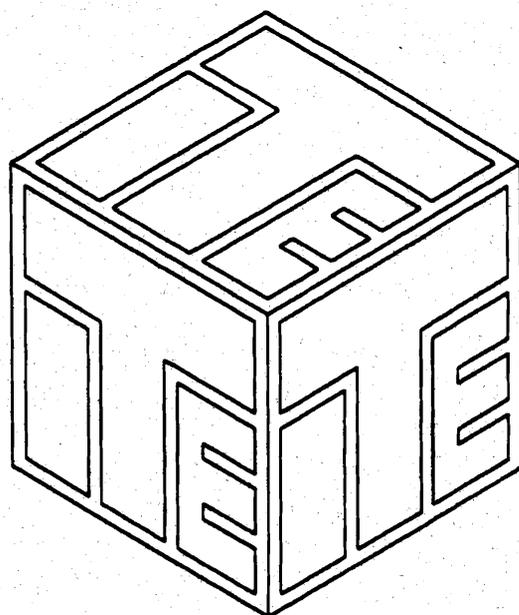
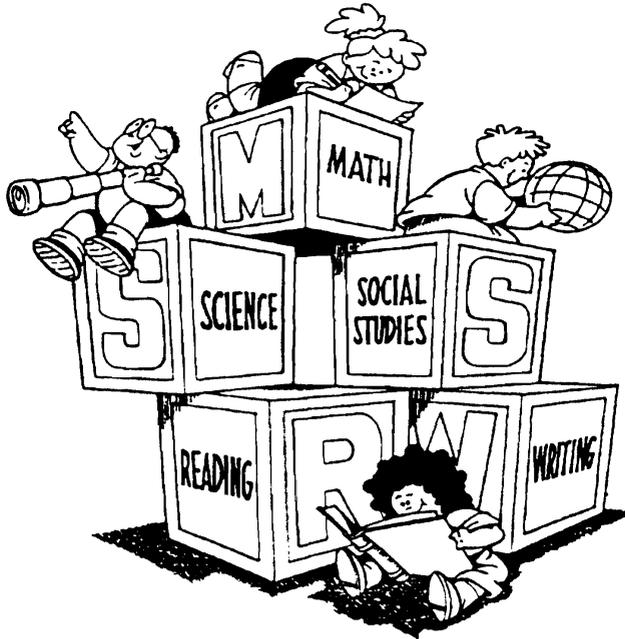


NEBRASKA K-12 FRAMEWORK



INDUSTRIAL
TECHNOLOGY
EDUCATION



The *Nebraska K-12 Industrial Technology Education Framework* was developed by the Nebraska Department of Education through funding provided by the Carl D. Perkins Vocational and Applied Technology Education Act with the State of Nebraska and Nebraska Department of Education general funds.

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Dear Colleagues:

The Department of Education is committed to the principle of providing quality education for all students. Our commitment is expressed in the High Performance Learning Model, a model that offers guidance to local school districts as they plan and implement school improvement activities including the redesign of their curriculum. The High Performance Learning Model identifies essential areas which school districts may consider in school improvement plans.

High Performance Learning requires quality curriculum and instructional programs and practices. Curriculum frameworks are essential strategies for designing quality curriculum and the instructional programs and practices necessary for quality teaching and learning.

The Department intends that curriculum frameworks be used by local schools in examining current curriculum, determining important revisions and considering the implementation of national standards. *The Nebraska K-12 Industrial Technology Education Framework* identifies essential content knowledge and skills and does so in a manner that provides direction without being prescriptive.

This framework utilizes the High Performance Learning Model by identifying the essential skills and concepts that should be integrated throughout the Industrial Technology Education curricula. The framework enhances the vision of school-to-work and lifelong learning by actively engaging students in an activity-based curriculum.

It is the intent of the *Nebraska K-12 Industrial Technology Education Framework* to provide guidance and support to enhance learning for all students in the State of Nebraska. The Framework is a resource for local curriculum planning and program improvement.

Sincerely,



DOUGLAS D. CHRISTENSEN, Ph.D.
Commissioner of Education

THE NEBRASKA K-12 INDUSTRIAL TECHNOLOGY EDUCATION FRAMEWORK

The Nebraska K – 12 Industrial Technology Education Framework is designed to provide direction for the local school districts as they plan and evaluate their Industrial Technology Education curriculum offerings.

This framework identifies student performance standards, defining what students should know and be able to do upon completion of an Industrial Technology Education program.

The framework was developed based upon the themes: communication technology, construction technology, manufacturing technology, and transportation technology. Teams of Industrial Technology Education instructors and business and industry representatives developed performance standards for each theme.

The writing teams represented a diverse cross-section of school sizes, philosophical beliefs and geographic locations. The efforts of these dedicated individuals have resulted in an excellent resource for all Industrial Technology Education instructors in Nebraska.

In January 2000, the Framework Advisory Team met to review and make recommendations to the Framework as part of a project that was to create the cross walk to the Nebraska L.E.A.R.N.S. At this time the decision was made to maintain the Framework as is, but to add coding that could be used with the new ITE LINKS to L.E.A.R.N.S. standards.

We believe that by using the framework, schools can provide the best possible Industrial Technology Education program for ALL students in Nebraska.



Bob Phelps, Director
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Tony Glenn, Consultant
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ACKNOWLEDGMENTS

Recognition and appreciation are extended to the many individuals who contributed to the development of the Nebraska Industrial Technology Education Framework. Special thanks are extended to Colleen Hill of California State University, Long Beach, for facilitating the writing portion of the project.

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Nebraska State Education Association
Nebraska Industrial Technology Education Association
Nebraska Vocational Association
Nebraska Council of Industrial Technology Teacher Educators
Nebraska Department of Education Curriculum Leaders
International Technology Education Association
Industrial Technology Teachers
City Industrial Technology Education Administrators
Nebraska Council on Vocational Education
School Administrators
Cooper Foundation

Special thanks goes to Diana Michael, Professional Assistant for Industrial Technology Education at the Nebraska Department of Education for her excellence in designing and formatting the Framework document, and for her excellent skills as a recorder during the writing process.

NEBRASKA K-12 INDUSTRIAL TECHNOLOGY EDUCATION FRAMEWORK

TABLE OF CONTENTS

Preface	i
Foreword from the Commissioner of Education	ii
Letter to Colleagues	iii
Acknowledgments	iv
Introduction	1
Industrial Technology Education	2
Framework Structure	4
Definition of Terms	5
Universal Systems Model	7
Industrial Technology Education Performance Standards	9
Elementary Industrial Technology Education	11
Communication Technology	15
Construction Technology	23
Manufacturing Technology	31
Transportation Technology	39

INTRODUCTION

INDUSTRIAL TECHNOLOGY EDUCATION

Historical Development

Industrial Technology Education has evolved from manual training, manual arts, and industrial arts education and continues to be an essential part of education in Nebraska. Changes in technology and society, and their industrial applications, have brought about these curricular changes. While Industrial Technology Education's predecessors focused on psychomotor job preparation, Industrial Technology Education integrates technological literacy and societal responsibility with occupational skill development.

This natural progression, from industrial arts education to Industrial Technology Education, provides all Nebraska students with the opportunity to integrate academic and vocational skills in an activity-based environment. *The Nebraska K-12 Industrial Technology Education Framework* identifies performance standards for elementary through high school Industrial Technology Education programs.

Industrial Technology Education is by its nature the study of adaption. Humans have had to develop tools, machines, and processes that allow individuals and society to advance as a whole. Society has learned to recognize and celebrate the diversity of thought, abilities, and interests of individuals. Without diversity, many of the great innovations of technology would never have happened. It is necessary to provide students with a challenging atmosphere that is accepting and encouraging of diversity. Industrial Technology Education provides students with the opportunity to make their own decisions based on their own wants and needs rather than be limited by outside forces.

The vision of Industrial Technology Education is to provide all Nebraska students with the skills necessary to become technologically literate, contributing members of society who will flourish in the information-based, global society of the 21st century.

Industrial Technology Education Defined

Industrial Technology Education is a comprehensive activity-based educational program concerned with technical means, their evolution, utilization, and significance with industry; it investigates industry's organization, personnel, systems, techniques, resources, and products. Industrial Technology Education also considers social/cultural impacts and provides opportunity for occupational preparation.

In Nebraska, the four curricular areas that encompass Industrial Technology Education are: communication, construction, manufacturing, and transportation. These four curricular areas are utilized as the topical strands in this Framework.

Mission Statement

The mission of Industrial Technology Education is to prepare individuals to comprehend and contribute to a society influenced by technology.

Purpose of The Framework

Industrial Technology Education is an integral part of the curriculum in Nebraska schools. Industrial Technology Education provides for the continuing needs of society. As technology changes, society's educational needs change.

The *Nebraska K-12 Industrial Technology Education Framework* is designed to assist administrators and teachers in planning, developing, and implementing Industrial Technology Education programs. It provides a philosophical foundation and a broad outline from which educators may construct comprehensive Industrial Technology Education programs. The materials presented will aid local educational systems to:

- Plan local curricula
- Develop local philosophy
- Define local scope and sequence
- Evaluate the extent to which the performance standards are contained in current curricular offerings
- Identify curricular content and instructional strategies

FRAMEWORK STRUCTURE

The *Nebraska K-12 Industrial Technology Education Framework* is divided into three levels: elementary, middle, and high school with standards focused on awareness, exploration, and preparation. The framework has been formatted into four topical strands and six conceptual threads encompassing these three levels.

Topical Strands in Industrial Technology Education

Four major topical strands are used in the *Nebraska K-12 Industrial Technology Education Framework*. These topical strands are intended to be organizers in development of local curriculum. The topical strands are: communication, construction, manufacturing, and transportation. Although each strand is developed separately, connections are implied between the topical strands.

Each topical strand begins with a definition and a rationale, followed by performance standards. The development of course content and objectives is the responsibility of individual school districts.

Conceptual Threads in Industrial Technology Education

The *Nebraska K-12 Industrial Technology Education Framework* is unified by six conceptual threads which tie the topical strands together. The conceptual threads are:

- Systems
- Resources
- Integrated skills
- Characteristics, impacts and development
- Problem solving/decision making
- Career information/transition

Each conceptual thread interacts with the four topical strands. Each thread is defined in the Definition of Terms for its conceptual use in the *Nebraska K-12 Industrial Technology Education Framework*.

DEFINITION OF TERMS

Awareness	The development of a basic understanding of industry and technology.
Basic Skills	The ability to read, write, perform mathematical computations, listen, and speak effectively.
Employability Skills	Attributes identified by industry required for successful employment, including personal qualities and occupational skills.
Exploration	Manipulation and experimentation with industrial and technological processes.
Framework	Frameworks define, support, and set parameters for key ideas, concepts and practices of curriculum and instructional design, development, and implementation.
Performance Standard	Industrial Technology Education Performance Standards are benchmarks that designate student ability levels.
Preparation	Development of occupational skills related to industry and technology.
Problem-solving Approach	A systematic approach used to reach a solution to a problem. This approach consists of identifying a problem, obtaining information, forming a hypothesis, testing the hypothesis, applying the solution, and evaluating its effectiveness.
Strand	A topical organizer in the development of local curriculum; not to be confused with a course title.
Technology	Technology is the application of knowledge, tools, and skills to solve practical problems and extend human capabilities.
Thread	A common concept across the curriculum.
Universal Systems Approach	A model with four standard components: input, process, output, feedback. The model is used to analyze the elements of a system.

Threads Defined

Systems	A group of components working together or influencing each other to achieve a common goal.
Characteristics, Impacts and Development	Knowledge of the nature of technology, the relationships and impacts among technological achievements, the interaction of the environment, the advancement of science and industry, individuals, and society. The context for this knowledge shall be historical, current and futuristic.
Problem Solving/ Decision Making	<p>Problem solving is the ability to define the problem, collect and analyze information and resources and then apply knowledge and skills to determine a workable solution and/or construction of a workable design.</p> <p>Decision making is the assessment of problems, and selection of appropriate solutions from an identified set of choices.</p>
Resources	Knowledge and skilled application of industrial resources to perform technological processes. Industrial resources include: people, information, space, tools, machines, materials, energy, capital and time.
Integrated Skills	Application of mathematical concepts, scientific principles, communication, measurement and other basic skills.
Career Information/ Transition	Development and application of the skills and knowledge related to current and future employment opportunities.

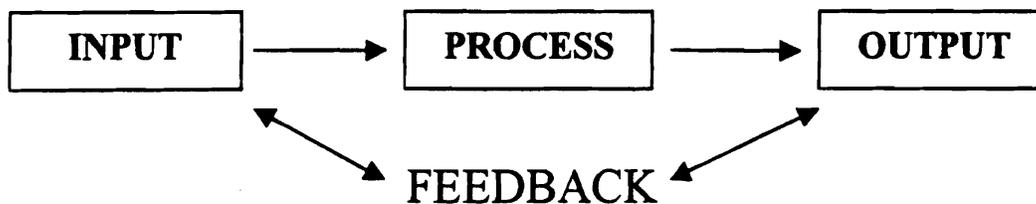
UNIVERSAL SYSTEMS MODEL

The UNIVERSAL SYSTEMS MODEL is a tool which can be used to organize content, analyze problems, or structure a discipline. *The Nebraska K-12 Industrial Technology Education Framework* provides this model to enhance its interwoven perspective of the threads, strands, and performance standards.

A system suggests a group of components working together or influencing each other to achieve a common goal. Industrial Technology Education has multiple systems which work together to enable students to develop a holistic understanding of content.

Throughout recorded history humans have been described as communicators, transporters, and producers of structures and products. Humans have engaged in these roles to satisfy the need for food, clothing, and shelter, as well as to provide additional goods and services to extend their potential. Therefore, Industrial Technology Education comprises a study of the four technical human adaptive systems of communication, construction, manufacturing, and transportation.

The major content areas of Industrial Technology Education can be represented systematically using a universal model for systems. The elements of the universal systems model are input, process, and output. Feedback is the evaluation loop of the system (see graphic below).



INPUT is the command given to the system and the resources to be used to produce the desired result. The input command is based on the desired result the system is expected to achieve.

PROCESS is the action of the system. Techniques and resources are used to provide this action to achieve the desired goal. Each content area has a unique set of processes that accompanies the appropriate input and output.

OUTPUT is the result or goal desired or undesired, of the system.

FEEDBACK is the ongoing evaluation and adjustment of the system.

NOTES

**INDUSTRIAL
TECHNOLOGY
EDUCATION
PERFORMANCE
STANDARDS**

INDUSTRIAL TECHNOLOGY EDUCATION PERFORMANCE STANDARDS

Industrial Technology Education Performance Standards are benchmarks that designate student ability levels upon completion of specific units of study.

Rationale: Performance standards provide a means to promote consistency, coordination, and continuity from one program to another. They define goals and promote positive change while identifying what every student should know, be able to do, and value within Industrial Technology Education.

Performance standards may be applied to:

- Selecting instructional processes
- Review existing curriculum
- Adapt and modify curriculum
- Develop new curriculum

**Each Performance Standard Statement
is to be prefaced with the statement:**

“The successful student will . . .”

**ELEMENTARY
INDUSTRIAL
TECHNOLOGY
EDUCATION**

Elementary Industrial Technology Education

Youth should be prepared for the world in which they live. Experiences should be provided that discover, develop, release, and realize individual potential. Because society is distinctly characterized as technological, it becomes a function of Nebraska schools to provide every student an insight and understanding of technology.

Technology is the application of knowledge, tools, and skills to solve practical problems and extend human capabilities. It is essential that elementary students gain an awareness of the technological nature of society.

Nebraska schools should implement Industrial Technology Education at all levels. Elementary school technology experiences should be included in the educational goals of all elementary students.

The elementary-level performance standards have been consolidated in one chart on the following page. They also appear throughout the document with each individual strand.

Elementary Industrial Technology Education				
	Communications	Construction	Manufacturing	Transportation
Systems	<ul style="list-style-type: none"> • Develop an awareness of basic technological systems and identify the components of the systems 			
Characteristics, Impacts & Development	<ul style="list-style-type: none"> • Apply concepts, processes, and skills to explore the impact of industrial technology in every day life • Recognize the inter-relationship among technology, people, and the environment in the past, present, and future 			
Problem Solving/ Decision Making	<ul style="list-style-type: none"> • Use a technical process to solve a problem and explain its relationship to decision making 			
Resources	<ul style="list-style-type: none"> • Select resources available in performing technological processes at home, school, and in the community 			
Integrated Skills	<ul style="list-style-type: none"> • Use industrial technology to reinforce and apply mathematical concepts, scientific principles, language arts, and other basic skills 			
Career Information/ Transition	<ul style="list-style-type: none"> • Develop an awareness of careers related to industrial technology 			

NOTES

COMMUNICATION TECHNOLOGY

Communication Technology

Definition: **Communication Technology** is the application of knowledge, skills, and resources to send and receive information.

Rationale: **Communication Technology** is studied to help learners:

- Clarify the concepts of: design, encoding, storing, retrieving, transmitting, receiving and decoding information
- Understand communication channels and interaction of humans and/or machines
- Communicate efficiently and effectively
- Create solutions to communication problems
- Make informed decisions as consumers of goods and services
- Inter-relate communication with construction, manufacturing, and transportation
- Explore careers and/or educational opportunities in communication

Communication Technology

	Level	ITE Code	Performance Standard
Systems [CM 1.0]	Elementary		<ul style="list-style-type: none"> • Develop an awareness of basic technological systems and identify the components of the systems
	Middle	CM 8.1.1	<ul style="list-style-type: none"> • Explain how the human sensory system contributes to communication
		CM 8.1.2	<ul style="list-style-type: none"> • Demonstrate an example of audio, visual, and/or audio-visual communication
	High School	CM 12.1.1	<ul style="list-style-type: none"> • Design and evaluate an effective audio, visual, and/or audio-visual communication system
		CM 12.1.2	<ul style="list-style-type: none"> • Analyze the input, process, output, and feedback processes of a communication system
		CM 12.1.3	<ul style="list-style-type: none"> • Analyze the interaction of humans and machines

Communication Technology

Characteristics, Impacts & Development [CM 2.0]	Level	ITE Code	Performance Standard
	Elementary		<ul style="list-style-type: none"> • Apply concepts, processes, and skills to explore the impacts of industrial technology in every day life • Recognize the inter-relationship among technology, people, and the environment in the past, present, and future
	Middle	CM 8.2.1 CM 8.2.2 CM 8.2.3	<ul style="list-style-type: none"> • Explore electronic, graphic, light, optic, and acoustic modes of communication • Recognize the interaction of communication systems and gender/cultural diversity • Send, receive, and understand verbal and non-verbal messages/information
	High School	CM 12.2.1 CM 12.2.2 CM 12.2.3	<ul style="list-style-type: none"> • Compare and contrast the past, present, and future characteristics, impacts, and developments of the communication systems • Apply electronic, graphic, light, optic, and acoustic modes to send, receive, and process information • Integrate gender/cultural diversity into a communication system

Communication Technology

Communication Technology			
Problem Solving/ Decision Making [CM 3.0]	Level	ITE Code	Performance Standard
	Elementary		<ul style="list-style-type: none"> • Use a technical process to solve a problem and explain its relationship to decision making
	Middle	CM 8.3.1 CM 8.3.2	<ul style="list-style-type: none"> • Apply a problem-solving process to arrive at a workable solution to a communication problem • Interact in a group to make informed decisions
	High School	CM 12.3.1	<ul style="list-style-type: none"> • Develop and analyze the solution to a problem of information transfer

Communication Technology

Resources [CM 4.0]	Level	ITE Code	Performance Standard
	Elementary		<ul style="list-style-type: none"> • Select resources available in performing technological processes at home, school, and in the community
	Middle	CM 8.4.1 CM 8.4.2	<ul style="list-style-type: none"> • Identify and safely apply communication resources to inform, persuade, or entertain • Develop skills to process information
	High School	CM 12.4.1 CM 12.4.2	<ul style="list-style-type: none"> • Compare, contrast, and safely utilize resources to inform, persuade, or entertain in the home, school, and community • Develop and apply skills in electronic, graphic, light, optic, and acoustic modes to send, receive, and process information

Communication Technology

Integrated Skills [CM 5.0]	Level	ITE Code	Performance Standard
	Elementary		<ul style="list-style-type: none"> • Use industrial technology to reinforce and apply mathematical concepts, scientific principles, language arts, and other basic skills
	Middle	CM 8.5.1	<ul style="list-style-type: none"> • Reinforce systems of communication by exploring and applying knowledge and skills from other curricular areas
	High School	CM 12.5.1	<ul style="list-style-type: none"> • Recognize knowledge and skills from other curricular areas and apply them to enhance systems of communication

Communication Technology

Career Information/ Transition [CM 6.0]	Level	ITE Code	Performance Standard
	Elementary		<ul style="list-style-type: none"> • Develop an awareness of careers related to industrial technology
	Middle	CM 8.6.1 CM 8.6.2	<ul style="list-style-type: none"> • Explore careers and opportunities related to the communication industry • Practice employability skills
	High School	CM 12.6.1 CM 12.6.2	<ul style="list-style-type: none"> • Choose and plan an experience in related fields of individual interest • Assess and implement employability skills

CONSTRUCTION TECHNOLOGY

Construction Technology

Definition: **Construction Technology** is the application of knowledge, skills, and resources in the planning and production of a structure.

Rationale: **Construction Technology** is studied to help learners:

- Develop skills to repair and maintain existing structures
- Develop skills to construct new structures
- Gain an awareness of the impacts of the construction industry
- Develop skills for employment and/or further education related to the construction industry
- Inter-relate construction with communication, manufacturing, and transportation
- Explore careers and/or educational opportunities in construction

Construction Technology

Construction Technology			
Systems [CT 1.0]	Level	ITE Code	Performance Standard
	Elementary		<ul style="list-style-type: none"> • Develop an awareness of basic technological systems and identify the components of the systems
	Middle	CT 8.1.1 CT 8.1.2	<ul style="list-style-type: none"> • Identify and use methods and techniques of construction • Identify the types of construction: light, commercial, industrial, and civil
	High School	CT 12.1.1 CT 12.1.2 CT 12.1.3	<ul style="list-style-type: none"> • Differentiate between and apply the methods and techniques of construction • Differentiate between the types of construction • Differentiate between the dependence and independence of construction sub-systems

Construction Technology

Characteristics, Impacts & Development [CT 2.0]	Level	ITE Code	Performance Standard
	Elementary		<ul style="list-style-type: none"> • Apply concepts, processes, and skills to explore the impacts of industrial technology in every day life • Recognize the inter-relationship among technology, people, and the environment in the past, present, and future
	Middle	CT 8.2.1 CT 8.2.2 CT 8.2.3 CT 8.2.4	<ul style="list-style-type: none"> • Summarize the history of the construction industry • Recognize the impact of technology on the construction industry • Recognize the impact of workforce diversity • Describe characteristics of the various types of construction: light, commercial, industrial, and civil
	High School	CT 12.2.1 CT 12.2.2 CT 12.2.3 CT 12.2.4	<ul style="list-style-type: none"> • Determine and describe how society and the environment have been affected or influenced by the construction industry • Predict how the construction industry is likely to be affected by technology • Identify the effects on the construction industry of workforce diversity • Describe the relationship among the various types of construction: light, commercial, industrial, and civil

Construction Technology

Problem Solving/ Decision Making [CT 3.0]	Level	ITE Code	Performance Standard
	Elementary		<ul style="list-style-type: none"> • Use a technical process to solve a problem and explain its relationship to decision making
	Middle	CT 8.3.1 CT 8.3.2	<ul style="list-style-type: none"> • Apply a problem-solving approach to solve a problem • Apply decision-making skills to select appropriate resources
	High School	CT 12.3.1 CT 12.3.2	<ul style="list-style-type: none"> • Apply a problem-solving approach to solve an advanced problem and analyze the solution • Apply decision-making skills to select appropriate resources

Construction Technology			
Resources [CT 4.0]	Level	ITE Code	Performance Standard
	Elementary		<ul style="list-style-type: none"> • Select resources available in performing technological processes at home, school, and in the community
	Middle	CT 8.4.1 CT 8.4.2 CT 8.4.3 CT 8.4.4 CT 8.4.5	<ul style="list-style-type: none"> • Safely operate tools and equipment appropriate for the construction industry • Introduce and develop skills related to the construction industry • Develop craftsmanship in the construction process • Identify and use different types of construction materials • Describe resources used in the construction industry
	High School	CT 12.4.1 CT 12.4.2 CT 12.4.3 CT 12.4.4 CT 12.4.5	<ul style="list-style-type: none"> • Safely operate tools and equipment appropriate for the construction industry • Develop and refine skills related to the construction industry • Develop craftsmanship in the construction of a product • Select and use fasteners, adhesives, and appropriate construction materials • Utilize resources in the construction process, adhering to applicable codes

Construction Technology			
Integrated Skills [CT 5.0]	Level	ITE Code	Performance Standard
	Elementary		<ul style="list-style-type: none"> • Use industrial technology to reinforce and apply mathematical concepts, scientific principles, language arts, and other basic skills
	Middle	CT 8.5.1 CT 8.5.2 CT 8.5.3 CT 8.5.4	<ul style="list-style-type: none"> • Demonstrate the ability to measure accurately • Perform basic skills related to the construction industry • Interpret working drawings • Follow written and oral directions
	High School	CT 12.5.1 CT 12.5.2 CT 12.5.3 CT 12.5.4	<ul style="list-style-type: none"> • Utilize and convert measurements accurately • Apply blueprint reading skills to appropriate situations • Develop and comprehend written and oral directions • Refine and utilize basic skills related to the construction industry

Construction Technology			
Career Information/ Transition [CT 6.0]	Level	ITE Code	Performance Standard
	Elementary		<ul style="list-style-type: none"> • Develop an awareness of careers related to industrial technology
	Middle	CT 8.6.1 CT 8.6.2 CT 8.6.3	<ul style="list-style-type: none"> • Identify employability skills • Practice employability skills • Explore current and future career paths and opportunities
	High School	CT 12.6.1 CT 12.6.2 CT 12.6.3	<ul style="list-style-type: none"> • Model appropriate employability skills • Examine career paths through work experience and/or educational opportunities in construction • Explore current and future employment opportunities

NEBRASKA K-12 INDUSTRIAL TECHNOLOGY EDUCATION FRAMEWORK

MANUFACTURING TECHNOLOGY

Manufacturing Technology

Definition: Manufacturing Technology is the application of knowledge, skills, and resources produce goods.

Rationale: Manufacturing Technology is studied to help learners:

- Develop an understanding of the organization of manufacturing
- Create solutions to manufacturing problems
- Select and apply appropriate tools, materials, and processes to safely produce goods
- Make informed economic and time-management decisions
- Inter-relate manufacturing with communication, construction, and transportation
- Explore careers and/or educational opportunities in manufacturing

Manufacturing Technology			
Systems [MA 1.0]	Level	ITE Code	Performance Standard
	Elementary		<ul style="list-style-type: none"> • Develop an awareness of basic technological systems and identify the components of the systems
	Middle	MA 8.1.1 MA 8.1.2 MA 8.1.3	<ul style="list-style-type: none"> • Explain what it means to manufacture a quality product • Recognize the four components of the systems approach in the manufacturing of a product • Demonstrate the basic processes involved in custom fabrication and mass production
	High School	MA 12.1.1 MA 12.1.2 MA 12.1.3	<ul style="list-style-type: none"> • Implement the four components of a system in the manufacturing of a product • Apply the advanced systematic processes involved in custom fabrication and mass production • In a prescribed setting, perform advanced operation representative of those utilized in manufacturing

Manufacturing Technology

Characteristics, Impacts & Development [MA 2.0]	Level	ITE Code	Performance Standard
	Elementary		<ul style="list-style-type: none"> • Apply concepts, processes, and skills to explore the impacts of industrial technology in every day life • Recognize the inter-relationship among technology, people, and the environment in the past, present, and future
	Middle	MA 8.2.1 MA 8.2.2 MA 8.2.3 MA 8.2.4 MA 8.2.5	<ul style="list-style-type: none"> • Develop an awareness and address the effect manufacturing has on the environment • Identify evolving manufacturing technologies • Develop an appreciation for products and inventors • Recognize historical contributions of men and women of different cultures in the advancement of manufacturing • Identify and describe the differences between renewable and exhaustible resources
	High School	MA 12.2.1 MA 12.2.2 MA 12.2.3 MA 12.2.4	<ul style="list-style-type: none"> • Develop an awareness and address the effect manufacturing has on the environment • Identify and apply evolving manufacturing technologies • Research and analyze the economics of a competitive market • Examine historical contributions of men and women of different cultures in the advancement of manufacturing

Manufacturing Technology			
Problem Solving/ Decision Making [MA 3.0]	Level	ITE Code	Performance Standard
	Elementary		<ul style="list-style-type: none"> • Use a technical process to solve a problem and explain its relationship to decision making
	Middle	MA 8.3.1 MA 8.3.2	<ul style="list-style-type: none"> • Employ a systematic model for problem-solving in materials processing and production • Identify and describe different approaches to formal and informal problem-solving
	High School	MA 12.3.1 MA 12.3.2 MA 12.3.3	<ul style="list-style-type: none"> • Utilize team work and individual ingenuity to solve technical problems in manufacturing • Suggest and analyze ideas that could be implemented to resolve problems in manufacturing • Employ higher-order thinking skills for solving manufacturing problems

Manufacturing Technology

Resources [MA 4.0]	Level	ITE Code	Performance Standard
	Elementary		<ul style="list-style-type: none"> • Select resources available in performing technological processes at home, school, and in the community
	Middle	MA 8.4.1 MA 8.4.2 MA 8.4.3 MA 8.4.4	<ul style="list-style-type: none"> • Demonstrate safe use of tools and machinery • Identify characteristics of industrial materials and how they are processed • Develop an awareness of the impacts manufacturing has on society and the environment • Identify, select and use resources in the solution of a problem to produce a product
	High School	MA 12.4.1 MA 12.4.2 MA 12.4.3 MA 12.4.4 MA 12.4.5 MA 12.4.6 MA 12.4.7	<ul style="list-style-type: none"> • Apply tools, materials, machines, processes, and technical concepts safely and efficiently to a prescribed situation • Evaluate and explain differences between characteristics of industrial materials • Demonstrate separating, forming, and combining in manufacturing a product • Meet or exceed product and processing specifications (i.e. measurements) • Demonstrate skills necessary to adapt to an ever-changing global environment • Develop and implement a plan to use manufacturing resources in the solution of a problem • Demonstrate ingenuity and creativity in the use of manufacturing resources

Manufacturing Technology			
Integrated Skills [MA 5.0]	Level	ITE Code	Performance Standard
	Elementary		<ul style="list-style-type: none"> • Use industrial technology to reinforce and apply mathematical concepts, scientific principles, language arts, and other basic skills
	Middle	MA 8.5.1 MA 8.5.2 MA 8.5.3	<ul style="list-style-type: none"> • Demonstrate the ability to integrate basic skills into the manufacturing process • Identify common units of measurement associated with manufacturing materials • Use team work to accomplish a common goal in manufacturing
	High School	MA 12.5.1 MA 12.5.2 MA 12.5.3 MA 12.5.4 MA 12.5.5 MA 12.5.6 MA 12.5.7	<ul style="list-style-type: none"> • Implement cross-curricular experiences in order to reach a common goal • Interpret data to manufacture a product • Evaluate and explain the importance of specifications in the production of a product • Demonstrate the ability to integrate basic skills into the manufacturing process • Demonstrate the use of common unity of measurement associated with manufacturing materials • Demonstrate the ability to work as a team member on the solution of manufacturing problems • Demonstrate the ability to comprehend written and oral directions in manufacturing a product

Manufacturing Technology

Career Information/ Transition [MA 6.0]	Level	ITE Code	Performance Standard
	Elementary		<ul style="list-style-type: none"> • Develop an awareness of careers related to industrial technology
	Middle	MA 8.6.1 MA 8.6.2	<ul style="list-style-type: none"> • Investigate educational opportunities and employment requirements related to manufacturing careers • Investigate career opportunities related to manufacturing
	High School	MA 12.6.1 MA 12.6.2	<ul style="list-style-type: none"> • Examine career paths through work experience and/or educational opportunities in manufacturing • Demonstrate employability skills required to make a transition from school to a manufacturing career

TRANSPORTATION TECHNOLOGY

Transportation Technology

Definition: **Transportation Technology** is the application of knowledge, skills, and resources move people and/or products.

Rationale: **Transportation Technology** is studied to help learners:

- Understand propulsion, suspension, and guidance systems in transportation
- Understand control and support systems in transportation
- Develop skill in maintenance and management of transportation systems
- Make informed decisions concerning transportation systems
- Apply concepts of energy, power and mechanics
- Inter-relate transportation with communication, construction, and manufacturing
- Explore careers and/or educational opportunities in transportation

Transportation Technology

Systems [TR 1.0]	Level	ITE Code	Performance Standard
	Elementary		<ul style="list-style-type: none"> • Develop an awareness of basic technological systems and identify the components of the systems
	Middle	TR 8.1.1 TR 8.1.2	<ul style="list-style-type: none"> • Identify characteristics of energy, power, and mechanics • Identify and discuss land, marine, air, and space transportation systems
	High School	TR 12.1.1 TR 12.1.2	<ul style="list-style-type: none"> • Examine and illustrate land, marine, air and space transportation systems • Apply and refine the skills and knowledge gained in the sub-systems of propulsion, suspension, guidance, control, support, and structure

Transportation Technology			
Characteristics, Impacts & Development [TR 2.0]	Level	ITE Code	Performance Standard
	Elementary		<ul style="list-style-type: none"> • Apply concepts, processes, and skills to explore the impacts of industrial technology in every day life • Recognize the inter-relationship among technology, people, and the environment in the past, present, and future
	Middle	TR 8.2.1 TR 8.2.2	<ul style="list-style-type: none"> • Identify and list characteristics of transportation • List historical factors, current impacts, and predict possible future impacts of innovative transportation technologies
	High School	TR 12.2.1 TR 12.2.2 TR 12.2.3	<ul style="list-style-type: none"> • Identify and evaluate the characteristics of transportation • Research and present historical factors, current impacts, and predict the possible future impacts of innovative transportation technologies • Predict and support with research the impact a shift in the availability of a selected input would have on a transportation system

Transportation Technology			
Problem Solving/ Decision Making [TR 3.0]	Level	ITE Code	Performance Standard
	Elementary		<ul style="list-style-type: none"> • Use a technical process to solve a problem and explain its relationship to decision making
	Middle	TR 8.3.1 TR 8.3.2 TR 8.3.3 TR 8.3.4	<ul style="list-style-type: none"> • Recognize factors and opportunities in developing a solution to a transportation problem • Apply a problem-solving approach to solve a problem • Formulate decisions based on information and time available • Identify individual task assignments in a group problem-solving situation
	High School	TR 12.3.1 TR 12.3.2 TR 12.3.3	<ul style="list-style-type: none"> • Research, apply, evaluate factors, and opportunities in developing a solution to a transportation problem • Apply an appropriate method of problem-solving • Assign and implement appropriate tasks in a problem-solving activity

Transportation Technology			
Resources [TR 4.0]	Level	ITE Code	Performance Standard
	Elementary		<ul style="list-style-type: none"> • Select resources available in performing technological processes at home, school, and in the community
	Middle	TR 8.4.1 TR 8.4.2	<ul style="list-style-type: none"> • Select and manipulate resources necessary in transportation • Identify and evaluate inputs, processes, and outputs used based on form, function, and aesthetic needs
	High School	TR 12.4.1 TR 12.4.2	<ul style="list-style-type: none"> • Identify, apply, and evaluate resources in transportation • Analyze various inputs, processes, and outputs to formulate decisions based on form, function, and aesthetic needs

Transportation Technology

Integrated Skills [TR 5.0]	Level	ITE Code	Performance Standard
	Elementary		<ul style="list-style-type: none"> • Use industrial technology to reinforce and apply mathematical concepts, scientific principles, language arts, and other basic skills
	Middle	TR 8.5.1	<ul style="list-style-type: none"> • Identify and list the basic skills, thinking skills, and personal qualities needed to produce a desired outcome or product
	High School	TR 12.5.1 TR 12.5.2	<ul style="list-style-type: none"> • Identify, list, and refine the basic skills and qualities needed to produce a desired outcome or product • Apply the knowledge, skills, and resources of other disciplines to a transportation activity

Transportation Technology			
Career Information/ Transition [TR 6.0]	Level	ITE Code	Performance Standard
	Elementary		<ul style="list-style-type: none"> • Develop an awareness of careers related to industrial technology
	Middle	TR 8.6.1 TR 8.6.2	<ul style="list-style-type: none"> • Identify the process of exploring a career • Describe a career path in an area of interest
	High School	TR 12.6.1 TR 12.6.2 TR 12.6.3	<ul style="list-style-type: none"> • Plan, apply, and evaluate the process of exploring a career • Evaluate a career choice based on skill and interest of learner and job characteristics • Examine and experience various means of making the transition from school to work