.	Examples of renewable resources are the sun and agricultural products, while nonrenewable resources include fossil fuels, such as coal, oil, and natural gas. Alternate and sustainable energy resources are being developed and tested in order to replace or supplement nonrenewable sources. For example, garbage can be used to produce methane gas and then burned for thermal energy. Also, corn can be fermented to produce ethanol (grain alcohol), which then can be used as a fuel. Power systems should be designed to conserve energy and to provide maximum efficiency without environmental degradation. For example, aircraft manufacturers are making more energy-efficient engines. Waste products associated with power systems can pollute the natural environment.
TPA5.01.05			A portable generator, for example, can be used to provide electricity to remote dwellings.	Usually feedback is part of this system. For example, the output of the system is sampled and provides a signal back to the input or process phase of the system in order to modify it. Power systems convert energy from one form to another and may transfer energy from one place to another. An example would be to burn coal in order to heat water and make steam, which turns a turbine and ultimately generates electricity.
TPA5.01.06	The roadway, vehicles, fuel, and controlling signs are just a few of the parts in a transportation system. Understanding how a transportation system works	The development of transportation systems has had a significant influence on where people live and work.	For example, the movement of a product from one part of the country to another may involve the person shipping the item, a delivery truck, a bus, plane, or train, and the people involved in controlling he product's	The transportation system includes the subsystems of aviation, transportation, water transportation, pedestrian walkways, and roadways. Each subsystem uses a wide array of devices, vehicles, and systems in order to move people and goods easily from one

	helps people and use it properly, such as walking on the left side of the street facing traffic when sidewalks are unavailable.		location, as well as those who made the road, the car, and the fuel.	mode to another.
TPA5.01.07	People's needs and wants influence the design of a transportation device, vehicle, fuel, and system. For example, cars replaced the horse and buggy because they allowed people to move faster. Goods are often moved in specially designed carriers, such as in refrigerated containers, on conveyor belts, or through piping systems.	For instances, and accident on a highway can throw a whole traffic pattern into chaos. Severe thunderstorms over Atlanta can result in the cancellation of airline flights up and down the east coast of North America.	Structural systems are the framework and body of a transportation vehicle or system. Propulsion systems provide the energy source, energy converter, and power transmitter to move a vehicle. Suspension systems connect or associate a vehicle with its environment. Guidance systems provide information to the operator of a vehicle. Control systems receive information from the guidance system to determine the changes in speed, direction, or altitude of a vehicle. Support systems provide life, legal, operational, maintenance, and economic support for safe and efficient operation.	An example of intermodalism is a truck container that is hauled on an ocean cargo ship from another country, transported to a railcar, and finally, attached to a truck that travels a highway to deliver goods. The same process is used by people who travel to all parts of the world using different modes of travel, from airplanes to ships to buses to trains or cars. Intermodalism provides a system that allows people to travel more efficiently and cheaply.
TPA5.01.08	People sometimes keep a log of what they must do to care for a vehicle, such as keeping it clean, rotating the tires, and looking for damage.		State agencies regulate the use of highway systems, set speed limits, and control other operating conditions. The Federal Aviation Administration regulates airspace and air safety and issues licenses to pilots.	For instance, people today can travel to foreign lands or to sites of interest hundreds of miles from home as quickly as they used to take a relatively short trip into town in a wagon 200 years ago.
TPA5.01.09			These processes may be used individually or in various combinations to move goods and people. For example, a conveyor system uses many of these processes	For example, the development of an intelligent transportation system – smart highways with electronic message boards, for instance – require the use of coordinated subsystems to determine capacity of lanes,

			to move boxes of goods in states from one location to another.	traffic flow, and potential congestion problems. Unintelligent transportation systems, such as walkways and bicycle paths, attract individuals and groups of people through innovative designs that capitalize on natural settings and provide convenience.

Delaware Technology Education Practical Information to Support Standards

Standard Statement TPA6: Students will develop an understanding of **Construction and Manufacturing Technologies** and be able to apply and transfer the related knowledge and skills.

	K-2	3-5	6-8	9-12
TPA6.01.01	Products can be made faster, cheaper, and better through the use of technology. People have different roles in the manufacturing and construction processes. If people work together, they can produce much more than if they work alone to make the same product.	Raw materials, which come directly from nature or are created by humans (synthetic), are essential inputs in the manufacturing and construction systems. Whether making a toy or a house preplanning is essential.	Separating includes cutting, sawing, shearing and tearing. Forming includes bending, shaping, stamping, and crushing. Combining includes gluing, welding, riveting, and using fasteners (e.g., nuts, bolts, and screws). Conditioning involves processing materials, such as by heating or cooling, to improve their structures. Tempering metals is an example of conditioning.	Infrastructure might include roads, sewers, and utilities while maintenance would include repairing, altering, upgrading, and retrofitting.
TPA6.01.02		When enterprises produce goods that people need and want, they will spend money to purchase them. This cycle provides jobs and helps the economy.	These classifications are based on the life expectancy of a product or system. Automobiles and homes are durable while toilet paper and tarps are nondurable.	Examples of materials found in nature are wood, stone, and clay. Synthetic materials are human made, such as plastics, glass, and steel. Composite materials are a combination of natural and synthetic materials, such as plywood, paper, and wool-polyester blends of fabric.
TPA6.01.03	Designers and engineers anticipate what people want and need with the intention that products will be bought. Some things are designed to be thrown away, while others are made to last a long time.	Many products are composed of standardized parts, which reduces the cost of making them thus making it easier to service and repair the products.	The manufacturing and construction processes include the use of materials (natural and synthetic), hand tools (e.g., hammers and scissors), human-operated machines (e.g., drills, sanders, and sewing machines), and automated machines (computer-controlled). Building codes and manufacturing standards are published by professional or governmental organizations.	Customized production meets the specific needs and wants of an individual or small group by producing a single item or small quantities of goods. Batch production generates parts to be assembled later into larger products. Continuous production makes items on an assembly line or in a processing plant**.** Examples include manufactured homes, sheds, firearms, and clothing.

Delaware Technology Education Practical Information to Support Standards

TPA6.01.04			Subsystems can include waste disposal, heating and cooling, transportation of goods and materials, quality control, and safety.	Components of a product or system must be interchangeable. Since manufacturing and construction have become global, international standards for the interchangeability of parts have emerged.
TPA6.01.05			Because few materials occur in nature in a usable state, they must be changed into new forms before they can be used as inputs in manufacturing and construction. For example lumber is processed from trees and plastics are processed from petroleum.	Emerging technologies have been used to improve the health and well-being of humans, plants, and animals. Examples could include recycling industrial and consumer waste.
TPA6.01.06			Marketing entails assessing what the public wants and then advertising and selling products to the buyers**.**	Marketing should be considered from the design stage of a product to its final sale. Large corporations typically have their own marketing departments, whereas smaller companies with limited resources may contract with a marketing firm.

Delaware Technology Education Practical Information to Support Standards

TPA6.01.07	Buildings are designed, built, and maintained by people. Special materials are used to make buildings. Historically people tended to use materials available in their communities for building materials. With the advent of modern ways to convert natural materials into building materials and improved transportation systems, special materials are now available, including lumber, stone brick, and plywood.	Special areas are designated for schools stores, parks, houses, apartments, manufacturing plants and offices. Sidewalks, trails, roads, and bridges provide routes for people to move throughout the community. In addition to building materials – sand, gravel, lumber, and brick – specialized tools and machines and large amounts of money – are needed in the construction industry as well as time, energy, land, and people.	One of the most important design constraints with structures is function. One of the most important design constraints with structures is function. For example, the function of houses is to provide safe and pleasant shelter for families, whereas the primary function of a bridge is to carry loads over barriers or obstructions. Other important constraints include appearance, strength, longevity, maintenance, and available utilities.	Building laws and codes are part of the city or county regulations or construction.
TPA6.01.08	The way the parts are arranged or put together to form a whole determines the type of structure. Some common structures include buildings, which protect people and goods, and roads and bridges which support transportation.	Weather and usage cause deterioration in any structure.	The structures determine the type of foundation needed. Foundations can be made from such materials as concrete, steel, and wooded poles.	In some cases, the procedure used depends on the type of material available. For example, welds, bolts, and rivets are used to assemble metal framing materials. Sometimes procedures are selected as a function of cost, skills, and preference of the worker or the level of quality desired. Citizens should be equipped to evaluate the appropriateness of procedures used.
TPA6.01.09		Some are simple, while others are complex. For example, a plumbing system provides water and eliminates sewage, and a heating and cooling system maintains comfortable temperatures in summer and winter. Other technologies are an integral part of a building as well. For example, the telephone is a part of communications technology. When building a house or office building, one	Many times, temporary structures are built to aid the construction of permanent structures. For example, scaffolding is often assembled to support workers who lay bricks, and forms are used as containers to hold poured concrete. There are many different types of interior and exterior building materials. These materials include brick, rock, stone, siding, log,	Structures must be designed and constructed to provide for maintenance. Most structures are comprised of a variety of systems, each of which commonly requires maintenance. For example, because electrical and telephone systems typically need to be upgraded in office buildings, easy access must be included in the original design process (renovating a hotel to serve as a nursing home, for

		part of the whole process is installing telephone lines so that the people who live or work in that structure can communicate with the outside world.	wood, brick veneer, plywood metal, wallboard, concrete, glass, and straw, and mud. Certain kinds are appropriate for some prefabricated structures and parts of structures while others are not. For example, wood, concrete, and steel are commonly used as prefabricated frames for houses, bridges, and buildings. One important quality variable concerns the type and quality of materials used and the support loads required. Prefabricated sections of buildings can be set in place to reduce costs and a wide range of options at different costs is typically available.	example). Sometimes, alterations and renovations are necessary because a structure has become outdated or is in need of repair.

The following curricula crosswalk is a document that provides links between high quality career and technical education and academic education to best prepare students for work and/or postsecondary education. Its intended audience is classroom teachers in grades 9-12 and it focuses on the four core academic areas: English language arts, mathematics, science and social studies. You will find the pathway level performance elements in career and technical content areas cross-walked to content standards in the four academic areas. Through this document educators in Delaware will be able to connect the theory of what is taught in core academic content areas to the authentic, real-world application of that theory through their application in the workplace via career and technical classes. This document is intended to be a tool to encourage and facilitate communication and collaboration among educators.

The crosswalk was completed in the summer of 2007 by a committee of Department of Education staff and both career and technical and core academic teachers from districts across the state. We would like to acknowledge the following crosswalk participants:

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Sharon Elzey	Business, Finance & Marketing- Management	Cape Henlopen School District
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Nancy Phillips	Math	Sussex Technical School District
Karen Breeding	Agriscience- Animal Science	Woodbridge School District
Fred Brock	Agriscience- Structures	Woodbridge School District

Curricula Crosswalk

Technology Education

Standard Statement M1: Students will recognize The Nature, Impacts, and Evolution of Technology as they relate to the chronological human presence on Earth, as well as recognize the consequential influence of inventions and innovations that extend human capabilities.

Core Academic Content Standards

Methodology of Technology Education					
ID #	**Performance Indicator**	**English Language Arts**	**Mathematics**	**Science**	**Social Studies**
M1.01.01	Analyze the impact, including the ethical, cultural, social, economic, and political ramifications, of a past or present technological trend on today's individuals and society.	3. Research, Information & Technical Literacy 4. Reading Fiction & Literary Texts		1: Nature and Application of Science and Technology	C3 9-12a H1 9-12a
M1.01.02	Evaluate the safety aspects of a student-generated product or system.				C3 9-12a E1 9-12a
M1.01.03	Perform a market analysis to ascertain a product's potential impact or real impact on individuals and communities.	1. Writing, Oral Presentation, & Listening	1. Numeric Reasoning 5. Problem Solving 7. Communication 8. Connections	8: Ecology	E1 9-12a G3 9-12a
M1.01.04	Develop and implement a performance-testing plan for a selected product or process.	1. Writing, Oral Presentation, & Listening			C3 9-12a
M1.01.05	Design a model, prototype, or process that improves or enhances the form or function of a product.		3. Geometric Reasoning	2: Materials and Their Properties	
M1.01.06	Understand that the evolutionary nature of technology is a function of setting and that technological development, which may be profit driven, is a result of specific goal-directed research.			1: Nature and Application of Science and Technology	H1 9-12a G3 9-12a

Core Academic Content Standards

Methodology of Technology Education					
ID #	**Performance Indicator**	**English Language Arts**	**Mathematics**	**Science**	**Social Studies**
M1.01.07	Identify how cultures develop specific technologies to meet their own needs and understand that technological development is influenced by societal opinions and demands.	1. Writing, Oral Presentation, & Listening 3. Research, Information & Technical Literacy		1: Nature and Application of Science and Technology	G3 9-12a
M1.01.08	Understand the impacts of and relationships between the technological ages (i.e., Stone Age, Bronze Age, Iron Age, Pre-Industrial Revolution, Industrial Revolution, and Information Age) relative to advances in inventions, processes, and the use of available resources.		8. Connections	1: Nature and Application of Science and Technology	H1 9-12a
M1.01.09	Collect and evaluate information, synthesize data, analyze trends, and draw conclusions; use assessment techniques to make decisions about future technologies; and design forecasting techniques to evaluate the results of altering natural systems.		1. Numeric Reasoning, 4. Quantitative Reasoning 5. Problem Solving 7. Communication 8. Connections	1: Nature and Application of Science and Technology	H2 9-12a

Technology Education

Standard Statement M2: Students will effectively communicate technological solutions by using Technology Education as an Interdisciplinary and Technological Link.

Core Academic Content Standards

Methodology of Technology Education					
ID #	**Performance Indicator**	**English Language Arts**	**Mathematics**	**Science**	**Social Studies**
M2.01.01	Consult and collaborate with instructors from other disciplines to successfully complete a design challenge.	1. Writing, Oral Presentation, & Listening	1. Numeric Reasoning 3. Geometric Reasoning 7. Communication 8. Connections		
M2.01.02	Generate a portfolio for the design challenge that contains evidence of cross-curricular information.	1. Writing, Oral Presentation, & Listening			
M2.01.03	Identify cross-curricular concepts of technology, including technology transfer, the relationship of science and math to technology, and progress that results from technology.		5. Problem Solving 8. Connections	1: Nature and Application of Science and Technology	H1 9-12a
M2.01.04	Deliver a presentation and complete a technical document in the final stage of the design challenge.	1. Writing, Oral Presentation, & Listening			
M2.01.05	Demonstrate knowledge of the patent process and how it protects technological ideas.				C3 9-12a

Technology Education

Standard Statement M3: Students will develop and apply a practical understanding of The Use and Management of Technological Resources and Systems.

Core Academic Content Standards

Methodology of Technology Education					
ID #	**Performance Indicator**	**English Language Arts**	**Mathematics**	**Science**	**Social Studies**
M3.01.01	Demonstrate the appropriate use and management of technological resources.				
M3.01.02	Identify criteria for evaluating the appropriateness of resources, processes, and products used to achieve an end goal.		8. Connections	2: Materials and Their Properties, 3: Energy and Its Effects	
M3.01.03	Develop an evaluation plan for testing according to pre-established criteria.	1. Writing, Oral Presentation, & Listening	8. Connections		
M3.01.04	Make decisions that result in optimum resource use and align technological processes with natural processes.			2: Materials and Their Properties, 3: Energy and Its Effects	E1 9-12a
M3.01.05	Compare a past technological process or product with a current technological process or product.	1. Writing, Oral Presentation, & Listening			H1 9-12a
M3.01.06	Contrast the resources used for and the environmental impacts of each selected example.	1. Writing, Oral Presentation, & Listening		8: Ecology	G2 9-12a
M3.01.07	Identify new technologies used to reduce the environmental impact of other technologies and ways in which these new technologies can monitor the environment to guide optimal decisions.	1. Writing, Oral Presentation, & Listening	7. Communication 8. Connections	8: Ecology	G2 9-12a

Core Academic Content Standards

Methodology of Technology Education					
ID #	**Performance Indicator**	**English Language Arts**	**Mathematics**	**Science**	**Social Studies**
M3.01.08	Understand that complex systems have layers of controls and feedback loops and learn to diagnose, troubleshoot, analyze, operate, and maintain these systems.		4. Quantitative Reasoning		
M3.01.09	Use electronic media to access, retrieve, organize, process, maintain, interpret, and evaluate data and information.	1. Writing, Oral Presentation, & Listening 3. Research, Information & Technical Literacy			
M3.01.10	Demonstrate knowledge of systems relative to logic and creativity, stability, optimization, quality control, and management.	1. Writing, Oral Presentation, & Listening			

Technology Education

Standard Statement M4: Students will demonstrate technological problem solving by applying The Design Process and The Systems Model.

Core Academic Content Standards

Methodology of Technology Education					
ID #	**Performance Indicator**	**English Language Arts**	**Mathematics**	**Science**	**Social Studies**
M4.01.01	Demonstrate a working knowledge of the design process, understanding that design requirements, such as criteria, constraints, and efficiency, sometimes compete with each other.	3. Research, Information & Technical Literacy			
M4.01.02	Achieve technological solutions by identifying problems, criteria, and constraints, then refining solutions to ensure quality, efficiency, and productivity.				
M4.01.03	Document revisions made during the design process by using verbal, graphic (including three-dimensional models), quantitative, virtual, and written means.	1. Writing, Oral Presentation, & Listening	4. Quantitative Reasoning		
M4.01.04	Produce a prototype that exemplifies the safe and effective use of technological resources.				
M4.01.05	Assume both a team approach and an individual approach to solve technological problems.	1. Writing, Oral Presentation, & Listening	4. Quantitative Reasoning 8. Connections		
M4.01.06	Understand that design problems are seldom presented in a clearly defined form and a design needs to be continually checked, critiqued, refined, and improved.				
M4.01.07	Demonstrate that the engineering design process takes into account a range of factors and that design is influenced by personal characteristics.				

Technology Education

Standard Statement M5: Students will develop an operational awareness of Technological Concepts through focused invention and subsequent innovation.

Core Academic Content Standards

Methodology of Technology Education					
ID #	**Performance Indicator**	**English Language Arts**	**Mathematics**	**Science**	**Social Studies**
M5.01.01	Research and identify technological concepts.	4. Reading Fiction & Literary Texts			
M5.01.02	Develop a successful model or prototype.		3. Geometric Reasoning		
M5.01.03	Generate plans or graphic displays to construct a solution.				
M5.01.04	Document the information resources used to solve a given problem.	1. Writing, Oral Presentation, & Listening 3. Research, Information & Technical Literacy			H2 9-12a
M5.01.05	Deliver a presentation to explain the rationale and operation of a product or prototype.	1. Writing, Oral Presentation, & Listening			

Technology Education

Standard Statement M6: Students will explore technology-related skills, leadership skills, personal growth, and careers through opportunities provided by Active Participation in the Technology Student Association (TSA).

Core Academic Content Standards

Methodology of Technology Education					
ID #	**Performance Indicator**	**English Language Arts**	**Mathematics**	**Science**	**Social Studies**
M6.01.01	Participate in current competitive events and related programs at local, state, and national levels.		8. Connections		
M6.01.02	Participate in leadership training activities at local, state, and national levels.				C4 9-12a
M6.01.03	Interact with each other on current competitive events and related programs in class, during which time they will be encouraged to examine the related political, ethical, cultural, and social issues.	4. Reading Fiction & Literary Texts			C3 9-12a
M6.01.04	Engage in real world simulations that incorporate technology, innovation, design, and engineering through competitive events and related programs.				

Technology Education

Standard Statement TPA1: Students will develop an understanding of The Design Process and be able to apply and transfer the related knowledge and skills to solve technological problems.

Core Academic Content Standards

Technical and Practical Application of Technology Education					
ID #	**Performance Indicator**	**English Language Arts**	**Mathematics**	**Science**	**Social Studies**
TPA1.01.01	Design problems are seldom presented in a clearly defined form.				
TPA1.01.02	A design needs to be continually checked and critiqued, and ideas of the design must be redefined and improved.				
TPA1.01.03	Design requirements, such as criteria, constraints, and efficiency, sometimes compete with each other.				
TPA1.01.04	Established design principles are used to evaluate existing designs, collect data, and guide the design process.	1. Writing, Oral Presentation, & Listening 3. Research, Information & Technical Literacy	4. Quantitative Reasoning		
TPA1.01.05	Engineering design is influenced by personal characteristics, such as creativity, resourcefulness, and an ability to visualize and think abstractly.				
TPA1.01.06	A prototype (or working model) helps an engineer test and observe a design in order to make necessary adjustments.				
TPA1.01.07	The process of engineering design takes into account a number of factors.	1. Writing, Oral Presentation, & Listening			

Curricula Crosswalk

Core Academic Content Standards

Technical and Practical Application of Technology Education					
ID #	**Performance Indicator**	**English Language Arts**	**Mathematics**	**Science**	**Social Studies**
TPA1.01.08	Research and development is a specific problem-solving approach that is intensively used in business and industry to prepare devices and systems for the marketplace.	3. Research, Information & Technical Literacy 4. Reading Fiction & Literary Texts			
TPA1.01.09	Technological problems must be researched before they can be solved.	3. Research, Information & Technical Literacy			
TPA1.01.10	Not all problems are technological, and not every problem can be solved with technology.				C3 9-12a
TPA1.01.11	Many technological problems require a multidisciplinary approach.	1. Writing, Oral Presentation, & Listening	8. Connections	1: Nature and Application of Science and Technology	

Technology Education

Standard Statement TPA2: Students will develop an understanding of Agricultural, Bio-related, and Medical Technologies and be able to apply and transfer the related knowledge and skills.

Core Academic Content Standards

Technical and Practical Application of Technology Education					
ID #	**Performance Indicator**	**English Language Arts**	**Mathematics**	**Science**	**Social Studies**
TPA2.01.01	Agriculture collaborates with related businesses that use a wide array of products and systems to process and distribute such things as food, fiber, fuel, and chemicals.			7: Diversity and Continuity of Living Things	E1 9-12a
TPA2.01.02	Conservation, which is essential to the maintenance of the environment, is the process of controlling soil erosion, reducing sediment in waterways, conserving water, and improving water quality.		6. Reasoning and Proof	5: Earth's Dynamic Systems	G2 9-12a
TPA2.01.03	Engineering design and management of agricultural systems requires knowledge of artificial ecosystems and the effects of technological development on plant and animal sciences.	4. Reading Fiction & Literary Texts	5. Problem Solving		
TPA2.01.04	A variety of specialized equipment, techniques, and practices are used to care for animals and to improve the production of food, fuel, and other commodities.			6: Life Processes	C3 9-12a
TPA2.01.05	Advances in biochemistry and molecular biology have made it possible to manipulate the genetic information of living creatures.		7. Communication	6: Life Processes	
TPA2.01.06	Biotechnology has applications in areas such as agriculture, pharmaceuticals, food and beverages, medicine, energy, genetic engineering, and the environment.			6: Life Processes	

Curricula Crosswalk

Core Academic Content Standards

Technical and Practical Application of Technology Education					
ID #	**Performance Indicator**	**English Language Arts**	**Mathematics**	**Science**	**Social Studies**
TPA2.01.07	Processes used to manage, recycle, and dispose of hazardous materials help protect people from harmful organisms and disease and shape the ethics of environmental safety.			6: Life Processes	E1 9-12a
TPA2.01.08	Medical practices used to maintain and protect health include prevention and rehabilitation, vaccines and pharmaceuticals, medical and surgical procedures, and genetic engineering.			6: Life Processes	
TPA2.01.09	The convergence of technological advances in a number of fields (e.g., medicine, telecommunications, virtual presence, computer engineering, informatics, artificial intelligence, robotics, materials science, and perceptual psychology) has created an emerging area called "telemedicine."			6: Life Processes	H1 9-12a

Technology Education

Standard Statement TPA3: Students will develop an understanding of Information and Communication Technologies and be able to apply and transfer the related knowledge and skills.

Core Academic Content Standards

Technical and Practical Application of Technology Education					
ID #	**Performance Indicator**	**English Language Arts**	**Mathematics**	**Science**	**Social Studies**
TPA3.01.01	Information and communication systems allow information to be transferred between humans and machines.	1. Writing, Oral Presentation, & Listening 2. Reading Informative, Non-fiction & Technical Texts 3. Research, Information & Technical Literacy 4. Reading Fiction & Literary Texts	7. Communication		
TPA3.01.02	The components of a communication system are made up of symbols and drawings that include the source, encoder, transmitter, receiver, and decoder, and storage, retrieval, and destination.				
TPA3.01.03	People use information and communication systems for many purposes, for instance, to inform, persuade, entertain, control, manage, and educate.				
TPA3.01.04	Technological knowledge and processes are communicated through symbols, measurement, conventions, icons, and graphic images, and languages that incorporate a variety of visual, auditory, and tactile stimuli.	1. Writing, Oral Presentation, & Listening			

Technology Education

Standard Statement TPA4: Students will develop an understanding of Drafting, Design, and CADD and be able to apply and transfer the related knowledge and skills.

Core Academic Content Standards

Technical and Practical Application of Technology Education					
ID #	**Performance Indicator**	**English Language Arts**	**Mathematics**	**Science**	**Social Studies**
TPA4.01.01	Accurately generated and conveyed solutions to design problems using drafting skills will solve technological challenges.	1. Writing, Oral Presentation, & Listening 2. Reading Informative, Non-fiction & Technical Texts 3. Research, Information & Technical Literacy 4. Reading Fiction & Literary Texts			
TPA4.01.02	Drafting and design conventions enable design ideas to be generated and communicated to appropriate stakeholders.		1. Numeric Reasoning		
TPA4.01.03	Precision measurements, accurate scale drawings, and proportion are essential to drafting and design conventions.		3. Geometric Reasoning 8. Connections		
TPA4.01.04	Developing a working knowledge of CADD systems and software and understanding CADD is a viable way to communicate solutions to design challenges.				
TPA4.01.05	Applying the essential elements of design (i.e., research, design, development, and the integration of previous knowledge) is necessary to solve complex technological challenges.		8. Connections		

Curricula Crosswalk

Technology Education

Standard Statement TPA5: Students will develop an understanding of Energy, Power, and Transportation Technologies and be able to apply and transfer the related knowledge and skills.

Core Academic Content Standards

Technical and Practical Application of Technology Education					
ID #	**Performance Indicator**	**English Language Arts**	**Mathematics**	**Science**	**Social Studies**
TPA5.01.01	Energy cannot be created or destroyed, yet it can be converted from one form to another.	1. Writing, Oral Presentation, & Listening 2. Reading Informative, Non-fiction & Technical Texts 3. Research, Information & Technical Literacy 4. Reading Fiction & Literary Texts		3: Energy and Its Effects	
TPA5.01.02	Energy can be grouped into major forms, such as thermal, radiant, electrical, mechanical, chemical, and nuclear.				
TPA5.01.03	It is impossible to build an engine that does not release thermal energy.		6. Reasoning and Proof		
TPA5.01.04	Energy resources can be renewable or nonrenewable.				
TPA5.01.05	Power systems must have a source of energy, a process, and loads.				
TPA5.01.06	Transportation plays a vital role in the operation of other technologies, such as manufacturing, construction, communication, agriculture, and health and safety.				G1 9-12a
TPA5.01.07	Intermodalism is the use of different modes of transportation (e.g., highways, railways, and waterways) to form an interconnected system in which people and goods can easily shift between modes.				G1 9-12a E4 9-12a
TPA5.01.08	Transportation services and methods have led to a population that is regularly in transit.				G1 9-12a G3 9-12a
TPA5.01.09	The design of intelligent and nonintelligent transportation systems depends on many processes and innovative techniques.				

Technology Education

Standard Statement TPA6: Students will develop an understanding of Construction and Manufacturing Technologies and be able to apply and transfer the related knowledge and skills.

Core Academic Content Standards

Technical and Practical Application of Technology Education					
ID #	**Performance Indicator**	**English Language Arts**	**Mathematics**	**Science**	**Social Studies**
TPA6.01.01	Manufacturing and construction infrastructures form the basic framework of a system.	1. Writing, Oral Presentation, & Listening			
TPA6.01.02	Materials used in manufacturing and construction have different qualities and may be classified as natural, synthetic, or mixed.	1. Writing, Oral Presentation, & Listening 2. Reading Informative, Non-fiction & Technical Texts 4. Reading Fiction & Literary Texts		2: Materials and Their Properties	
TPA6.01.03	Manufacturing and construction systems can be classified by type, such as customized or mass production.	1. Writing, Oral Presentation, & Listening 2. Reading Informative, Non-fiction & Technical Texts			

Core Academic Content Standards

Technical and Practical Application of Technology Education					
ID #	**Performance Indicator**	**English Language Arts**	**Mathematics**	**Science**	**Social Studies**
TPA6.01.04	The interchangeability of parts increases the effectiveness of manufacturing and construction processes.	1. Writing, Oral Presentation, & Listening 2. Reading Informative, Non-fiction & Technical Texts			
TPA6.01.05	Emerging technologies help humans alter or modify natural materials to create new products.			2: Materials and Their Properties	
TPA6.01.06	Marketing involves establishing a product's identity; conducting research on the product's potential; and advertising, distributing, and selling the product.		4. Quantitative Reasoning 8. Connections		E1 9-12a
TPA6.01.07	The selection of design for structures is based on factors such as building laws and codes, style, convenience, cost, climate, and function.				
TPA6.01.08	Structures are constructed through a variety of processes and procedures.			2: Materials and Their Properties	
TPA6.01.09	Constructed and manufactured products periodically undergo maintenance, alterations, or renovations to improve and prolong their function.				

English Language Arts Content Standards

And Enduring Understandings/Essential Questions

Students in Delaware public schools, using the processes of effective readers, writers, listeners, viewers, and speakers, will be able to:

ENGLISH LANGUAGE ARTS STANDARD ONE: USE WRITTEN AND ORAL ENGLISH APPROPRIATE FOR VARIOUS PURPOSES AND AUDIENCES.

Writing Enduring Understandings:

- Audience and purpose (e.g., to inform, persuade, entertain) influence the use of literary techniques (e.g., style, tone, word choice).
- Writers do not always say what they mean. Indirect forms of expression (e.g., satire, irony) require readers to read between the lines to find the intended meaning.
- Punctuation marks and grammar rules are like highway signs and traffic signals. They guide readers through the text to help avoid confusion.
- A writer selects a form based on his purpose.
- A writer's point of view is influenced by his experience.
- Conventions of language help readers understand what is being communicated.
- The purposeful use and non-use of language conventions help readers understand.
- A writer's word choice and syntax are characteristics of voice which help to personalize text.

Writing Essential Questions:

- Why write? What if writing didn't exist? Why share personal experiences in writing? To what extent is the pen mightier than the sword?
- How is written language different from spoken language? What makes writing worth reading?
- How do writers express their thoughts and feelings? Where do ideas for writing come from? What makes writing flow?
- How do effective writers hook and hold their readers? What makes writing easy to follow? What is the best beginning? What is the best ending? What is the best order (sequence)? What is a complete thought?
- Why am I writing? For whom? What am I trying to achieve through my writing? Who will read my writing? What will work best for my audience?
- Why does a writer choose the form of writing he/she does?
- What is the relationship between reader and writer?
- How do writers communicate clearly?
- To what extent do conventions of language impact communication?
- What is the voice thing, anyway?

- Why do we need grammar?

Oral Communication Enduring Understandings:

- Audience and purpose (e.g., inform, persuade, entertain) influence communication
- Speakers do not always say what they mean. Indirect forms of expression (e.g., eye contact, hand gestures, facial expressions) require the audience to read between the lines to find the intended meaning.
- The use of the voice (e.g., pitch, rate, volume, intonation) helps the audience understand the message.
- A speaker selects a form and organizational pattern based on his purpose.
- A speaker's point of view is influenced by his experience.
- Rhetorical devices (e.g., questioning, repetition, alliteration) help the speaker convey his message.
- A speaker's word choice and style are characteristics of voice which helps to personalize the message.
- Oral discourse helps to shape our lives and build connections to others; mastery of oral discourse can open up opportunities to individuals.
- Discussion creates a greater understanding of a variety of topics.
- Learning is about sharing different views and actively listening to those with different views

Oral Communication Essential Questions:

- Why share written ideas orally?
- How is spoken language different from written language?
- How can I communicate so others will listen?
- How do speakers express their thoughts and feelings? From where do ideas for speeches come?
- How do effective speakers hook and hold their audience? What is the best beginning? What is the best ending?
- Why am I speaking? For whom? What am I trying to achieve through my speech? Who is my audience?
- Why does a speaker choose the organizational pattern he/she does?
- What is the relationship between speaker and listener?
- How do speakers communicate clearly?
- What is the voice thing, anyway?
- What makes a good speech?
- How do authors use the resources of language to impact an audience?
- Why is a comprehensive vocabulary important to effective reading, writing, listening, and speaking?

English Language Arts Content Standards

And Enduring Understandings/Essential Questions

Students in Delaware public schools, using the processes of effective readers, writers, listeners, viewers, and speakers, will be able to:

ENGLISH LANGUAGE ARTS STANDARD TWO: CONSTRUCT, EXAMINE, AND EXTEND THE MEANING OF LITERARY, INFORMATIVE, AND TECHNICAL TEXTS THROUGH LISTENING, READING, AND VIEWING.

Reading Enduring Understandings:

- Great literature provides rich and timeless insights into the key themes, dilemmas, and challenges that we face. They present complex stories in which the inner and outer lives of human beings are revealed.
- Sometimes the author makes his/her meaning plain; often however, a reader must dig beneath the "surface" of the text to find the meaning.
- Reading for meaning often requires imagining conversation with and questioning of the author. You must consider and respond- very different from passively accepting or instantly liking or disliking.
- Just because you read the text doesn't mean you understood it. Just because you had a strong response to the text doesn't mean you understood it either.
- Different readers may respond to the same text in different ways. The better responses are those that provide that provide greater insight into the text and/or the issues raised.
- Good readers may use many strategies that work, and they quickly try another one when the one they are using doesn't work. They not only know many different strategies, but they never get stuck in persisting with one that isn't working.
- Good readers are never afraid or embarrassed to admit when they don't understand. Asking questions-of a text, of a teacher, of another reader-is what good readers do.
- Everyone is entitled to an opinion about what a text means, but the text supports some interpretations more than others.
- Different types of texts (e.g., narrative, mystery, biography, expository, persuasive) have different structures. Understanding a text's structure helps a reader better understand its meaning.
- The impact of a text on a reader is influenced by the reader's experience.
- The reader's interaction with text changes with time and experience.
- A good story has a pattern or plan.
- Good readers employ strategies to help them understand text.
- Understanding of text develops over time and experience.
- No opinion is privileged, but some are better than others.

- Different authors use techniques/strategies to convince readers. Readers must apply criteria to evaluate credibility of information.

Reading Essential Questions:

- What makes a book or story great? What is the relationship between popularity and greatness in literature? Is a “good read” always a great book?
- Why read fiction? Can a fictional story be “true”? What is the relationship between “fiction” and “truth”? Is historical fiction a contradiction?
- What is a story? How are stories from other places and times about me? Must a story have a moral? Must a story have heroes and villains? Should a story or fairy tale teach you something?
- Why read? What can we learn from print? Can all of our experiences be put into words? Does literature primarily reflect culture or shape it? To what extent is written text conservative and to what extent dangerous?
- What do good readers do? What do they do when do not understand? How do texts differ? How should I read different types of texts?
- What is the author saying? How do I know? What is the gist? What is the main idea? How do I read between the lines? How do I know I am getting the point and not merely imposing my views and experience?
- From whose viewpoint are we reading? What is the author’s angle or perspective? What should we do when texts or authors disagree?
- What’s new and what’s old here? Have we run across this idea before? So what? Does it matter?
- What lies beneath the surface of this text? (In fiction: symbol and theme; in nonfiction texts: assumptions, biases, preconceptions) How much does this matter? How can I uncover it?
- What is the relationship between reader and writer?
- How can a reader recognize truth in text?
- What does a reader gain from re-visiting or re-reading a text?
- How do you know a piece of text is worth reading more than once?
- What do you do when you do not understand everything in the text?
- To what extent does it matter that you do not understand the whole text?
- Under what conditions is an interpretation of text valid?
- How does literature reveal us to ourselves?

English Language Arts Content Standards

And Enduring Understandings/Essential Questions

Students in Delaware public schools, using the processes of effective readers, writers, listeners, viewers, and speakers, will be able to:

ENGLISH LANGUAGE ARTS STANDARD THREE: ACCESS, ORGANIZE, AND EVALUATE INFORMATION GAINED THROUGH LISTENING, READING, AND VIEWING.

Research Enduring Understandings:

- Good research comes from a variety of sources.
- Good researchers check information for accuracy and validity.
- Good researchers employ strategies to help them research information.
- Good researchers start with a clear purpose, topic, and audience when doing research.
- Good researchers present information without plagiarizing.
- Good researchers have criteria to determine sources that are authoritative.
- Good researchers extract information from sources and draw logical conclusions.

Research Essential Questions:

- Why conduct research?
- Why use technology for research?
- In what ways do researchers gather information?
- How does a researcher know information is accurate?
- Why check for validity and accuracy?
- Why do good researchers avoid plagiarizing?
- What is an authoritative source?
- What is a logical conclusion?
- What is the purpose for research?

English Language Arts Content Standards

And Enduring Understandings/Essential Questions

Students in Delaware public schools, using the processes of effective readers, writers, listeners, viewers, and speakers, will be able to:

ENGLISH LANGUAGE ARTS STANDARD FOUR: USE LITERARY KNOWLEDGE ACCESSED THROUGH PRINT AND VISUAL MEDIA TO CONNECT SELF TO SOCIETY AND CULTURE.

Reading Enduring Understandings:

- Great literature provides rich and timeless insights into the key themes, dilemmas, and challenges that we face. They present complex stories in which the inner and outer lives of human beings are revealed.
- Sometimes the author makes his/her meaning plain; often however, a reader must dig beneath the "surface" of the text to find the meaning.
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- What is the relationship between reader and writer?
- How can a reader recognize truth in text?
- What does a reader gain from re-visiting or re-reading a text?
- How do you know a piece of text is worth reading more than once?
- What do you do when you do not understand everything in the text?
- To what extent does it matter that you do not understand the whole text?
- Under what conditions is an interpretation of text valid?
- How does literature reveal us to ourselves?

Mathematics Standards

And Enduring Understandings/Essential Questions

Content Standards:

MATHEMATICS STANDARD ONE: NUMERIC REASONING

Students will develop **Numeric Reasoning** and an understanding of *Number and Operations* by solving problems in which there is a need to represent and **model real number**s verbally, physically, and symbolically; to **explain** the relationship between numbers; to determine the relative magnitude of **real number**s; to use operations with understanding; and to select appropriate methods of calculations from among mental math, paper-and-pencil, calculators, or computers.

Enduring Understandings:

- Numbers can be represented in multiple ways.
- The same operations can be applied in problem situations that seem quite different from one another.
- Being able to compute fluently means making smart choices about which tools to use and when to use them.
- Knowing the reasonableness of an answer comes from using good number sense and estimation strategies.

Essential Questions:

- What makes an estimate *reasonable*?
- What makes an answer *exact*?
- What makes a strategy both *effective* and *efficient*?
- What makes a solution *optimal*?

Mathematics Standards

And Enduring Understandings/Essential Questions

MATHEMATICS STANDARD TWO: ALGEBRAIC REASONING

Students will develop **Algebraic Reasoning** and an understanding of Patterns and Functions by solving problems in which there is a need to recognize and extend a variety of patterns; to progress from the concrete to the abstract using physical models, equations, and graphs; to describe, represent, and analyze relationships among variable quantities; and to analyze, represent, model, and describe real-world functional relationships.

Enduring Understandings

- Change is fundamental to understanding functions.
- Numbers or objects that repeat in predictable ways can be described or generalized.
- An operation can be "undone" by its inverse.
- Rules of arithmetic and algebra can be used together with notions of equivalence to transform equations and inequalities so solutions can be found.

Essential Questions:

- How can change be described mathematically?
- How are patterns of change related to the behavior of functions?
- How do mathematical models/representations shape our understanding of mathematics?

Mathematics Standards

And Enduring Understandings/Essential Questions

MATHEMATICS STANDARD THREE: GEOMETRIC REASONING

Students will develop **Geometric Reasoning** and an understanding of Geometry and Measurement by solving problems in which there is a need to recognize, construct, transform, analyze properties of, and discover relationships among geometric figures; and to measure to a required degree of accuracy by selecting appropriate tools and units.

Enduring Understandings:

- Two- and three-dimensional objects can be described, classified, and analyzed by their attributes.
- An object in a plane or in space can be oriented in an infinite number of ways while maintaining its size or shape.
- An object's location on a plane or in space can be described quantitatively.
- Linear measure, area, and volume are fundamentally different but may be related to one another in ways that permit calculation of one given the other.

Essential Questions:

- How does *what* we measure affect *how* we measure? How can space be defined through numbers/measurement?
- Why do we compare contrast and classify objects?
- How do decomposing and recomposing shapes help us build our understand of mathematics?
- How can transformations be described mathematically?

Mathematics Standards

And Enduring Understandings/Essential Questions

MATHEMATICS STANDARD FOUR: QUANTITATIVE REASONING

Students will develop **Quantitative Reasoning** and an understanding of Data Analysis and Probability by solving problems in which there is a need to collect, appropriately represent, and interpret data; to make inferences or predictions and to present convincing arguments; and to **model** mathematical situations to determine the probability.

Enduring Understandings:

- The question to be answered determines the data to be collected and how best to collect it.
- Basic statistical techniques can be used to analyze data in the workplace.
- The probability of an event can be used to predict the probability of future events.

Essential Questions:

- What is average?
- What makes a data representation useful?
- How does my sample affect confidence in my predication?
- What is fair?

Mathematics Standards

And Enduring Understandings/Essential Questions

Process Standards:

MATHEMATICS STANDARD FIVE: PROBLEM SOLVING

Students will develop their Problem Solving ability by engaging in developmentally appropriate problem-solving opportunities in which there is a need to use various approaches to investigate and understand mathematical concepts; to formulate their own problems; to find solutions to problems from everyday situations; to develop and apply **strategies** to **solve** a wide variety of problems; and to integrate mathematical reasoning, communication and connections.

Enduring Understandings:

- Mathematics can be used to solve problems outside of the mathematics classroom.
- Mathematics is built on reason and always makes sense.
- Reasoning allows us to *make* conjectures and to *prove* conjectures.
- Classifying helps us build networks of mathematical ideas.
- Precise language helps us express mathematical ideas and receive them.

Essential Questions:

- Is your plan working? Do you need to reconsider what you are doing?
- How are *solving* and *proving* different? How are *showing* and *explaining* different?
- How do you know when you have proven something?
- What does it take to **verify** a conjecture? How do you develop a convincing argument?
- How do you make sense of different strategies? How do you determine their strengths? Why do we classify? Why do we classify numbers? Why do we classify geometric objects? Why do we classify functions?

Mathematics Standards

And Enduring Understandings/Essential Questions

MATHEMATICS STANDARD SIX: REASONING AND PROOF

Students will develop their Reasoning and Proof ability by solving problems in which there is a need to investigate significant mathematical ideas in all content areas; to **justify** their thinking; to reinforce and extend their logical reasoning abilities; to reflect on and clarify their own thinking; to ask questions to extend their thinking; and to construct their own learning.

Enduring Understandings:

- Mathematics can be used to solve problems outside of the mathematics classroom.
- Mathematics is built on reason and always makes sense.
- Reasoning allows us to *make* conjectures and to *prove* conjectures.
- Classifying helps us build networks of mathematical ideas.
- Precise language helps us express mathematical ideas and receive them.

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- How are *solving* and *proving* different? How are *showing* and *explaining* different?
- How do you know when you have proven something?
- What does it take to **verify** a conjecture? How do you develop a convincing argument?
- How do you make sense of different strategies? How do you determine their strengths and weaknesses? How do you determine similarities and differences?
- Why do we classify? Why do we classify numbers? Why do we classify geometric objects? Why do we classify functions?

Mathematics Standards

And Enduring Understandings/Essential Questions

MATHEMATICS STANDARD SEVEN: COMMUNICATION

Students will develop their mathematical Communication ability by solving problems in which there is a need to obtain information from the real world through reading, listening and observing; to translate this information into mathematical language and symbols; to process this information mathematically; and to present results in written, oral, and visual formats.

Enduring Understandings:

- Mathematics can be used to solve problems outside of the mathematics classroom.
- Mathematics is built on reason and always makes sense.
- Reasoning allows us to *make* conjectures and to *prove* conjectures.
- Classifying helps us build networks of mathematical ideas.
- Precise language helps us express mathematical ideas and receive them.

Essential Questions:

- Is your plan working? Do you need to reconsider what you are doing?
- How are *solving* and *proving* different? How are *showing* and *explaining* different?
- How do you know when you have proven something?
- What does it take to **verify** a conjecture? How do you develop a convincing argument?
- How do you make sense of different strategies? How do you determine their strengths and weaknesses? How do you determine similarities and differences?
- Why do we classify? Why do we classify numbers? Why do we classify geometric objects? Why do we classify functions?

Mathematics Standards

And Enduring Understandings/Essential Questions

MATHEMATICS STANDARD EIGHT: CONNECTIONS

Students will develop mathematical Connections by solving problems in which there is a need to view mathematics as an integrated whole and to integrate mathematics with other disciplines, while allowing the flexibility to approach problems, from within and outside mathematics, in a variety of ways.

Enduring Understandings:

- Mathematics can be used to solve problems outside of the mathematics classroom.
- Mathematics is built on reason and always makes sense.
- Reasoning allows us to *make* conjectures and to *prove* conjectures.
- Classifying helps us build networks of mathematical ideas.
- Precise language helps us express mathematical ideas and receive them.

Essential Questions:

- Is your plan working? Do you need to reconsider what you are doing?
- How are *solving* and *proving* different? How are *showing* and *explaining* different?
- How do you know when you have proven something?
- What does it take to **verify** a conjecture? How do you develop a convincing argument?
- How do you make sense of different strategies? How do you determine their strengths and weaknesses? How do you determine similarities and differences?
- Why do we classify? Why do we classify numbers? Why do we classify geometric objects? Why do we classify functions?

Science Standards

And Enduring Understandings/Essential Questions

Content Standards:

SCIENCE STANDARD ONE: NATURE AND APPLICATION OF SCIENCE AND TECHNOLOGY

Science is a human endeavor involving knowledge learned through inquiring about the natural world. Scientific claims are evaluated and knowledge changes as a result of using the abilities and understandings of inquiry. The pursuit of scientific knowledge is a continuous process involving diverse people throughout history. The practice of science and the development of technology are critical pursuits of our society.

Enduring Understandings:

- Scientific inquiry involves asking scientifically-oriented questions, collecting evidence, forming explanations, connecting explanations to scientific knowledge and theory, and communicating and justifying the explanation.
- The development of technology and advancement in science influence each other and drive each other forward.
- Understanding past processes and contributions is essential in building scientific knowledge.

Essential Questions:

- What makes a question scientific? What constitutes evidence? When do you know you have enough evidence? Why is it necessary to justify and communicate an explanation?
- How do science and technology influence each other?
- How have past scientific contributions influenced current scientific understanding of the world? What do we mean in science when we say that we stand on the shoulders of giants?

Science Standards

And Enduring Understandings/Essential Questions

SCIENCE STANDARD TWO: MATERIALS AND THEIR PROPERTIES

Materials exist throughout our physical world. The structures of materials influence their physical properties, chemical reactivity and use.

Enduring Understandings:

- The structures of materials determine their properties.
- People develop new materials as a response to the needs of society and the pursuit of knowledge. This development may have risks and benefits to humans and the environment.

Essential Questions:

- How do the properties of materials determine their use?
- How do you know which material is best for a particular product or need? What determines if new materials need to be developed? Why should people consider the risks and benefits before the production of new materials and/or the implementation of a new process?

Science Standards

And Enduring Understandings/Essential Questions

SCIENCE STANDARD THREE: ENERGY AND ITS EFFECTS

The flow of energy drives processes of change in all biological, chemical, physical, and geological systems. Energy stored in a variety of sources can be transformed into other energy forms, which influence many facets of our daily lives. The forms of energy involved and the properties of the materials involved influence the nature of the energy transformations and the mechanisms by which energy is transferred. The conservation of energy is a law that can be used to analyze and build understandings of diverse physical and biological systems.

Enduring Understandings:

- Energy takes many forms. These forms can be grouped into types of energy that are associated with the motion of mass (kinetic energy), and types of energy associated with the position of mass and with energy fields (potential energy).
- Changes take place because of the transfer of energy. Energy is transferred to matter through the action of forces. Different forces are responsible for the transfer of the different forms of energy.
- Energy readily transforms from one form to another, but these transformations are not always reversible. The details of these transformations depend upon the initial form of the energy and the properties of the materials involved. Energy may transfer into or out of a system and it may change forms, but the total energy cannot change.
- People utilize a variety of resources to meet the basic and specific needs of life. Some of these resources cannot be replaced. Other resources can be replenished or exist in such vast quantities they are in no danger of becoming depleted. Often the energy stored in resources must be transformed into more useful forms and transported over great distances before it can be helpful to us.

Essential Questions:

- How do we know that things have energy?
- How can energy be transferred from one material to another? What happens to a material when energy is transferred to it?
- What happens to the energy in a system — where does this energy come from, how is it changed within the system, and where does it ultimately go? How does the flow of energy affect the materials in the system?
- What is a “responsible” use of energy? Are there alternative forms of energy that will serve our needs, or better ways of using traditional forms of energy?

Science Standards

And Enduring Understandings/Essential Questions

SCIENCE STANDARD FOUR: EARTH IN SPACE

Our Solar System is a collection of gravitationally interacting bodies that include Earth and the Moon. Universal principles of gravitation allow predictions regarding the motions of objects within the Galaxy and beyond. Earth's motion, position, and posture account for a variety of cyclic events observable from Earth. While the composition of planets vary considerably, their components and the applicable laws of science are universal. The motions and interactions of objects within the Solar System are consistent with the hypothesis that it emerged from a large disk of gas and dust. Our Solar System is part of the Milky Way Galaxy, which, in turn, is one of many galaxies in the known Universe.

Enduring Understandings:

- What predictable, observable patterns occur as a result of the interaction between the Earth, Moon, and Sun?
- How has technology expanded our knowledge of the Earth, Moon, and Sun System?

Essential Questions:

- Enduring Understanding: There are observable, predictable patterns of movement in the Earth, Moon, and Sun system that account for day and night.
- Enduring Understanding: Technology expands our knowledge of the Earth, Moon, and Sun System.

Science Standards

And Enduring Understandings/Essential Questions

SCIENCE STANDARD FIVE: EARTH'S DYNAMIC SYSTEMS

Earth's dynamic systems are made up of the solid earth (geosphere), the oceans, lakes, rivers, glaciers and ice sheets (hydrosphere), the atmosphere, and organisms (biosphere). Interactions among these spheres have resulted in ongoing changes to the system. Some of these changes can be measured on a human time scale, but others occur so slowly, that they must be inferred from geological evidence.

Enduring Understandings:

- Earth's systems can be broken down into individual components which have observable measurable properties.
- Earth's components form systems. These systems continually interact at different rates of time, affecting the Earth locally and globally.
- Technology enables us to better understand Earth's systems. It also allows us to analyze the impact of human activities on Earth's systems and the impact of Earth's systems on human activity.

Essential Questions:

- How does understanding the properties of Earth materials and the physical laws that govern their behavior lead to prediction of Earth events?
- How do changes in one part of the Earth system affect other parts of the system? In what ways can Earth processes be explained as interactions among spheres?
- How does technology extend human senses and understanding?

Science Standards

And Enduring Understandings/Essential Questions

SCIENCE STANDARD SIX: LIFE PROCESSES

The natural world is defined by organisms and life processes which conform to principles regarding conservation and transformation of matter and energy. Living organisms use matter and energy to build their structures and conduct their life processes, and have mechanisms and behaviors to regulate their internal environments and to respond to changes in their surroundings. Knowledge about life processes can be applied to improving human health and well being.

Enduring Understandings:

- Living systems demonstrate the complementary nature of structure and function.
- All organisms transfer matter and convert energy from one form to another. Both matter and energy are necessary to build and maintain structures within the organism.
- Organisms respond to internal and external cues, which allow them to survive.
- The life processes of organisms are affected by their interactions with each other and their environment, and may be altered by human manipulation.

Essential Questions:

- How does structure relate to function in living systems?
- How is matter transferred and energy transferred/transformed in living systems?
- How do responses to internal and external cues aid in an organism's survival?
- What can we do to benefit the health of humans and other organisms?

Science Standards

And Enduring Understandings/Essential Questions

SCIENCE STANDARD SEVEN: DIVERSITY AND CONTINUITY OF LIVING THINGS

The natural world consists of a diversity of organisms that transmit their characteristics to future generations. Living things reproduce, develop, and transmit traits, and theories of evolution explain the unity and diversity of species found on Earth. Knowledge of genetics, reproduction, and development is applied to improve agriculture and human health.

Enduring Understandings:

- Organisms reproduce, develop, have predictable life cycles, and pass on heritable traits to their offspring.
- The diversity and changing of life forms over many generations is the result of natural selection, in which organisms with advantageous traits survive, reproduce, and pass those traits to offspring.
- The development of technology has allowed us to apply our knowledge of genetics, reproduction, development and evolution to meet human needs and wants.

Essential Questions:

- Why do offspring resemble their parents? How do organisms change as they go through their life cycles?
- How are organisms of the same kind different from each other? How does this help them reproduce and survive?
- How does the understanding and manipulation of genetics, reproduction, development and evolution affect the quality of human life?

Science Standards

And Enduring Understandings/Essential Questions

SCIENCE STANDARD EIGHT: ECOLOGY

Organisms are linked to one another in an ecosystem by the flow of energy and the cycling of materials. Humans are an integral part of the natural system and human activities can alter the stability of ecosystems.

Enduring Understandings:

- Organisms and their environments are interconnected. Changes in one part of the system will affect other parts of the system.
- Matter needed to sustain life is continually recycled among and between organisms and the environment. Energy from the sun flows irreversibly through ecosystems and is conserved as organisms use and transform it.
- Humans can alter the living and non-living factors within an ecosystem, thereby creating changes to the overall system.

Essential Questions:

- How can change in one part of an ecosystem affect change in other parts of the ecosystem?
- How do matter and energy link organisms to each other and their environments? Why is sunlight essential to life on Earth?
- How do humans have an impact on the diversity and stability of ecosystems?

Social Studies Standards

And Enduring Understandings/Essential Questions

Content Standards:

CIVICS STANDARD ONE: GOVERNMENT

Students will examine the structure and purposes of governments with specific emphasis on constitutional democracy.

Enduring Understandings:

- Students will understand that Constitutional democracy as a structure of government developed from the tension between the need for authority and the need to constrain authority.
- Students will understand that governments are structured to address the basic needs of the people in a society.

Civics Standard One 9-12a

Students will analyze the ways in which the structure and purposes of different governments around the world reflect differing ideologies, cultures, values, and histories.

Essential Question

- What is the relationship between the political culture and experiences of a country and the form and structure of its government?

Social Studies Standards

And Enduring Understandings/Essential Questions

CIVICS STANDARD TWO: POLITICS

Students will understand the principles and ideals underlying the American political system..

Enduring Understanding

- Students will understand that the principles and ideals underlying American democracy are designed to promote the freedom of the American people.

Civics Standard Two 9-12a

Students will examine and analyze the extra-Constitutional role that political parties play in American politics.

Essential Questions:

- To what extent are political parties necessary to democracy? Why do two political parties dominate in America but other democracies have more?
- Under what conditions might political parties evolve or collapse?

Civics Standard Two 9-12b

Students will understand that the functioning of the government is a dynamic process which combines the formal balances of power incorporated in the Constitution with traditions, precedents, and interpretations which have evolved over the past 200 years.

Essential Questions:

- What problems would arise if a government failed to adapt to changing needs and desires of the people?
- To what extent do the structures and traditional processes of government minimize the dangers of change?

Social Studies Standards

And Enduring Understandings/Essential Questions

CIVICS STANDARD THREE: CITIZENSHIP

Students will understand the responsibilities, rights, and privileges of United States citizens.

Enduring Understandings:

Students will understand that:

- Effective citizens are committed to protecting rights for themselves, other citizens, and future generations, by upholding their civic responsibilities and are aware of the potential consequences of inaction.
- Distinctions between a citizen's rights, responsibilities, and privileges help to define the requirements and limits of personal freedom.

Civics Standard Three 9-12a

Students will understand that citizens are individually responsible for keeping themselves informed about public policy issues on the local, state, and federal levels; participating in the civic process; and upholding the laws of the land.

Essential Question:

- What are the consequences of citizens not participating in democracy?

Social Studies Standards

And Enduring Understandings/Essential Questions

CIVICS STANDARD FOUR: PARTICIPATION

Students will develop and employ the civic skills necessary for effective, participatory citizenship.

Enduring Understandings:

- Students will understand that effective citizens can research issues, form reasoned opinions, support their positions, and engage in the political process.
- Students will understand that effective governance requires responsible participation from diverse individuals who translate beliefs and ideas into lawful action and policy.

Civics Standard Four 9-12a

Students will develop and employ the skills necessary to work with government programs and agencies.

Essential Question:

- How should private citizens and interest groups most effectively communicate with government?

Civics Standard Four 9-12b

Students will understand the process of working within a political party, a commission engaged in examining public policy, or a citizen's group.

Essential Question:

- How should groups engaged in political activities organize to accomplish their goals?

Social Studies Standards

And Enduring Understandings/Essential Questions

ECONOMICS STANDARD ONE: MICROECONOMICS

Students will analyze the potential costs and benefits of personal economic choices in a market economy.

Enduring Understandings:

- Students will understand that due to scarcity, individuals, families, communities, and societies as a whole, must make choices in their activities and consumption of goods and services.
- Students will understand that goods, services, and resources in a market economy are allocated based on the choices of consumers and producers.
- Students will understand that effective decision making requires comparing the additional costs of alternatives relative to the additional benefits received.

Economics Standard One 9-12a

Students will demonstrate how individual economic choices are made within the context of a market economy in which markets influence the production and distribution of goods and services.

Essential Questions:

- To what extent does economic self-interest (individual consumers and producers) contribute to the greater good?
- Does competition ensure efficiency?
- To what extent do government policies affect markets?
- How might markets create incentives that impact decisions of individual consumers, producers, and government?

Social Studies Standards

And Enduring Understandings/Essential Questions

ECONOMICS STANDARD TWO: MACROECONOMICS

Students will examine the interaction of individuals, families, communities, businesses, and governments in a market economy.

Enduring Understandings:

- Students will understand that a nation's overall levels of income, employment, and prices are determined by the interaction of spending and production decisions made by all households, firms, government, and trading partners.
- Students will understand that because of interdependence, decisions made by consumers, producers, and government impact a nation's standard of living.
- Students will understand that market economies are dependent on the creation and use of money, and a monetary system to facilitate exchange.

Economics Standard Two 9-12a

Students will develop an understanding of how economies function as a whole, including the causes and effect of inflation, unemployment, business cycles, and monetary and fiscal policies.

Essential Questions:

- Why is our economy interdependent?
- How might government policy decisions affect the stability of the economy?

Social Studies Standards

And Enduring Understandings/Essential Questions

ECONOMICS STANDARD THREE: ECONOMIC SYSTEMS

Students will understand different types of economic systems and how they change.

Enduring Understandings:

- Students will understand that because resources are scarce, societies must organize the production, distribution, and allocation of goods and services.
- Students will understand that the way societies make economic decisions depends on cultural values, availability and quality of resources, and the extent and use of technology.
- Students will understand that changing economic systems impact standards of living.

Economics Standard Three 9-12a

Students will analyze the wide range of opportunities and consequences resulting from the current transitions from command to market economies in many countries.

Essential Questions:

- Why do some economies in transition experience success and others fail?
- Why might citizens of a society question whether an increase in the standard of living improves the quality of life?

Social Studies Standards

And Enduring Understandings/Essential Questions

ECONOMICS STANDARD FOUR: INTERNATIONAL TRADE

Students will examine the patterns and results of international trade.

Enduring Understandings:

- Students will understand that individuals and nations trade when all parties expect to gain.
- Students will understand that nations with different economic systems often specialize and become interdependent as a result of international trade.
- Students will understand that government actions that promote competition and free trade among people and nations increase the health of an economy and the welfare of nations.

Economics Standard Four 9-12a

Students will analyze and interpret the influence of the distribution of the world's resources, political stability, national efforts to encourage or discourage trade, and the flow of investment on patterns of international trade.

Essential Questions:

- To what extent is a nation's standard of living related to its trading patterns?
- How might changes in trading patterns affect the distribution of income and quality of life globally?
- To what extent should developed nations trade with less developed nations?

Social Studies Standards

And Enduring Understandings/Essential Questions

GEOGRAPHY STANDARD ONE: MAPS

Students will develop a personal geographic framework, or "mental map," and understand the uses of maps and other geographics.

Enduring Understandings:

- Students will understand that mental maps summarize differences and similarities about places. These differences and similarities lead to conflict or cooperation and the exchange of goods and ideas between peoples.
- Students will understand that mental maps change as the scale moves from local to global; we know more about our home area than more distant places; and these differences affect how we feel and behave towards places that are distant versus those that are close.
- Students will understand the ways mapped patterns are analyzed and used help solve societal problems.
- Students will understand that maps can be used to distort or introduce bias into the information they portray.

Geography Standard One 9-12a

Students will identify geographic patterns which emerge when data is mapped, and analyze mapped patterns through the application of such common geographic principles as "hierarchy," "accessibility," "diffusion" and "complementarity."

Essential Questions:

- To what extent is competition or interaction between places influenced by their relative location and accessibility?
- How might the position of a place in a settlement hierarchy affect the life of the people in that place?
- What makes it likely or unlikely that people and/or goods will flow between two points?

Geography Standard One 9-12b

Students will apply the analysis of mapped patterns to the solution of problems.

Essential Question

- How might societal problems be posed so that they are open to solution through geographic map analysis?

Social Studies Standards

And Enduring Understandings/Essential Questions

GEOGRAPHY STANDARD TWO: ENVIRONMENT

Students will develop a knowledge of the ways humans modify and respond to the natural environment.

Enduring Understanding

- Students will understand that the human response to the characteristics of a physical environment comes with consequences for both the human culture and the physical environment.

Geography Standard Two 9-12a

Students will understand the Earth's physical environment as a set of interconnected systems (ecosystems) and the ways humans have perceived, reacted to, and changed environments at local to global scales.

Essential Questions:

- To what extent can people predict the consequences from human alterations to the physical environment?
- Why might focusing on how people perceive the risks and resources of the natural environment help to explain human behavior in different parts of the world?

Social Studies Standards

And Enduring Understandings/Essential Questions

GEOGRAPHY STANDARD THREE: PLACES

Students will develop an understanding of the diversity of human culture and the unique nature of places.

Enduring Understandings:

- Students will understand that places are unique associations of natural environments and human cultural modifications.
- Students will understand that Concepts of site and situation can explain the uniqueness of places. As site or situation change, so also does the character of a place.

Geography Standard Three 9-12a

Students should understand the processes which result in distinctive cultures, economic activity and settlement form in particular locations across the world.

Essential Questions:

- Why are some places more culturally diverse or similar than others?
- To what extent does the culture of a place change over time?

Social Studies Standards

And Enduring Understandings/Essential Questions

GEOGRAPHY STANDARD FOUR: REGIONS

Students will develop an understanding of the character and use of regions and the connections between and among them.

Enduring Understandings:

- Students will understand that a region is a concept rather than a real object on the ground, used to simplify the diversity of places.
- Students will understand that regions must have boundaries to exist, yet there advantages and disadvantages associated with any real or abstract feature used to draw a boundary.

Geography Standard Four 9-12a

Students will apply knowledge of the types of regions and methods of drawing boundaries to interpret the Earth's changing complexity.

Essential Questions:

- How might regional analysis help to solve societal problems?
- To what extent are regional boundaries permanent? What might cause them to change over time?

Social Studies Standards

And Enduring Understandings/Essential Questions

HISTORY STANDARD ONE: CHRONOLOGY

Students will employ chronological concepts in analyzing historical phenomena.

Enduring Understandings:

- History is often messy, yet a historian must logically organize events, recognize patterns and trends, explain cause and effect, make inferences, and draw conclusions from those sources which are available at the time.
- The questions a historian chooses to guide historical research that creates accurate chronologies will affect which events will go into the chronology and which will be left out. Competing chronologies can both be accurate, yet may not be equally relevant to the specific topic at hand.

History Standard One 9-12a

Students will analyze historical materials to trace the development of an idea or trend across space or over a prolonged period of time in order to explain patterns of historical continuity and change.

Essential Questions:

- Were contemporary issues also problematic for past societies? Why are those issues difficult? Is there a pattern of continuity or change?
- To what extent can we learn from studying historical responses to societal problems?

Social Studies Standards

And Enduring Understandings/Essential Questions

HISTORY STANDARD TWO: ANALYSIS

Students will gather, examine, and analyze historical data.

Enduring Understandings:

- Many different types of sources exist to help us gather information about the past, such as artifacts and documents. Sources about the past need to be critically analyzed and categorized as they are used.
- Critical investigation demands constant reassessment of one's research strategies.
- A historian must prove where the information can be found that is the basis for historical conclusions.

History Standard Two 9-12a

Students will develop and implement effective research strategies for investigating a given historical topic.

History Standard Two 9-12b

Students will examine and analyze primary and secondary sources in order to differentiate between historical facts and historical interpretations.

Essential Questions:

- What is the evidence for this argument? Is that all the evidence, or just what the author wanted me to read?
- Does differentiating between fact and interpretation matter?

Social Studies Standards

And Enduring Understandings/Essential Questions

HISTORY STANDARD THREE: INTERPRETATION

Students will interpret historical data.

Enduring Understandings:

- What is written by a historian depends upon that historian's personal background and methods, the questions asked about the sources, and the sources used to find the answers to those questions.
- Historians select important events from the past they consider worthy of being taught to the next generation. That selection process, deciding what to emphasize, and the questions that historians ask of the documents and other evidence, contributes significantly to the conclusions drawn.
- History is what the historian says it is. Historians may collect, use, and emphasize sources in ways that result in differing interpretations as they describe, compare, and interpret historical phenomena. Disagreement between historians about the causes and effects of historical events may result from these differences.

History Standard Three 9-12a

Students will compare competing historical narratives, by contrasting different historian's choice of questions, use and choice of sources, perspectives, beliefs, and points of view, in order to demonstrate how these factors contribute to different interpretations.

Essential Questions:

- Does the way research is conducted matter?
- To what degree is historical investigation about the historian as much as the history? Is it necessary to include an investigation of the writer in regard to what we read?
- Is there such a thing as completely unbiased history?